

Breakthrough Capability and Value for Mission-Critical Computing



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Executive Summary

“Red Hat Enterprise Linux running on Intel Xeon processor-based servers is truly a rock-solid platform. We absolutely trust Red Hat Enterprise Linux and Intel with our most mission-critical systems.”

— **Brad Massey, director, IT Support Services, Odyssey Logistics & Technology¹**

Intel and Red Hat have been supporting mission-critical computing environments for years, helping companies achieve the highest levels of performance and reliability, while increasing their vendor options and optimizing their cost models. Many of the world’s largest businesses rely on the combined platform to support core business applications, including high-volume financial trading companies with their extreme performance, security and uptime requirements.

Recent breakthroughs from Intel and Red Hat take the mission-critical capability of the combined platform to new heights.

- **The Intel® Xeon® processor E7 family** delivers top-of-the-line performance in large, highly resilient server configurations designed to support today’s most demanding enterprise workloads. These processors extend the world-record performance² of the previous-generation Intel® Xeon® processor 7500 series by as much as 40 percent.³ They also support up to twice the memory capacity and extend the mainframe-inspired features of the previous generation to enable even more robust reliability, security, and availability for mission-critical computing applications.
- **Red Hat Enterprise Linux® 6** is highly optimized for these new servers, providing scalable performance, high availability, and comprehensive enterprise functionality in one of the world’s most secure operating environments. It represents the most comprehensive release in the history of Red Hat Enterprise Linux, providing thousands of enhancements to improve performance, scalability, reliability, security, and data-center operational flexibility in bare-metal, virtualized, and cloud deployments.

The importance of these advances is resonating throughout the computing industry. More than a dozen hardware vendors already offer eight-socket or larger Intel Xeon processor-based servers, and leading enterprise software vendors, including SAP and SAS, are certifying their entire solution stacks for Red Hat Enterprise Linux running on these powerful systems. With these additions to the Intel and Red Hat portfolio of solutions, there is simply no better foundation for optimizing capability versus cost across the entire enterprise infrastructure.

The Platform of Choice for Enterprise Computing

A major shift is underway in the computing industry. Sales for UNIX*/RISC architectures continue to decline, while sales for industry-standard solutions are rising fast.⁴ Intel and Red Hat have been driving forces behind these developments, working independently, together, and with the broader open-source community to deliver comprehensive, enterprise-ready solutions that meet the most demanding requirements, while preserving the flexibility and value of their combined platform (Figure 1).

Innovation continues at an unprecedented pace, and Intel and Red Hat are leading the way. Red Hat is the number-one commercial contributor to the upstream Linux kernel and Intel is number three. Together they account for nearly 20 percent of the total work done to advance open-source Linux.⁵ Even more importantly, Intel and Red Hat devote substantial resources to integrating, optimizing, and hardening their combined platform to provide comprehensive, enterprise-ready solutions and support. Through these efforts, they deliver a trusted enterprise computing platform that can be deployed with confidence. Thousands of enterprise customers, including industry leaders such as Gap, Inc.⁶, NYSE Euronext⁷, Sabre Holdings⁸, Salesforce.com⁹, and Wall Street Systems¹⁰, are running mission-critical applications on Red Hat Enterprise Linux and Intel Xeon processor-based servers today, and view it as their strategic computing platform moving forward.

Breakthrough Support for Mission-Critical Environments

Recent advances from Intel and Red Hat offer another major leap in mission-critical capability, providing an even more powerful, scalable, reliable, and secure computing platform, along with the comprehensive service and support large businesses need for supporting their core business systems (Figure 2).

Powerful, Highly Resilient Servers

The Intel Xeon processor E7 family is designed specifically to support mission-critical workloads in the heart of the enterprise data center. The previous-generation Intel Xeon processor 7500 series delivered Intel's biggest performance leap ever for an Intel® processor generation, with approximately 3x better performance across a range of workloads.¹¹ It also provided breakthrough support for data integrity and high availability, with more than 20 new, mainframe-inspired reliability, availability, and serviceability (RAS) features.

