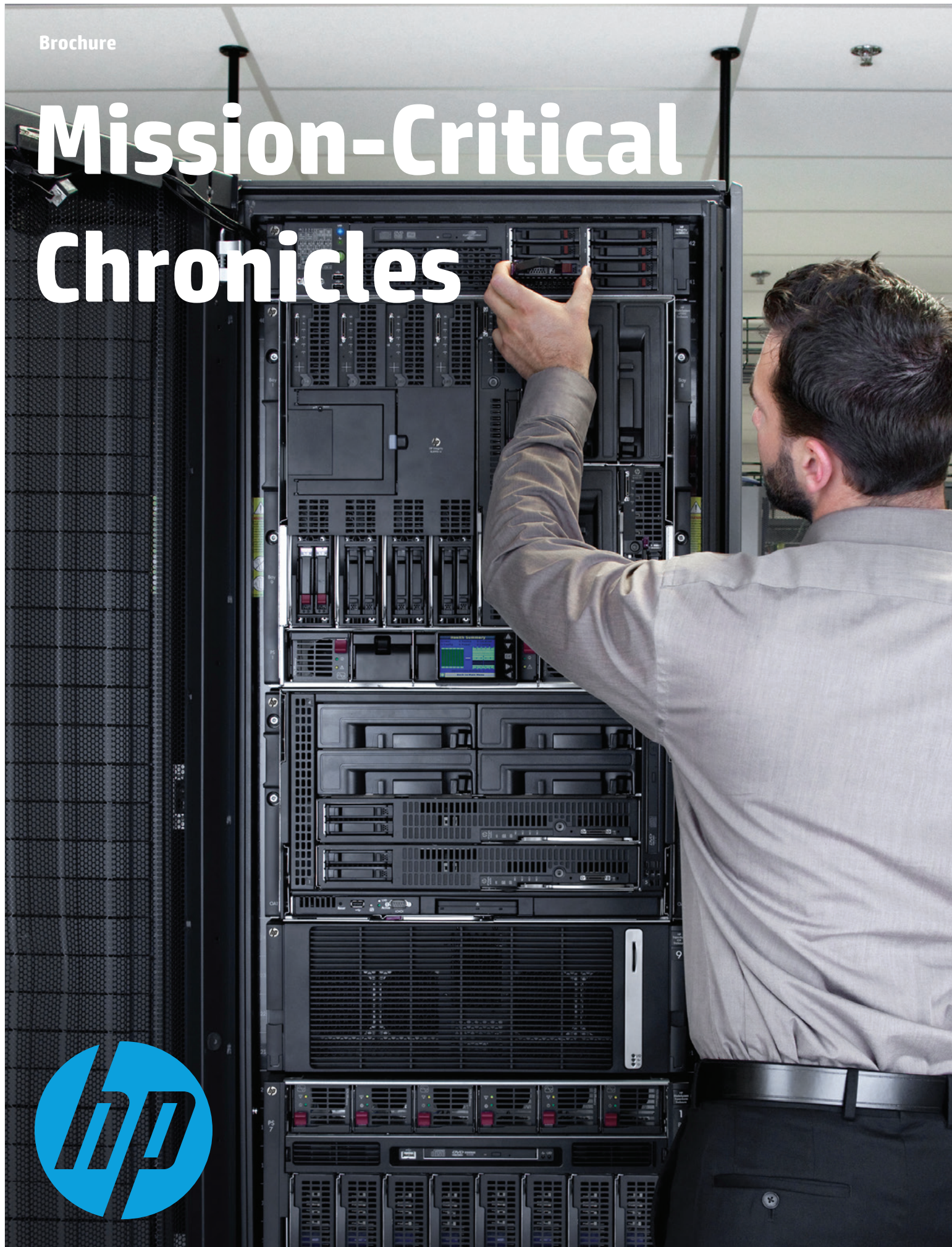


Brochure

Mission-Critical Chronicles



Introduction

Every IT professional knows that the need for mission-critical application performance is growing continuously. The expectations of end users, customers, and c-level executives have kept pace with technology developments, leading to greater availability, reliability, and performance needs. HP understands that financial, communications, government, and manufacturing environments can't afford unplanned downtime. This is one of the reasons HP Integrity servers have been a leader in the mission-critical landscape for decades.

