SOLUTION BRIEF
Intel® Xeon® Processor E7 Family
Red Hat Enterprise Linux* 6

Red Hat and Intel: New Horizons in Scalable Performance, Reliability, Security, and Efficiency

The Intel® Xeon® processor E7 family and Red Hat Enterprise Linux* 6 combine to create an extremely flexible, secure, and cost-effective computing environment.

Solution provided by:

Building on a long history of collaborative engineering, Red Hat and Intel have enabled the latest generation of their products to deliver state-of-the-art performance, reliability, security, and efficiency for mission-critical solutions. Red Hat runs in the world's largest businesses, including crucial infrastructure markets around the globe. Optimizing Red Hat Enterprise Linux* 6 for the Intel® Xeon® processor E7 family extends the tradition.

Intel and Red Hat are driving tremendous innovation into a thriving ecosystem, delivering industry-leading technologies in integrated, hardened, and thoroughly tested enterprise solutions. IT organizations can scale and manage their most critical workloads at a far lower cost than they can using proprietary UNIX*/RISC architectures. At the same time, they can establish a powerful, open, and unified foundation for virtualization and cloud computing:

- **The Intel Xeon processor E7 family** is extending the limits of scalable performance, high availability, and security once again for Intel-based servers running Red Hat Enterprise Linux. This processor family provides more cores, cache, and system bandwidth than the Intel® Xeon® processor 7500 series, along with additional features that enable even more robust reliability, security, and availability in mission-critical computing environments.
- **Red Hat Enterprise Linux 6** is highly optimized for these new servers, providing scalable performance, high availability, and comprehensive enterprise functionality in a very secure operating environment. 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 on physical and virtual servers as well as those in the cloud.

Exceptional Scalable Performance Delivers Tremendous Headroom

The results-oriented collaboration between Intel and Red Hat includes alignment of their respective technology roadmaps, collaborative contributions to the open source community, and developing Red Hat Enterprise Linux for optimal results on Intel® architecture-based systems. As the latest advance in this tradition, the co-engineering of the Intel Xeon processor E7 family and Red Hat Enterprise Linux 6 delivers scalable performance to power the next-generation enterprise.

The new Intel Xeon processor E7 brings top-of-the-line performance featuring up to 10 cores supporting 20 threads and 30 MB of shared cache per processor. Four advanced, high-bandwidth interconnect links allow multiple processors to be directly connected to one another, reducing latency and increasing performance. Encryption is basic to data protection, but its cost is often measured in computing resources, and it traditionally levies a significant performance "tax" that can dissuade use. New microprocessor instructions called Intel® Advanced Encryption Standard New Instructions (Intel® AES-NI)[1] dramatically reduce this encryption overhead and make pervasive encryption more practical.

Red Hat Enterprise Linux 6 is optimized for scale-up computing or virtualization consolidation on these powerful servers. It includes major enhancements in memory management, scheduling, and networking that help 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 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.

SCALABLE PERFORMANCE FROM INTEL AND RED HAT

Hardware Performance Features: Intel® Xeon® Processor E7 Family	Software Performance Features: Red Hat Enterprise Linux* 6
▪ **Increased parallelism** is provided by up to 10 cores, 30 MB of shared cache per processor, and Intel® Hyper-Threading Technology,[2] extending the parallelism up to 20 threads. ▪ **Four improved Intel® QuickPath Interconnects** increase processor-to-processor and processor-to-memory data transfer frequency compared to predecessors. ▪ **Intel® Turbo Boost Technology**[3] dynamically and automatically maximizes server application performance by increasing core frequencies, enabling faster speeds for specific threads, and mega-tasking workloads. ▪ **Enhanced memory scalability** supports up to 2 TB of DDR3 memory in a four-socket system.	▪ **Massive scalability** of up to 4,096 processors, 64 TB of memory, and 100 TB file systems supports today's largest Intel-based servers and future larger systems. ▪ **Non-uniform memory access (NUMA) technology** optimizes memory allocation and access across large numbers of processing cores for efficient sharing of compute resources. ▪ **Transparent huge memory pages** of up to 2 MB in size increase computing efficiency by greatly simplifying page mapping. ▪ **Policy-based control groups** offer fine-grained resource control to ensure that high-priority workloads can access sufficient processing, memory, and I/O.

Red Hat Enterprise Linux 6 scales easily to support the largest Intel Xeon processor-based servers available today and much larger servers to come. The OS can take advantage of cores and parallelism using advances such as multi-queue networking, asynchronous I/O, and SR-IOV. Combined with Intel's robust technology roadmap, these advances provide a high level of assurance to customers that they will be able to scale their solutions to handle more users, heavier workloads, and larger data sets as their needs evolve.

Advanced Reliability and Security Make Your Environment Mission-Critical Ready

Intel and Red Hat have been supporting mission-critical computing environments for years, helping companies optimize their cost models while maintaining the highest levels of performance and reliability. With recent breakthroughs at both the hardware and software levels, Intel and Red Hat are delivering exceptional new support for large-scale data center consolidation and for hosting today's most demanding and mission-critical database and transactional workloads on powerful, resilient enterprise-class servers.

