Red Hat and Intel: Moving Intelligence Forward

Put state-of-the-art intelligence to work on the challenges of tomorrow by running Red Hat Enterprise Linux* on the latest Intel® Xeon® processors. Red Hat's open source, commercial-strength innovation delivers optimized results for performance, energy efficiency, and advanced virtualization on Intel platforms, all at an affordable price.

Modern business must deliver outstanding results every day, with an IT infrastructure that can meet extreme demands while staying nimble enough for the changes around the corner. Running Red Hat Enterprise Linux* on Intel® server platforms brings together the brilliance of open source software with standards-based hardware to meet those challenges. What's more, this combination delivers the performance, stability, and support that come from a commercial relationship that stretches back many years.

Red Hat Enterprise Linux 5.3 is highly optimized for the Intel® Xeon® processor 5500 series, creating excellent results:

- **Intelligent performance.** Red Hat Enterprise Linux 5.3 takes advantage of the Intel Xeon processor 5500 series to adapt throughput to the workload, delivering a greater than 2x performance compared to predecessors.[1]

- **Virtualization performance and efficiency.** Taking advantage of next-generation Intel® Virtualization Technology (Intel® VT),[2] Red Hat Enterprise Linux delivers high consolidation ratios and virtualized performance.

- **Automated energy efficiency.** Red Hat Enterprise Linux uses Intel® Intelligent Power Technology to support low-latency changes among power states and to lower power consumption during off-peak times.

Intelligent performance: A unified front from Intel and Red Hat

Intel and Red Hat have a long history of collaboration that includes aligning their technology roadmaps, making complementary open source contributions, and developing Red Hat Enterprise Linux on both pre-production and post-production Intel® architecture-based systems. Both companies share a commitment to extending the x86 platform to its full potential, and the stunning results of Red Hat Enterprise Linux 5.3 on the new Intel Xeon processors show just how powerful that combination is:

- The ability to increase workloads and add capabilities without bogging down

- Plenty of headroom in reserve for usage peaks

- Budget-friendly low cost per transaction

"Red Hat and Intel have worked together as strategic partners for many years, and have integrated our technologies to meet the needs of our global customers. In the past, customers had to separately select the right hardware, virtualization and operating system layers. With the combination of Red Hat Enterprise Linux featuring built-in virtualization and the new Intel® Xeon® processor 5500 series, we offer an integrated solution that can reduce complexity, boost performance and expand scalability."*

— Paul Cormier
Executive Vice President and President, Products and Technologies, Red Hat

2X PERFORMANCE GAINS

Relative Performance of Red Hat Enterprise Linux 5.3 on Enterprise and High-Performance Computing Workloads

2x
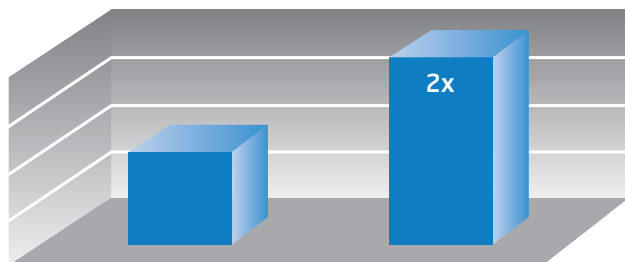
Intel® Xeon® processor 5400 series | Intel Xeon processor 5500 series

Enterprise and high-performance computing applications have shown a greater than 2x performance improvement with Red Hat Enterprise Linux* 5.3 running on the Intel® Xeon® processor 5500 series, compared to predecessor systems.[1]

The Intel Xeon processor 5500 series introduces a new microarchitecture, and with it comes the concept of "intelligent performance." This set of capabilities enables the platform to adapt dynamically to the workload with measures such as increasing the processor speed and engaging Intel® Hyper-Threading Technology to increase throughput when needed.

Red Hat Enterprise Linux was built with this hardware in mind, and it includes features designed specifically to take advantage of the architecture. As a result, infrastructures based on Red Hat Enterprise Linux 5.3 and the Intel Xeon processor 5500 series can deliver performance gains of more than 2x[1] and extremely high scalability to support high numbers of transactions per server.

The combination of innovations in Red Hat Enterprise Linux 5.3 and the Intel Xeon processor 5500 series creates synergies that deliver these dramatic performance improvements to the enterprise.

FEATURES AND CAPABILITIES THAT DELIVER INTELLIGENT PERFORMANCE IN THE DATA CENTER

Intel® Xeon® Processor 5500 Series	Red Hat Enterprise Linux* 5.3
• **Intel® QuickPath Interconnect:** CPU-to-chipset bandwidth supports up to 6.4 gigatransfers per second, as much as 2.2x higher than predecessors • **Integrated memory controllers:** Shared DDR-3 memory connects locally to each processor, improving latency • **Intel® Turbo Boost Technology:** Increases operating frequency on demand according to software needs • **Intel® Hyper-Threading Technology:** Two software threads per core enhance performance on highly threaded workloads	• **Advanced parallelism:** Efficient use of software threads and support for Intel Hyper-Threading Technology builds performance • **Expanded physical server limits:** Support for up to 255 CPUs and 1 TB main memory enhances system scalability • **Monitoring and tuning tools:** ktune script assists kernel tuning for large memory systems; SystemTap utility dynamically monitors production applications

Next-generation virtualization: Making a great thing better

The combination of the Intel Xeon processor 5500 series and Red Hat Enterprise Linux 5.3 delivers very low virtualization overhead and high performance. As a result, IT organizations can drive up server-consolidation ratios, which reduce the number of physical hosts needed.

