



HP Upgrades Integrity to Dual-Core Itanium 2 — Worth the Wait? Most Definitely!

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Management Summary

With fall in the air, it can mean only one thing. The end of another baseball season? No. The start of another football season? No. Political election season? No. Fall always brings the unmistakable aroma of a new car year, and with it, astonishing claims from every car manufacturer trying to get their share of the automotive market. What do you look for when you buy a new car? What factor will get your attention and get you to vote with your wallet. In 2006, I dare say, no one single factor will be decisive; it will take a combination of qualities, or functions, to get you to sign on the dotted line. Style, luxury features, and price – these are all important factors in the buying decision. In 2006, however, with higher gasoline prices still fresh in our minds, fuel economy will play an important role in your decision. Soccer moms, beware, that SUV to drive the kids around town may not be the right choice. The total cost of ownership of your new car over 100,000 miles may require you to look at a hybrid, for example.

Similarly, the CIO of every Fortune 500 company is shopping for a new solution to his/her personal energy crisis. How can the CIO increase the performance of the mission-critical server network in the data center without bankrupting the enterprise from the recurring charges of increased energy requirements? The current costs to drive under-utilized servers, and cool the data center environment from the excess heat generated, often exceeds the purchase price of the platform. In fact, the energy requirement to keep your enterprise competitive may exceed the power that your local utility can deliver to your facilities. The CIO has to consider a variety of alternatives to keep response time up and recurring costs down. Consolidation and virtualization are two likely candidates to solve data center performance problems. Consolidation will enable the data center staff to reduce the number of servers running the same application, and the number of administrators required to keep the network running smoothly. However, how do you consolidate heterogeneous applications running under different operating environments onto a single platform? The answer here is virtualization - partitioning the server into multiple environments to share not only the processing power of the server, but also the memory, storage, and I/O. What do you do, however, if the mission-critical application set includes *UNIX*, *Windows*, and *Linux* applications? The answer to that is HP with its *Integrity* family of *Itanium 2* servers.

To learn how HP has adapted their Integrity family to improve performance while at the same time reducing the total costs of IT ownership that are draining enterprise resources, please read on.

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Data Center Issues

The key challenges facing the data center in every enterprise focus around the same issues: *server utilization, improved availability, growth, physical and logical consolidation of enterprise resources, energy cost, and the continued use of legacy applications*. The CIO needs to reduce the TCO of IT resources, from acquisition costs, to operating expenses such as data center staffing and the energy required to run and cool the data center. Existing scale-out infrastructures consist of an excess of aging, underutilized mono- and dual-processor nodes, often clustered together creating a series of high-cost processing islands, requiring an excessive amount of systems administration. Some larger enterprises have implemented a scale-up environment, using a large number of processors, usually 16 to 32, or more, networked together in a symmetrical multiprocessing (SMP) architecture. Clearly, these SMP systems utilize the available CPU cycles better through a virtualized operating environment, however, their operating costs, from maintenance to energy, continue to rise due to their age and the nature of their single-core, high-clock-speed architectures.

Many enterprises are now considering a move to scalable, general-purpose, open system servers in order to handle the rampant growth resulting from an increase in user activity and mergers. These servers are based upon commodity processors such as Intel's *Xeon* and AMD's *Opteron*, and take advantage of dual-core architecture to improve the performance of their server infrastructure. They are *perceived* to have a lower purchase cost and a better price/performance ratio. Unfortunately, these CISC¹ systems lack the on-demand scalability available in some legacy RISC² systems, such as HP's HP9000, PA-RISC and AlphaServers, and their successor, HP's *Integrity* family of EPIC³ servers. CIOs can take advantage of the latest features, a new warranty, and lower maintenance costs to offset acquisition costs and lower data center TCO. In fact, many data centers are still dependent on mission-critical applications that require the higher reliability, availability, and serviceability (RAS) traits available in long-standing operating environments, such as *HP-UX* and *OpenVMS*, and need to continue using them to facilitate growth. The availability of *Windows* and *Linux*, however, is essential in order to access a wealth of commodity

applications appearing from the open systems community. Consolidation and virtualization techniques enable improved utilization by allowing the enterprise to run multiple mission-critical *and* commodity environments at the same time and share system resources. Enterprises with existing HP-UX and OpenVMS applications can virtualize their newer Integrity platforms and share processing cycles between their proprietary *and* commodity applications, improving server utilization and reducing operating costs.

Many installed open x86 servers are running at less than 20% efficiency, wasting energy and leaving significant unused computing capacity. Many remote departments and smaller enterprises are now restricted from additional growth, while enterprise data centers are reaching their limit for floor space and available power to the facilities. The CIO needs to consolidate enterprise servers to improve CPU utilization and relocate server resources in order to reduce the administrative overhead and staffing. Increasing the density and utilization of server and storage resources will reduce the power requirements, and simplify the application environment to facilitate growth.

