



# RED HAT ENTERPRISE LINUX 5 GENERAL OVERVIEW

For IT managers and end users who wish to understand the primary values of the Red Hat open source operating system environments and to familiarize themselves with details of the Red Hat Enterprise Linux family of products.

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# INTRODUCTION

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Red Hat introduced its Red Hat® Enterprise Linux® line of products in 2002, setting the standard as the highest quality open source products available for commercial computing deployments. Red Hat Enterprise Linux version 5 was released in early 2007, delivering significantly enhanced capabilities and new levels of performance, scalability, and security. Following is an overview of the product family and its capabilities. The first section describes the core features of the family, while the second section describes product packaging.

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## The power of open source

Red Hat is the world's leading supplier of open source technology and services, covering the software stack from the operating system—with its Red Hat Enterprise Linux range of products—to the portfolio of JBoss J2EE-compliant middleware components. Today, the collaborative open source model is the driving force behind modern software development, delivering rapid innovation with higher quality and lower cost than proprietary development models. Open source solutions are deployed in the most demanding IT environments.

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## Delivering the virtual enterprise

The power of open source development is well demonstrated by the rapid development of virtualization technology over the past three years. A major feature of the latest release of Red Hat Enterprise Linux is the ability to fully virtualize both compute and data resources. A virtualized IT infrastructure provides significant improvements in operational flexibility, asset utilization, and application availability. These improvements enable IT organizations to reduce costs and deliver new IT capabilities more effectively, by freeing time to foster innovation.

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# RED HAT ENTERPRISE LINUX OVERVIEW

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The following sections outline the primary features of the Red Hat Enterprise Linux product line.

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## Certified applications

The value of any computer system ultimately rests with the applications that run on it. For this reason, the Red Hat Enterprise Linux family provides the broadest possible application portfolio. The security, stability, and performance of Red Hat Enterprise Linux has proven compelling to Independent Software Vendors (ISVs): it has more certified applications than another other open source product. For information on which applications are supported, refer to [www.redhat.com/apps/isv\\_catalog](http://www.redhat.com/apps/isv_catalog) or the specific application information on your vendor's website. At last count, over 6,000 open source and proprietary applications were certified, including offerings from the these vendors:



## Certified hardware

Red Hat Enterprise Linux supports a wide range of system configurations and form factors. These range from laptop systems to blade servers to large mainframe servers, in standalone, clustered, fault tolerant, HPC, grid, and virtualized topologies. Supported architectures include:

- 32-bit x86 compatible systems
- 64-bit AMD64 (Opteron) and Intel EM64T systems
- Intel Itanium2 systems
- IBM POWER systems
- IBM z-Series and S/390 systems

Red Hat certified systems spanning these architectures are available from all the leading hardware vendors, including:



In addition, certification extends to a large portfolio of peripheral options, including graphics, storage, and networking options. For full information on Red Hat hardware certification, refer to [www.redhat.com/hwcert](http://www.redhat.com/hwcert).

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## Common deployments

Deployments of Red Hat Enterprise Linux cover all aspects of today's computing infrastructure. From the edge-of-network systems that were common in the late 1990's, commercially-focused open source products such as Red Hat Enterprise Linux are now found in the most demanding corporate environments. High volume deployments include:

- Corporate applications (CRM, ERP, etc.)
- Databases
- Vertical market applications (financial services, human resources, healthcare, manufacturing, retail, etc.)
- Application servers
- Network infrastructure systems
- Web serving
- File/print serving
- HPC compute systems

Cost reduction. Improved price and performance. Improved security, performance, and flexibility when compared to other operating system environments. These are some of the benefits that drive customers to adopt Red Hat Enterprise Linux.

## References and testimonials

A comprehensive collection of Red Hat Enterprise Linux customer references covering a wide range of market segments can be found at [www.redhat.com/rhel/informationcenter/successstories](http://www.redhat.com/rhel/informationcenter/successstories).



