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WHITE PAPER

Scalable Windows Servers for the Datacenter

Sponsored by: HP and Intel

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Executive Summary

The market for scalable servers running the Microsoft Windows Server 2003 operating system is growing, and HP is supporting that trend with offerings from its Integrity server product line, which uses the Intel Itanium 2 processor. The increasing availability of larger servers running the Microsoft operating system is driven by the availability of 64-bit editions of Microsoft Windows Server 2003 and their support for 64-bit scalable servers, including the HP Integrity line of servers. Workloads such as large databases, line-of-business (LOB) applications, and business intelligence (BI) that traditionally demand high-performance enterprise servers are well supported by HP's scalable Windows environment.

IDC believes that the market for scalable servers running the 64-bit Windows Server 2003 (referred to as Windows in the balance of this paper) operating system will grow over time. In some cases, these servers will provide resources for workloads that have outgrown smaller servers; in other cases, scalable Windows servers will support workloads that have previously been hosted by other operating environments. Trends such as the move to consolidate workloads on fewer, larger servers also drive growth in this segment.

Workloads such as business intelligence, database, decision support, and ERP applications — which are already available for Windows operating environments — are expanding to reach more users and to process more corporate data in many organizations. These workloads can sometimes outgrow smaller servers, prompting a search for scalable servers that can host those workloads, and manage them more easily in a datacenter environment. Server consolidation for Windows workloads is another driver of the need for scalable Windows servers.

The process of IT transformation built on a new generation of hardware and software products will result in both scale-up and scale-out server deployments. In some cases, customers will choose to link multiple servers with clustering or grid software to support a given workload. In others, the processing power of larger, scalable servers will be needed to support large single system image (SSI) databases or to ensure the highest levels of availability and manageability for mission-critical applications.

Introduction

The market for scalable servers — including midrange and high-end servers — running Windows is growing. Until recently, the number of server vendors providing scalable servers running Windows was relatively small on a worldwide basis. Now servers running 64-bit Windows are available from large server vendors and also from a number of small start-up firms, providing hardware platforms for scalable workloads accessed by large numbers of end users and for large databases supporting enterprise applications.

IDC Worldwide Server Data

IDC worldwide server data shows that servers using Windows generated about $16 billion in customer revenue in 2004. Based on IDC's latest annual forecast, the Windows server segment is expected to grow to $23 billion in 2009 and to become the largest single operating system–defined segment of the worldwide server market. Windows technology now runs on servers across all three categories of the worldwide server market, as follows:

- Millions of units are sold annually in the *volume server* market, which comprises servers priced at less than $25,000. Most of these units are 1-way or 2-way systems.
- Tens of thousands of units are sold annually in the *midrange enterprise server* market, which comprises servers priced from $25,000 to $499,999. Most of these units are 2-way to 8-way servers.
- Many hundreds of units are sold in the *high-end enterprise server* market, which comprises servers priced at $500,000 or more. Most of these units are larger than 8-way servers.

Scalable servers are a segment of the worldwide Windows-based server market. IDC server research shows that servers running Windows as the primary operating system account for more than 30% of all factory revenue in the worldwide market. Today, most of these Windows servers are based on x86 architecture, but annual IDC server data shows that an increasing number, including scalable midrange and high-end servers, are based on EPIC (i.e., Itanium processor–based) architecture. IDC expects the market for EPIC servers to grow to more than $6 billion in 2009, more than four times the size of the market for EPIC servers in 2004, in terms of customer revenue.

With the entire computing ecosystem in the worldwide server market moving to 64-bit and multicore processor technologies, the capabilities of underlying server hardware based on new processor technology to support mission-critical enterprise workloads have improved, and this improvement in turn has brought Windows workloads to a new level of capability within the enterprise datacenter. As a result, servers running Windows are now available to take on enterprise workloads that traditionally have been assigned to midrange and high-end servers based on RISC and CISC architectures and running a variety of operating systems other than Microsoft Windows.