These results cut down both initial equipment expense and ongoing costs to run and maintain the infrastructure. Along with those advantages, customers get a variety of benefits that expand the positive impact of virtualization in their day-to-day operations:

- Virtualized efficiency that is more than 80 percent of native performance

- The ability to extend virtualization to workloads where it was previously infeasible

- Increased scalability of virtual CPUs and virtual memory available to virtual servers

Red Hat Enterprise Linux 5.3 is highly tuned to take advantage of the performance features of the Intel Xeon processor 5500 series, including Extended Page Tables. Next-generation Intel VT features deliver real-world, high virtualization performance on Intel® 64 architectures through support for huge pages, improved paravirtualization and virtualized I/O drivers, and better use of physical memory.

Businesses now find dramatic success in virtualizing demanding workloads, such as enterprise-scale databases, enterprise resource planning (ERP) applications, and online transaction processing (OLTP) implementations.

FEATURES AND CAPABILITIES THAT DELIVER NEXT-GENERATION VIRTUALIZATION IN THE DATA CENTER

Intel® Xeon® Processor 5500 Series	Red Hat Enterprise Linux* 5.3
• **Extended Page Tables:** Increased efficiency in translation between physical and virtual memory dramatically improves virtualized performance • **Throughput enhancements:** New microarchitecture and redesigned memory subsystem provide headroom • **Next-generation Intel® Virtualization Technology:**[2] Expanded set of hardware features helps virtualization provide the basis for expanded efficiency and performance	• **Increased virtual server scalability:** Support for up to 32 virtual CPUs and 512 GB of memory enhances flexibility in configuring virtual resources • **Open source hypervisor:** Incorporation of open source contributions from both Intel and Red Hat improves virtualized performance, efficiency, and consolidation ratios • **Paravirtualized drivers:** Replacement of high-overhead drivers eliminates substantial performance overhead

Automated energy efficiency: Saving money while saving the planet

Environments that run Red Hat Enterprise Linux on the Intel Xeon processor 5500 series benefit from advanced capabilities for automated energy efficiency.

Intel Intelligent Power Technology lets these solutions dynamically decrease power consumption during off-peak times, for lower overall power usage. Organizations that implement these technologies benefit in a variety of ways:

- Decreased operating costs, leading to lower total cost of ownership

- Positive support for green computing policies and initiatives

- Higher effective capacity for existing power and cooling infrastructure

Because consuming less input power means less heat to dissipate, organizations also benefit from lower cooling requirements in the data center. Together, these advantages add up to substantial savings in overall energy costs. As forward-thinking companies become more involved in mitigating the effects of their operations on climate change, those reductions in energy use take on additional weight, in terms of modeling good corporate citizenship.

FEATURES AND CAPABILITIES THAT DELIVER ENERGY EFFICIENCY IN THE DATA CENTER

Intel® Xeon® Processor 5500 Series	Red Hat Enterprise Linux* 5.3
• **Automated low-power states:** Automatic changes among up to 15 operating power states with less than 2 μs latency, compared with up to three states with 5 μs latency in predecessors • **Integrated power gates:** Allows processor cores to power down individually • **Integrated memory controllers:** Efficiently places memory in a low power state when idle, saving energy	• **Support for CPU clock frequency scaling:** Lets you change the clock speed of a running processor on the fly • **Enhanced power management:** Operational cost savings and physical space considerations drive the need for higher efficiency and low power consumption. Red Hat Enterprise Linux* 5.3 includes low-level kernel optimizations aimed at operating equipment efficiently in the lowest possible power states. This includes exploiting the new deep C states available on the Intel Xeon processor 5500 series. Additionally, the inclusion of ACPI T-state support facilitates effective processor throttling.

Community work toward power savings: LessWatts.org

LessWatts.org is a growing open source community dedicated to advancing technologies around power savings initiatives. The community benefits from collective research, code, and forums that support power savings on Linux* through open source software.

"Together, the compelling combination of Red Hat Enterprise Linux* and Intel® Xeon® processor-based servers enable customers to run the most demanding workloads on high-performance, cost-effective, reliable platforms."

— Doug Fisher
Vice President, Intel Software and Services Group
General Manager, Intel Systems Software Division

Take the next step

Solutions based on Red Hat Enterprise Linux running on
Intel Xeon processor 5500 series-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**

Solution provided by: