



Migrating to Red Hat Enterprise Linux from Red Hat Linux - Benefits and Guidelines

Abstract

This white paper describes the features and benefits of the Red Hat Enterprise Linux product family. It briefly outlines factors that need to be considered when planning a migration from a consumer Red Hat Linux release, such as 8.0 or 7.1, to an Red Hat Enterprise Linux family product.

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Table of Contents

Introduction.....	3
What is Red Hat Enterprise Linux?.....	4
Application Availability.....	7
Benchmarks.....	8
Migrating to Red Hat Enterprise Linux.....	9
Professional Services.....	11
Reference Documentation.....	12
Summary.....	13

Introduction

The Red Hat Enterprise Linux product family, released in several phases starting in May 2002, provide enterprise-class features that enable Linux-based solutions to be deployed across the widest range of enterprise IT environments. With a potent combination of technical features, certified ISV applications, and portfolio of services, Red Hat Enterprise Linux products are the world's leading Linux-based enterprise operating system solutions.

Red Hat Enterprise Linux products join Red Hat's traditional consumer-focused products, which continue to be developed and released as before. These products – Red Hat Linux Personal and Red Hat Linux Professional – are available for direct Internet download or purchasable through retail channels. While the focus of the consumer products is on general usability and inclusion of the latest open source technologies, Red Hat Enterprise Linux products are focused on features such as scalability, reliability, availability and performance.

Many existing users of Red Hat's traditional consumer products will be faced with the prospect of upgrading their existing systems to Red Hat Enterprise Linux products. The upgrade decision will be based on technical and non-technical considerations, several of which are outlined in this paper. It will be seen that the benefits of Red Hat Enterprise Linux solutions are compelling for any enterprise-class application environment, and that a properly planned and managed upgrade will be straightforward for the majority of existing Red Hat Linux customers.

What is Red Hat Enterprise Linux?

The Red Hat Enterprise Linux product family is a suite of powerful enterprise operating system solutions that are designed for mission critical business applications. Currently, the family of products comprises:

- Red Hat Enterprise Linux AS (previously named Red Hat Linux Advanced Server). This is the top-of-the-line X86-based high-end server product, suitable for large departmental and corporate server deployments.
- Red Hat Enterprise Linux ES. This is the entry-level and mid-range X86-based server product, suitable for most small system and departmental deployments.
- Red Hat Enterprise Linux WS. This is the client side, desktop partner to the server products. It is suitable for technical/commercial desktop use, in X86-based S/W development and custom application environments (e.g. EDA and Oil/Gas applications).
- Red Hat Linux Advanced Server for the Itanium Processor. This product is compatible with Red Hat Enterprise Linux AS, but supports the Intel Itanium 2 processor.
- Red Hat Linux Advanced Workstation for the Itanium Processor. This product is compatible with Red Hat Enterprise Linux WS, but supports the Intel Itanium 2 processor.

Red Hat plans to continue to enhance the Enterprise Linux family, providing additional features and expanded architecture support. The following points outline the major technical and non-technical features of the family:

- Performance

All current Red Hat Enterprise Linux products are based on Linux Kernel 2.4.9, enhanced to include numerous performance and scalability features from later kernel versions and developed by Red Hat and its partners. These include support for features such as:

- Asynchronous I/O - applications need no longer pause after issuing I/Os until they are complete.
- Increased SMP granularity - particularly in the SCSI I/O subsystem, permitting increased I/O throughput.
- SMP Scheduler enhancements - support process-CPU affinity, which improves performance by increasing the CPU cache hit rate and greatly reducing scheduler spinlock contention.
- Bounce Buffer Elimination - this feature provides significant performance gains in systems with more than 1GB of main memory by eliminating I/O buffer copy operations.

These and other performance enhancements make Red Hat Enterprise Linux products the most suitable Linux solutions for server and workstation systems

that are running commercial/enterprise applications. Leveraging these features has enabled Red Hat Enterprise Linux products to deliver excellent benchmark performance for TPC-C, TPC-R, SPECjAppServer2001, Lotus NotesBench, and Ecpref.