This document is designed to show how HP has engaged with customers in proof-of-concept (POC) tests as a means to determine the best IT and business use cases for HP Integrity servers. These case studies highlight the performance advantages of the HP Integrity platform across a number of industries.

HP Integrity servers for mission-critical workloads

HP offers customers the world's first mission-critical Converged Infrastructure supported by a bold portfolio of HP Integrity servers featuring the latest Intel® Itanium® processor 9500 series. The newest generation Integrity servers include hundreds of HP innovations in reliability, flexibility and performance to deliver the next decade of mission-critical computing. Combined with HP-UX, the industry's leading UNIX operating environment for real-world performance, Integrity servers deliver significant business value and high levels of performance. In tests by customers and partners as well as internal benchmarking, HP servers running HP-UX 11i v3 have shown performance gains of anywhere from three to up to 10 times the performance of previous-generation systems at the socket level.

HP Integrity i4 servers combine resiliency, data protection, secure networks, and mission-critical services to support the most demanding workloads with unparalleled availability, built-in efficiency, and proven stability.

The HP lineup of Integrity servers blends HP BladeSystem efficiency with HP Integrity resiliency. Delivering investment protection and longevity, these platforms are designed to power the workloads that are most vital for the enterprise.

HP Integrity Superdome 2 is the ultimate mission-critical platform, scaling up, out, and within to consolidate applications on a common platform. Engineered with trusted Integrity Superdome reliability, Superdome 2 now supports up to 32 eight or four core Intel Itanium processor 9500 series and up to 8 TB of memory, increasing overall performance and memory capacity versus previous generations.

HP Integrity server blades are the industry's first eight-socket UNIX scale-up server blades built on the No. 1 blade infrastructure—flexible mission-critical server blades that combine the efficiency of HP BladeSystem to accelerate IT effectiveness. There are three models that leverage the Intel Itanium processor 9500 series: the HP Integrity BL860c i4 Server Blade; the HP Integrity BL870c i4 Server Blade; and the BL890c i4 Server Blade, which can provide up to 64 cores of computing power. The BL890c i4 also offers the unique HP Blade Link technology, which joins multiple blades to create 2, 4 and 8 socket systems, providing greater scalability and flexibility. The HP Integrity server blades leverage HP Virtual Connect Flex-10 technology, which offers increased network scalability and configuration flexibility with up to 20 times more networking bandwidth than the competition.

Intel® Itanium® Processors

These case studies often refer to several families of the Intel Itanium processor by model number as shown in the following table.

Family name	Release Date
Itanium 2 9000	July 2006
Itanium 2 9100	October 2007
Itanium 9300	February 2010
Itanium 9500	November 2012

HP Integrity use cases

Use Case #1: Government IT Agency

This Government IT Agency qualifies technology for use in government agencies in the region to determine best-of-breed purchase recommendations. The agency performs a yearly benchmark, which qualifies vendors for orders each business year. By engaging with the manufacturer of a local Relational Database Management System, HP was able to drive down license costs per core on HP Integrity i4 servers by 50% vs. a major competitor. The significant reduction in per-core licensing costs, combined with the 45% performance boost provided by the Intel Itanium processor 9500 series vs. Itanium processor 9300 series, qualified HP's big data solution for wider adoption in the region.

