

Performance Comparison: HP OpenVMS on HP AlphaServer and HP Integrity server systems

Technical white paper



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Executive summary

Since the introduction of the AlphaServer product line in 1992, HP customers running the OpenVMS operating system have depended on the solid performance and reliability of AlphaServer systems, backed by support from HP Services. Today, customers are increasingly looking at HP Integrity servers based on the Intel® Itanium® microprocessor to protect their long-term IT investments. The decision to move to Integrity servers running OpenVMS is a sound one based on both technical and business requirements.

The extreme flexibility, secured availability, and simplified management that HP Integrity servers deliver can help you improve business outcomes by accelerating growth, lowering costs, and mitigating risks. Moreover, they deliver balanced performance to match demanding workloads and meet high levels of business continuity and availability. They are flexible in multiple dimensions, including

- Dynamic reallocation of computing resources to meet fluctuating business demands
- A choice of four operating systems: OpenVMS, HP-UX 11i, Linux, or Microsoft® Windows® 2003 Server in secure, electrically isolated partitions
- A modular design that preserves your investment through straightforward in-box upgrades to gain increased future performance

Recently, HP engineers ran tests to compare the performance of applications running on OpenVMS AlphaServer and OpenVMS Integrity server systems. In addition, customers are now testing their applications on HP Integrity servers running OpenVMS in the HP OpenVMS Customer Lab (See Appendix B.)

The results of these tests strongly indicate that OpenVMS users can obtain substantial performance improvements on the Integrity server platform. Moreover, as OpenVMS itself continues to undergo investment and enhancement the changes in the operating system can also enhance application performance. These platform improvements—coupled with the price/performance benefits of Integrity systems and the proven high value of OpenVMS—provide a convincing argument for choosing these products for the next generation of your server infrastructure.

HP Integrity servers

HP Integrity servers provide a strong foundation for an adaptive IT infrastructure. HP extends the capabilities of the industry-standard Intel Itanium microprocessor through high-performance system chipsets that ensure balanced performance and excellent memory and I/O subsystem scalability. The introduction of the HP Super-Scalable Processor Chipset sx2000 in midrange and high-end Integrity servers provides increased bandwidth, enhanced availability and I/O connectivity, reduced system latencies, and better manageability.

HP Integrity servers meet your key requirements by providing flexible capacity for your changing business needs, secured availability to ensure service levels, and simplified management to streamline operations. This can free up resources to add increased value to your business or enterprise.

Integrity servers can handle any type of workload—whether batch, query, or online transactions—and scale up or out as your needs change. The modular design of Integrity servers enables you to span multiple generations of Itanium CPUs to provide a longer system life cycle (preserving the same chassis and serial number for approximately four to seven years), resulting in outstanding investment protection and lower TCO.

Flexible capacity

Virtualization is the key to implementation of a next-generation data center. Many businesses assign applications to specific servers. When that application is not used, the server is idle, wasting resources. HP Integrity server virtualization solutions increase resource utilization by pooling, sharing, and allocating resources as needed, ensuring that you meet or exceed your service level objectives, streamline system management, and reduce overall cost. HP provides virtualization solutions for multiple operating systems on Integrity server, providing great flexibility.

Secured availability

HP integrated solutions for secured availability support continuous business operations and protect your IT environment at every level from intrusion. Innovative technologies preserve data integrity and significantly increase application availability while reducing planned and unplanned downtime. Plus, with Integrity servers' advanced partitioning capabilities, you can upgrade live systems one partition at a time.

Simplified management

HP Integrity servers provide powerful, unified infrastructure management to simplify your IT operations. HP Systems Insight Manager (HP SIM) is a single, unified platform to manage HP Integrity, HP ProLiant, and HP 9000 servers across operating systems as well as HP StorageWorks MSA, EVA, and XP arrays. HP Integrity Essentials extends HP SIM, providing modular, integrated system management software for complete HP Integrity server management. By providing a consistent set of management tools, HP enables you to simplify Integrity server management.

HP OpenView software allows you to manage your IT infrastructure and troubleshoot networks with a unified and integrated enterprise-wide management solution for reduced total cost of ownership (TCO).

OpenVMS for HP Integrity servers



HP Integrity servers promote lower operating costs and greater agility so you can respond more quickly to business needs. They provide greater scalability and more headroom to handle the increasing demands of your enterprise. Together with the industry-leading high availability, impenetrable security, vast scalability, and low TCO inherent within OpenVMS, you get an IT environment that offers breakthrough value within and beyond the system.

OpenVMS is now in its fifth release for HP Integrity servers. Version 8.3 delivers even greater flexibility and investment protection along with lower total cost of ownership (TCO) and additional virtualization capabilities. New clustering and data-shadowing functions further increase performance levels in disaster-tolerant environments while additional security capabilities enhance the OpenVMS reputation for secure, rapid application delivery.

With OpenVMS version 8.3, you can choose to deploy HP Integrity servers as your business needs require. The Virtual Server Environment for HP Integrity servers marshals your resources where and when you need them for the most flexible and efficient operation. And the mixed architecture clusters of Integrity servers and AlphaServer systems are fully supported, promoting the integration of HP Integrity servers into an OpenVMS environment at the pace directed by your business needs. In addition, licensing and service plans for OpenVMS on HP Integrity servers offer reduced complexity, increased cost-effectiveness, and greater flexibility.

Purchasing OpenVMS on HP Integrity servers is less complex

HP offers three levels of the OpenVMS operating environment on HP Integrity servers so you can buy only what you need, when you need it. Plus, you can mix and match these operating environments. Moreover, per core licensing (PCL) allows you to balance your investments with your needs.

- The HP OpenVMS Foundation Operating Environment (FOE)—an Internet-ready, feature-rich offering with leading price/performance
- The HP OpenVMS Enterprise Operating Environment (EOE)—enhanced manageability functions, single-system availability, and performance
- The HP OpenVMS Mission-Critical Operating Environment (MCOE)—the highest levels of multi-system availability and workload management

Comparison testing

During the OpenVMS on Integrity development and qualification process, HP engineers ran some informal tests to compare the performance of applications running on OpenVMS AlphaServer and OpenVMS Integrity systems. These tests were conducted with minimal effort using “out-of-the-box” software in a real-world environment.

The results of these tests strongly indicate that OpenVMS users can obtain substantial performance improvements on the Integrity platform. That, coupled with the price/performance benefits of Integrity systems and the proven high value of OpenVMS, provides a convincing argument for choosing the Integrity platform and OpenVMS for the next generation of your server infrastructure.

These performance tests were run on AlphaServer ES47 and ES80 systems and Integrity rx3600 and rx6600 Servers. These machines were not chosen for direct comparison purposes but as representative AlphaServer systems and Integrity servers. All of these tests were run with out-of-the-box software installations, with no application or OpenVMS tuning. A scripting tool was used to emulate concurrent users exercising a subset of each application’s functionality. The three applications were

- HP Secure Web Server
- The current Java Virtual Machine
- MySQL 4.1.14

The graphs in figures 1, 2, and 3 show the relative performance of one of the applications on the four machines. They are unaudited and are suggestive of the performance improvement possible if just the hardware architecture is changed (remember: your mileage will vary!).

Note that figures 1 and 3 are throughput graphs, so higher is better. Figure 2 is a response-time graph, so lower is better.

Figure 1. Intensive Java workload (higher is better)

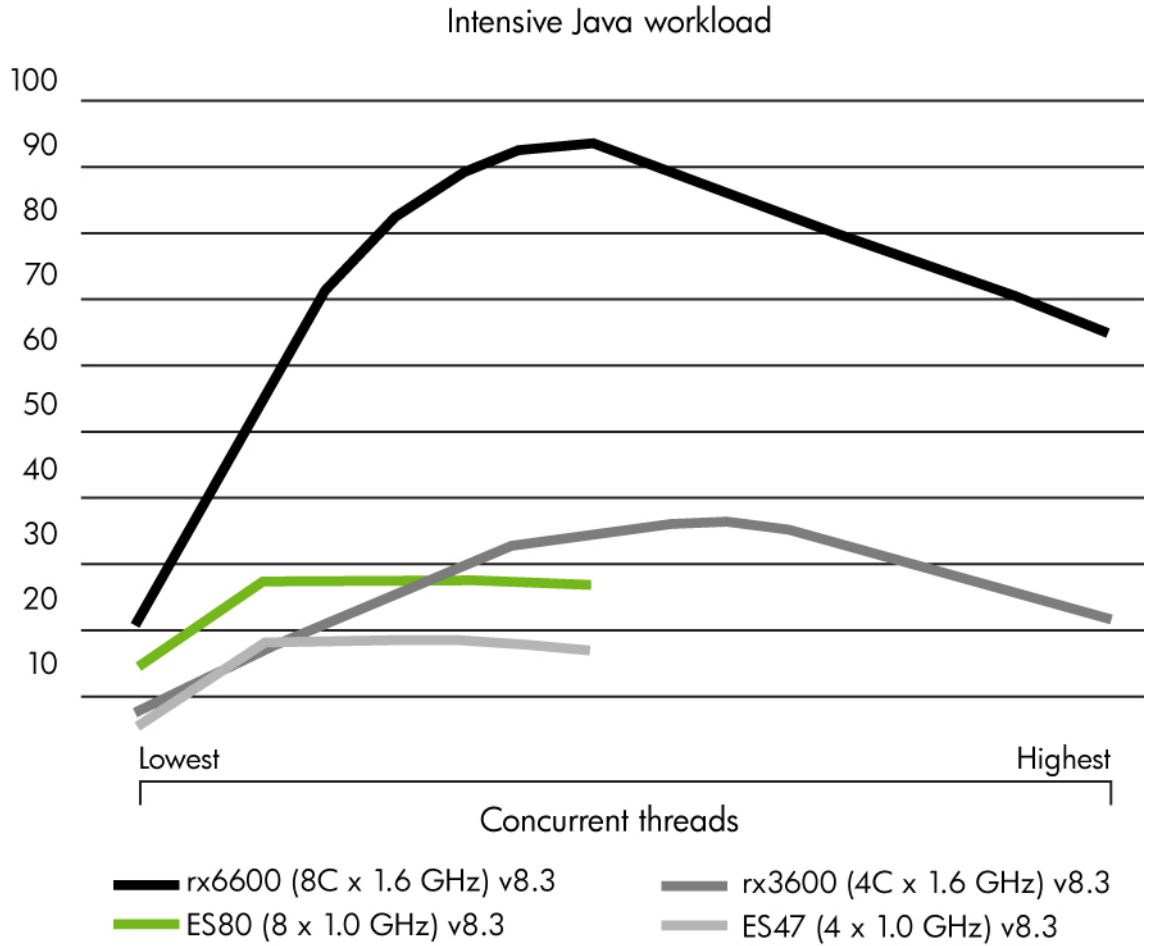


Figure 2. Intensive local SWS workload (lower is better)

