Simplifying the Data Center Environment with a Mission-Critical Converged Infrastructure

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Management Summary

We are living in a very competitive and innovative world. New technologies enter the marketplace every day, with more than one option for the consumer to select. For example, there is any number of LCD or LED high-definition televisions from which to choose. You even have a choice for 3-D television. The importance of being first to market cannot be stressed emphatically enough. As the old saw goes: *The early bird catches the worm.* Being first is not easy, however, when dealing with the complexities of modern business. Everything in the development process must be streamlined and simplified in order to get to the store shelves first. The modern enterprise needs to reduce costs and increase productivity in order to be successful. One of the first places that any enterprise can target to accomplish these goals is the enterprise data center where the proliferation of under-utilized servers has resulted in server sprawl, increasing costs and lowering productivity. With the introduction of multi-core processors and improved virtualization techniques, the IT staff now has the tools to simplify the data center architecture and improve performance and productivity while increasing reliability.

With the maturation of the *Itanium* processor, Intel has added a quad-core, multi-threaded design to the data center environment, implementing advanced virtualization features and energy controls within the processor. Intel has also included memory management and intra-system communications capabilities (between CPUs in the same system). Moreover, the introduction of multiple cores and advanced virtualization has led to another significant advancement within the data center architecture – enabling the IT staff to simplify a complex infrastructure through consolidation. **Unfortunately, these enablements, and the resulting consolidations, have led to further set of challenges. First is the increased scalability required to support the many virtual machines (VMs) that can be run on a multi-socket quad-core platform (even those with only two processors). Second but still important are the related TCO issues.** In order to achieve a more efficient utilization of the server platform, with more and larger virtual machines and even larger databases than before, the processor needs to be able to flexibly scale all resources, including memory and I/O, for any workload, with always-on resiliency to ensure business continuity for mission- and business-critical applications. The processor and surrounding architecture also need to lower energy and management costs and need the flexibility to optimize performance for the required workloads.

With the newest version of their Integrity platform, HP has combined the features of Intel's *Itanium* and *Xeon* architectures with systems optimized for a converged infrastructure, combining servers, storage, networking, and energy management into a simplified, mission-critical *Blade-Scale Architecture* to deliver the highest levels of reliability and flexibility. With this *Blade Scale Architecture* and HP *BladeSystem Matrix* with *HP-UX*, HP *Integrity* servers lay the foundation for the next decade of mission-critical computing. To learn more about HP's scalable blade solutions, please read on.

Mission-Critical Customer Challenges

There are many issues that are causing pain in data centers around the globe. They are not unique to any one industry. They are common challenges that apply cross-industry. Today's enterprises, working in an Internet economy, have no tolerance for downtime. Their customers, suppliers, and users expect improved service levels even while the IT staff is faced with a shrinking budget and as they struggle with islands of legacy applications and monolithic systems.

Financial services enterprises on Wall Street demand a higher level of resiliency than ever before. Every minute of downtime equates to lost revenue – millions of dollars per hour, in many cases, as customers go elsewhere to execute their financial transactions. It is no different in the manufacturing world. If production comes to a stop because of a failure in the IT infrastructure, heads will roll – perhaps yours.

The communication, media, and entertainment industry rapidly is becoming more dependent on the technological advancements being made in digital technology. These include the high-definition and 3-D techniques required to develop, edit, and deliver the TV shows and movies that we, as consumers, covet. The healthcare industry presents even more significant issues, especially where patient well-being is concerned. The life of a patient may depend upon continuous access to an ever-expanding base of patient data. *Rapid access to an x-ray or an MRI may be a life-saving event.* Any complexity in the infrastructure that hinders the delivery of that information can become a matter of life and death.

The complexity caused by an infrastructure made up of heterogeneous servers and storage arrays spread around a data center (or across the enterprise) can negatively affect your business on the bottom line. Server sprawl likely is inhibiting the performance of your enterprise. It raises the total cost of ownership of your data center through wasted resources via poor server utilization, unused but allocated storage, excessive energy consumption, and an IT staff overburdened by the administration of a complex and under-performing architecture. Trying to manage an environment supplied by a myriad of vendors often results in more time and money being spent on administration than on new development. In fact, when 70% of the IT budget has to be dedicated to operations and maintenance, only 30% can be invested in business innovation.