“This is huge. This is Intel taking its x86 architecture up into the mainframe space.”¹²

– Robert Enderle, The Enderle Group

The Intel Xeon processor E7 family takes those advantages to new heights, providing more cores and cache and twice the memory capacity of its predecessor. A single eight-socket server based on the Intel Xeon processor E7 family provides up to 80 cores, 160 threads, and 4 TB of memory, and larger servers are available to support today's most extreme workloads. This processor family also includes additional RAS and security features that help to deliver even higher levels of data integrity and system resilience, while making it easier for IT organizations to protect vital business assets.

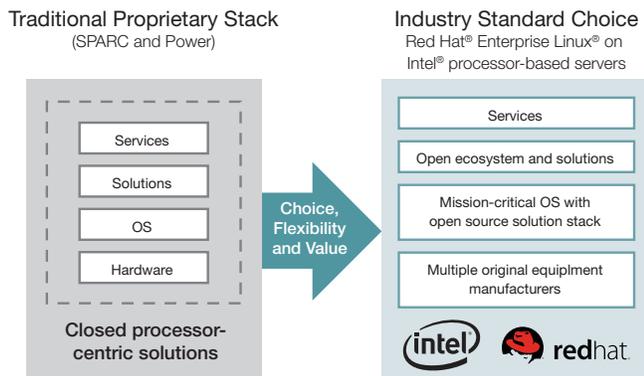


Figure 1. With recent advances, Red Hat® Enterprise Linux® running on Intel® Xeon® processor-based servers is delivering leadership capability for mission-critical computing, at a fraction of the cost of proprietary UNIX*/RISC architectures and with far greater choice and flexibility.

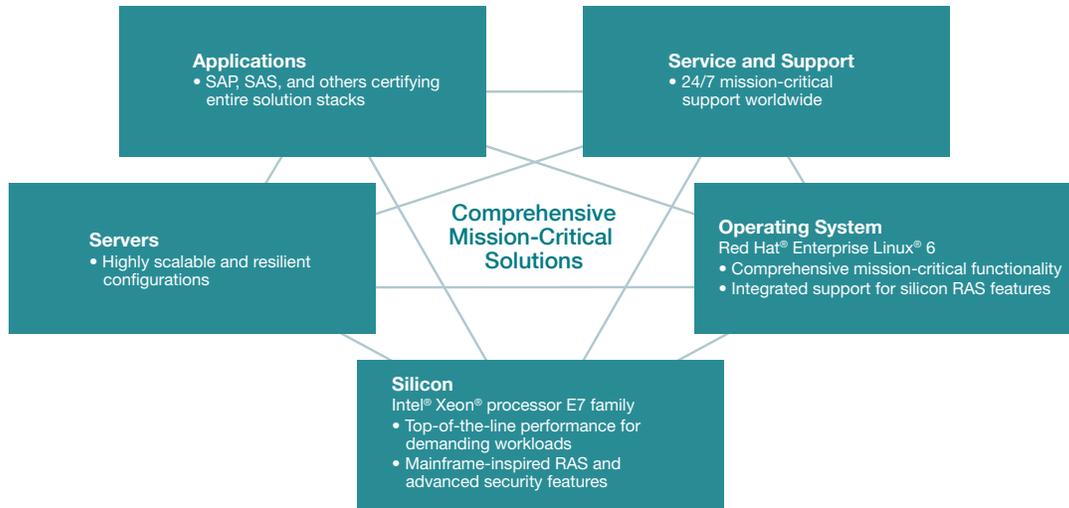


Figure 2. Together, Intel and Red Hat provide comprehensive support for mission-critical computing.

A World-Class Operating Environment

Red Hat Enterprise Linux 6 provides a scalable, stable, and uniquely secure operating environment that is highly optimized for Intel Xeon processor E7 family-based servers. It represents the most comprehensive release in the history of Red Hat Enterprise Linux, providing thousands of enhancements to improve performance, scalability, reliability, security, and data center operational flexibility.