Key Market Drivers

Three key developments have strengthened the case for deploying scalable midrange enterprise and high-end enterprise servers to support mission-critical workloads in a Windows operating environment. Those developments are related to the availability of the following technologies:

- **64-bit Windows.** In April 2003, Microsoft shipped 64-bit versions of Microsoft Windows Server 2003, Enterprise Edition, and Microsoft Windows Server 2003, Datacenter Edition, and both are now available on scalable server hardware, including versions for Itanium processor–based servers and for x86-64 servers. The Datacenter Edition is designed for 8-way to 64-way servers, and the Enterprise Edition is designed for smaller 1-way to 8-way servers. Microsoft has been shipping 64-bit Windows for servers using Itanium processors, either in early release or in production, for nearly two years.

- **Scalable servers that run Windows.** Windows now runs on several types of processor architectures. Scalable servers are available that use x86-32, x86-64, or EPIC (i.e., Itanium processor–based) architectures. The x86-32 and x86-64 categories, which IDC groups together in the x86 category, continue to account for the largest number of unit shipments in the worldwide server market, and most of those servers have four or fewer processors. The opportunity for Windows to run on scalable servers built with Itanium processors is increasing. Windows on Itanium processor–based scalable servers with four or more processors is still relatively new in the worldwide server market and grew in 2004 and 2005 as a result of the wider availability of 64-bit Windows and more ISV support for Windows applications and databases.
- **Enterprise software for Windows environments.** A wider range of scalable enterprise-class software products — such as ERP, database, and business intelligence software from a variety of software vendors — now runs under Windows. For example, Microsoft introduced SQL Server 2005 in the fall of 2005 to support a wider range of workloads for corporate databases housing multiple terabytes of mission-critical data. Other new features support high transaction rates in reading and writing data to the database engine itself, allowing the database to scale more easily and to meet the demands of large numbers of concurrent users. The development of these server-side software products underscores Microsoft's support for datacenter systems, including scalable server systems that can be partitioned to run a variety of workloads.

Windows Servers and IT Workloads

Historically, the most scalable workloads have remained on large symmetrical multiprocessing (SMP) servers running operating systems other than Windows, with large numbers of smaller servers running Windows supporting a wide spectrum of applications and workloads throughout the enterprise. Today, larger SMP servers are available with 64-bit Windows and 64-bit applications that can take advantage of this computing platform.

The inventory of applications for Windows runs deep and, in many cases, overlaps with the inventory of applications for servers running Unix. IDC's annual workloads study, which is based on interviews with personnel at more than 1,000 IT sites, found that Unix and Windows operating environments coexist in more than 80% of the sites studied. Moreover, Windows skill sets are already widely deployed in mixed-vendor computing environments.

Multitier Windows Server Deployments

Today, many IT sites leverage end-to-end applications that tap multiple servers as part of an enterprise solution that taps two or more servers in a networked computing environment. Scalable Windows servers in tiers 2 and 3 can host LOB applications or large databases that can be accessed by a variety of other servers, including smaller Windows servers that are deployed throughout an enterprise in tiers 1 and 2 of a three-tier computing environment.

Why are scalable Windows servers so useful in supporting growing applications and databases? Scalability, capacity, and balanced systems design are all important factors in providing scalable computing resources that can be seamlessly expanded, as needed, to support growing applications and databases. Importantly, this approach preserves the SMP programming model so that programmers do not need to write special codes or scripts that allow a growing application to run across a cluster of smaller Windows systems. Running the growing application on a single, large computer simplifies system management and allows applications and databases to run across more processors and memory, as the workload grows, over time.