A rigid and aging infrastructure leads to application and information complexity as it tries to conform to evolving business processes. This complexity delays the deployment of new applications, increasing the time to revenue. All of this lost time and effort results in missed opportunities, as the competitor that has modernized its IT architecture becomes the "early bird" and catches your customers.

What is required to simplify data center operations? The answer to that is, well, "simple". The IT staff may want to implement a common, modular architecture that virtualizes, consolidates, and automates all mission- and business-critical applications in the data center environment on fewer platforms. In this way, they can implement a mission-critical, converged[1] infrastructure that can deliver the highest levels of reliability and flexibility.

To achieve this, the IT staff needs to deploy a server network with improved performance, reliability, and energy consumption. For those data centers that have deployed HP systems based upon the Intel *Itanium Processor 9100 Series*, or those that have installed servers with end-of-life technologies, the answer has arrived. Intel has announced the follow-on to the Itanium 9100 – the Intel *Itanium Processor 9300 Series*, internally known as *Tukwila*.

Intel's Itanium Processor 9300 Series

Designed to address directly the issues that are causing the most pain in the offices of CIOs around the Globe, the Intel Itanium Processor 9300 Series enables the enterprise IT staff to virtualize and simplify the most complex mission-critical data center environment. With twice as many cores as its predecessor, the Itanium 9300 provides double the performance with greater scalability than previously available. With new RAS[2] features, the 9300 provides increased support for mission-critical computing environments running the most demanding workloads, such as database, business intelligence, and ERP[3] applications. These features facilitate the consolidation of multiple applications onto a single platform, which simplifies data center operations, thus reducing the total cost of ownership (TCO) of the IT infrastructure.

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[1] A converged infrastructure has a common, modular architecture, a common network fabric, comprehensive cross-domain control, and comprehensive power and cooling management.

[2] Reliability, Availability, and Serviceability.

[3] Enterprise Resource Planning.

Double the Performance

With four high-performance processing cores (twice as many as the Intel 9100), two threads per core, and up to 24MB of L3 Cache, the Intel 9300 can help to increase throughput and reduce latency for any application that has been designed to operate in a multi-threaded environment. It provides the ideal platform to consolidate multiple applications to improve the utilization of the data center's server resources. The 9300 takes advantage of Intel's *Hyper-Threading Technology* to enable each core to manage two active software threads. Moreover, applications running on *HP-UX 11iv3* on today's systems will run unchanged on the newest HP *Integrity* servers, based on the Intel 9300 processor and can deliver significant performance improvements without additional software optimization.

In addition to the core count, the Intel 9300 has an improved memory subsystem with significantly more memory than the 9100 (via Intel *7500 Scalable Memory Buffer* support) and two integrated memory controllers to facilitate the delivery of data to the four cores, with up to six times more memory bandwidth.[4] Along with this, the new Intel *Scalable Memory Interconnect* can help to increase core utilization and overall throughput for data-intensive applications, helping to lower TCO. A single four-socket server can support a full TB of memory, scaling even higher for larger systems.

Greater scalability

Further contributing to system scalability in large multiprocessor systems, the Itanium 9300 can provide seamless support for up to eight sockets, totaling 32 cores. This enables system vendors to build servers with fewer chips and a smaller footprint for the motherboard. This also enables faster CPU-to-CPU communications to improve performance for many applications.

This faster communications is enabled via Intel's *QuickPath Interconnect* (*QPI*) *Technology*. QPI accelerates processor-to-processor and processor-to-I/O hub communications, enabling greater capacity for I/O-intensive applications, such as database and transaction processing with a large number of simultaneous users. QPI is also available in the Intel *Xeon* family, enabling a common chipset and faster innovation for both architectures.

Improved Resiliency

With 24x7x365 access required for any mis-

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[4] Based upon internal Intel measurements.

Exhibit 1 — Itanium 9300 Features

World-Class reliability for Continuous Operation
- Advanced Machine Check Architecture
- Flexible partitioning and dynamic resource management
- Intel Cache Safe Technology
- Advanced error detection/correction

Scalability/flexibility for virtualization and consolidation
- Silicon-level virtualization support
- Intel QuickPath Interconnect with 4.8GT/s peak bandwidth
- Configurability for up to eight sockets
- Directory-based Cache Coherency

Enterprise-level computing for complex transactions in multi-user environment
- High-performance, quad-core design
- Intel Hyper-Threading Technology
- Addressability up to 1,024TB
- Low-latency 24MB L3 cache, 6MB per core
- Dual, integrated memory controllers
- Intel Scalable Memory Interconnect