Reducing energy requirements to run and cool the data center efficiently is of paramount importance, along with reducing the number of systems administrators. With the cost of energy rising to previously unheard of limits, it becomes necessary for every data center to increase their performance per watt in order to reduce the recurring costs of data center operation. With one eye on the bottom line and the other on the horizon, the CIO must protect the enterprise's investment with a scalable platform, capable of adding, and upgrading processors and memory without the aid of a forklift.

In order to avoid the addition of staff and minimize the costs of training, maintenance, and integration, many enterprises try to standardize on a single platform architecture to achieve the economies of scale desired, much the same way that a company such as Southwest Airlines has standardized on a single airplane model, the Boeing 737. A standard platform architecture enables the enterprise to implement a uniform, scalable processing model, along with scalable I/O, to simplify systems management and take advantage of future architectural advances. This will maximize the return on investment while, at the same time, mitigating risk. Any new platform must be able to protect the investment in storage solutions already installed, be it DAS, SAN, or NAS, as well as have access to the latest in low-cost, high-capacity storage architecture. This will enable the data center to maximize the utilization of business-

¹ Complex Instruction Set Computing

² Reduced Instruction Set Computing

³ Explicitly Parallel Instruction Computing

critical data for applications that take advantage of D2D storage techniques, such as backup/ recovery and archiving. Standardizing the consolidation on one platform architecture also enables the enterprise to simplify network manageability, reducing administrative overhead. The question is: *Which platform?*

Intel and Itanium

Intel (and HP) has been working on the development of the *Itanium* microprocessor for the past 15 years, with the first iteration of the chip released in 2001 (*Merced*). Designed to fill an ultra-high performance server niche, Itanium executes the *Explicitly Parallel Instruction Computing* (EPIC)⁴ architecture to maximize a high level of parallel processing to enable high performance without high clock frequencies. *Merced* failed to gain market acceptance, however, because of issues with both performance and price/performance. *Itanium 2* has corrected that. With the release, of *McKinley*, in 2002 and *Montecito* in 2006, Intel used innovative, compiler-based optimization and dual-core to more than double the performance of the original version. Itanium 2 can execute six simultaneous instructions per clock cycle, with an abundance of applications Registers, and a very large cache space, along with a faster 533MHz front side bus to support 8.5GB/s of system bandwidth. In fact, based upon the latest SPEC benchmarks, Itanium 2 ranks near the top for integer performance (CINT2006) and is at the top of the floating-point performance (CFP2006) rankings⁵. This confirms Intel's original intent to provide balanced performance for improved throughput for both enterprise and technical solutions. It is ideal for transaction-driven financial applications, and scale-up OLTP applications, as well as high performance computing applications.

Montecito, or *Itanium 2 9000*, is the first multi-core version of Itanium 2, but it is not the last. Intel has at least four new implementations in the laboratory, including: *Montvale*, a 90-nm version of *Montecito*, in 2007, *Tukwila*, a four-core implementation, in 2008, and *Poulson*, a multi-core follow-on to *Tukwila*.

Itanium 2 was designed to support both x86 and HP-UX applications, but it is not aimed at the traditional x86 space. Itanium 2 was conceived as

a commodity RISC-replacement engine which could also run x86 applications. It competes with Sun's *UltraSPARC* family and IBM's *POWER processors*, not Intel's *Xeon* or AMD's *Opteron*. These x64 microprocessors are predominant in the scale-out and web services markets and will continue to be so. Itanium 2 has experienced its greatest success in HP's *Integrity* family, where it is used to run HP-UX and OpenVMS, as well as *Windows* and *Linux*.

HP's Integrity Solution

On September 7, HP announced the latest additions to the Integrity family, two new dual-core entry-class models, the rx3600 and the rx6600. It also announced dual-core versions of all the multi-processor models of Integrity, from the dual-processor rx2620 to the 64-way (128 cores) Superdome. These upgrades allow HP to improve its entire value proposition, enabling the adaptive enterprise through virtualization, balanced growth in new DDR2 memory, and in storage, with 2.5" SAS drives. Because the new server-surround environment requires less power, while providing increased performance, HP can help the enterprise reduce the total cost of IT ownership (TCO). Dual-core HP Integrity servers deliver flexible capacity, secured availability and simplified management to address a variety of workloads from transactional to batch to HPC.

Virtualization allows the enterprise to achieve a greater return on its IT investment, providing the data center with on-demand capacity expansion, adapting the distribution of server resources when and where they are required, based upon evolving business priorities. Virtualization is enabled through the HP *Virtual Server Environment* to help the data center staff optimize server utilization dynamically. New enhancements allow the data center to, automatically, flex, add, and move resources and workloads across a virtualized pool of virtual servers. This allows the data center to consolidate multiple applications on a single physical server, simplifying management while retaining agreed upon service levels.