Use Case #2: National Banking Provider

A national bank in China with an installed Superdome 2 base was interested in the advantages of HP Integrity i4 servers vs. new systems from another major IT vendor. In a proof of concept between the vendor's servers running 4.42 GHz processors and HP Integrity servers with Itanium processor 9500 series running at 2.53 GHz, the HP Integrity servers delivered a 130% performance boost to the customer's core banking application through a combination of system optimization and fine tuning applications and storage.¹

Use Case #3: Business Software Manufacturer

A leading software manufacturer wanted to test the performance of its versatile message transport software on the new Itanium processor 9500 series vs. Itanium processor 9300 series for broad customer use. In a benchmark that pitted eight 9300 cores (on two processors) against eight 9500 cores on a single processor, the manufacturer experienced an 80% performance increase per core.

Use Case #4: International Pharmaceutical Manufacturer

This leading international pharmaceutical company runs one of the largest global instances of SAP. The customer has run the environment on HP Integrity servers for the past eight years, and wanted to compare performance on its existing Itanium 9300 architecture vs. Itanium 9500. The customer's objective is to optimize its 19,052 SAP instances. Using Superdome 2 with Itanium processor 9500 series, HP was able to achieve 2,000 SAP instances per core, for a total of 32,000 instances, compared with 1,327 instances per core and 21,232 total instances with Itanium processor 9300 series.

Use Case #5: Financial Software Manufacturer

The provider of a market-leading banking software system for retail, corporate, private, institutional, and community banks wanted to test its core banking solution on HP Integrity systems with Intel Itanium processor 9500 series in comparison with existing Itanium processor 9300 series installations. In the same form factor, HP Integrity BL860c i4 gave 3 times the performance as the BL860c i2 with a 45% core-to-core performance boost between 9500 and 9300 processors.

Case 1: Government IT Agency

Strategic licensing deal with local software provider results in 50% per-core reduction in costs, plus a 45% per-core performance boost with Intel Itanium processor 9500 series vs. Itanium processor 9300 series.

Summary

Situation:

This Government IT Agency qualifies technology for use in government agencies in the region. The agency performs a yearly benchmark, which qualifies vendors for purchase orders each business year. Before the Government IT Agency can recommend infrastructure technology for wider purchase, the equipment must pass strict performance benchmarks for database environments.

HP Integrity servers are in a tight competitive space with other major vendors in the region, both for performance and cost-per-license. HP needed to find a way to deliver both performance and added business value.

¹ 130% performance improvement on HP Integrity i4 servers with Itanium processor 9500 series vs. previous generation Integrity servers with Itanium processor 9300 series

Objective:

Demonstrate superior throughput and per-core price-performance value against the competition.

Approach:

- Prove at least a 30% performance improvement with Intel Itanium processor 9500 series over Intel Itanium processor 9300 series
- Work with local vendor of database software to lower per-core license fees
- Utilize newly introduced Last Level Cache for enhanced database performance
- Maximize I/O benchmark performance with storage tuning

Results:

- Achieved 45% performance improvement over Intel Itanium processor 9300 series in per-core performance
- Lowered per-core database software licensing costs by 50% vs. a major competitor

Proving the value of HP Integrity i4 servers

Every year, this government IT group certifies a set of standard server models that function as purchasing guidelines for the next 12 months. In late 2012, HP had recently introduced the HP Integrity BL8x0c i4 Server Blades—the first blades to incorporate the Intel Itanium processor 9500 series. HP spent considerable time meeting with the IT staff, explaining the benefits of the new Integrity i4 servers. HP knew it needed to prove at least a 30% per-core improvement over its Itanium processor 9300 series servers.

A major competitor was quick to react, proposing its own servers, which are a popular option in the region. The agency already had an installed base of HP Integrity Superdome servers that were due to be refreshed. Determined to base its purchasing decisions on hard data, the agency asked each of its hardware vendors to perform a POC test.



Winning the price-performance wars

Many countries encourage the growth of local enterprises through favorable procurement policies. In this case, a local software firm had developed a database with comparable functionality to Oracle. The government's IT agency had recently decided to migrate from Oracle to the locally developed product. This shift would reduce licensing fees and support the growth of the country's technology infrastructure.