Scalable Windows Servers and Workload Consolidation

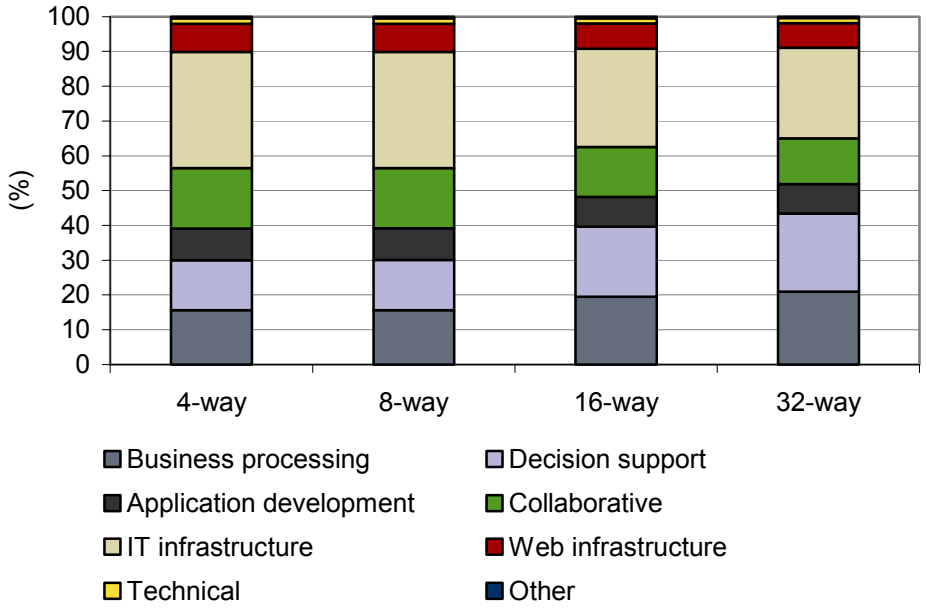
Consolidation of workloads is a powerful incentive to move mission-critical Windows workloads onto larger servers that provide advanced hardware and system management features. Scalable servers provide better support for larger SSI workloads, such as large databases, which can be viewed as a single, logical instance by large numbers of end users. Scalable server resources also can be allocated to workloads with hardware-defined and software-defined partitions. Furthermore, scalable servers have advanced workload management software that moves workloads to available resources, as needed.

Figure 1 shows the variety of workloads that scalable Windows servers support and the mix of workloads, which changes as the server processor count increases. For example, business processing and decision support workloads grow as a percentage of processor usage as server hardware increases in capability. Scalable servers have the ability to provision workloads with processing resources within a partition and to adjust the partition's resources, as needed.

IDC's annual workloads study found a broad range of infrastructure and enterprise workloads running on Windows. Further, IDC found that IT staffers with Windows skill sets are most likely to move enterprise workloads to scalable Windows systems. Workloads running on servers using Windows include all major categories studied in IDC's workloads research: IT infrastructure (file/print, network protocol support); Web infrastructure (Web serving, proxy, cache); collaborative (email and groupware); decision support (including database-oriented workloads); and business processing (enterprise applications such as ERP, OLTP, and BI). Both decision support and business processing workloads typically leverage databases that are running on the same server or on another server in the next "tier" of computing. This shows how x86 servers and EPIC servers can coexist, and interoperate, across the tiers — often supporting end-to-end applications.

FIGURE 1

Worldwide Windows Midrange and High-End Server Customer Revenue Share by Workload Category and CPU Capacity, 2004



Source: IDC, 2006

Business Requirements for Scalable Windows Deployments

When IT organizations evaluate new opportunities to deploy scalable Windows servers, they will frame their analysis with the following set of business requirements:

- **The need for applications to support more end users.** More end users can log on to scalable servers than individual smaller servers, allowing all of them to access a single system image. This capability is particularly important for users who need to access large corporate databases and data warehouses, which in turn can be leveraged for analysis via BI workloads. Scalable servers are needed to provide sufficient processing capability, larger and directly accessible memory, and greater I/O bandwidth.

- **Consolidation of Windows workloads.** More workloads can be supported by a single scalable server than by numerous smaller servers. Managing dozens, or even hundreds, of small servers has led to increasing operational costs for some IT organizations. Scale-out configurations work well for tier 1 Web serving and also for many types of applications in tier 2, but many workloads will benefit by being managed in a scalable server where workloads can span partitions, for example, and additional computing resources can be allocated, as needed, to support growing workloads.

- **Central-site system management.** Central-site management improves the granular controllability of workloads. The central-site IT staff can leverage Windows skill sets to provide more efficient system management (e.g., system administration, change management, provisioning, and application of security updates) when Windows workloads are run on fewer machines.