- Reliability

To ensure that Red Hat Enterprise Linux software components are of the highest quality, Red Hat Engineering subjects them to the most stringent qualification and testing over an extended period of time.

Driven by the hectic pace of development in the open source arena, new versions of Red Hat's traditional consumer products are generally released every 4-6 months. This rapid cycle favors inclusion of new technology over extended testing, so the qualification period for these products is necessarily limited. However, for commercial deployments, where quality and robustness are of major concern, extended qualification and beta cycles are vital. Red Hat's Enterprise Linux products are delivered on a 12-18 month schedule; this provides the opportunity to impose a much more rigorous development environment, and to implement an extensive six month testing process, much of it performed jointly with hardware and software partners.

- Availability

A major requirement of any enterprise IT deployment is that the system should be available at all times. 24X7 operation is the norm today. While today's hardware systems are far more reliable than in the past, and the Linux operating system is exceptionally reliable, many organizations do not wish to depend entirely on the continuous availability of a single server. To handle this situation Red Hat Enterprise Linux AS includes a high availability clustering feature, which can be used to increase the availability of almost any application. The clustering feature, called Cluster Manager, allows a pair of servers, configured with a shared disk storage subsystem, to operate in tandem. This ensures that critical application services are always being provided by one of the two servers.

- Services

A primary goal of the Red Hat Enterprise Linux family is to ensure that deployments are as successful as possible. Consequently, the provision of a world-class service infrastructure is a vital component of the products. All Red Hat Enterprise Linux products are provided with a full year of services, with support for unlimited incidents. Several service plans are available, scaling up to 24x7 coverage with 1 hour response. Additionally, Red Hat will provide support for Red Hat Enterprise Linux releases for 5 years (and up to 7 years by special arrangement), making long term deployments a practical proposition.

Included as a core component of all service plans is access to Red Hat Network, Red Hat's Internet-based system management capability. Red Hat Network (RHN) simplifies system administration by detecting when security and software errata are available, and then automating system updates. Optional features, such as RHN Satellite and Proxy, allow customers to create customized RHN configurations, with the ability to securely manage thousands of systems and

custom applications.

In summary, Red Hat Enterprise Linux products provide a fully-featured, enterprise-strength operating system solution that is capable of meeting the demands of the most rigorous commercial environment. Its functionality, performance, scalability, and reliability, combined with comprehensive services, make it a far more effective platform for commercial deployments than Red Hat's 6.x, 7.x and 8.x consumer products.

Application Availability

Independent software vendors (ISVs) have been quick to appreciate the benefits of Red Hat Enterprise Linux solutions. Providing support for their applications on these products offers numerous advantages:

- The extended release cycle simplifies application delivery, sales and support.
- The extended release cycle means that applications from multiple vendors will all be supported on the same platform at the same time (a situation that rarely occurred with the traditional consumer products).
- The high availability clustering of Red Hat Enterprise Linux AS permits deployments in the most demanding environments
- Technical features deliver performance and scaling to match or exceed proprietary Unix and Microsoft Windows solutions.

Since the initial availability of Red Hat Enterprise Linux products, Red Hat has been working with a wide range of ISVs to ensure that customers can choose from a rich application portfolio. Many ISVs have chosen to support the Red Hat Enterprise Linux family exclusively, thereby avoiding the expense of certifying on new consumer releases every few months. Because all products in the family are based on a common core, ISV application certification on one family member automatically accrues to other family members. The number of ISVs who are providing their applications on the Red Hat Enterprise Linux family is growing rapidly.

Refer to <http://www.redhat.com> for the latest list of ISV partners. By late early 2003, Red Hat's ISV partners included:



Benchmarks

Traditional consumer Linux distributions are updated and delivered so rapidly that providing audited benchmarks is often impractical. However, the commercial focus and longevity of Red Hat Enterprise Linux products makes the provision of formal industry benchmarks important; indeed they are often a critical part of a customer's purchase decision process.