HP knew it needed to prove more than performance metrics; it needed to show the government IT agency that its solution could also offer lower per-core software licensing fees for the preferred database vendor in the region: Tibero advanced Relational Database Management System by TmaxSoft. HP built a strategic relationship with TmaxSoft by offering help to optimize the DBMS at the kernel level of HP-UX. Eventually, the partnership enabled HP to drive down license costs by 50% per-core on HP Integrity i4 servers vs. a major competitor's systems.

The proof of concept (POC) tests would demonstrate the server performance for the locally produced DBMS using a simulated data warehousing workload (TPC-H), and POC results would determine procurements for the coming year.

Benchmark results

HP system	Processor model	CPU cores	Improvement throughput
Superdome 2	Tukwila 9350	56 cores	Baseline
Superdome 2	Poulson 9560	14 cores	46% up

Tuning the test system for maximum performance

By leveraging the shared last-level cache (LLC) of the Intel Itanium processor 9500 series, HP was able to tune the cache for superior database performance. With this feature, threads running on different cores within the same processor can share the same cache data, increasing DBMS performance by lowering latency, eliminating duplicate data and improving performance of applications that share common data. HP 3PAR storage systems further enhanced I/O performance.

Case 2: National Banking Provider

POC enhances national bank's confidence in HP Integrity servers vs. competing solutions from another major vendor.

Summary

Situation:

A bank in China with an installed Superdome 2 base was interested in the advantages of HP Integrity i4 servers vs. new systems from another vendor. In a proof of concept between the other vendor's hardware running 4.42 GHz processors and Integrity servers featuring the Intel Itanium processor 9500 series running at 2.13 GHz, the HP Integrity server offered a 130% performance boost to the customer's core banking application, versus previous generation Integrity servers, through a combination of system optimization and fine tuning applications and storage.

Objective:

Determine architecture for national bank's next-generation core banking solution.

Approach:

- Test the customer's real-world application and data
- Optimize infrastructure environment, including servers, storage and networking elements
- Collaborate with customer for two weeks on baseline setup prior to extensive testing and tuning

Results:

- Demonstrated 2.3x per-core performance improvement of Intel Itanium processor 9500 series over Intel Itanium processor 9300 series
- Over-achieved the customer's projected workload of 50 million transactions per day
- Achieved positive TCO analysis for the bank's next-generation core banking project

Can HP Integrity be the next-generation core banking slam-dunk solution?

This high-profile national bank is a reference site for the country's banking sector. They were looking for the best platform on which to build its next-generation core banking solution. Another vendor was quick to step in, putting forth its systems based on their new 4.42 GHz-clocked chip architecture. HP responded, suggesting a POC against its newly released Integrity servers featuring the Intel Itanium processor 9500 series.

HP analyzed the bank's application and workload to thoroughly understand what data was most and least frequently accessed. It was determined that due to the bank's specific application and data needs, the POC would take place on site. Because IT leaders at the bank projected a substantial daily transaction growth in the next 5 years, it was determined that the target for the POC be set to 50 million transactions per day.

Performance improvement – Highlight	% Performance Improvement
Intel Itanium processor 9500 series; Hyper-Threading; Non-Uniform Memory Architecture (NUMA); HP-UX Kernel Configuration; HP-UX update	43.5%
Apply optimization: Tuxedo configuration, Number of servers/queues tuning; Tuxedo server binaries settings; application recompiled by enhanced compiler options	27.5%
Database: Oracle parameters and table/index tuning; SQL tuning; database files and redo log tuning; data layout optimization on 3PAR storage	26%
Total improvement (compound)	130%*

*Figure includes 33% improvement due to several non-measurable factors.

Benchmark proves HP Integrity's performance

HP carried out the benchmark over a six-week period using the customer's real-world application stack, a close approximation of its data set, and the top 50 business transactions from its production system, with the objective of meeting the bank's projected transaction load.

Running the POC on Superdome 2 with 64-core Intel Itanium processor 9500 series 2.13 GHz processors and an HP 3PAR V800 storage system, HP achieved a 2.3x per-core performance improvement over Superdome 2 with Intel Itanium processor 9300 series processors. This combination easily outperformed the customer's projected workload of 50 million transactions per day with excellent linear scale-up capabilities. The value of HP 3PAR storage was a significant system performance-boosting factor. In all, a compound performance improvement of 130% was achieved over the previous Integrity server, with more than 43% of that benefit coming from enhancements to HP-UX 11i v3 and the improvements built into the architecture, including non-uniform memory access (NUMA).

Case 3: Business Software Leader

International software leader experiences an 80% performance increase per core with Integrity i4 servers featuring Intel Itanium processor 9500 series.

Summary

Situation:

An international software company provides a messaging middleware application used to transport any type of data as messages, enabling businesses to build flexible, reusable architectures such as service-oriented architectures (SOA). This manufacturer wanted to test the performance of its versatile message transport software on the Integrity servers running on Itanium 9500 vs. Itanium 9300 to qualify it as a competitive platform for broad customer use.

Objective:

Test the performance of high-profile middleware application on latest HP Integrity Superdome 2 systems

Approach:

- Establish a testing environment using Cognos Solutions Implementation Methodology (CSIM) tool
- Create and load message queues to be managed by the middleware
- Create a test server topology based on two Superdome 2 systems
- Test and evaluate Integrity servers featuring Intel Itanium processor 9500 series vs. Intel Itanium processor 9300 series systems on a per-core basis

Results:

- An average of 80% throughput performance increase on Intel Itanium processor 9500 series- vs. Intel Itanium processor 9300 series -based Integrity systems
- Performance increases can be attributed to advances in Last Level Cache and NUMA
- Solution “just worked” without issues, delivering peak performance with minimal tuning

The case for HP Integrity i4 servers

The HP Integrity i4 servers feature the Intel Itanium processor 9500 series, which has double the core-count of the Intel Itanium processor 9300 series used in the previous i2 generation of HP Integrity i2 server systems. This means that customers can now buy smaller systems to process the same workload, and smaller systems have cost benefits in terms of lower capital and operating expenditures. For example, if a workload requires 16 cores then it will be more cost effective to acquire an HP Integrity BL860c i4 Server Blade than an HP Integrity BL870c i2 Server Blade, and the BL860c i4 Server Blade has the additional advantages of lower running costs, due to lower power consumption, and occupying less rack space.

Integrity and HP-UX customers who upgrade to the latest HP Integrity i4 servers should see a considerable performance improvement over the previous-generation HP Integrity i2 servers. For those upgrading from older HP Integrity servers, the performance improvement is likely to be even greater.

Improving performance by 80% in core-to-core comparison

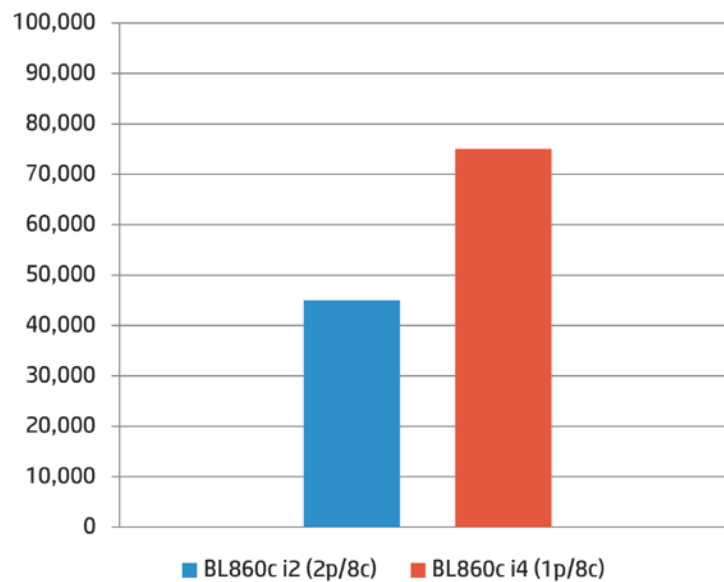
CSIM was used to test three different queuing models against three different combinations of message-type and binding-type. A message size of 2,048 bytes was used for all tests—it's worth noting that this is a small message size and may not be representative of those from other applications.