- **Drive for enhanced server utilization.** Many volume servers running in today's enterprises average just 10–15% utilization, especially volume servers deployed across tiers 1 and 2 of the IT infrastructure. Individual servers are often overprovisioned to meet the peaks and valleys of user demand, and as a result, these assets sit idly much of the time. Scalable servers can direct workloads to available compute resources. Partitions can be resized to match changing workload requirements. Some scalable servers support pay-per-use options that further enhance utilization.

- **Enhanced high-availability (HA) and reliability, availability, and serviceability (RAS) requirements.** Windows workloads benefit from support for HA features such as hardware redundancy, partitioning, and hot-swappable hardware components. Partitioning of computing resources, support for resource reallocation, error checking architectures, and advanced workload management across partitions combine to improve HA and robustness across scalable computing systems.

- **Support for business intelligence applications.** Business processing (BP) workloads, such as ERP, OLTP, and BI, benefit most from the availability of scalable server resources, such as large global memory for SMP servers and large cache sizes for paging and swapping of large data files. BP workloads benefit from faster I/O inside scalable systems and support for HA features, such as multipath I/O. Finally, BP workloads often generate a large number of procedures and data requests that are best processed on scalable servers.

- **Support for decision support workloads.** Applications that leverage corporate databases also require scalable servers. Databases tend to grow over time, and large SSI databases also demand large computing resources over time. In some cases, IT managers decide to scale *out* these workloads, using parallel databases to span multiple server systems that create a single view of the database. More commonly, however, IT organizations support growing databases by scaling *up* to a single larger server, using memory in a single address space and running a single database instance. In this case, the availability of 64-bit Windows on scalable servers provides a new opportunity to process larger datasets and to scale up Windows-based workloads.

- **Workload isolation for security and performance.** Scalable servers support multiple hardware-defined partitions, each of which runs a separate workload, so that Windows workloads can be run in isolated partitions (e.g., a database in one partition and applications in another partition). Some scalable systems even allow for workloads running under several different operating systems to be run in separate partitions, each running a different supported operating system. An application that is isolated within a partition cannot interfere with other applications in other partitions, and performance will not be affected by workloads running in other partitions. Security of the data and applications is also preserved through physical isolation. In some scalable systems, full electrical isolation between partitions further guarantees that each partition runs entirely independently.

- **Simplification of IT infrastructure.** Because many customer sites have three-tier architectures, scalable server systems allow customers to collapse the functionality of these tiers into a more scalable system that can be managed centrally. In many cases, managing hundreds of servers across tiers can prove to be complex, and consolidation can reduce soft costs associated with system administration, operations, and personnel.

HP Integrity Server Products

In 2003, HP launched its Integrity line of servers that utilized the Itanium processor. In the mid-1990s, HP and Intel began a partnership to develop a new category of processors tailored to server-based workloads. HP and Intel codesigned the original parallel-processing architecture that has resulted in Itanium processors. Today, Intel engineers run the entire design process, and Intel fabricates all processors, ensuring end-to-end management of processor design, engineering, fabrication, and distribution. The current Itanium processor technology is the Madison generation, which will be replaced by the dual-core Montecito in 2006.

HP and Intel have positioned Itanium processors as alternatives to RISC processors. When HP and Intel first partnered on the Itanium architecture and the initial processor (called Merced) in the 1990s, the intent was to replace RISC functionality and thus to compete directly with RISC architectures in the marketplace. This objective remains, and the Itanium processor's 64-bit architecture, its support for parallel-processing capabilities that improve the system's capacity to do work, and its floating-point processing features are all intended to compete directly with RISC processor offerings.

Positioning HP Integrity Servers

HP's Integrity servers compete on a worldwide basis with servers using RISC processors. HP believes that its Itanium processor–based Integrity servers offer equivalent functionality to other types of datacenter servers that host the most demanding mission-critical workloads, with performance levels that place the Integrity servers on the short list of top benchmark results for technical and commercial workloads. IDC notes that the scalable Integrity servers offer customers the option of mixing PA-RISC processors with Itanium processors, as IT sites consolidate Unix workloads and Windows workloads to run on the same Integrity server to simplify management and administration.

