

WHITEPAPER

RED HAT ENTERPRISE LINUX 6: THE EVOLUTION OF HIGH PERFORMANCE AND RAS

Red Hat has always made performance a top priority. More specifically, Red Hat Enterprise Linux has always extracted the most out of your hardware, scaling from very small to very large systems, and drawing better performance out of all of them. It is normal to find that record-setting performance benchmarks are achieved by running demanding applications on Red Hat Enterprise Linux.

Red Hat has earned this success by working closely with hardware vendors in advance of software and hardware releases. More than just “good-enough” support of new hardware, these long-standing partnerships have allowed Red Hat Enterprise Linux to be an early adopter of hardware advances such as 64 bit, multi-core and multi-socket architectures, virtualization enablement, and Reliability, Availability, and Serviceability (RAS) features.

Red Hat Enterprise Linux 6 includes support for exciting new hardware features. This is the time to reflect on the continuing evolution of Red Hat Enterprise Linux, and to consider the advantages-and timing-of moving to Red Hat Enterprise Linux 6.

THE EVOLUTION OF HIGH-PERFORMANCE AND RAS IN RED HAT ENTERPRISE LINUX

Red Hat does not chase hardware advances. The evolution of Red Hat Enterprise Linux and the rapid growth of processor abilities are deeply intertwined, driven by business requirements that continue to demand better performance, scale, and availability. Sometimes Red Hat Enterprise Linux takes the lead, for example, creating clustering solutions that implement high availability in software. Sometimes hardware leads, such as providing support for virtualization so that virtualized environments can offer performance competitive with bare metal systems.

The common goal for both hardware and software is to provide functionality that brings complementary advantages out of the other. Programs used threads to define independent chains of logic long before desktop machines offered a way to run those threads at the same time. The rise of multi-core processors unlocks the performance built into programs that anticipated that evolution, and, as the number of cores supported by a single socket continues to climb, compilers - and developers - look for more methods of identifying parallelism in programs to take advantage of those cores.

Now, commodity hardware is starting to incorporate RAS capabilities. Proprietary hardware has a longer history of providing RAS features, but at a premium that has kept those benefits from less-expensive systems. New x86-based hardware with many cores and RAS features represents a new opportunity for datacenters that were previously locked into proprietary solutions. Red Hat Enterprise Linux 6 delivers the complementary software support to make those hardware advances available to users at an extremely competitive cost point.

Consider the impact on virtualization. Although virtualization has existed on mainframes for years, existing commodity hardware running Red Hat Enterprise Virtualization has had to rely on software high availability and custom solutions to match the proprietary competition. However, combining the new many-core, RAS-enabled commodity processors with Red Hat Enterprise Linux 6 will allow virtualization solutions to scale to the largest configurations with the robustness of hardware RAS.

What was previously the exclusive province of proprietary hardware will now be available with standards-based, Red Hat Enterprise Linux software running on commodity hardware.

RAS FEATURES IN RED HAT ENTERPRISE LINUX 6

The features listed below are available in Red Hat Enterprise Linux. Features that allow physical and logical devices (processors, memory, I/O hubs, and PCIe cards) to be hot added or removed improve system availability, increase serviceability, and increase capacity.

¹ This feature is intrinsic to the processor and does not require software to provide its benefits.

² This feature is not available on some platforms due to system design considerations.

RAS FEATURES IN RED HAT ENTERPRISE LINUX 6

Physical CPU board hot add ^{1,2}	A physical CPU board may be added to a running system without system downtime.
CPU logical on-lining / off-lining ²	With operating system assistance, the resources of an installed physical processor can be added to or removed from a running system without system interruption. This feature is only available on systems that support the physical CPU board hot add / remove function.
Physical memory hot add ^{1,2}	Physical memory (mirrored or unmirrored) may be added to a running system without system downtime.
Memory logical on-lining / off-lining ²	With operating system assistance, already installed memory devices can be added to or removed from a running system without system interruption. This feature is only available on systems that support the physical memory hot add / remove function.
Memory demand and patrol scrubbing (also known as HWPoison)	The operating system can declare a page as "poisoned", kill the processes associated with it, and avoid using the page in the future.
Advanced Error Reporting (AER) for PCIe devices	AER is a Red Hat Enterprise Linux feature that provides detailed reporting of PCIe devices so that problems can be quickly identified, prioritized, and, if necessary, the failed device can be hot swapped with a replacement.
Physical PCIe card hot add / remove ^{1,2}	A physical PCIe card may be added to or removed from a running system without system interruption.
Compute node hot add / remove ²	Some systems use compute nodes (a modular design that integrates CPUs, memory, and I/O into a sub-chassis) that plug into the system's backplane. Some of these systems allow compute nodes to be physically added to or removed from a running system. Red Hat Enterprise Linux provides reporting on the status of compute nodes.
Machine Check Architecture Recovery (MCA Recovery)	MCA Recovery enables logging of physical system errors and operating system assisted recovery from some uncorrectable errors that would have brought down previous-generation servers. Logging and analysis of system errors allows Red Hat Enterprise Linux to provide work-around advice for previously fatal errors. Work-arounds are possible when hardware redundancy or alternate path technology can be invoked to avoid a reported error.
Web-Based Enterprise Management (WBEM) providers for virtual environments	Red Hat Enterprise Linux supports reporting and modification of virtual machine information in the industry standard CIM format (previously, it was available only in proprietary form). This provides the ability to create, modify, and delete virtual machines via WBEM protocols.

THERE IS ALWAYS A GOOD TIME TO MOVE TO RED HAT ENTERPRISE LINUX

You can migrate to Red Hat Enterprise Linux, or update from an earlier version, when the time is right for you.

Every Red Hat major release, such as Red Hat Enterprise Linux 4, 5, and 6, is actively supported for seven years, and extensions are available. Throughout those years, you have the option to upgrade your system to newer releases as soon as they are available. Moreover, you also have the ability to move to previous releases if the need arises. Your Red Hat subscription makes this possible at no special charge.

You also don't have to wait for a major release to receive new functionality from Red Hat. For example, Kernel-based Virtual Machine (KVM) virtualization technology was added alongside existing virtualization technology in Red Hat Enterprise Linux 5.4. This wasn't an anomaly - it is the result of our release model, where major new functionality is released as soon as it is fully tested and integrated into the ecosystem. Major releases include important features as well, but serve primarily to define support lifecycles.

When you are ready, Red Hat Consulting can help you plan your migration to Red Hat Enterprise Linux 6 from an earlier release or from another platform. Detailed migration notes and how-tos are available from our thorough on-line resources.

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