For a given headline test combination, CSIM works by starting off with one CSIM client program putting a message onto a request-queue, and waiting for a reply. The CSIM server program gets the message from the request queue, and simply puts a reply message onto the reply-queue. When the CSIM client program gets the reply-message, a “message round-trip” is completed. The client program will then repeat the process by putting another message onto the request-queue.

Based on the observed results for a 2KB message-size, and ignoring the persistent message results due to differences in SAN storage used, the HP Integrity BL860c i4 1p/8c server systems resulted in application throughput rates that were approximately 80% higher than when using the HP Integrity BL860c i2 2p/8c server systems. This is an 8-core against 8-core comparison, and the difference is much greater than the difference in processor clock speed, and is partly due to reduced NUMA effects of the BL860c i4 1p/8c configuration. The shared L3 or last-level cache (LLC) of the Intel Itanium processor 9500 series also helps the BL860c i4's performance in these tests compared to the non-shared LLC of all previous generations of Itanium processors.

With regard to the test results for 2KB message size for the BL860c i4 servers in 2p/16c configuration showing negligible improvement over BL860c i4 servers in 1p/8c configuration, it's important to bear in mind that the test CSIM client and server programs do no processing with the MQ messages. This is not representative of real-world usage of the application, where typically a request-message from the client results in the server doing processing such as a database query or update, which would consume CPU resources. It is presumed that real-world applications would scale much better with increased processor core counts than the CSIM tests used in these tests.

Message Throughput Rate: Core-to-Core Comparison



Case 4: International Pharmaceutical Manufacturer

Running one of the largest global instances of SAP on HP Integrity, this customer wanted to lower TCO and boost performance.

Summary

Situation:

This leading international pharmaceutical company runs one of the largest global instances of SAP. The customer has run the environment on HP Integrity servers for the past eight years, and wanted to compare performance on its existing Itanium 9300 architecture vs. Itanium 9500.

Objective:

Demonstrate that the customer can consolidate its infrastructure, reduce cost, and achieve a significant performance increase in transaction processing.

Approach:

- Utilize the Hammerora benchmark²
- Establish the four test scenarios of Intel Itanium processor 9500 series vs. Intel Itanium processor 9300 series, with and without Hyper-Threading enabled

Results:

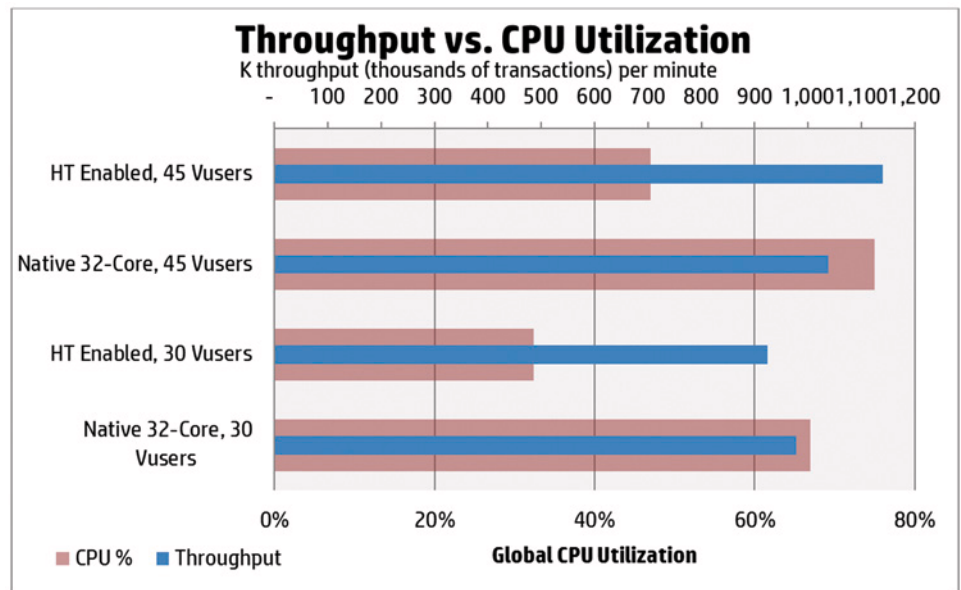
- HP Integrity i4 server with Intel Itanium processor 9500 series delivers 39% more per-core throughput with less CPU usage vs. Intel Itanium processor 9300 series
- With Hyper-Threading enabled, HP Integrity server with Intel Itanium processor 9500 series delivers 58% more throughput vs. Intel Itanium processor 9300 series in a per-core comparison
- Initial tests resulted in over 300,000 transactions per minute (TPM) for the customer's Oracle® Database
- After tuning, the system exceeded 1 million TPM