The new Integrity *Montecito* platforms draw 50% of the power per core of previous Itanium processors, and combined with an HP-designed, scalable zx2 chipset for mission-critical availability (see Exhibit 1 on the next page), will support multiple generations of the dual-core Itanium 2 processor, with support for a front side bus of 533MHz and PCI Express I/O backplanes. The zx2 chipset, the central building block of the rx3600 and rx6600, is a modular, three-chip

⁴ See **The Clipper Group Navigator** dated July 29, 2003, entitled *HP Takes First (Super-sized) Step Toward Product Line Consolidation (Simplification)* at <http://www.clipper.com/research/TCG2003034.pdf>.

⁵ As of September 21, 2006.

Exhibit 1 – rx3600/rx6600 Features

- Supports five operating environments – HP-UX, OpenVMS, Windows Server 2003 Enterprise Edition, Red Hat Enterprise Linux, and SUSE Linux Enterprise Server;
- *Dynamic Processor Resiliency* - to enable the replacement of a failed processor without taking the system off-line;
- Error checking and correction (ECC) of the front side bus;
- Large memory capacity – to improve performance by reducing the number of I/O requests;
- Double DRAM chip sparing - to improve reliability and availability by a factor of 17 over single chip sparing and a factor of 1200 over single-bit ECC;
- Proactive hardware memory scrubbing;
- ECC with PCI-X 2.0 cards;
- A full set of high availability features;
- Ten I/O card slots – two for core I/O and eight available for expansion; and
- PCI card online replacement.

Source: HP

solution designed for cost-effective, high-bandwidth, low-latency four-processor/eight-core servers. It supports two memory controllers each delivering increased system bandwidth of up to 8.5 GB/s, enabling the dynamic selection of memory pages to reduce access time and memory latency, and providing optimized memory page management. These new platforms provide increased I/O bandwidth, supporting 266MHz PCI-X I/O⁶ cards, twice the capability of *zx1*, increasing overall I/O bandwidth to 8GB/s. In addition, Integrity uses internal data buses between I/O and the memory controllers to offload I/O traffic from the processor bus, reserved for data transfers between processor cache and I/O. The *zx2* chipset improves reliability, reducing scheduled and unscheduled downtime.

The dual-processor rx3600, a 4U rack-mount server, and quad-processor rx6600, a 7U rack-mount server, provide outstanding scalability and availability at an entry-level price. Both servers support the dual-core Itanium 2 9000 at 1.4 GHz with 12MB of Level 3 cache and the 1.6GHz processor with 18MB⁷. The rx6600 also supports the 1.6GHz chip with 24MB of cache. The rx3600

⁶ There is an optional upgrade to PCI Express.

⁷ The rx3600 will support 18MB of cache as of Nov. 1.

configures to 96GB⁸ of DDR2 memory and eight SAS⁹ disks (600GB), while the rx6600 configures to 192GB of memory and 16 disks (1.2TB). Both models come with a rich set of management tools to facilitate deployment and reduce operational costs, including *HP System Insight Manager (SIM)*, *Integrity Essentials*, *Integrated Lights Out2 (iLO2)*, and *Openview*.

Conclusion

When the CIO of any enterprise initiates an RFP for a new server, he is NOT buying Itanium, Xeon, or Opteron – he is buying a solution based upon the integration of an application set and a hardware platform. With support for HP-UX and OpenVMS, as well as Windows and both Red Hat and SUSE Linux, HP's Integrity has access to the application set that HP and a broad ISV community have ported – to the tune of 9000 applications and climbing.

What you get with Integrity is increased agility for your enterprise – improved performance with a reduction in operating costs, protection of your investment in legacy software applications, and access to a virtually unlimited supply of commodity software from ISVs writing to the Windows and Linux standards. You get capacity on demand. You get an adaptive enterprise.

In addition to application access, Integrity with dual-core Itanium 2 provides outstanding performance in a cross-section of application environments – from OLTP to HPC. Is it just a coincidence that HP also stands for *high performance*?

If your enterprise is migrating from a legacy UNIX environment such as HP-UX or OpenVMS, or upgrading from an older Integrity platform that no longer provides the performance required, take a look at the newest generation of Integrity servers from HP. You may be able to reduce your TCO and improve your bottom line results.



⁸ Requires availability of 4GB DIMMs.

⁹ See **The Clipper Group Explorer** dated January 4, 2006, entitled *Breaking the I/O Paradigm – SAS Enters the Nearline Storage Race*, at <http://www.clipper.com/research/TCG2006002.pdf>.

⁹ Just a Bunch of Disks.

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