



HP Gives Green Light to NonStop — Adapts Integrity for Failsafe Environments

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Management Summary

How often has it happened to you? You drop something on a tile floor and break a designer tile; a child scribbles on the wall with an indelible marker and ruins a strip of expensive wallpaper; you go to start your garden tractor and discover that it won't. In each case, you immediately call the manufacturer to order a replacement piece only to discover that the items in question have been discontinued and are no longer available. You can try eBay, but more than likely you will have to replace all the tiles, select new wallpaper to repaper the entire room, and start a search for a new tractor and, hopefully, select one before your lawn becomes a jungle.

These events are typical for the normal lifecycle of consumer products. Unfortunately, that does not make the replacement more palatable. The time required to find replacements, as well as the unexpected out-of-pocket expense, complicates our lives, and contributes to prematurely graying hair. We don't want to face these same issues in our professional lives as well. However, that is exactly what we face in the typical IT environment when we have to upgrade a legacy architecture that may have been installed initially 20-30 years ago. **Systems built with older proprietary architectures tend to run out of steam – they can no longer be expanded; they can no longer be upgraded; they can no longer be maintained economically.** They must be replaced. The question then becomes – *replaced by what?* Does the IT staff have to start over, learning a new operating environment as well as a new platform or is there a way to transition the existing environment onto a new architecture — retaining the value that the staff has acquired over the past decades. Some companies believe that a new architecture can best be utilized by radical change – moving to a commodity solution as well as a commodity platform. Hewlett-Packard (HP) has adopted a slightly different strategy for its *NonStop S-Series* platform.

In 2003, HP announced the evolution of its *HP-PA* and *Alpha* architectures to its *Integrity* line of 64-bit servers based upon Intel's 64-bit *Itanium 2* architecture. To their credit, they have maintained a dual-path, enabling both the enhancement of legacy systems along with the evolution to a new technology. **HP also had promised to evolve their Fault Tolerant (F/T) NonStop community to Integrity - and that is what they now have done!** With the announcement of HP *Integrity NonStop* servers, HP has enabled the transition of a mission-critical, proprietary F/T environment to a failsafe commodity one. To see how Integrity NonStop might solve your IT problems, please read on.

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Fault Tolerant Data Center Challenges

The advent of commodity technology has had a major impact on the biggest challenges facing the enterprise data center: system availability, scalability, and data integrity. Commodity processors within a *high-availability*, or *HA*, data processing environment has contributed to an improvement in the overall resiliency of HA server architectures. Having “five 9s” reliability¹ now comes standard in HA configurations with *no-single-point-of-failure*, although custom scripts are still required. However, what can the data center with mission-critical processing requirements do when that is not good enough, when even 6 minutes of unscheduled downtime is not an option? How does the hospital avoid a computer outage to ensure that the MRI needed for life-saving surgery will be available? How does the Police or Fire Department ensure that an emergency call to 911 will be processed immediately and correctly when a life could be at stake? These are but two examples of mission-critical environments where “seven 9s” reliability, or 3 seconds of unplanned outages per year, with the highest level of data integrity is demanded. Examples of Industries that require these highest service levels are listed in Exhibit 1.

Some enterprises have been operating in a fault-tolerant environment for several decades. These data centers use legacy systems built upon proprietary architectures that have withstood the test of time and deliver reliable, mission-critical service levels to the enterprise community (customers, partners, etc.). The IT staff in these data centers tends to be of a conservative nature as the business continuity of their enterprise depends upon maintaining a 100% delivery of information services. It’s easy to understand why many feel *if it ain’t broke, don’t fix it*.

Unfortunately, time and technology move on. Many of the proprietary systems that provide the required service levels are at or near the end of their useful lives. Components required to *expand* the systems to meet mounting enterprise scalability demands (CPUs, memory, etc.) are no longer in production. Investments to *upgrade* the performance of the

¹ Five 9’s reliability equates to 6 minutes of unplanned downtime per year.

Exhibit 1 —

Mission-Critical Service Industries

- **Healthcare** – To provide real-time access for patient health records completely and electronically; downtime puts patients at risk.
- **Financial** – To provide immediate and accurate transaction handling of trades (brokerage activity) and prompt access to customer funds (ATM or funds transfer).
- **Government** – To provide constantly vigilant systems for national defense while also providing vital emergency services for local government agencies (Police/Fire).
- **Telecommunications** – To provide network management and real-time, operational data handling for hundreds of millions of call records daily for optimization of customer services.
- **Manufacturing** – To provide continuous processing capability for enterprises with automated factories and JIT inventory processes.

processors can no longer be made due to a lack of volume and a poor return on investment. The cost to *maintain* the systems has now escalated beyond the limit of any reasonable budget. The time has come to evolve the architecture with the commodity processor capability that powers the rest of the enterprise.