“The high performance and flexibility that comes with the Red Hat Enterprise Linux operating platform makes it the natural choice for developing mission-critical turnkey systems. The excellent support network and ecosystem available for Red Hat solutions provide a strong sense of comfort, allowing one to sleep well at night.”¹³

– Zia Saquib, executive director, C-DAC

Red Hat Enterprise Linux 6 scales easily to support the largest Intel Xeon processor-based servers available today, and much larger servers to come in the future (it supports up to 4,096 processors and 64 TB of memory per server, with file systems as large as 100 TB). Combined with Intel’s robust technology roadmap, this provides a high level of assurance to customers that they will be able to scale their solutions as needed to handle more users, heavier workloads, and larger data sets as their needs evolve.

Red Hat Enterprise Linux 6 includes comprehensive support for mission-critical computing environments, with integrated capabilities such as policy-based resource management, high-availability clustering, advanced error management, and predictive failure analysis. These features, many

of which would be costly add-ons in proprietary UNIX environments, are included with each subscription, which further reduces total costs and simplifies deployment. Red Hat also offers a complete set of enterprise add-ons to address the most demanding enterprise requirements across the server, network, and storage infrastructure.

Exceptional Scalable Performance

Previous-generation Intel Xeon processor 7500 series-based servers running Red Hat Enterprise Linux 5.5 have already demonstrated world-record performance across critical industry benchmarks (Table 1). Additional benchmark tests are underway using the Intel Xeon processor E7 family and Red Hat Enterprise Linux 6, and these tests are expected to deliver another major leap in performance across a wide range of enterprise workloads. To view the latest results as they become available, visit the Intel Web site at <http://www.intel.com/performance/server/index.htm>

Intel and Red Hat technologies lay the foundation for ongoing advances in scalable performance across the full range of server configurations. The high-bandwidth, low-latency interconnect architecture of the Intel Xeon processor E7 family is designed to scale and will readily support the higher core counts, larger memory configurations, and heavier I/O demands of future servers.

Red Hat Enterprise Linux 6 is optimized for scale-up computing on Intel Xeon processor-based servers. It includes major enhancements in memory management and scheduling that help to provide more efficient performance on large, multi-processor systems. As one example, Intel and Red Hat worked together to deliver synchronized hardware and software support for non-uniform memory

Table 1. Industry-leading performance on key industry benchmarks.

BENCHMARK	PROCESSOR (PLATFORM)	SOFTWARE DETAILS	RESULT	IMPORTANCE
Technical Computing • SPECfp*_rate_base2006	Intel® Xeon® processor 7560 (HP ProLiant* DL980 G7)	Red Hat® Enterprise Linux® 5.5	1,020 base score ^a	World record for 8-socket x86 servers
General-Purpose Computing • SPECint*_rate_base2006	Intel Xeon processor 7560 (HP ProLiant DL980 G7)	Red Hat Enterprise Linux 5.5	1,380 base score ^b	World record for 8-socket x86 servers
Virtualization • SPECvirt_sc2010*	Intel Xeon processor 7560 (IBM System x* 3850 X5)	Red Hat Enterprise Linux 5.5 (KVM)	1,369.23 @ 84 VMs ^c	World record

^a Platform: Hewlett-Packard ProLiant* DL980 G7 server platform with eight Intel® Xeon® processors X7560 (24M cache, 2.26 GHz, 6.40GT/s Intel® QPI), 256GB memory, Red Hat® Enterprise LINUX® 5.5, Intel C++ and Fortran Compiler 11.1. Referenced as published baseline score of 1020. Source: <http://www.spec.org/cpu2006/results/res2010q3/cpu2006-20100816-12949.html>.

^b Platform: Hewlett-Packard ProLiant* DL980 G7 server platform with eight Intel® Xeon® processors X7560 (24M cache, 2.26 GHz, 6.40GT/s Intel® QPI), 256GB memory, Red Hat® Enterprise LINUX® 5.5, Intel C++ and Fortran Compiler for LINUX. Referenced as published baseline score of 1380. Source: <http://www.spec.org/cpu2006/results/res2010q3/cpu2006-20100816-12950.html>.