Energy efficiency to reduce TCO
- Enhanced Demand Based Switching to reduce energy consumption
- Intel Turbo-Boost Technology to deliver higher performance for peak workloads
- Advanced CPU and memory thermal management

Source: Intel

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sion-critical application in an integrated computing environment, the enterprise data center demands continuous server operation and data integrity to handle an increasing data volume. The Itanium 9300 builds upon the RAS features of the 9100 to extend and improve the support for these applications. These new processor features, combined with recent system innovations, provide:

- An integrated *Advanced Error Management* to greatly reduce the chance of a system crash or contaminated data;
- *Dynamic Hard Partitioning* with full electrical isolation and dynamic allocation of resources, to enable complete workload isolation for mission-critical applications while providing resource scalability to deliver consistent, reliable performance; and

- *The serviceability* required to add or replace major components without downtime.

These features enable potential problems to be detected and corrected while maintaining continuous business operation. For a full list of Itanium features, see Exhibit 1, on the previous page.

HP's New Integrity Platforms

HP now has integrated the new Intel Itanium 9300 into the latest version of their Integrity family to provide improved performance and flexibility. Using an array of *common*, modular building blocks, HP has assembled *a most un-common, and appealing, mission-critical infrastructure*. In order to overcome the server sprawl that has become manifest throughout enterprise data centers around the world, HP has designed a family of systems using common enclosures, server architecture, networking, and, most significantly, common management to simplify installation and operation of the infrastructure and lower the TCO for the IT environment. Instead of continuing a "one-of-everything" strategy with islands of legacy applications, HP has enabled a single converged infrastructure that enables a unified, mission-critical architecture – to reduce complexity and increase flexibility.

With reliability built-in, these Integrity platforms, based on the *Blade Scale* architecture to lower TCO, can be installed with a *rack-once, wire once, power once* strategy. This reliability can be crucial in mission-critical environments as minutes of downtime are quickly translated into lost business.

The Blade Scale Architecture

The Blade Scale architecture provides a unified blade environment for both *ProLiant* and Integrity servers, including:

- A virtual *FlexFabric* to enable scaling resources to any workload;
- Always-on resiliency to ensure business continuity, and a common management platform; and
- HP *BladeSystem Matrix*, designed to simplify the deployment of applications and business services by delivering IT capacity through pools of readily deployed resources. With the HP BladeSystem Matrix operating environment, an application infrastructure can be provisioned rapidly, administrator productivity can be doubled and application deployment time can be reduced by as much as 50%, according to HP.

FlexFabric provides HP Integrity with internal scalability and resiliency via *BladeLink* for linear scalability from two to eight sockets and the *Superdome 2 Crossbar Fabric* for fault-tolerant flexible scalability in compute-intensive and I/O-intensive environments, and *Virtual Connect*[5] for scalability across the network.

HP Integrity servers are configured with *HP-UX 11iv3*, the most current version of the HP-UX operating environment, to ensure availability, accelerate innovation, and simplify operations. HP-UX delivers an integrated operating environment with both high availability and virtual server environments, including a rich portfolio of virtualization capabilities. HP-UX also has Industry-validated UNIX security, meeting the most stringent standards.

HP Integrity Systems provide the data center with exceptional value compared to previous generations. Not only do they deliver outstanding performance, but they also reduce deployment time for new applications by up to 50%, reduce power consumption by up to 30% per core with new energy efficiencies, and reduce their data center footprint by up to 50% by doubling the core count. Integrity systems also provide the data center with 100% applications compatibility with the previous version of Integrity with HP-UX 11iv3.

HP Integrity Superdome 2

Integrity systems can be deployed in a variety of packages from the largest HP Integrity *Superdome 2*, to a highly-scalable mid-sized Integrity server blade configuration, to a compact rack install. Superdome 2 is HP's ultimate offering for high-end, mission-critical computing. It can be deployed in a variety of environments, scale-up, scale-out, or scale-in, in order to consolidate heterogeneous applications onto a common platform.