With the arrival of commodity processors, the cost to implement a new fault-tolerant IT architecture has fallen dramatically. This makes a highly scalable, continuously available environment accessible to a new tier of data centers, enterprises that have always *needed* fault tolerance, but could not afford it.

With their new *Integrity NonStop* servers, HP has recognized both of these opportunities. First, for the HP *S-Series* data center, they have provided an evolution path to transition from a legacy hardware platform to a contemporary one while retaining the same software applications that have been driving these enterprises for decades. Recognizing the

conservative nature of this base, HP delayed the introduction of the Integrity NS-Series servers, originally scheduled for 2004, until well after the delivery of the standard Integrity Itanium 2 platforms in production quantities. With two years of experience with Intel's scale-up microprocessor and HP's interface chipset, within the framework of a *Superdome*, HP appears to be ready to deliver a highly scalable Integrity NonStop architecture to their most demanding customers.

For the second group, the enterprises that always wanted fault tolerance but could not afford it, **now they can**. By continuing their investment in Integrity servers, HP is bringing low-cost innovation to the NonStop server community through a commodity technology that has also already proven effective in simplifying data center operation through the consolidation of *HP-UX*, *OpenVMS*, *Windows*, and *Linux* environments.

The NonStop Evolution

With the announcement from HP ending sales of the MIPS-based NonStop S-Series servers by the end of 2008², enterprises that depend on that environment for maintaining business continuity are facing a decision of epic proportions. *Upgrading* is not possible as there will be no versions of this architecture. This leaves *migration* and *evolution* as the only viable paths to the future. Migration means a brand-new environment, both hardware and software; evolution involves transitioning existing business-critical processes to HP's new Integrity NonStop NS-Series servers. Given the conservative nature of this user community, migration to a new environment with new applications would seem to be out of the question. Evolving the existing application set to a new, but stable, environment would appear to be the only viable option. However, exactly what is involved in this evolution?

First, because the Integrity NonStop Series is based on industry standards with a commodity microprocessor, Itanium 2, there is already a wealth of familiarity and system knowledge present within the IT staff, and this knowledge aids greatly in acceptance of a new technology. Transitioning to a commodity

processor also simplifies the data center by using open standards, such as Fibre Channel disk arrays and SANs. Transitioning to Integrity NonStop enables the staff to take advantage of the experience that HP has gained in adapting other legacy products to Integrity NonStop. Evolving to Integrity also enables the data center to move to a known basic environment with known service levels.

Since the announcement of HP's plan to move the NonStop user base to Itanium 2, the ISV community has been diligently converting their application set to an Itanium compatible status. At this time, 280 ISVs have converted over 700 applications to Integrity NonStop servers. This represents 65% of the applications running on NonStop S-Series servers. In addition, implementing an Integrity NonStop solution also integrates the management of an HP data center under a single *OpenView* and *SIM* framework.

What is involved for the data center, or an ISV, to make this epic decision and migrate an application to an *EPIC*-based³ Integrity NonStop? Not much! The IT staff has built their application set with either a CISC compiler and an optional CISC-to MIPS object code translator, called the *Accelerator*, or a native MIPS RISC compiler. The MIPS-based S-Series supports three execution modes:

- **TNS mode:** Interpreted CISC object code;
- **Accelerated mode:** MIPS RISC code produced by processing CISC object code;
- **TNS/R native mode:** MIPS RISC code produced by compiling with a MIPS RISC compiler.

The Integrity NonStop servers are enhanced with a CISC-to-EPIC object code translator called OCA and a native EPIC compiler. The new Integrity NonStop servers also support three modes:

- **TNS mode:** Interpreted CISC object code;
- **Accelerated mode:** EPIC code produced by processing CISC object code;
- **TNS/E native mode:** EPIC code produced by compiling with an EPIC compiler.

³ 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>.

² Support will continue until 2013.

The TNS mode and Accelerated mode on Integrity NonStop servers leverage the binary interpretation and translation technologies that have been successful with the original evolution from CISC processors to the MIPS RISC processor in the early 1990's. In short, CISC object code is binary compatible across NonStop S-series and Integrity NonStop servers. In fact, a CISC object file can be processed by both the MIPS Accelerator and EPIC OCA tools to produce an object that is optimized to run on both platforms. Integrity NonStop servers can run existing native MIPS applications after recompiling the software from the source code. In most cases, only minor source code changes are required, and the port can be completed in a few hours, presenting an almost transparent evolution.

HP Integrity NonStop

Integrity NonStop Platform

The HP Integrity NonStop server, with July availability, is based upon the Itanium 2 processor running at 1.6GHz with a 6MB cache, and HP's own NonStop Advanced Architecture. They are leveraging the most recent improvements in technology to raise the bar for both scalability and reliability, while protecting the investment that their clients have made in personnel, application solutions, and peripherals, such as S-Series disks and I/O. In addition, Integrity NonStop can connect to HP's *StorageWorks XP* disk array, scalable to 1152 drives, to create synergy with HP's open storage solutions.