"The reason we started with open source was a cost decision... Cost was my original reason. It allowed me to do a lot of things I wanted to do. And we realized we weren't dealing with software that wasn't going to work. We found it was high quality and higher quality than other software. **IT WAS THE BEST DECISION I COULD HAVE MADE.**"

Joseph Kennedy, Vice-President,  
Technology Architecture and Strategy Services,  
State Street Wealth Manager Services -

"CIOs: Open-Source Software Offers Cost, Quality Benefits" Darryl K. Taft, Feb. 13, 2006

## Subscription model

Traditional software products are sold using a wide range of licensing and support models. The most common involves the purchase of a perpetual right-to-use license for the software, with additional fees for per-user connectivity (such as Client Access Licenses), maintenance, and upgrades to new versions. The model for Red Hat Enterprise Linux was specifically designed to be straightforward and all-inclusive. Simplifying budgeting, eliminating unexpected costs, and ensuring a high-quality support experience.

The software source code for Red Hat Enterprise Linux is open source, mostly under the GPL license, and is freely downloadable. Meanwhile, Red Hat Enterprise Linux products are sold on a per-system, all-inclusive annual subscription basis that provides:

- Code binaries and documentation
- Product maintenance - Delivered using Red Hat Network, which provides secure access to media kits and all security updates and bug fixes. Security updates are provided immediately, while general bug fixes are available individually using Red Hat Network Fastrack or in consolidated updates provided approximately 2-3 times per year. Updates may be installed automatically, semi-automatically, or manually depending on administrative policies.
- Product updates - New versions of Red Hat Enterprise Linux are provided at no additional charge and access to older versions is also allowed.
- Product support - Subscriptions are provided that offer three levels of support: Basic, Standard, or Premium. These are described in detail in a later section. Note that all subscriptions offer unlimited incident support.
- Certifications and stability - Each version of Red Hat Enterprise Linux is supported for seven years from product release, with new releases being issued every 18-24 months. During the life of each release, all User Mode and mainline Kernel Mode application programming interfaces and application binary interfaces (APIs and ABIs) are held stable. The stability of this environment is unique among the commercial Linux distributions and is vital to the extensive certification ecosystem mentioned previously.



- Version independence - Red Hat Enterprise Linux is not sold on a per-version basis. Rather, after purchasing a subscription, customers are free to run any version. This is useful for customers who wish to standardize on a particular version, or in instances when a specific application is not yet certified on a newer version.
- Architecture independence - Red Hat Enterprise Linux subscriptions are transferable across physical systems and architectures (with the exception of mainframe and IBM Power subscriptions). This means that if a subscription is initially deployed on a 32-bit x86 system, it is possible to upgrade the system to a 64-bit Itanium/Opteron/EM64T and continue to use the same subscription.

Note that Red Hat Enterprise Linux subscription model does not require Client Access Licenses. For a full description of Red Hat Enterprise Linux subscriptions, refer to [www.redhat.com](http://www.redhat.com).

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## Technology

Red Hat Enterprise Linux 5, released in early 2007, is based on the Linux 2.6.18 kernel and includes approximately 1200 software components. A large number of open source server applications are provided, including:

- A full suite of network services (DHCP, DNS, firewall, VPN, etc)
- Apache web server
- MySQL and PostgreSQL databases
- File/print servers for FTP, NFS and CIFS (Samba)
- Remote access services (SSH, VNC)

**The system provides enterprise-focused features, such as:**

- Integrated virtualization
- Mandatory Access Control security
- Logical Volume Management and host-based RAID capabilities
- Multipath I/O
- Support for fault tolerant systems, NUMA, and large-scale SMP
- Extensive application debugging and profiling capabilities (e.g. Systemtap, which provides functionality similar to Sun Solaris Dtrace)

**For client systems Red Hat Enterprise Linux provides a full complement of capabilities, including:**

- GNOME and KDE window managers, running on X-based display subsystem
- Choice of email clients
- Comprehensive Office suite that includes word processor, spreadsheet, presentation applications
- Choice of web browsers, including Firefox
- Smart card login/authentication



## VIRTUALIZATION

Support for virtualized environments is a major new feature provided in Red Hat Enterprise Linux 5 and is included in the base product. Based on the open source Xen project, virtualization allows multiple operating systems to simultaneously run on a single physical system. Red Hat Enterprise Linux 4 and 5 are able to run in a para-virtualized mode that enables the highest levels of performance and manageability. Other 3rd party operating environments and older versions of Red Hat Enterprise Linux run in a fully virtualized environment, which requires Intel Virtualization Technology or AMD-V hardware. These systems have been available from all major vendors since the summer of 2006.