HP prices Integrity servers competitively so that they can be sold at lower prices than many RISC processor–based servers and traditional mainframe systems. This pricing is a key part of the overall value proposition for Integrity servers and indicates that HP is planning to stay beneath the price threshold of other types of scalable server systems with which Integrity servers will compete, including mainframes and RISC-based servers for the datacenter. HP uses a battery of benchmarks to demonstrate the performance, and the price/performance ratio, for these systems, which can then be compared with other industry benchmarks for other vendors. HP also positions the Integrity server line as manageable, flexible, and highly reliable.

Technical Overview of HP Integrity Servers

HP has leveraged its experience in enterprise computing to build its Integrity server product line. The six models of HP Integrity business-critical servers are shown in Table 1 along with socket count and chipset. Today, these servers use the Itanium 2 processor — and they are expected to support dual-core Itanium processors later this year. Smaller servers use HP's zx1 chipset, while the larger servers use the HP sx1000 and sx2000 chipsets.

TABLE 1

HP Integrity Servers

Server	Number of Sockets	Chipset
Integrity rx1620-2	2	zx1, zx2 (for a future server platform)
Integrity rx2620-2	2	zx1, zx2 (for a future server platform)
Integrity rx4640-8	4	zx1, zx2 (for a future server platform)
Integrity rx7620-16	8	sx1000, sx2000 (future)
Integrity rx8620-32	16	sx1000, sx2000 (future)
Integrity Superdome	64	sx1000, sx2000 (future)

Source: HP, 2006

Impact of Dual-Core Processors

Dual-core designs for the next generation of Itanium processors, as implemented in the Montecito processors, will increase compute density, as multiple cores tackle multiple workload threads within the same system boards that were used in previous HP Integrity servers. For servers with eight or more sockets, a new HP chipset, called the sx2000, provides high-bandwidth connections between processors, memory, and I/O buses.

With the Montecito generation of dual-core Itanium processors, the number of cores per socket will double. In addition to increasing performance, dual-core processors have the potential to lower the cost of software licensing, provided that ISVs agree to focus on per-socket pricing rather than per-core pricing. Although Microsoft has announced that per-processor licensing applies to multicore processors for Windows and SQL Server, it is too soon to declare how the software pricing trends will develop until multicore processors ship more widely in 2006 and 2007. IDC notes that a variety of pricing schedules will likely emerge, including a number of software vendors offering variations on per-processor, per-employee, and per-site pricing.

Sockets, Processors, Cores, and Multiprocessor Modules

Changes in processor technology have affected the way in which IDC describes servers. Prior to the advent of multicore processors and multiprocessor modules, the number of processors, sockets, and cores was always the same. Now IDC describes server models by socket count. And when we refer to a 4-way or 8-way server, we are also referring to the number of sockets. In the case of HP Integrity servers, single-core or dual-core Intel Itanium processors can be plugged into available sockets. Also, HP offers the MX2, which is a multiprocessor module that allows two Itanium processors to plug into a single socket.

Reliability, Availability, and Serviceability

Integrity server hardware also addresses the issue of RAS. Itanium processors include Intel's Machine Check Architecture (MCA), which, in conjunction with HP Integrity server chipsets, detects and handles errors while logging and containing them, thus preventing errors from being propagated to other parts of the system, including the operating system environment.

HP Integrity servers feature physical and electrical isolation between the hardware-defined partitions, which HP calls nPARs. Isolation provides assurance that workloads in separate nPARs will not interfere with one another. Isolation also improves overall system performance and ensures the integrity of the computing process within each partition on the system. HP's cell-based servers have a redundant power supply and optional redundant power input architecture for additional RAS. Other technologies include double chip-spare, link self-healing, and a triple-redundant system fabric. These types of features have been associated with enterprise-class datacenter servers.

Partitioning

Physical partitioning is supported by the HP Integrity server's cellular design in midrange and high-end servers, in which four processors are grouped together into "cells." HP Integrity servers with eight or more sockets can be partitioned. The system bandwidth can be "dialed up" to support I/O-intensive workloads and to avoid I/O bottlenecks. Multiple I/O paths are available to access off-board resources (e.g., to out-board storage). This capability is a key consideration for I/O-intensive workloads, such as database, decision support, and business processing.