^c Platform: IBM System x* 3850 X5 server platform with the two Intel® Xeon® Processor X7560 (24M Cache, 2.26 GHz, 6.40GT/s Intel® QPI —32 cores/4 chips/8 cores per chip), WebSphere® Application Server 7.0.0.7, DB2 v9.5, Dovecot* 1.2.11, Apache* 2.2.3, Red Hat® Enterprise LINUX® 5.5 on all VMs. Referenced as published at 1369.23@84VMs. Source: http://www.spec.org/virt_sc2010/results/specvirt_sc2010_perf.html.

access (NUMA) technology. NUMA allows memory allocation to be optimized across large numbers of processing cores. It enables each core to make optimal use of fast, nearby memory to minimize latencies, while also supporting efficient memory sharing among all cores.

Another key technology in Red Hat Enterprise Linux 6 is control groups, which provides fine-grained, policy-based control of resource allocation in both virtualized and bare-metal deployments. IT organizations can use control groups to ensure that multiple applications or processes running on the same physical server all receive the CPU, memory, network, and storage resources they need. This can help IT eliminate resource contention and meet stringent service level agreements, while simultaneously optimizing server utilization.

See Appendix A for a more complete list of technologies that enable scalable performance for Red Hat Enterprise Linux 6 running on Intel Xeon processor E7 family-based servers.

Advanced Reliability and Security

Intel and Red Hat support high-end reliability in one of the world’s most secure operating environments. Intel® Advanced Reliability Technology lays the hardware foundation for optimizing uptime and data integrity in mission-critical environments through extensive error-checking across all critical components and pathways, silicon-level redundancy and failover, and advanced logging and recovery capabilities. Red Hat Enterprise Linux 6 supports and extends this hardware foundation with a complete array of integrated capabilities for mission-critical environments, including policy-based resource management, high-availability clustering, advanced error management, and predictive failure analysis.

“Because of its rigorous quality control, Red Hat Enterprise Linux running on Intel Xeon processor-based servers is truly a rock-solid platform. Its reliability continues to impress us daily.”

— Brad Massey, director, IT Support Services, Odyssey Logistics & Technology¹⁴

Intel and Red Hat are also delivering leadership security capabilities across bare-metal, virtualized, and cloud computing environments. Security Enhanced Linux (SELinux) was jointly developed by Red Hat and the United States National Security Agency (NSA) to meet high-end security requirements in today’s increasingly threat-filled world. New Intel technologies in the Intel Xeon processor E7 family offer additional support for addressing growing security requirements more easily and cost-effectively.

- **Intel® Advanced Encryption Standard-New Instructions¹⁵ (Intel® AES-NI)** dramatically reduces encryption overhead, so customers can implement encryption pervasively to protect valuable business data.
- **Intel® Trusted Execution Technology¹⁶ (Intel® TXT)** verifies the integrity of the computing platform at launch to enable stronger security in virtualized and cloud computing environments. It also lays the foundation for comprehensive, real-time, compliance monitoring in public and private cloud environments.

See Appendix B for a more complete list of key RAS and security technologies in Red Hat Enterprise Linux 6 and the Intel Xeon processor E7 family.

Mission-Critical Stability, Service, and Support

When a company's core operations depend on the underlying computing infrastructure, the vendors behind that infrastructure can be as important as the products and technologies. Red Hat and Intel are industry leaders. They work extensively together to deliver synchronized innovations rapidly and continuously and to ensure that new technologies are fully integrated and extensively tested for backward compatibility.