Datacenters or large configurations using Red Hat Enterprise Linux will be best served by purchasing the Red Hat Enterprise Linux Advanced Platform, which provides a complete, integrated server and storage virtualization solution (described below).

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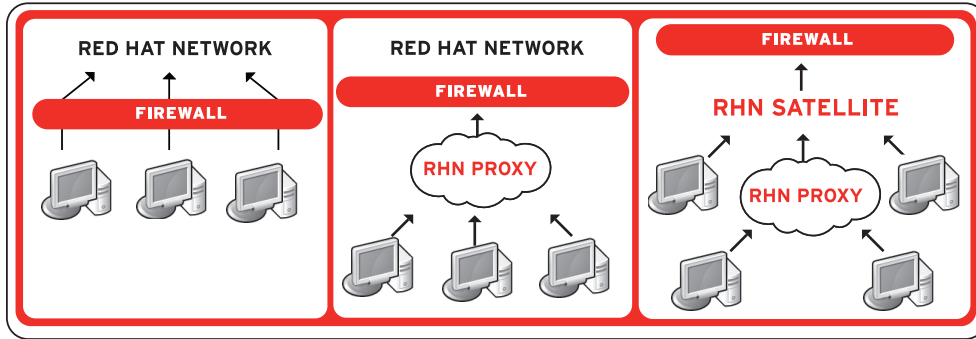
## RED HAT NETWORK

Red Hat Network is the Internet-based system maintenance and management infrastructure for Red Hat customers. Red Hat Network's core capability is to analyze all the packages on a Red Hat Enterprise Linux system and identify packages for which updates are available, resolving any dependencies that the packages require. Red Hat Network can then apply the updates as required. The strength of Red Hat Network is its ability to manage hundreds of systems automatically, with features such as system grouping, automatic updates, and continuous monitoring and alerts. Using Red Hat Network greatly simplifies the process of keeping multiple systems up-to-date and secure. As Red Hat continuously provides enhancements and security updates, Red Hat Network provides the mechanism to ensure that they are applied to customer systems quickly and efficiently.

All Red Hat Enterprise Linux subscriptions provide one year of Red Hat Network access. And in most cases Red Hat Network will be used to download the purchased Red Hat Enterprise Linux variant and any layered products (CD/DVD media kits are also available).

Red Hat Network provides several modes of operation: Hosted, Proxy and Satellite.

- In Hosted mode each managed system connects across the Internet to a Red Hat Network server hosted by Red Hat. The Red Hat Network server will inventory the system's packages and apply updates as required.
- Proxy mode is useful for reducing Internet bandwidth consumption when a customer has multiple systems. Updates are cached at the customer's site in a local proxy server, and need only be downloaded from Red Hat Network servers once. Package inventorying is still performed by Red Hat Network servers, allowing Red Hat to notify administrators immediately when an update is available.
- Satellite mode provides a fully disconnected Red Hat Network environment, where package inventorying and caching is all performed using a satellite server located on the customer's site. Updates from Red Hat are performed on an as-needed basis. A satellite server can also be used to deliver and update customer-specific applications.



Red Hat Network provides four management modules: Update, Management, Monitoring, and Provisioning. Update provides the basic ability to keep systems up-to-date and is included in all Red Hat Enterprise Linux subscriptions. Management provides additional features such as system grouping and role-based permissions. Monitoring provides the ability to keep track of systems and applications via dynamic probing and automated alerts. Provisioning provides bare-metal system deployment capabilities (allowing new systems to be up-and-running in the shortest possible time) and multi-state rollback. For additional information on Red Hat Network, refer to [rhn.redhat.com](http://rhn.redhat.com).