In addition to nPARs, HP Integrity servers will support software partitioning for Windows in 2006 with HP Virtual Machines. When this product is available for Windows workloads, there can be several Windows virtual machines, or even a mix of Windows and other operating systems running within a single nPAR partition, resulting in even more finely grained partitioning.

Because computing resources, including processors, memory, and I/O, are controlled by the Integrity server's built-in management software, system resources can be reallocated, and processors can be added or removed from a partition. In addition, HP is working with Microsoft and other ISVs to "size" database, decision support, ERP, and BI workloads to understand their scale-up requirements.

In addition, IDC highlights that in support of seasonal or unpredictable workloads, HP Integrity servers are available with pay-per-use features today using a utility computing payment model. This payment model addresses peak periods of demand for computing resources by allowing customers to pay for additional capacity only for time periods when it is needed.

Operating Environment Choices

HP Integrity servers run four operating systems: Unix (HP-UX 11i); Microsoft Windows Server 2003; Linux (Red Hat and Novell SUSE), and HP OpenVMS. Microsoft Windows Server 2003 first became available on the Integrity servers in 2003, and it was shipped more widely in 2004 and 2005. IDC notes that the Datacenter Edition of Windows Server 2003 is shipped directly from server vendors that support the entire system, including HP. The Enterprise Edition, which is typically used on volume servers and midrange servers and which is widely available with or without the purchase of a new server, is supported through agreements with HP or Microsoft. In 2006, Microsoft is shipping Windows Server 2003 across all "builds" of Windows systems. The Longhorn release of Windows Server is due to ship in 2007 and will include support for Itanium-based servers.

Customers also have the option of configuring multiple partitions as a "cluster in a box" by leveraging Microsoft Cluster Server, linking multiple partitions together as if they were free-standing servers that were clustered together. Or, separate partitions can be assigned to a tier of processing. For managed services suppliers, a partition can be assigned to support processing requirements for a given customer. Thus, some IT managers may choose to view this approach as comprising a "datacenter in a box" or "multitiers in a box" because the partitions take the place of individual server systems within a cluster.

Business Benefits of Windows and HP Integrity Servers

Business benefits associated with deploying Integrity servers with Itanium processors and the Windows operating system include the following:

- **IT discipline associated with datacenter operations.** Deploying Windows in the datacenter allows Windows workloads to be supported by more sophisticated and standardized IT processes than those typically used in a company's business units.

- **Enhanced management and management efficiency.** Central-site management of Windows workloads on scalable servers leverages programming and system administration skills, and it impacts larger numbers of end users throughout the company.

- **RAS** enhancements that have been engineered into HP Integrity servers will result in reduced downtime, thus avoiding the high operational costs that are often associated with system outages. Outages are more common within server farms, which are populated by multiple volume servers that lack advanced RAS features.

- **Familiarity with the Windows operating environment.** Future development of applications for the scalable servers in the Windows server market segment will benefit from a large pool of certified developers and system administrators who are already trained in Windows operating system environments.

- **Compatibility with Microsoft software products.** Windows is able to support fewer, and more scalable, SQL Server databases in a single server system, including the new SQL Server 2005 database. Scalable server resources will allow many end users to be supported by single or multiple instances of Microsoft products running on a smaller number of servers.

- **Lower soft costs associated with central-site operations.** Customers can now deploy Windows applications by scaling up in addition to scaling out. The choices made will depend on customer preferences, IT skill sets at a given site, and the availability of software that supports scale-out server configurations. The scale-up option gives businesses the option of containing some of the IT operational costs to central-site datacenters, which can reduce expenses that are associated with IT personnel and ongoing maintenance.

IDC Analysis

Although the market for scalable Windows-based servers is still emerging, it is well populated with product choices. In addition to HP, players in the Itanium-based server space include Fujitsu, Groupe Bull, Hitachi, IBM, NEC, SGI, and Unisys. Some of these suppliers provide scalable Windows servers exclusively using Itanium processors, while others offer servers using processors with the x86 architecture, which now includes x86-64 processor designs.

Opportunities

As a major server vendor across multiple operating system categories, HP has a well-established reputation as a provider of volume server systems (i.e., its ProLiant server line) and scalable server systems (i.e., its Integrity server line and other scalable HP systems, including HP Integrity NonStop).