"Our clients are completely comfortable knowing that they can run their largest, most critical systems on Red Hat Enterprise Linux and that they'll get enterprise-class support."¹⁷

— Mark Tirschwell, Chief Technology Officer,
Wall Street Systems

- **A Stable, Low-Risk Environment**—Red Hat supports major Red Hat Enterprise Linux distributions for up to 10 years through its Extended Lifecycle Supports (ELS) offering, and provides extended updates even for minor releases with its Extended Update Support Add-On. This provides customers with a high level of stability. They can maintain a consistent environment for extended periods, and still receive the support they need to ensure ongoing reliability and security.
- **A Flexible Path Forward**—Red Hat maintains consistent Application Binary Interfaces (ABIs) throughout its product lifecycle, and Intel maintains software compatibility with each successive processor generation. This backward and forward compatibility provides customers with a high level of flexibility and control. They can upgrade hardware or software at any time and at their own discretion, with minimal cost and disruption. Applications do not have to be recertified following hardware or OS upgrades, and software upgrades are covered by their Red Hat subscription, so there is no additional cost.
- **World-Class Service**—Red Hat offers end-to-end support for mission-critical implementations with comprehensive consulting services and mature tools for planning, implementing, and supporting both new deployments and migrations from UNIX/RISC and other computing platforms. Expert, 24/7 technical support with fast response times is available worldwide, and Red Hat collaborates with many third-party hardware and software vendors to deliver integrated solution support with a single point of contact.

- **Advanced Mission-Critical Support**¹⁸—The Red Hat Advanced Mission-Critical Program, in combination with select hardware vendors, provides an even higher level of support for the most demanding applications. Through this program, IT organizations can standardize on a minor release for up to 60 months to defer costly software stack revalidation testing, rely on a 10-year advanced mission-critical life cycle, and receive advanced mission-critical service level agreements (SLAs).

Rapid Innovation on a Trusted Enterprise Platform

Enterprise IT organizations need to know they are building on a platform that will deliver increasing value over time, and Intel and Red Hat are uniquely positioned to deliver on this need. Intel Xeon processor-based servers are the most widely deployed and supported server architecture in the world, and Red Hat accounts for more than 70 percent of all commercial Linux deployments. The two companies share a common vision and are collaborating closely with each other and the broader industry to deliver the world's most advanced computing capabilities on an open, flexible, high-value infrastructure—and they have the resources to make that vision a reality.

Given the rapid pace of technology innovation, businesses should be evaluating every new IT investment in light of current and future cloud computing solutions. Intel and Red Hat are leading the industry in this respect, breaking down the barriers to cloud computing by delivering industry-leading virtualization performance¹⁹ with the scalability, reliability, and security needed to support the full range of enterprise applications. Importantly, they are delivering these industry-leading capabilities with cost models that make end-to-end virtualization truly affordable. Companies such as Amazon²⁰, DreamWorks Animation²¹, and NTT Communications²² have chosen the combined platform for large-scale cloud deployments, and many others are using it to consolidate infrastructure and extend the benefits of virtualization and automation into the heart of their data centers.

The wide interoperability of Red Hat and Intel technologies adds to these advantages, simplifying the integration of diverse hardware and software components to help companies preserve the value of their investments and move forward with greater flexibility. The consistency of Red Hat ABIs increases agility still further. Software vendors and IT organizations can certify their applications just once, and then move them with confidence among bare-metal, virtualized, and cloud environments as their infrastructure solutions evolve.

Conclusion

Enterprise IT organizations are challenged to deliver rapidly increasing IT capability while containing or reducing total costs. Intel and Red Hat are uniquely positioned to address this need. Together, they harness the power of the vast open-source software community and the world's most widely supported server architecture to deliver comprehensive, enterprise-ready solutions that can be deployed with confidence from the desktop to the back-end of the data center.

Recent breakthroughs from both companies offer a quantum leap in mission-critical capability. Red Hat Enterprise Linux 6 running on two-socket, four-socket, eight-socket and larger Intel Xeon processor E7 family-based servers delivers high-end performance, scalability, and availability—along with a comprehensive set of mission-critical IT capabilities—at a fraction of the cost of proprietary UNIX/RISC solutions. As business computing requirements continue to grow, there is no better platform for optimizing capability versus cost across the entire infrastructure to deliver the highest possible value to the business.