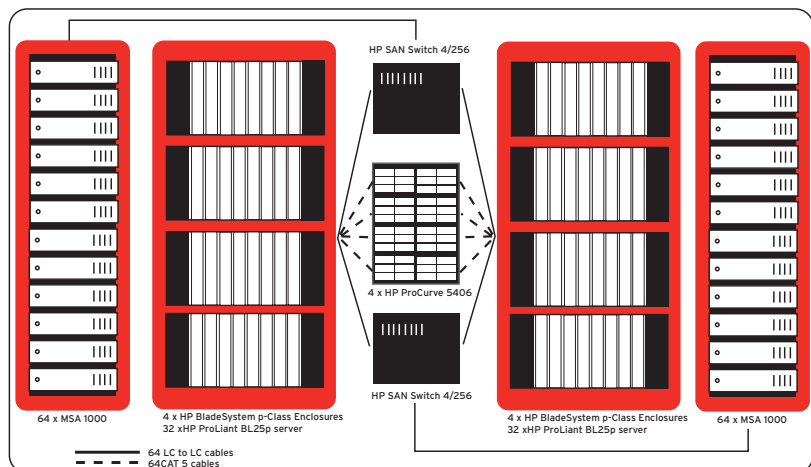
## Performance

For many customers the availability of audited performance results is an important criteria to be considered during a product evaluation and purchase cycle. Working with a number of hardware and software partners, Red Hat has established a wide range of world-record results for industry standard performance benchmarks with Red Hat Enterprise Linux. Benchmark partners include AMD, Intel, Dell, Fujitsu, HP, IBM, NEC, BEA, Oracle, and SAP.

The following two benchmark results illustrate Red Hat Enterprise Linux capabilities. These results are based on version 4; results for version 5 are expected to be available after the product release in 2007.

### WORLD RECORD: TPC/H

This result, published June 8, 2006, in partnership with HP and Oracle, delivered the outright world record performance figure of 110,576.5 QphH at a database size of 3000GB. The configuration comprised an HP BladeSystem ProLiant BL25p cluster with 64 processors. The software was Oracle Database 10g Release 2 with Real Application Clusters and Partitioning, running on Red Hat Enterprise Linux 4.



## WORLD RECORD: SPECWEB2005 FOR 4 CORE SYSTEMS

This result, published in May 2006, in partnership with IBM, delivered the world record performance figure for a four core system of 9182 connections. The configuration comprised an IBM xSeries 3650 configured with two 3.0GHz Intel dual-core processors. The software used was Red Hat Enterprise Linux 4, Apache Tomcat, and Accoria Networks Rock Web Server.



Results for the major industry standard benchmarks can be found at:

[www.tpc.org](http://www.tpc.org)

[www.spec.org](http://www.spec.org)

[www.oracle.com/benchmarks](http://www.oracle.com/benchmarks)

[www.sap.com/benchmark](http://www.sap.com/benchmark)

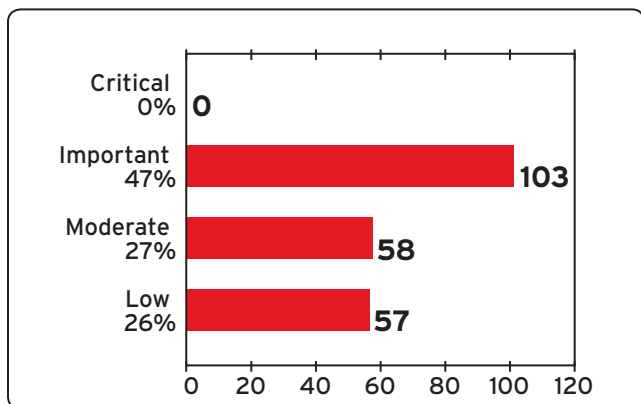
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## Security

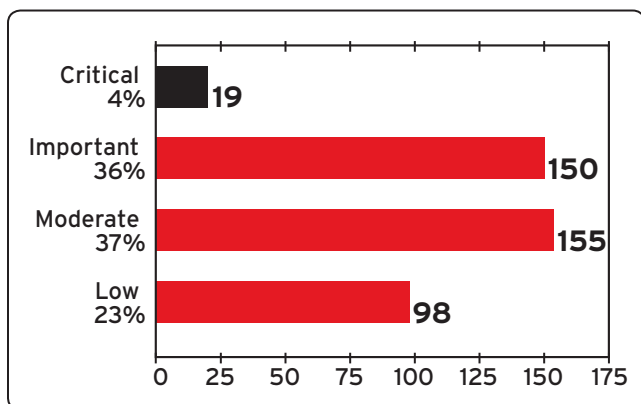
A critical component in the success of open source software and Red Hat Enterprise Linux has been its outstanding security record. The open source software development model has proven able to deliver code that is of higher quality, with fewer bugs and security flaws than proprietary software. Red Hat Security Response Team is responsible for providing timely fixes for all security problems and has achieved an outstanding record. The team's responsibilities include:

- Threat and vulnerability monitoring
- Accountability for all vulnerabilities affecting Red Hat products and services
- Providing updates for security issues throughout the seven year Red Hat Enterprise Linux life cycle
- Prioritizing releases based on public severity impact ratings
- Backporting the latest security patches to minimize update risk
- Provision of a direct contact point for customers

The following chart demonstrates the security of a Red Hat Enterprise Linux version 4 default server installation for the year February 2005 - 2006. Note that there were no critical flaws during this period.



For full installations of Red Hat Enterprise Linux, where non-server applications such as web browsers are installed, the number of critical flaws is shown in the following chart. Note that most of the critical flaws were in web browsers, which tend to exhibit the most security weak points.



Of the 19 critical flaws reported, 73% were fixed in less than 24 hours, and all were fixed within 2 days.

In day-to-day operations, the time it takes to deploy a fix is often longer than the time to obtain the fix. With Red Hat Network, which is provided with every Red Hat Enterprise Linux subscription, it is possible to deploy fixes to thousands of systems in a single operation. The combination of rapid fix time and rapid deployment time is one aspect of the Red Hat Enterprise Linux security environment that makes it so effective.

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## SECURITY TECHNOLOGIES

Another important aspect of Red Hat Enterprise Linux security is the underlying technologies that deliver an exceptionally risk-free environment. Red Hat Enterprise Linux includes two major security features:

- ExecShield - A selection of capabilities implemented in the kernel, compilers, and libraries that thwart hacker attacks, such as buffer overflows and denial of service attempts.



- Security Enhanced Linux (SELinux) - A policy-based Mandatory Access Control (MAC) infrastructure that is included in the kernel. SELinux supplements the standard Unix-style Discretionary Access Control (DAC) security offered by the kernel. MAC offers three policy modes: Type Enforcement (TE), Role Based Access Control (RBOC), and Multi-Level Security (MLS). The newly added SELinux MLS capability will enable Red Hat Enterprise Linux to obtain US Government EAL4+/LSPP certification in addition to the existing EAL4+/CAPP certification. This means that Red Hat Enterprise Linux will offer the highest level of security clearance of any mainstream operating system.

For additional information on Red Hat Enterprise Linux security, refer to the appropriate Red Hat whitepapers.

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## Support services

For Red Hat Enterprise Linux servers, subscriptions are offered with three support levels (Service Level Agreements):

- Basic support - Offers a year of web-based support with 2 business day response guarantee coupled with Red Hat Network access for maintenance, upgrades, and updates.
- Standard support - Offers a year of phone/web/email support from Monday to Friday 9:00 a.m. to 9:00 p.m. in North America and 9:00 a.m. - 5:00 p.m. in the rest of the world. Response time is 1 hour for critical outages and 4 hours for other issues.
- Premium support - Enhances Standard support with 24x7 coverage.

All subscriptions provide unlimited incident coverage, which Red Hat believes provides the best customer experience. Per-incident support is available from a number of Red Hat partners. Support is delivered in eight languages from four Red Hat Customer Service centers located around the world.

Basic, standard, and premium subscription prices vary according to the size of the physical servers. Two primary server size ranges are defined: those with up to two sockets and all larger systems. (A socket relates to the physical server processor capacity; sockets could be populated with hyper-threaded or multi-core processors.)

For Red Hat Enterprise Linux client systems, subscriptions are offered with two support levels:

- Basic Support – This offers the same services as on server systems, described above, and is the default support offering for all client systems.
- Help Desk Escalation Support – Customers with 50 or more client systems may opt, for no additional charge, to convert their subscriptions to provide Help Desk Escalation support. With Help Desk Escalation Support desktop end users contact their local corporate IT help desk for resolution of day-to-day problems - networking, printing, local application issues, etc. If a member of the IT help desk staff requires specific product assistance then he/she is able to log a support call with Red Hat. Help Desk Escalation provides the IT staff with Standard support services. The primary benefit of Help Desk Escalation over Basic is that it provides phone support with rapid response guarantees.

## OTHER SERVICES

Red Hat also offers a range of other support services:



- Red Hat Global Learning Services - Offers a full curriculum of courses on Red Hat Enterprise Linux and other Red Hat products.
- Red Hat Global Professional Services - Offers consulting services of all sizes, from small deployments to complete design/deployment/integration/management services.
- Red Hat Global Engineering Services - Offers bespoke engineering capabilities.
- Red Hat Global Support Services - in addition to delivering the Basic, Standard, and Premium support for Red Hat Enterprise Linux, Red Hat GSS also offers additional services, such as Developer Support and enhanced SLA subscriptions.

# RED HAT ENTERPRISE LINUX PRODUCT SUMMARY



The following sections outline the specific members of the Red Hat Enterprise Linux product family.

## Overview

The Red Hat Enterprise Linux family covers three general computing areas: servers, clients, and miscellaneous variants for specific environments, such as High Performance Computing.

All Red Hat Enterprise Linux products for a given release are based on a common technology core—they use the same kernels, APIs/ABIs, libraries, development toolchain, management tools, packages, etc. A common code base is used for all architectures so that the feature set is the same regardless of the underlying hardware. As a result, a single application certification applies across the entire family. It also simplifies the deployment and management of homogeneous configurations. Client products differ from server products in that a number of server application packages are not included, and the support SLAs are designed to be appropriate for client systems.

## SERVER PRODUCTS

Server systems are supported by two Red Hat Enterprise Linux models:

- Red Hat Enterprise Linux Advanced Platform
- Red Hat Enterprise Linux

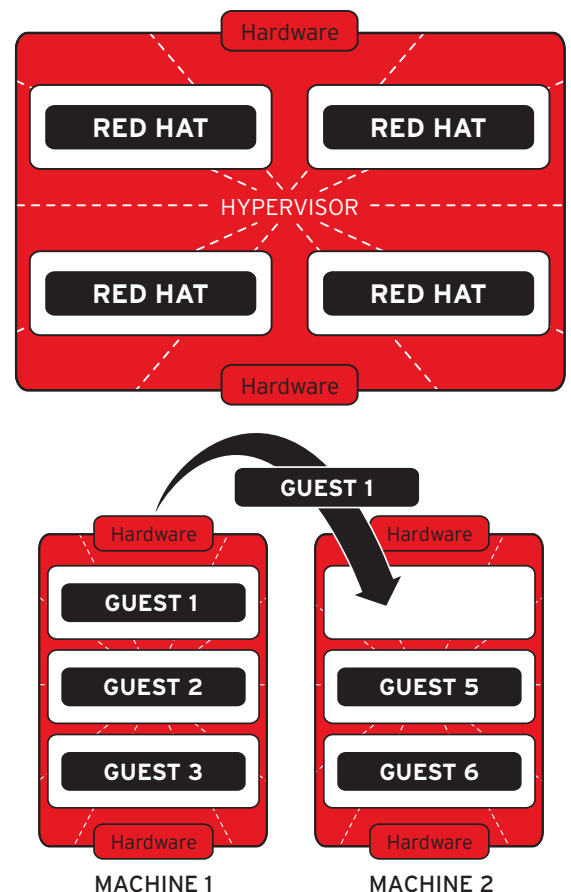
### Red Hat Enterprise Linux Advanced Platform:

Designed from the ground up to dramatically reduce both the acquisition and operating costs for servers, improving service levels and simplifying IT, from white boxes to mainframe, for both scaling up and scaling out.

Red Hat Enterprise Linux Advanced Platform provides a complete, integrated server and storage virtualization environment, offering the highest levels of deployment flexibility and application availability. The ability to perform logical volume management and share file systems across multiple virtualized servers and physical systems provides the foundation for a seamless computing grid.

Red Hat Enterprise Linux Advanced Platform provides a powerful combination of features, including:

- The ability to deploy an unlimited number of virtualized guest operating systems.
- The ability to deploy a fully virtualized storage subsystem. This capability is enabled by bundling the Red Hat Global File System into the Advanced Platform. (Note that the Red Hat Global File



System includes the Cluster Logical Volume Manager and high availability Red Hat Cluster Suite.)