HP sells all of these systems so that customers can deploy servers in a multitier computing environment, with 32-bit applications running on ProLiant systems and 64-bit applications running on Integrity servers. In this way, customers can preserve their existing investments in 32-bit applications running on x86 systems that are accessing applications and databases running on powerful 64-bit Integrity servers.

HP can leverage its experience as a server vendor along with its ability to provide system management software, storage, and services and to act as a provider of complete technology stacks. Further, HP can offer IT services to deliver complete solutions. Being a comprehensive systems supplier is part of HP's overall value proposition.

HP's experience in building, deploying, and maintaining scalable datacenter servers will bring this knowledge base to the scalable Windows-based servers it delivers to the marketplace. HP has shared that experience with Microsoft when the two companies worked together to optimize the operation of Microsoft products running on Integrity servers.

HP's broad installed base in customer sites gives HP a deep knowledge of the IT life cycle, and HP has long positioned itself as a "trusted advisor" to its customer base. The company can leverage its deep knowledge of scalable server systems to the Windows server computing environment because HP Services personnel and HP channel partners are well positioned to suggest places in the IT infrastructure where scalable servers can improve IT operations and the management of mission-critical Windows workloads.

Challenges, and Meeting the Challenges

HP may find that some IT organizations may not have considered moving from existing x86 servers to Itanium-based servers to gain additional scalability. Alternatively, some organizations may be resistant to the idea of running existing workloads on new EPIC platforms, especially if they do not understand the technical and business benefits of doing so. Further, the x86 architecture began as 32-bit only, but it is expected to move to x86-64, which supports both 32-bit and 64-bit applications, by 2007. HP supports all three styles of computing — x86-32, x86-64, and EPIC — but it needs to show how customers who have adopted these computing styles can orchestrate these systems to work together in multitier IT infrastructures. Indeed, many sites have already deployed all of these computer architectures on the same corporate network.

Intel has a role to play in identifying the types of workloads that run best on each type of processor architecture. For example, the EPIC architecture has specific strengths in supporting data-intensive workloads — and also in compute-intensive workloads, including those for high-performance computing, online transaction processing, and business intelligence. EPIC was designed to run 64-bit workloads, while many servers within the installed base continue to run older 32-bit-only applications and workloads. IT organizations need to understand the scenarios for which servers based on Itanium processors offer a best fit for applications and databases.

One challenge for HP is that some IT organizations may never have considered servers that run multiple operating systems at the same time. These organizations may be accustomed to deploying scale-out configurations of Windows servers — usually rack-optimized x86 servers in the datacenter and tower-based servers in the business units. This is a "head-room" opportunity to show how Windows workloads will run on larger systems with built-in advanced system management that can reduce IT operational costs. Although HP also stands to benefit from continued scale-out deployments of small x86 servers in the ProLiant product line, HP will also need to address the other end of the computing-power scale: demonstrating how scalable Windows servers in the Integrity product line can support consolidated workloads and run more efficiently than large arrays of small Windows servers housed in a server farm.

Conclusion

Datacenters are becoming hubs where corporate databases live and where corporate networks are managed. Given the large number of Windows workloads in the modern enterprise, there will be substantial opportunity to gather Windows applications running on small systems or on older systems and to run the most business-critical applications and databases on scalable servers.

The Windows computing environment has matured in many ways in recent years, allowing workloads that formerly ran on other operating environments to move to Windows systems. Sometimes, deployment of scalable Windows systems can be seen as part of an effort to simplify the existing IT infrastructure by reducing the total number of versions of the Windows operating system within an organization and by including Windows as one option on a short list of operating systems. Further, Windows servers will continue to be strong in scale-out computing environments, even as they expand their presence in scale-up computing environments, providing customers with greater flexibility in future waves of IT deployments.

As HP addresses a wide spectrum of computing requirements, the company is providing scalable Integrity servers running the Windows operating environment, especially for workload consolidation and for supporting business processing applications and databases. These workloads will leverage the enhanced RAS characteristics and advanced functionality that are already being shipped in scalable Itanium-based Integrity servers.