Appendix A: Key Technologies for Scalable Performance

INTEL® XEON® PROCESSOR E7 FAMILY FEATURES	
High Per-Socket Scalability	<ul style="list-style-type: none"> • Up to 10 cores, 20 threads and 30 MB of on-die cache per socket. <ul style="list-style-type: none"> – Provides massive resources for demanding workloads and large-scale consolidation.
<ul style="list-style-type: none"> • Intel® QuickPath Technology • Two Integrated Memory Controllers 	<ul style="list-style-type: none"> – Accelerates traffic between processor cores and I/O controllers. – Ideal for data-intensive transactional, database, and analytics applications. – Will scale easily to support future servers with larger core counts and memory configurations.
Intel® Turbo Boost Technology²³	<ul style="list-style-type: none"> • Increases peak performance by letting processors operate above the rated frequency when thermals allow.
Scalable Server Designs	<ul style="list-style-type: none"> • Supports up to 8-socket server designs with no need for third-party node controllers. <ul style="list-style-type: none"> – Up to 80 cores, 160 threads, and 4 TB of memory per server. • Supports massively scalable systems with up to 256 sockets (2,048 cores) and 16 TB of memory.
RED HAT® ENTERPRISE LINUX® 6	
Massive Scalability	<ul style="list-style-type: none"> • Scales up to 4,096 processors, 64 TB of memory, and 100 TB file systems.
NUMA Technology	<ul style="list-style-type: none"> • Helps to unleash the performance potential of multi-core Intel® Xeon® processors by: <ul style="list-style-type: none"> – Optimizing memory allocation and access across large numbers of processing cores. – Allocating fast nearby memory to each core, while still enabling efficient sharing of memory resources as needed.
Enhanced Scheduler and Ticketed Spinlocks	<ul style="list-style-type: none"> • Optimizes the sharing of resources across NUMA boundaries. • Ensures that all running processes get a fair share of resources to support stringent service levels.
Huge Memory Pages	<ul style="list-style-type: none"> • Up to 1 GB memory pages increase computing efficiency by greatly simplifying page mapping. <ul style="list-style-type: none"> – Automated for ease of use, but can be tuned and managed by IT.
Control Groups	<ul style="list-style-type: none"> • Fine-grained, policy-based control of resource utilization. <ul style="list-style-type: none"> – Enables dynamic management of CPU, memory, and I/O (network and storage). – Ensures that high-priority workloads always have the resources they need.
Dramatic Improvements in: <ul style="list-style-type: none"> • Network rates (up to 2X) • Multi-user file system performance (up to 5X) 	<ul style="list-style-type: none"> • Helps to ensure scalable performance for network- and storage-intensive workloads. <ul style="list-style-type: none"> – Red Hat has demonstrated scalability to 500 LUNs on a 128-core Intel Xeon processor 7500 series-based server.

Appendix B: Key RAS and Security Technologies

INTEL® XEON® PROCESSOR E7 FAMILY	
Advanced Error Detection, Correction, and Containment	<ul style="list-style-type: none"> Implemented across all major components and communication pathways, including processors, cache, memory, and I/O interfaces.
<ul style="list-style-type: none"> Intel® Scalable Memory Interconnect Intel® QuickPath Interconnect 	<ul style="list-style-type: none"> Built-in redundancy at the silicon level. <ul style="list-style-type: none"> – Automated failover without downtime for many silicon-level issues.
Intel® Machine Check Architecture Recovery (MCA Recovery)	<ul style="list-style-type: none"> OS-assisted system recovery from many uncorrectable errors that would have brought down previous-generation systems.
Intel® Advanced Encryption Standard-New Instructions¹⁵ (Intel® AES-NI)	<ul style="list-style-type: none"> Accelerates core encryption processes and reduces computing overhead. Enables organizations to implement encryption more comprehensively to protect critical systems and data, while still delivering fast response times.
Intel® Trusted Execution Technology¹⁶ (Intel® TXT)	<ul style="list-style-type: none"> Verifies the integrity of the computing platform at launch to enable stronger security in bare-metal, virtualized and cloud computing environments. Lays the foundation for comprehensive, real-time, compliance monitoring in public and private cloud environments.
RED HAT® ENTERPRISE LINUX® 6	
Advanced Error Logging and Management	<ul style="list-style-type: none"> Leverages and extends Intel® silicon advances to enable more intelligent system responses, such as: <ul style="list-style-type: none"> –Automated system recovery –Marking of a faulty memory page to avoid reuse –Isolation of a failing peripheral device –Predictive failure analysis to enable proactive repairs
Control Groups	<ul style="list-style-type: none"> Enables IT to isolate critical workloads and control resource allocation to guarantee service levels.
Many Other Features, Including: <ul style="list-style-type: none"> Advanced Error Reporting PCI Hot Plug Multipath I/O Hardware-based Checksumming 	<ul style="list-style-type: none"> Provide high levels of data integrity, resilience and serviceability at the network and storage layers.
SELinux (Security Enhanced Linux)	<ul style="list-style-type: none"> Developed by Red Hat with the United States National Security Agency (NSA). Certified by the federally sponsored Common Criteria for Information Technology Security Evaluation. Provides policy-based security control at the kernel level, so IT can control access rights more efficiently and effectively.

¹ Source: Odyssey Logistics & Technology Migrates from UNIX to Red Hat Enterprise Linux on Intel Xeon Processor-based Servers to Run Mission-critical Supply Chain Operations, an Intel and Red Hat case study, 2009, http://rhcustomers.files.wordpress.com/2009/08/rh_odysseylogistics.pdf

² The Intel Xeon processor 7500 series set more than 30 world-records across a range of industry-standard benchmarks. For details, visit the Intel Web site at http://www.intel.com/performance/server/xeon_mp/summary.htm

³ Based on Intel internal measurements, typical gains range from 20 to 40 percent. For the latest published benchmark results as they become available, visit <http://www.intel.com/performance/server/index.htm>

⁴ "Now that the fourth-quarter figures are out, the UNIX drop is 18.1 percent year-over-year. That adds up to worldwide UNIX revenues of \$3.9 billion for the quarter, representing 29.9 percent of the total server spend — down from 36.2 percent in 4Q08. In comparison, x86 grew 12.6 percent in the same quarter to \$7.3 billion." Source: RISC to x86 Server Migration Buyer's Guide, by Drew Robb, ServerWatch, March 4, 2010. <http://www.serverwatch.com/hreviews/article.php/3868681/RISC-to-x86-Server-Migration-Buyers-Guide.htm>.

⁵ Source: eWeek.com. <http://www.eweek.com/c/a/Linux-and-Open-Source/Red-Hat-Novell-IBM-Among-Top-Contributors-to-Linux-Development-527696/>

⁶ Download the complete Red Hat case study at http://www.redhat.com/f/pdf/customers/Red_Hat_Likewise_Gap_Inc_Direct.pdf

⁷ Download the complete Red Hat case study at http://www.redhat.com/videos/customers_nyse.html

⁸ Download the complete Red Hat case study at http://www.redhat.com/f/pdf/blog/RH_Sabre-Holdings_CS_734891_0808_cw_web.pdf

⁹ View the complete Red Hat video at http://www.redhat.com/videos/customers_salesforce.html

¹⁰ Download the complete Red Hat case study at http://www.redhat.com/f/pdf/customers/RH_CS_WallStreetSystems_web.pdf

¹¹ Geometric mean of four common enterprise benchmarks TPC Benchmark* E, SPECjbb*2005, SPECint*_rate_base2006, and SPECfp*_rate_base2006 based on best published / submitted results on 4-socket (4S) Xeon X7560 server platform vs. best published 4S Xeon X7460 server platform.