Red Hat has worked closely with ISVs and OEMs to provide industry standard benchmarks for Red Hat Enterprise Linux products. By early 2003 several important benchmarks were complete, with others underway. These benchmarks are repeatedly proving the performance and scalability of the Red Hat Enterprise Linux platform.

- TPC-C. This transaction benchmark is often used as the primary baseline measurement for an operating system. Red Hat Enterprise Linux and Oracle 9iRAC, running on eight clustered HP Proliant DL580s, delivered performance approximately 14% better than equivalent hardware running Windows 2000 and SQL Server.
- NotesBench. This benchmark measures the performance of a Lotus Domino environment. Running on an IBM eServer xSeries 342 system this benchmark supported 7000 concurrent users.
- Ecperf. This benchmark measures the performance of J2EE environments in an environment that is designed to be as close to real-world as possible. Advanced Server currently holds the world record price/performance figure of \$5/BBop for this benchmark, running Oracle 9i Application Server on HP Proliant DL360s.

These benchmarks can be accessed at their respective web sites:

- www.tpc.org
- www.notesbench.org
- www.theserverside.com/ecperf

As additional benchmarks become available they are documented on the Red Hat website at <http://www.redhat.com>.

Migrating to Red Hat Enterprise Linux

For customers currently using Red Hat's traditional consumer products - Red Hat Linux Linux Personal and Professional 6.x, 7.x and 8.x - to run commercial application such as Oracle, the benefits of migrating to the Red Hat Enterprise Linux platform are clear. As always, however, the migration must be planned carefully if it is to be done effectively and successfully.

While there will be straightforward and simple upgrade paths between successive releases of Red Hat Enterprise Linux products, it proved impractical to create an upgrade procedure that could cover all possible scenarios when migrating from the consumer releases. Red Hat's experience with the consumer releases has shown that many systems accumulate software of unknown origin and quality over time, and that upgrading such systems reliably is extremely difficult. So, because it was important to ensure that Red Hat Enterprise Linux deployments started from a fresh, known state, Red Hat did not provide an upgrade capability from the consumer releases. This means that a migration to any Red Hat Enterprise Linux product requires a fresh installation (except where noted below).

Fortunately, the heritage of Red Hat Enterprise Linux products, which were originally based on the consumer products, makes fresh installation a straightforward exercise. Externally visible components, for example, are the same across the systems, including:

- Scripts, configuration and init files
- Device semantics
- Network setup
- File systems, partitions, mount points
- Local databases for entities such as printers and user management
- Graphics and X support

In almost all cases existing systems will be configured with separate partitions for user populations, applications and database files. These do not need to be changed during the migration process, which will only effect the root and other system partitions.

Maintenance of control scripts and local Linux datafiles is usually managed from a remote management server by the system administrator, using tools such as Cfengine. These tools provide management and centralized provisioning of all configuration-specific files.

Greatly simplified, the migration process will proceed as follows:

- Backup all partitions.
- If not maintained by a remote management server, identify and save all system-specific control, init, configuration and script files .
- Install the appropriate Red Hat Enterprise Linux product in the root and other system partitions.

- The installation process is comprehensively documented in the Advanced Server Installation Manual provided with the product. It is also available at <http://www.redhat.com/docs>. For system administrators experienced with Red Hat Linux 6.x, 7.x and 8.x releases, the installation will be familiar and straightforward.
- Restore saved control files directly or from remote management server.
- Test the new configuration.

After the installation has been completed features that are specific to Red Hat Enterprise Linux products can be enabled, such as Network Crashdump and Console Logging. Also, since all Red Hat Enterprise Linux systems are provided with a year's subscription to Red Hat Network (RHN), it is important to register the system with RHN in order to receive the latest errata and updates. Instructions on how to do this are included in the documentation.