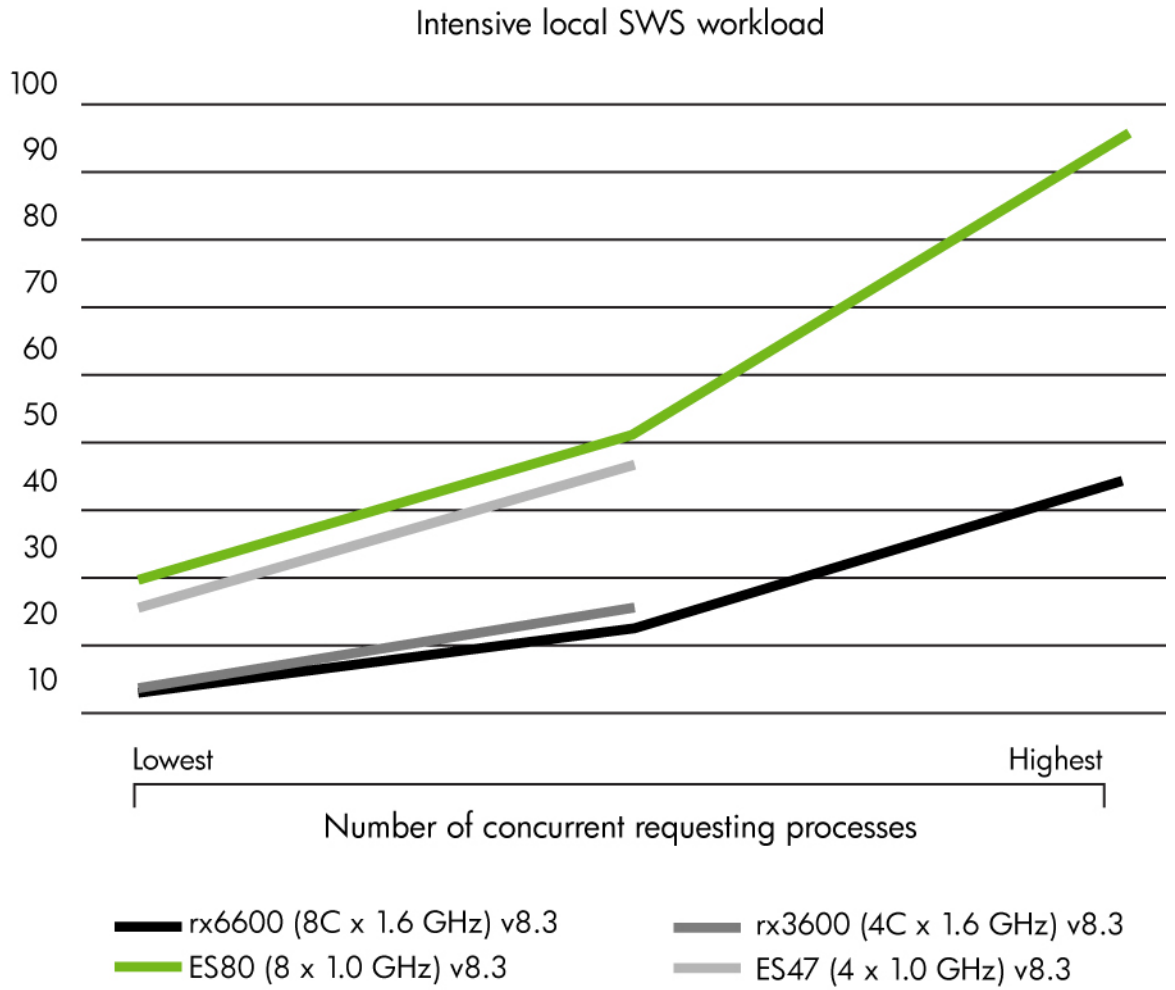
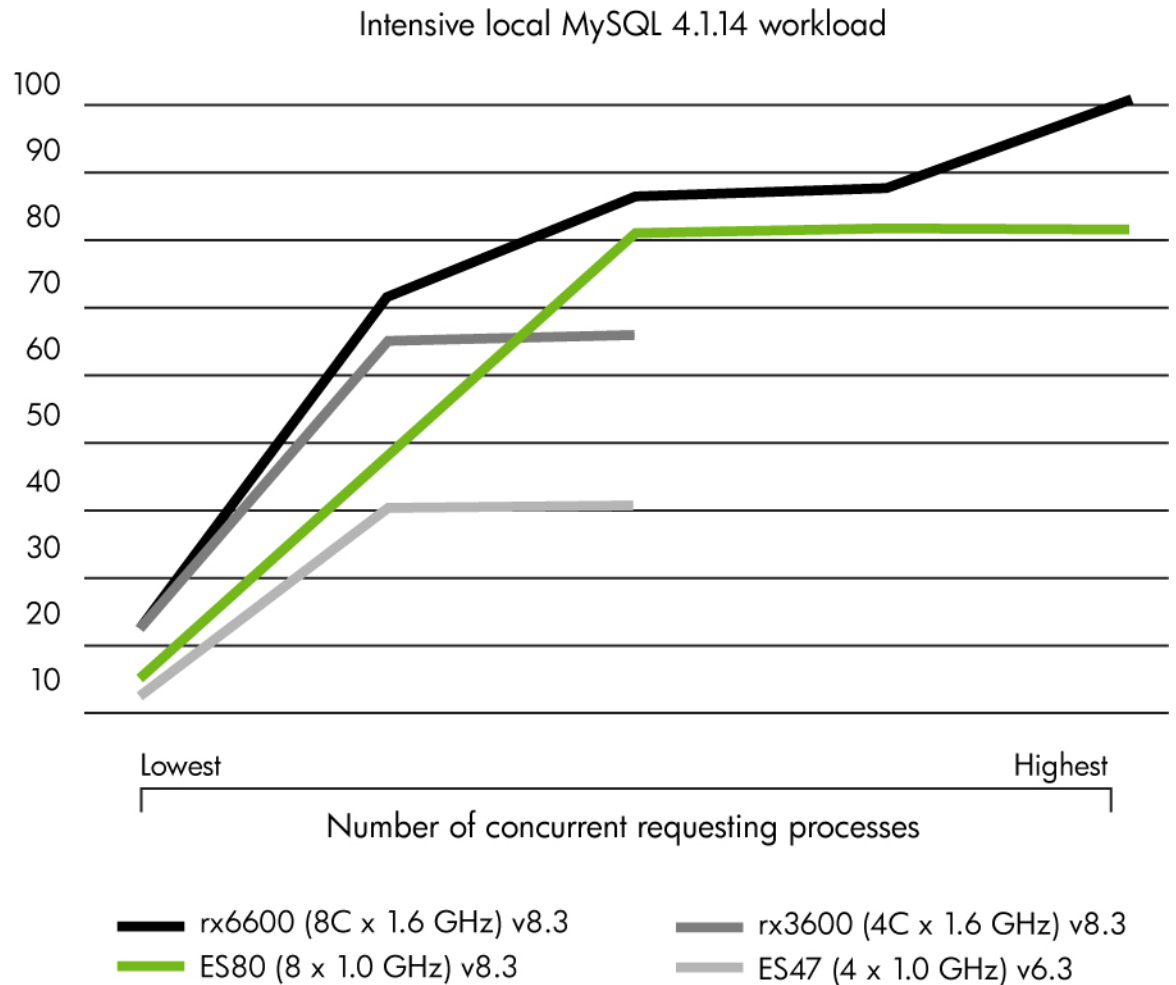