² <http://hammerora.sourceforge.net/>

How to boost performance while strategically minimizing TCO profile

This leader in the international pharmaceutical world has relied on HP Integrity servers to power its massive, global SAP deployment for the past eight years. The customer has experienced the benefits of upgrading its mission-critical systems as new technology becomes available from HP. The release of Integrity servers featuring the Intel Itanium processor 9500 series in late 2012 was no exception. The customer wanted to take the new technology through its regular benchmarking process to determine whether the Itanium processor 9500 series-based servers would enable a significant performance boost as well as an opportunity for consolidation.

The Hammerora benchmark and four test scenarios were agreed upon. The Intel Itanium processor 9500 series would be benchmarked against Intel Itanium processor 9300 series with, and without Hyper-Threading enabled. The customer's golden images of standard operating environments were loaded onto the HP Integrity i4 server blades with Intel Itanium processor 9500 series and they loaded without issue and worked well without any tuning. However, after tuning, and adding Hyper-Threading, the overall server performance increased dramatically.



Excellent benchmark results for HP Integrity i4 servers

Throughput with the Hammerora benchmark was excellent, varying between 950,000 and 1,141,060 TPM on the Intel Itanium processor 9500 series 32-core HP Integrity i4 blade server. Throughput was limited, however, by the Oracle Database instance and the nature of the Hammerora benchmark—the server still had available capacity for additional processing. Hyper-Threading provided a significant increase in potential throughput, reducing CPU utilization from 67% to 32% with similar throughput.

System tuning triples performance

Several tuning steps were implemented to improve the throughput of the Hammerora benchmark. The initial test achieved 314,564 TPM. After tuning the system exceed 1,000,000 TPM. It should be noted that these changes are intended for a benchmark environment and may not be appropriate for production workloads.

Case 5: Financial Software Designer

HP Integrity BL860c i4 delivers 3x the performance vs. BL860c i2 server blades with a 45% core-to-core performance boost.

Summary

Situation:

A market-leading banking software provider for retail, corporate, private, institutional, and community banks wanted to test its core banking solution on HP Integrity systems with Intel Itanium processor 9500 series and compare them to their existing Integrity servers with Itanium processor 9300 series.

Objective:

Demonstrate the value of Intel Itanium processor 9500 series in a banking “close-of-business” workload test

Approach:

- Simulate a banking environment with 1 million accounts
- Select Oracle 11gR2 as the database
- Choose HP BL860c i4 with 16 cores and 64 GB RAM
- Run the test using HP-UX 11i v3
- Use HP 3PAR StoreServ P10000 V800 as the storage system

Results:

- Successfully processed 1 million accounts for interest and charges
- Achieved a steady-state rate of 47.5 TPS per core with 56% CPU utilization with Intel Itanium processor 9500 series
- Achieved a steady-state rate of 32.7 TPS per core with 64% CPU utilization with Intel Itanium processor 9300 series
- Intel Itanium processor 9500 series achieved a core-to-core performance gain of 45%