These advances mark a true tipping point in the computing industry. Leading enterprise software vendors are certifying their entire solution stacks on Red Hat Enterprise Linux running on Intel Xeon processor-based servers. Enterprise IT organizations can now address their most demanding computing requirements on an affordable, standards-based computing infrastructure, and they can do so at a fraction of the cost of UNIX/RISC architectures. With these new solutions, the reasons for continuing to invest in costly, proprietary computing solutions have all but disappeared, even for the largest and most mission-critical enterprise applications.

RELIABILITY AND SECURITY FROM INTEL AND RED HAT

Hardware Reliability and Security Features: Intel® Xeon® Processor E7 Family	Software Reliability and Security Features: Red Hat Enterprise Linux* 6
▪ **Machine Check Architecture Recovery** works with the OS to recover from otherwise-uncorrectable memory errors. ▪ **Double Data Device Correction (DDDC)** enables recovery from two simultaneous DRAM device failures, helping maximize uptime. ▪ **Intel® Advanced Encryption Standard New Instructions (Intel® AES-NI)**[1] increases security by significantly reducing the performance penalties often associated with pervasive encryption. ▪ **Intel® Trusted Execution Technology** verifies the integrity of hypervisors and other software components, for a trusted execution environment.[4, 5]	▪ **High availability features** include clustering with shared file systems and automated failover, and advanced error management. ▪ **Reliability features** include Data Integrity Framework (DIX/DIF), PCI hot plug, multipath I/O, and hardware-based check summing, for high data integrity and resilience. ▪ **Security policy enforcement** reduces the prevalence of vulnerabilities and automatically verifies system patch and configuration state. ▪ **Enhanced access control** includes an improved permission scheme to help control risk and sandboxing for safe execution of untrusted applications.

Reliability and security are fundamental requirements for mission-critical deployments. One of the world's most flexible secure operating environments, Security Enhanced Linux (SELinux), was jointly developed by Red Hat and the U. S. National Security Agency (NSA). Whether the goal is to protect against hardware failure, data corruption, or malicious code, Intel and Red Hat provide a highly resilient platform.

Outstanding Energy Efficiency Builds a Power-Smart Enterprise

Environments that run Red Hat Enterprise Linux on the Intel Xeon processor E7 family benefit from advanced capabilities for automated energy efficiency. Intel® Intelligent Power Technology combined with Red Hat Enterprise Linux 6 power-management capabilities allow these solutions to dynamically decrease power consumption during off-peak times, resulting in lower overall power usage.

Red Hat Enterprise Linux 6 has evolved in concert with the hardware-based energy-efficiency advances in the new Intel Xeon processors, reducing system power consumption. The overhead of the operating platform has been lowered through aggressive code optimization and innovative technologies, such as the tickless kernel.

With support for Active State Power Management and Aggressive Link Power Management, Red Hat Enterprise Linux can manage power consumption across the entire system. Power management features reduce customers' data center carbon footprints, helping enable more sustainable IT.

ENERGY EFFICIENCY FROM INTEL AND RED HAT

Hardware Energy Efficiency Features: Intel® Xeon® Processor E7 Family	Software Energy Efficiency Features: Red Hat Enterprise Linux* 6
▪ **New 32-nanometer process technology** enables higher performance at a given thermal design point, relative to predecessor platforms. ▪ **Automated low-power states** allow the platform to change automatically among operating power states with very low latency. ▪ **Integrated power gates** allow processor cores to power down individually and consume nearly zero power when idle. ▪ **Power-efficient memory subsystem** includes support for low-power memory and the option for new low-voltage memory buffers.	▪ **Tickless kernel** replaces timer-based interrupts with on-demand interrupts, allowing idle processor cores to go into deeper, longer sleep states. ▪ **New kernel task scheduler algorithm** improves the efficiency of resource usage, reducing the amount of time the kernel needs to schedule tasks. ▪ **Automated workload balancing** migrates running virtual machines onto fewer physical servers, shutting down unused systems to reduce power consumption. ▪ **Monitoring tools and virtualization management APIs** improve visibility into system resource usage, for better power management.

Organizations that implement Red Hat Enterprise Linux 6 on servers based on the Intel Xeon processor E7 family can directly benefit from decreased operating costs. Automated energy efficiency also provides higher effective capacity for existing power and cooling infrastructure. Consuming less input power means less heat to dissipate, which leads to lower cooling requirements for data centers and improved TCO.

Take the Next Step

Solutions based on Red Hat Enterprise Linux running on Intel Xeon processor-based servers deliver an intelligent foundation for the future of business computing.

Buy Intel® products and services: **www.intel.com/buy**

Buy Red Hat Enterprise Linux*: **www.redhat.com/wapps/store**

Migrate from UNIX*/RISC to Intel and Red Hat: **http://www.redhat.com/intelligence**

Learn about Intel's work in Open Source: **oss.intel.com**

[1] 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 select Intel® processors. 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/.

[2] Intel® HT Technology requires a computer system with a processor supporting Intel® HT Technology. Performance will vary depending on the specific hardware and software used. For more information including details on which processors support HT Technology, visit http://www.intel.com/info/hyperthreading.

[3] Intel® Turbo Boost Technology requires a computer system with a processor supporting Intel® Turbo Boost Technology. Consult your computer system manufacturer. Performance varies depending on hardware, software and system configuration. For more information, visit http://www.intel.com/technology/turboboost.

[4] 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.

[5] Support for Intel® Trusted Execution Technology will be added in a future release of Red Hat Enterprise Linux*.