The Integrity NonStop platform can scale-up from two to 4080 processors, providing almost linear performance growth. This scalability is the basis for application virtualization on the Integrity NonStop platform enabling rapid growth of key business functions without adding any labor costs, compromising service levels, or causing user disruption. HP does this through optimum use of pooled resources and increasing application availability, while simplifying the infrastructure, and reducing the management complexity. In fact, the NonStop server has demonstrated a 98% scaling efficiency over hundreds of CPUs. On-demand

scalability will be available for both hardware and software via *TiCAP (Temporary Instant Capacity)*. This will allow the flexibility to expand the performance capabilities of the platform to adapt to dynamic business conditions created by monthly or seasonal processing needs. TiCAP also enables the cost-effective deployment of new pilot applications.

Taking advantage of both the lower cost of standards-based technology and the higher performance capability of Itanium 2, Integrity NonStop has up to a 2.5x price/performance edge over the S-Series MIPS CPU, reducing transaction costs by 60%. In fact, a single Integrity NonStop processor is equal to the performance of 4.4 *S74000* processors or 2.0 *S88000* CPUs. With twice the performance at the same cost of an S-Series system, the Integrity NonStop platform also makes an ideal launch pad for entry level HA customers who have always wanted to be fault tolerant, but were afraid of the buy-in point. For either, the ROI makes the acquisition easier to handle because of the improved performance, scalability, and investment protection that comes with a commodity processor with a long-term roadmap. Any enterprise that acquires an Integrity NonStop will be able to take advantage of the enhancements that Intel has in store, including the dual-core *Montecito* processor, scheduled for availability from Intel by the end of 2005.

The fault tolerant Integrity NonStop implementation was designed with HP's NonStop Advanced Architecture. The fault tolerant Integrity NonStop implementation was designed with HP's NonStop Advanced Architecture. Each logical processor is implemented by two physical microprocessors in a Dual Modular Redundancy (DMR) design. Processors are connected to each other by a dual-fabric interconnect. For each logical processor, a Logical Synchronization Unit (LSU) checks to see if the results are identical for each I/O request from the two physical processors. Unlike the NonStop S-Series servers where the physical processors are in lockstep at the instruction level, this "loosely coupled" lockstep allows the server to leverage the self-checking capabilities of the Itanium processor. If a logical processor fails, system software ensures that the system continues to run on the remaining logical processors.

For the enterprise with zero tolerance for outages, the Integrity NonStop can be configured with Triplex Modular Redundancy (TMR) with three physical Itanium micro-processors making up a logical processor. With a TMR implementation, the hardware automatically fails-over to the remaining two processors, eliminating the necessity for a software failover, improving overall system availability. This functionality is the foundation of the "seven 9s" reliability. The TMR configuration provides for a 100 times increase in hardware availability over DMR and is only 15% more expensive than a DMR configuration, enabling the CIO to choose the level of availability that is best suited for the enterprise needs and the enterprise budget.

Integrity NonStop Services

Not every enterprise has a support staff in place to deliver the level of professional services required for the evolution of a fault tolerant information system. HP has recognized this and put in place a pair of services to assist the data center:

- **An Evolution Assessment Service** – Tailored to the specific needs of the enterprise, this service assesses the current non-stop environment and makes specific evolution recommendations; and
- **An Evolution Infrastructure Planning Service** – Provides a detailed project plan with schedules to maximize the benefits of the Integrity NonStop environment.

Integrity NonStop Systems Management

The evolution of the NonStop environment from S-Series to Integrity NonStop also integrates the NonStop environment under the HP *Systems Insight Manager (SIM)* and *OpenView* umbrella. The latest version, SIM 5.0, provides for a unified infrastructure management with complete infrastructure control and resource flexibility. This will significantly reduce the cost of management for any data center with a proliferation of HP systems by providing a common set of management tools regardless of the platform, i.e., ProLiant, Integrity, StorageWorks, etc.

OpenView has also been adapted for the fault tolerant environment. HP has implemented two new agents, OpenView NonStop

Server Management and OpenView NonStop Performance Management to simplify the configuration and setup processes. They have also implemented smart plug-ins for popular NonStop applications.

Conclusion

To the advantage of its traditional NonStop customers, HP has done what they set out to do: they have provided an evolution path for a generation of fault-tolerant NonStop enterprises that should provide them with investment protection and a level of scalability unheard of when their initial systems were installed. At the same time, by using standards and open systems components, they have enabled a new generation, and a new tier, of enterprises to avail themselves of a technology that can allow them to compete with enterprises with larger budgets, in industries that demand the highest levels of reliability and dynamic scalability.

Following in the footsteps of *HP PA-RISC* and *Alpha*, the HP Integrity NonStop Server has been introduced to breathe new life into the environment by bringing standards to NonStop and NonStop to standards. Today, these enterprises can expand to meet their mission statements for the 21st century. If you are one of them, take a look at Integrity NonStop; it may be the answer you seek.



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