Integrity Server Blades

The Integrity server blade solution is a family unto itself, with multiple, scalable blade options to enable the data center to right-size the blade to the infrastructure requirement. There are three Integrity blade options based on the Itanium 9300 to choose from: the *Integrity BL860c i2*, the *Integrity BL870c i2*, and the *Integrity BL890c i2*, the industry's first eight-socket UNIX scale-up server blade. Each blade has three processor kits

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[5] See **The Clipper Group Navigator** entitled *HP Builds a Greener Environment Through a Virtualized Networking Infrastructure* dated December 5, 2008, and available at http://www.clipper.com/research/TCG2008062.pdf.

to choose from: The *Intel Itanium 9350 4c* with a base frequency of 1.73GHz and 24MB of L3 Cache, the *Intel Itanium 9340 4c* with a base frequency of 1.60 GHz and 20MB of L3 Cache, and the *Intel Itanium 9320 4c* with a base frequency of 1.33 GHz and 16MB of L3 Cache.

All three blades feature HP's *Blade Link* technology, which combines multiple blades into 2-, 4-, and 8-socket configurations, providing double the performance in half of the footprint of HP's Itanium 9100-based rack servers. Moreover, the new blades provide that performance with built-in resiliency. In addition to the processor scalability, HP Virtual Connect Flex-10 provides increased network scalability and configuration flexibility, with up to 20 times more network bandwidth.

HP Integrity BL860c i2

The BL860c i2 is a 2-socket, 8-core[6], 16-thread blade with 24 DIMM slots supporting up to 96GB of memory with 4GB DIMMs[7]. In addition to the three Itanium processors already defined, the BL860c i2 can be configured with the Itanium 9310 dual-core CPU at 1.60GHz and 10MB of L3 Cache for low power consumption. The BL860c i2 has two hot swap SFF[8] SAS HDDs[9] and four 10GbE NICs, along with three PCIe mezzanine I/O slots for expansion.

HP Integrity BL870c i2

The BL870c i2 is a 4-socket, 16-core, 32-thread blade pair with 48 DIMM slots supporting up to 192GB of memory with 4GB DIMMs[10]. The BL870c i2 has four hot-swap SFF SAS HDDs and eight 10GbE NICs, along with six PCIe mezzanine I/O slots for expansion.

HP Integrity BL890c i2

The BL890c i2 is an 8-socket, 32-core, 64-thread four blade group with 96 DIMM slots supporting up to 384GB of memory with 4GB DIMMS[11]. The BL890c i2 has eight hot-swap SFF SAS HDDs and sixteen 10GbE NICs, along with twelve PCIe mezzanine I/O slots for expansion.

HP Integrity rx2800 i2

HP's rack-mounted *Integrity rx2800 i2* server is a 2U, 2-socket server that can take advantage of your existing rack infrastructure, preserving your

investment while increasing performance and flexibility. The rx2800 i2 is ideal for a branch deployment or for smaller, remote offices.

HP Storage and Services

In addition to this new level of processor functionality, HP also provides the enterprise with a broad range of storage arrays and mission-critical services. Any data center in need of help in consolidating their legacy platforms into a more flexible, energy efficient environment, or migrate an end-of-life architecture to the future of HP and Integrity, can find a complete range of services from HP. If your enterprise needs to develop a global strategy to sustain business continuity or wants to build a private cloud in order to accelerate response to business demand, HP can provide the support that you require.

Conclusion

The newest line of HP Integrity servers provides a broad offering of Itanium performance capabilities, protecting the data center investment in BladeSystem enclosures. Integrity delivers memory, storage and I/O scalability along with the increased compute power of the Intel Itanium 9300.

In addition to delivering the latest Itanium CPU to the enterprise, improving performance and facilitating the virtualization and consolidation of the data center, HP has put together the first mission-critical, converged architecture utilizing a common, modular platform. This enables the data center to simplify the deployment of their IT infrastructure, removing complexity while investing in the data center of tomorrow. With a unified architecture, a flexible fabric, and improved resiliency, HP has delivered a server infrastructure that will help the IT staff to eliminate downtime and improve SLAs despite reduced resources.

With their Matrix operating environment, HP can simplify the management of this converged infrastructure, built to support the mission-critical environment. HP's Integrity platforms are resilient and protect the investment made in previous generations of servers. If you need to build an IT infrastructure that will carry your enterprise into the future, you need to review the capabilities of HP's Integrity systems.

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[6] The BL860c i2 is also available with two cores.

[7] Support for 192GB with 8GB DIMMs is planned.

[8] Small Form Factor.

[9] Available with 72GB, 144GB, and 300GB.

[10] Support for 384GB with 8GB DIMMs is planned.

[11] Support for 384GB with 8GB DIMMs is planned.

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