- Support for servers of any size (unlimited processor sockets).



### **Red Hat Enterprise Linux:**

Designed for servers with up to 2 processor sockets, Red Hat Enterprise Linux is the foundation of the entire family. It offers a broad range of capabilities, as described earlier, including virtualization. Red Hat Enterprise Linux supports up to four virtualized guest operating systems.

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### **PURCHASING A SERVER SUBSCRIPTION**

Selecting a Red Hat Enterprise Linux 5 subscription requires just two simple choices:

- Which level of service is required?
- Is the Advanced Platform needed?

Red Hat Enterprise Linux supports servers with up to 2 sockets at each service level (Basic, Standard or Premium). Red Hat Enterprise Linux Advanced Platform supports servers of any size and is available with either a Standard or Premium subscription.

Note that a Red Hat Enterprise Linux subscription is not version specific. Once a subscription has been purchased, customers are free to run any version.

## Client products

Client systems, such as laptop and desktops, are supported by a single product, Red Hat Enterprise Linux Desktop 5.



This product includes all the latest open source client technologies and supports systems with one processor socket and up to 4 GB of main memory. Support is provided for 32-bit x86-compatible and 64-bit AMD64 and EM64T architectures.

An important feature of Red Hat Enterprise Desktop is that it includes three Red Hat Network modules: Update, Management and Provisioning. These modules combine to greatly simplify the deployment and management of high volume desktop environments.

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### CLIENT OPTIONS: WORKSTATION AND MULTI-OS

Two options are available for Red Hat Enterprise Linux Desktop:

#### Workstation

- This option upgrades the basic Red Hat Enterprise Linux Desktop for use in more demanding environments. It is appropriate for powerful workstation systems.
- The option supports systems with up to two processor sockets, with no limit on memory size.
- Standard support is available for client systems using the Workstation option.

#### Multi-OS

- This option permits the Red Hat Enterprise Linux Desktop user to deploy virtualized guest operating systems.

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### CAPABILITIES

The following table summarizes Red Hat Enterprise Linux Desktop capabilities and options:

#### RED HAT ENTERPRISE LINUX 5 DESKTOP: SUMMARY

| Base Product                     | Includes   | Installer Behavior  | SLA   |
|----------------------------------|--|---|---|
| Red Hat Enterprise Linux Desktop | <ul style="list-style-type: none"><li>• 1 year RHN Update, Management and Provisioning</li><li>• 1 year Basic support (converts to Help Desk Escalation at 50 units)</li></ul> | Full set of Client packages provided—Office suite, email, Internet, multimedia, etc (no server or developer packages) | <ul style="list-style-type: none"><li>• 1 CPU socket &amp; 4Gb of memory</li><li>• Support SLA for Client use</li></ul> |

| Options            | Includes   | Installer Behavior                         | SLA  |
|--------------------|--|--|--|
| Workstation Option | <ul style="list-style-type: none"><li>• Support for calculation intensive applications that require more powerful desktops</li></ul> | Option to load server & developer packages | <ul style="list-style-type: none"><li>• Up to 2 CPUs &amp; unlimited memory</li><li>• Support SLA for Client &amp; Developer use, and server applications in workgroup environments (no support for use as a general purpose server)</li></ul> |
| Multi OS Option    | <ul style="list-style-type: none"><li>• Run 3rd party operating systems with the security of Linux</li></ul>                         | Option to load virtualization packages     | <ul style="list-style-type: none"><li>• Support for up to 4 virtualized guests</li></ul>   |

# MISCELLANEOUS PRODUCTS

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## High Performance Computing (HPC)

Support for HPC environments is provided with a specific product variant, Red Hat Enterprise Linux for HPC Compute Nodes. This product contains the same functionality as the mainline server but is focused on the HPC market through specific bundling, pricing, and subscription SLA:

- The initial purchase must be for at least eight HPC compute nodes. Individual units may be purchased subsequently.
- The product is only available with Basic support, and the Service Level Agreement (SLA) restricts use to HPC environments.