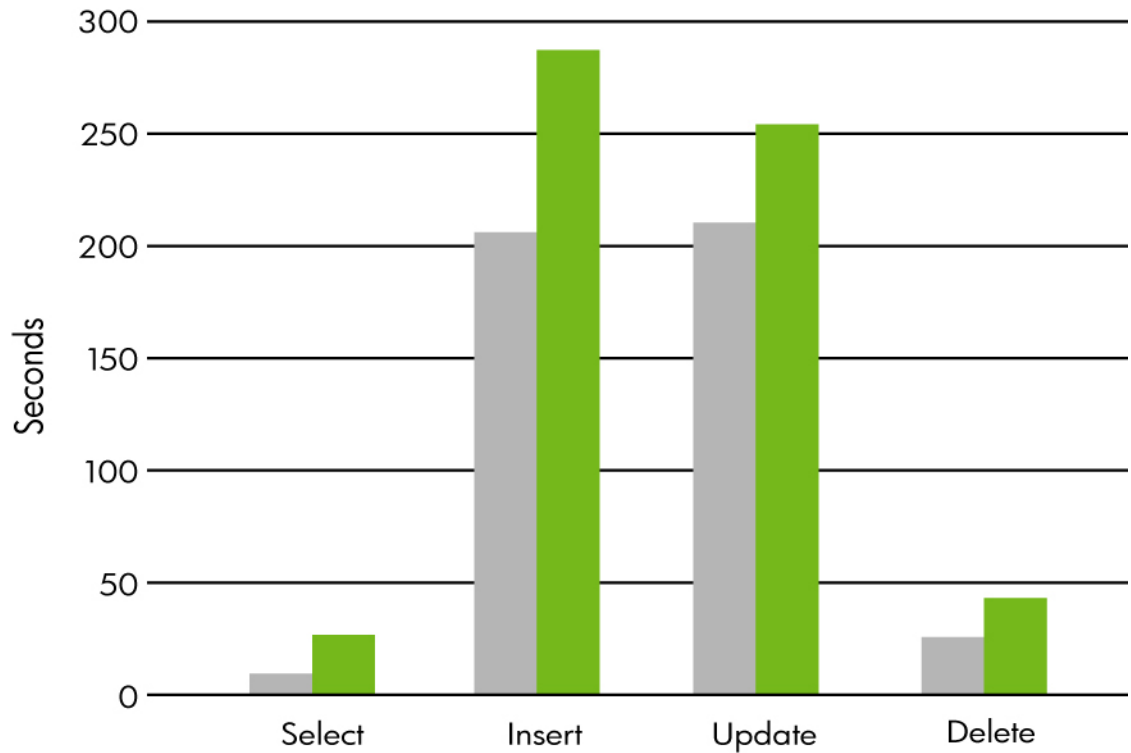
Figure 3. Intensive local MySQL 4.1.14 workload (higher is better)



Oracle® testing

HP engineers carried out this round of testing using out-of-the-box installations of a RAC/CRS Oracle 10g R2 configuration with a 2-node cluster comprising either an AlphaServer GS1280 (8 CPU) or Integrity rx8640 Server (8 core x 1.6 GHz). DCL scripts were executed both as “local” clients—connected to a RAC instance on the same machine (Figure 4)—and as “remote” clients—connected to a RAC instance on the other node in cluster (Figure 5). The tests consisted of OpenVMS DCL scripts which executed 100,000 iterations of basic SQL*Plus functions (select, insert, update, delete). There was no Java executed or any application layer. No database or system tuning was done. Each test run was executed 10 times and the average of those runs are shown in following graphs. Tests never reached bottleneck or thresholds.

Figure 4. Oracle comparisons—100,000 local iterations (less is better)



Less is better.

■ rx8640 (8C x 1.6 GHz)
Oracle 10g R2

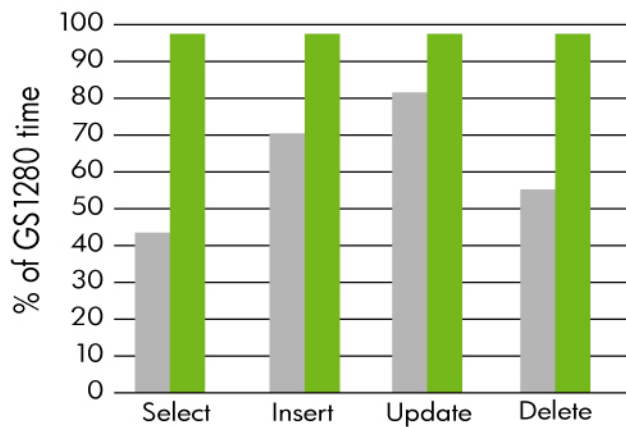
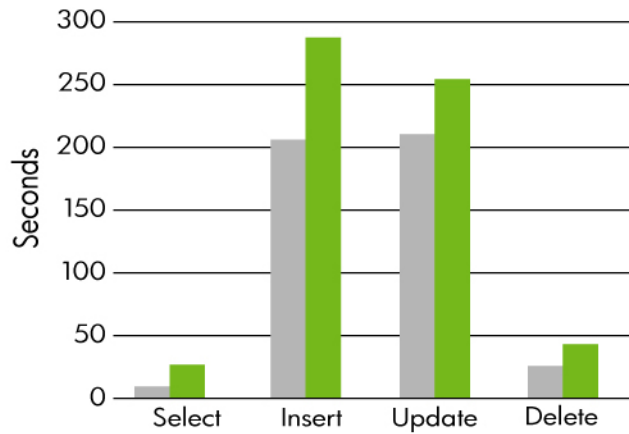
■ GS1280 (8 CPU)
Oracle 10g R2

■ Integrity

■ Alpha

The graph clearly shows execution time is between 20–50% faster on the Integrity system. There is typically more “change overhead” in update statements than in inserts or deletes (and of course selects), so you see the smallest amount of improvement in execution time for updates than for the other SQL statement executions.

Figure 5. Oracle comparisons—100,000 remote iterations (less is better)



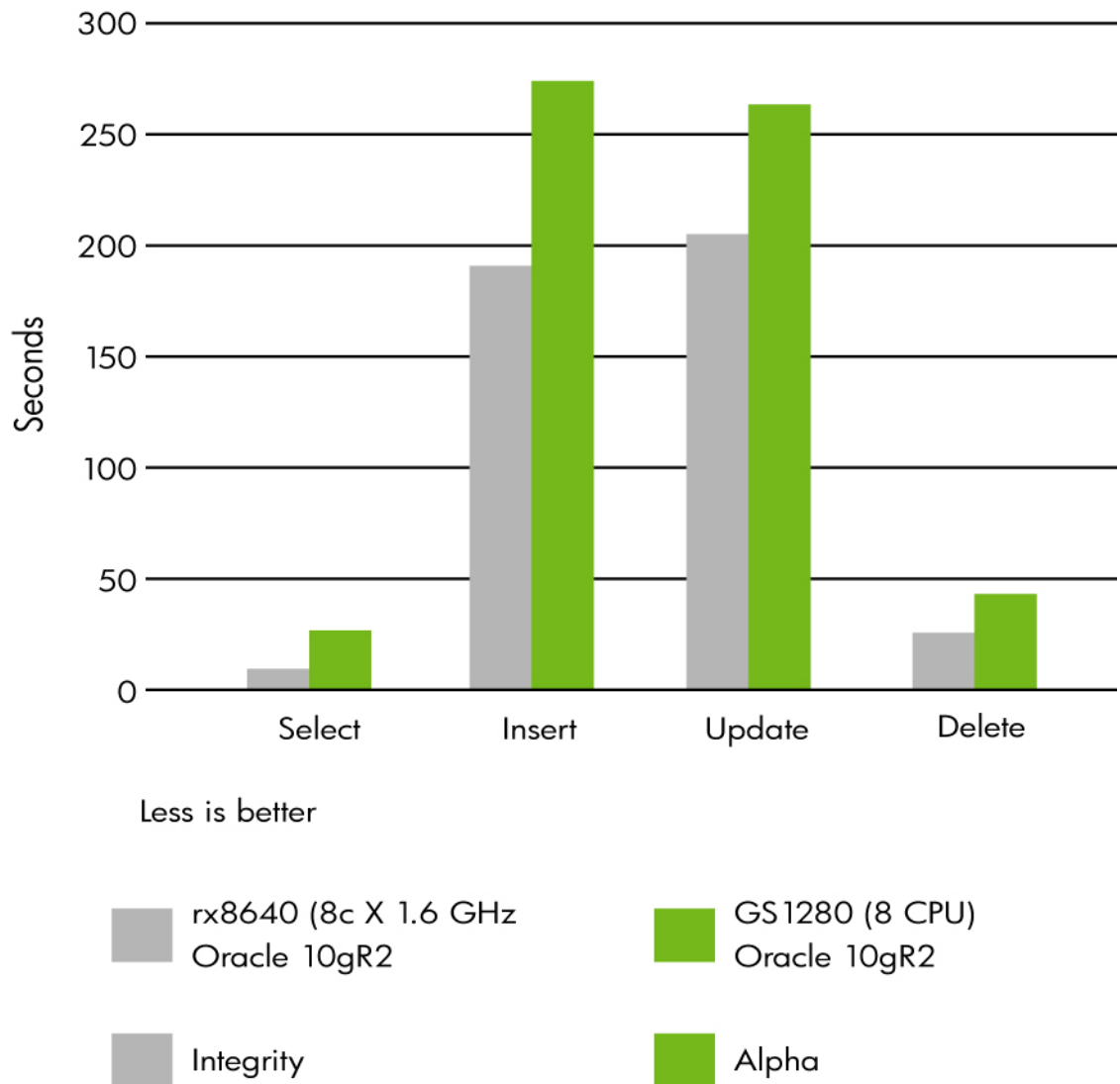
Less is better.



The SQL execution times shown in figure 5 are very similar to those shown in Figure 4 even though the clients are connecting to a non-local instance. In production environments, where there could be significant network traffic, there might be longer execution times. This would be very dependant on the amount of traffic, but the ratio between Integrity and Alpha execution time would be expected to remain the same.

Figure 6 shows the results of a sequence of 100,000 iterative SQL statements run multiple times. The first graph is the total elapsed time. The second shows the same data with the GS1280 normalized to 100. Improvement of the Integrity rx8640 Server over the AlphaServer ranges from 20% to 60% depending on the operation.

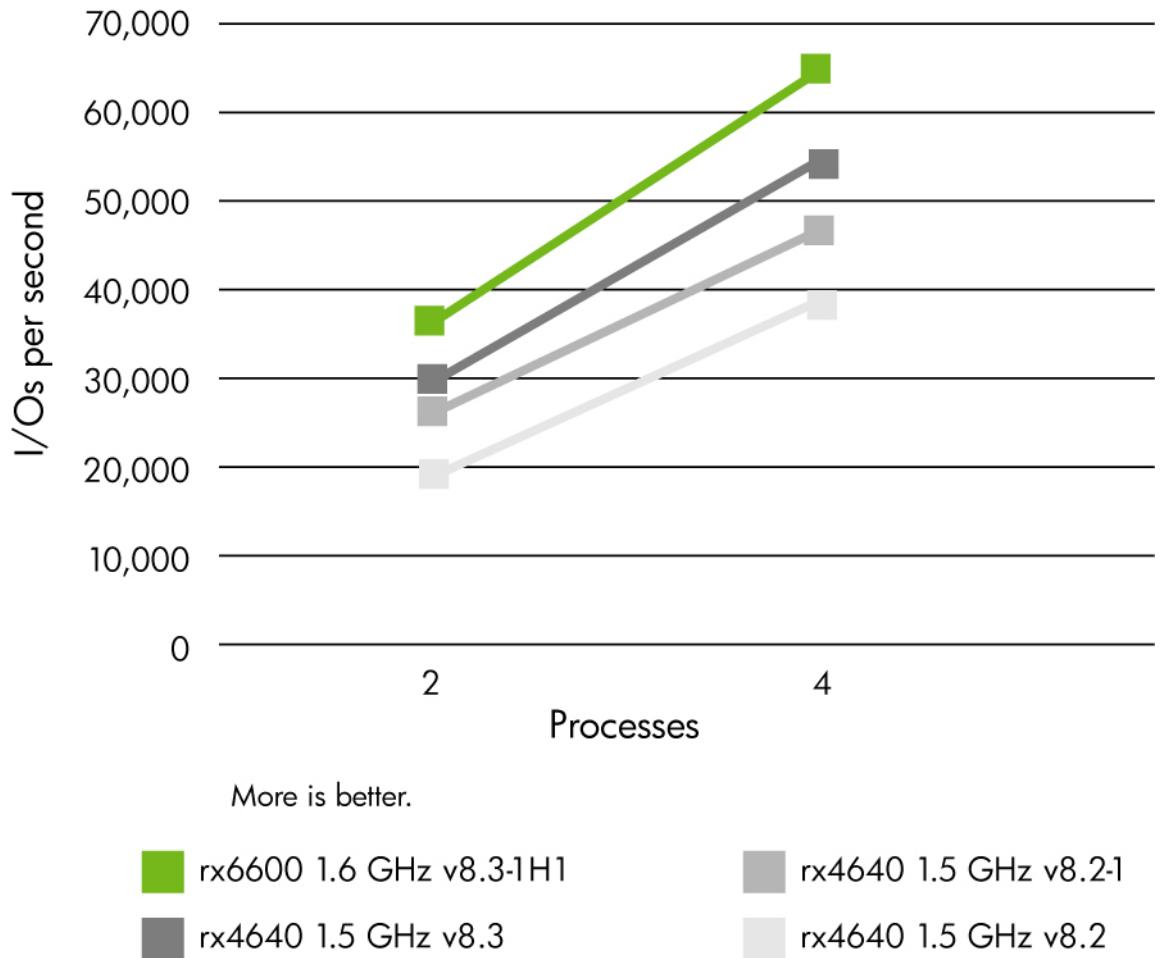
Figure 6. Oracle comparisons—elapsed time and normalized data