Server Model	Threads	TPS	CPU Utilized	Total Cores	Cores Utilized	TPS/Core
BL860c i4	20	426	56%	16	8.96	47.54464
BL870c i2	20	333	63.5%	16	10.16	32.77559
					Diff in TPS/Core	14.76905
					Core-to-Core % gain	45%

Successful benchmark shows lower CPU usage, higher TPS rates for Itanium processor 9500 series

This core banking application is a complete front to back office, CRM and product lifecycle management software platform that powers retail, corporate, wholesale, universal and private banking operations. The software has been consistently ranked as the first or second best-selling core banking software platform worldwide for the last 14 years.

The benchmark was designed to test a large-scale financial institution workload at close of business, calculating fees and interest on 1 million accounts. The test compared a 16-core HP Integrity BL860c i4 server with 64 GB RAM against an Integrity BL870c i2 server in the same form factor. Both servers were running installations of HP-UX 11i v3, and accessed an Oracle Database 11gR2 on HP 3PAR StoreServ P10000 V800 storage.

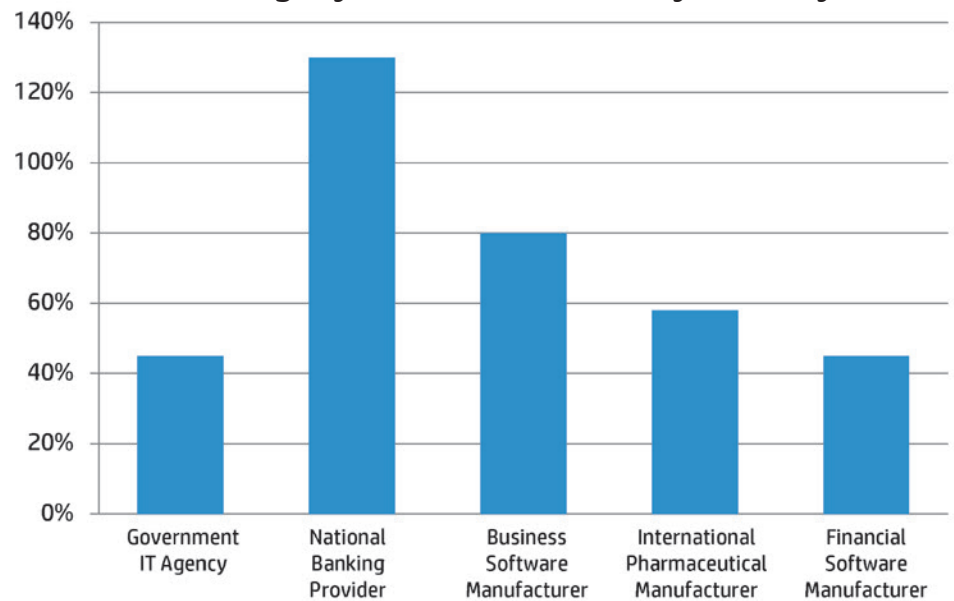
Installed on the server with Intel Itanium processor 9500 series, the application delivered 3x the performance of the server with Itanium processor 9300 series on the test workload. In core-to-core performance, the BL860c i4 server delivered a 45% performance improvement over the blade with Itanium processor 9300 series, providing a clear benchmark win.

Conclusion

- **Choose the right benchmark.** When performance is the primary consideration, the benchmark is critical. Close coordination between HP's technical experts and your IT team is the best way to ensure the choice of a benchmark that measures the right parameters.
- **Tuning the entire system is critical.** Achieving top performance requires not only tuning the test hardware but also setting key parameters in HP-UX and any related databases or applications.
- **Don't underestimate the benefits of upgrading HP-UX.** In some cases, moving from HP-UX 11i v2 to v3 accounted for as much as a 30% performance gain.

With the proven infrastructure and OS to offer industry-leading performance and availability even with the most volatile and demanding workloads, HP Integrity will reliably run your applications so you can focus on running your business.

Integrity Performance Gain by industry



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