¹² Source: As quoted in the article: "Intel Elevates Its Mainstream x86 Processors into HPC Space," by Chris Preimesberger, eWeek.com, March 30, 2010. <http://www.eweek.com/c/a/IT-Infrastructure/Intel-Elevates-Its-Mainstream-x86-Processors-into-HPC-Space-639577/>

¹³ Source: C-DAC Designs a High-Performing, Flexible System for the NSDG Project with Red Hat Solutions, a Red Hat case study, 2010, http://rhcustomers.files.wordpress.com/2010/08/a4_rh_c-dac_casestudy_2896147_0610_jp_web.pdf

¹⁴ Source: Odyssey Logistics & Technology Migrates from UNIX to Red Hat Enterprise Linux on Intel Xeon Processor-based Servers to Run Mission-critical Supply Chain Operations, an Intel and Red Hat case study, 2009, http://rhcustomers.files.wordpress.com/2009/08/rh_odysseylogistics.pdf

¹⁵ Intel® AES-NI requires a computer system with an AES-NI enabled processor, as well as non-Intel software to execute the instructions in the correct sequence. AES-NI is available on Intel® Core™ i5-600 Desktop Processor Series, Intel® Core™ i7-600 Mobile Processor Series, and Intel® Core™ i5-500 Mobile Processor Series. For availability, consult your reseller or system manufacturer. For more information, see <http://software.intel.com/en-us/articles/intel-advanced-encryption-standard-instructions-aes-ni/>

¹⁶ No computer system can provide absolute security under all conditions. Intel® Trusted Execution Technology (Intel® TXT) requires a computer system with Intel® Virtualization Technology, an Intel TXT-enabled processor, chipset, BIOS, Authenticated Code Modules and an Intel TXT-compatible measured launched environment (MLE). Intel TXT also requires the system to contain a TPM v1.s. For more information, visit <http://www.intel.com/technology/security>. Intel TXT will be supported in Red Hat Enterprise Linux 6, Update 1, which is targeted for release in the second quarter of 2011.

¹⁷ Source: Wall Street Systems Boosts Revenues, Cuts Costs by Migrating to Red Hat Enterprise Linux, an Intel and Red Hat case study, 2009, http://www.redhat.com/f/pdf/customers/RH_CS_WallStreetSystems_web.pdf

¹⁸ Advanced Mission Critical Support is available from select hardware vendors in specific geographies. For more information, visit www.redhat.com/promo/mc_program/ Standard Red Hat support includes the ability to standardize on a minor release for up to six to eight months, and all customers have the option to extend support for a minor release up to 18 months through extended Red Hat programs.

¹⁹ Red Hat® Enterprise Linux® 5 running on Intel Xeon processor-based servers delivered world record SPECvirt2010 benchmark. For complete information about the benchmark, the test setup and the results, visit the SPEC Web site at http://www.spec.org/virt_sc2010/. Tests currently underway with Red Hat Enterprise Linux 6 are expected to demonstrate another leap forward in performance.

²⁰ For more information, visit the Red Hat Web site at <http://www.redhat.com/solutions/cloud/amazon/>

²¹ For more information, read the Red Hat press release at <https://www.redhat.com/about/news/prarchive/2009/derek-chan.html>

²² For more information, view the Red Hat video at http://www.redhat.com/videos/customers_ntt.html

²³ Requires a system with Intel® Turbo Boost Technology capability. Consult your PC manufacturer. Performance varies depending on hardware, software and system configuration. For more information, visit <http://www.intel.com/technology/turboboost>



Performance will vary depending on the specific hardware and software you use. See <http://www.intel.com/info/hyperthreading/> for more information including details on which processors support HT Technology. Performance tests and ratings are measured using specific computer systems and/or components and reflect the approximate performance of Intel products as measured by those tests. Any difference in system hardware or software design or configuration may affect actual performance. Buyers should consult other sources of information to evaluate the performance of systems or components they are considering purchasing. For more information on performance tests and on the performance of Intel products, visit <http://www.intel.com/performance/resources/limits.htm> or call (U.S.) 1-800-628-8686 or 1-916-356-3104.

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