Performance comparison of OpenVMS versions

The previous few pages have demonstrated how the performance of Integrity servers exceeds that of AlphaServer systems in the OpenVMS operating environment. Beyond that, though, it is important to recognize that HP is investing in and continuously improving the OpenVMS operating system. Figure 7 clearly shows the improvement in performance from OpenVMS version 8.2 to version 8.3. In addition, version 8.3-1H1 which becomes available at the end of 2007 continues the improvement curve. Although it is important to note that it was run on an HP Integrity rx6600 Server, the successor to the Integrity rx4640 Server.

Figure 7. Performance improvement from OpenVMS version 8.2 to version 8.3



Summary and recommendations

For more than a decade, you have relied on AlphaServer systems to run your core business applications. Now is the time to bring HP Integrity servers into your environment. The Alpha RetainTrust (ART) program provides the guidance to help you choose the best option and the resources, tools and services to make it successful.

The Alpha RetainTrust Program includes:

- **Programs and incentives:** Special offers and programs available in your region.
- **Excellent products:** The final generation of AlphaServer systems delivers strong performance whether you're upgrading a single system or consolidating older systems. And, when your business needs require, you can easily transition to HP Integrity Server, an excellent server platform that addresses a broad workload spectrum and provides increased flexibility, reliability, and security.
- **Strong partner support:** HP is working with ISVs to provide continued, ongoing support for their applications on AlphaServer, and to ensure your smooth transition to Integrity server. OpenVMS ISV partners are enthusiastically porting their applications to Integrity server and continuing to make new releases available on AlphaServer.

- **Extensive services and tools:** Transition planning, design and implementation tools, and services help minimize disruption and cost while adding business value to your IT environment. These tools help you size the effort involved in moving from your current AlphaServer systems to HP Integrity servers and leverage the experience of many customers who have already done so.
- **Compelling business practices:** Generous system hardware, operating system and layered products, and storage trade-in programs extend the value of your investment. HP Financial Services offerings provide financing and leasing alternatives.

As shown in this paper, recent testing strongly indicates that OpenVMS customers can obtain substantial performance improvements on the Integrity server platform. What's more, OpenVMS itself is not in a holding pattern, but undergoing continuous investment and enhancement. These hardware and software platform improvements—coupled with the price/performance benefits of Integrity systems and the proven high value of OpenVMS—provide a convincing argument for choosing the Integrity platform and OpenVMS for the next generation of your server infrastructure.

Appendix A: Customer examples

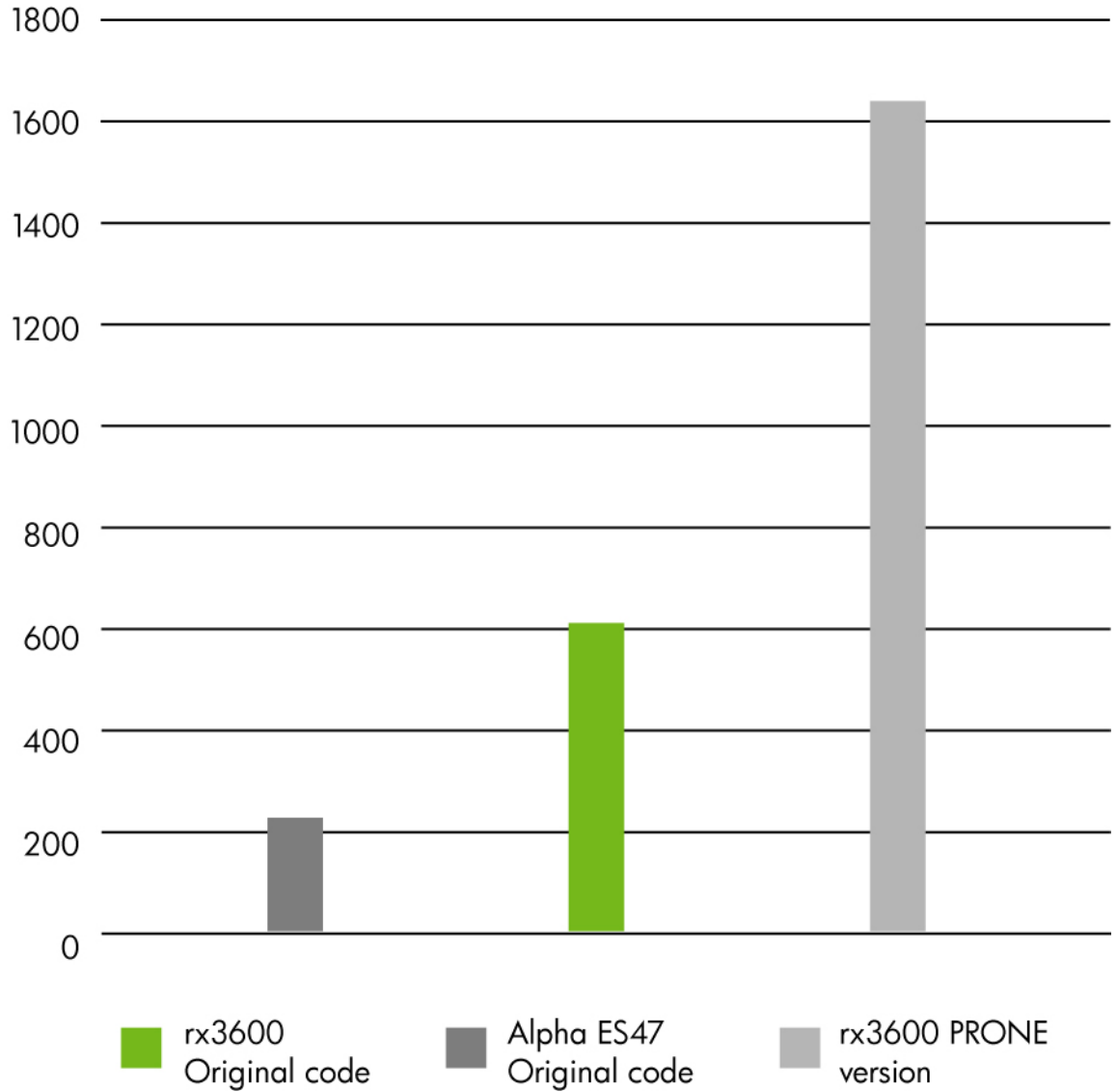
The HP OpenVMS systems division does not typically conduct what are commonly known as *standard benchmarks*. This is because we feel that conducting performance tests with *actual* customer environments is a much more reliable way to determine what the customer will achieve. This is one of the missions of the HP OpenVMS customer lab (see Appendix B), located in Nashua, NH. In addition, other organizations, including BRUDEN-OSSG (www.brudenossq.com)—an independent consulting firm—assist customers in assessing performance characteristics and improving performance in HP OpenVMS environments.