Professional Services

For customers that do not wish to undertake the task of migrating their servers from Red Hat Linux to Red Hat Enterprise Linux, Red Hat's Professional Services organization provides programs that can be tailored to do the job. Red Hat has developed specific programs to support migrations – from the small-scale to the very large – to Red Hat Enterprise Linux AS, ES and WS. In some circumstances Red Hat's Professional Services consultants can perform tailored upgrades to Red Hat Enterprise Linux, avoiding the need for a fresh installation.

- **In-House Resource Augmentation Program**
This solution is designed for technically self sufficient companies with either large Linux development and administration staffs, or small-scale Linux deployments (less than 25 production servers). Under this program, Red Hat will address development, porting, and migration issues that may be encountered when moving from older version of Red Hat Linux to Red Hat Enterprise Linux. This program allows in-house resources to tap Red Hat's expertise through a Red Hat provided onsite Engineer, while relying primarily on in-house staff to manage the migration project. Additionally, this program provides add-on training options to enhance in-house skills development on Linux technologies.
- **Comprehensive Advanced Server Migration Program**
Ideally suited for more complex, larger Linux deployments, this program addresses environments with more than 25 production Linux servers and/or multiple third party enterprise applications deployed. Under the Comprehensive Red Hat Enterprise Linux Migration Program, Red Hat Professional Services provides end-to-end project management, porting services, onsite engineering oversight, training and testing services, to minimize the project's risk and accelerate time to production. Enhanced SLAs for custom environments are available under this program for ongoing production support once migration is complete.

Reference Documentation

Since the original availability of Red Hat Enterprise Linux, Red Hat and its partners have developed a number of white papers covering various technical aspects of the product. The following papers will be of interest to any Red Hat Linux customer.

- Red Hat papers.
Available at: <http://www.redhat.com>
 - An Overview of Red Hat Enterprise Linux 2.1 Reliability, Availability, Scalability and Manageability (RASM) Features. This paper provides a comprehensive description of Red Hat Enterprise Linux technologies.
 - Delivering High Availability Solutions with Red Hat Enterprise Linux AS 2.1. This paper provides a technical overview of the Cluster Manager feature.
- Oracle papers.
Available at: <http://otn.oracle.com/tech/linux/content.html>
 - Oracle 9iR2 on Linux: Performance, Reliability and Manageability Enhancements on Red Hat Linux Advanced Server¹.
 - Tips and Techniques: Install and Configure Oracle 9i on Red Hat Linux Advanced Server.
 - Linux Virtual Memory in Red Hat Linux Advanced Server 2.1 and Oracle's Memory Usage Characteristics
 - Oracle 9i Application Server: The Application Platform for LinuxAdditionally, details of Oracle's "Unbreakable Linux" program, developed in partnership with Red Hat, can be found at <http://www.oracle.com/redhat>.
- Dell papers.
A selection of Red Hat Linux-related papers are available at: http://www.dell.com/us/en/esg/topics/linux_005_technical.htm

¹Note that the original product name of Red Hat Enterprise Linux AS was Red Hat Linux Advanced Server. This and several other Oracle papers were written prior to the name change.

Summary

For Red Hat customers currently deploying commercial applications on Red Hat Linux products the benefits of migrating to the Red Hat Enterprise Linux family of products are clear. Platform stability - freedom from “version churn” - combined with performance, availability, scalability and service features make Red Hat Enterprise Linux AS, ES and WS compelling solutions. These products have been enthusiastically embraced by the ISV community who rapidly appreciated that they are the ideal platform on which to deploy Linux in the most complex and demanding enterprise solutions. Red Hat's partners, such as Oracle, having gained considerable experience with Red Hat Enterprise Linux AS, are recommending it to their customers as the Linux platform of choice.

For an existing Red Hat Linux installation the migration to a Red Hat Enterprise Linux product is not complex, despite the fact that it requires a fresh installation. The benefits will certainly outweigh the effort involved. Red Hat's Professional Services organization has programs to assist customers where necessary.

For additional information please refer to <http://www.redhat.com> or call 1-888-2REDHAT.