Below are some examples of improvements that customers have observed after moving their OpenVMS environments from AlphaServer systems to HP Integrity servers. Some tests were conducted in the HP OpenVMS customer lab and others were conducted by BRUDON-OSSG.

C and RMS application

BRUDEN-OSSG provided a stock exchange in the EMEA region with porting and performance consulting for an application being moved from an Alpha ES47 to an Integrity rx3600 Server. The application was written using the C programming language and wrote to files using RMS calls. As shown in figure A1, after the initial port the number of transactions went from around 250/second to just over 600/second. BRUDEN-OSSG provided additional application/system tuning and increased the number to over 1,600/second.

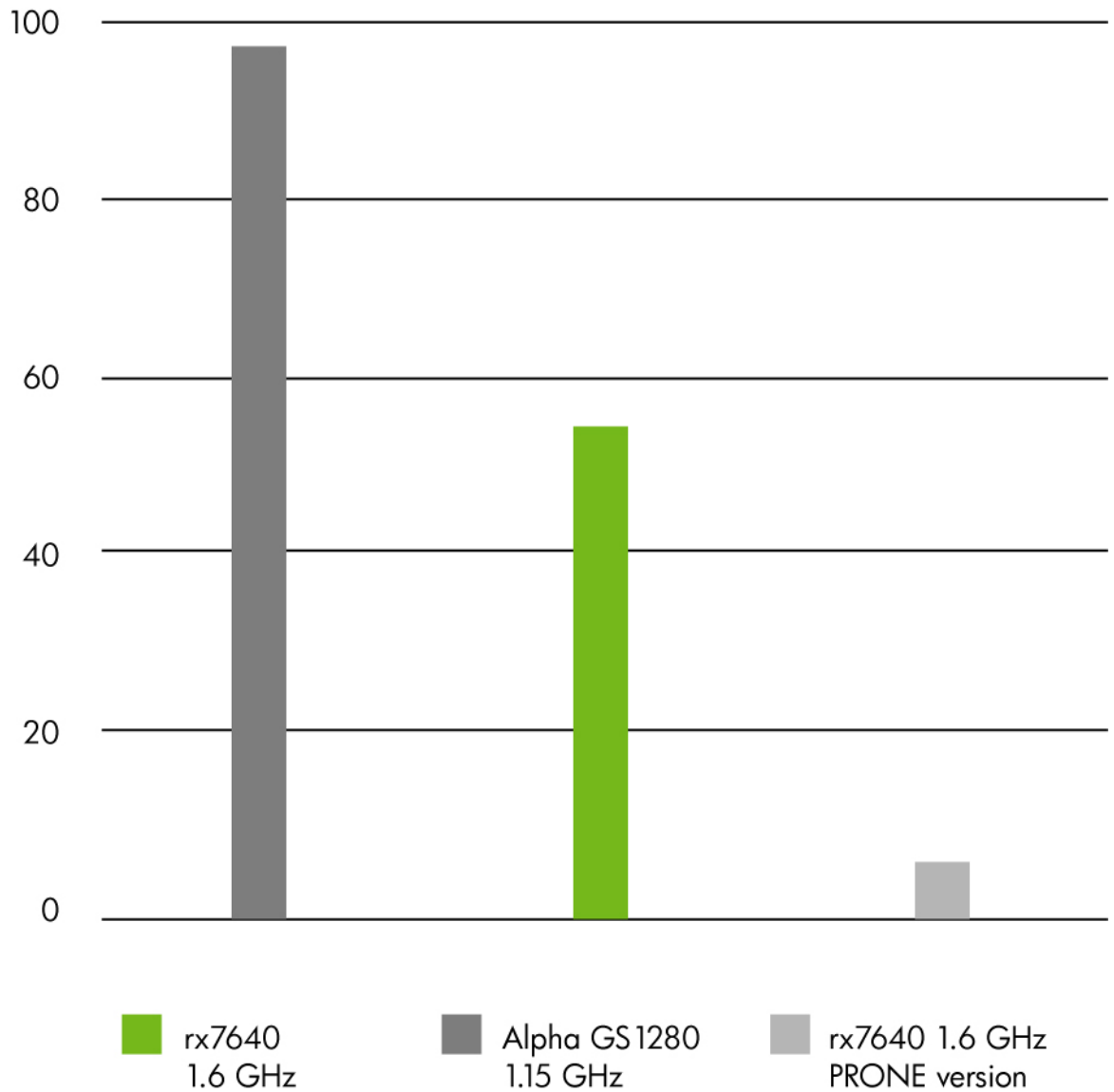
Figure A1. Comparison of transactions per second between AlphaServer and Integrity server systems



Oracle application

BRUDEN-OSSG also assisted a customer in Switzerland in porting an Oracle application from an Alpha GS1280 to an Integrity rx7640 Server. The benchmark included a batch job that took 100 minutes to run on a GS1280. After porting to the Integrity rx7640 Server (single-cell) the customer saw run times reduced to just under 60 minutes. BRUDEN-OSSG applied tuning to the application and reduced the elapsed run times to less than 7 minutes. Figure A2 illustrates the reduction in elapsed time.

Figure A2. Elapsed time (minutes) to complete critical batch job (100% SQL statements)



Futures trading application

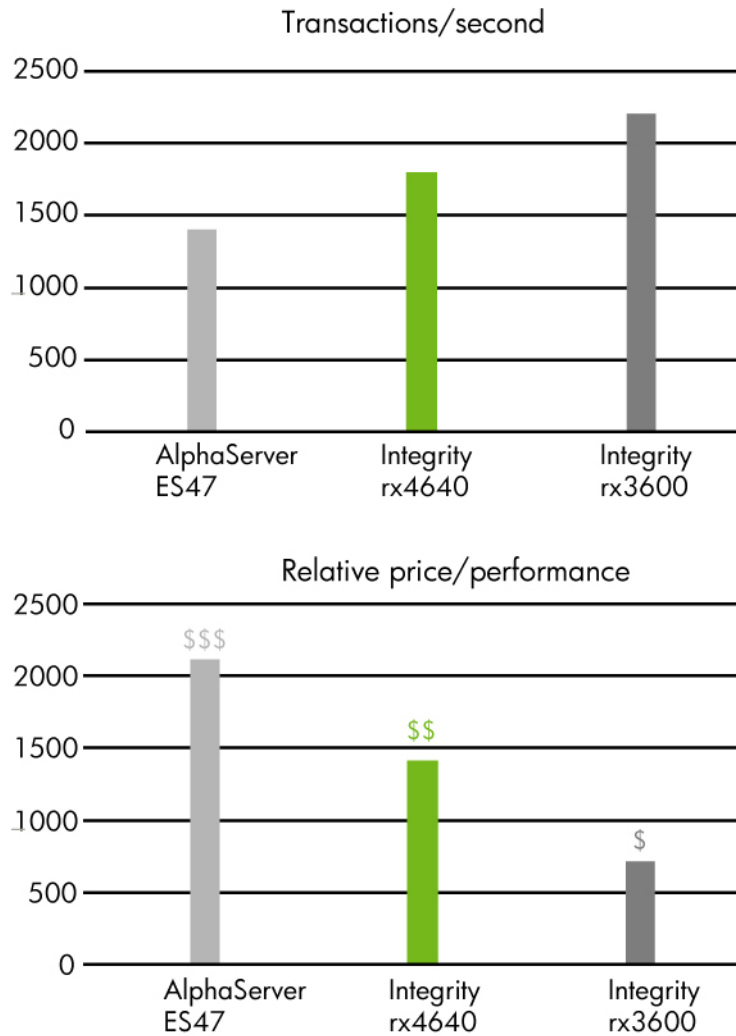
A rapidly growing electronic futures trading company tested their key application on three similarly configured OpenVMS systems in the OpenVMS customer lab. The application manages trading in the financial services industry.

Transaction rates were compared on similarly three configured servers including:

- AlphaServer ES47
- HP Integrity rx4640 Server with the current single core CPU technology and
- HP Integrity rx3600 Server, one of the new entry-class Integrity servers based on dual core CPU technology

The performance, based on transactions per second, increased significantly as shown in figure A3.

Figure A3. Improved price/performance with OpenVMS v8.3 on HP Integrity servers



- Financial services application
- Unaudited, based on a customer test scenario
- All systems 4 CPU and similarly configured
 - AlphaServer ES47: 4 x EV7
 - rx4640: 4x single core Itanium[®] 9M-based microprocessor
 - rx3600 2x dual core Itanium-based microprocessor

TIMS 2.x

Chris Little, Technical Services Manager at Computers Unlimited, recently visited Hewlett-Packard's OpenVMS headquarters in Nashua, NH, to evaluate the performance of running TIMS 2.x on the new Intel Itanium 2 chip (dual-core Montecito) and OpenVMS. The Intel Itanium 2/OpenVMS is the migration path for users who wish to remain on the VMS operating system when support for the Alpha processor ends in 2011.

"I was hoping to see an equivalent performance from these machines as compared to a similarly sized Alpha running, since the Alpha EV7 chip is still relatively new" says Little. "Most of the programs that we ran through tests saw significant gains in performance. Some recorded a 50 percent increase in speed! The most significant change was in the CPU cost of reads and writes. Efficiencies from 15 to 20 percent from this type of low level work means even better performance for end users and more scalability per machine than what we could achieve with Alpha."

This is great news as HP's Alpha chip is no longer being manufactured and will stop being sold by HP in the near future. Little continues, "HP's line of Integrity servers allow those TIMS customers using the VMS operating system a path to retain their investment in TIMS, VMS, and all its benefits while receiving better performance as well." David Schaer, director of Product Management and Marketing adds, "Running on the latest version of Synergy also provides new opportunities for data replication to SQL or Oracle for richer data analysis and development of alternative front ends applications such as Windows and Web to supplement traditional character based front ends which continue to be lightning fast."

Appendix B: OpenVMS Customer Lab

Measuring your specific performance requirements on various configurations

Many factors can affect performance. Wouldn't it be nice if you could take your solution and "Test Drive" it on a variety of configurations to see what "feels best?" The OpenVMS Engineering group has created a lab to help you do just that.

The OpenVMS Customer Lab, located in Nashua, NH, provides HP partners and customers access to a secure application testing environment with cutting-edge technology developed by HP and the OpenVMS Engineering Group. With access to hardware, software, and engineering resources for pre-scheduled amounts of time, guests are able to stage their applications in a controlled setting before going live in their own production environments. Access to the lab can either be local "hands-on" in-lab or done remotely. The hardware is custom configured to meet the needs of the engagement and includes both Integrity server and AlphaServer systems ranging from low-end to high-end, blades, storage, tapes, and more.

Typical usage

Performance characterization: how will my solution perform on various sized systems? How does memory affect performance? How does the performance compare with what I see on Alpha today?

Validation of solutions on new hardware or a new version of the operating system: Will my solution work as expected on the new platform? How about mixed architecture clusters?

Proof of Concept: configure an environment that closely resembles the actual desired configuration and validate solution before purchasing equipment

Porting to Integrity server: Create a side-by-side environment of your Alpha and Integrity configuration and have the experts close by to assist as needed to answer your questions and look over your shoulder.

For more information on the HP OpenVMS Customer Lab, please contact your local sales rep or visit www.hp.com/go/openvms.com.

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