



# RED HAT CIO WHITEPAPERS: DATA CENTER TRANSITIONS: UNIX TO LINUX

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## TABLE OF CONTENTS

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<b>EXECUTIVE SUMMARY</b>	<b>Page 3</b>
Target Audience	Page 3
<b>INTRODUCTION</b>	<b>Page 3</b>
The changing role of the CIO	Page 3
Evolving business conditions and the rise of 'Open' and 'Standard'	Page 4
A disruptive technology comes of age	Page 4
<b>THE SIBLINGS: UNIX AND LINUX</b>	<b>Page 5</b>
Same heritage, different philosophy	Page 5
Initial challenges to adoption	Page 5
<b>THE PATH FROM UNIX TO LINUX</b>	<b>Page 8</b>
Transition triggers are varied	Page 8
First define the business objective	Page 9
Determine scope and evaluate options	Page 9
Plan and implement	Page 11
<b>CONCLUSION</b>	<b>Page 12</b>
UNIX to Linux - a road well travelled	Page 12



## EXECUTIVE SUMMARY

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The role of the CIO continues to evolve from one of simply a provider of a reliable and cost effective IT services to one of a business change enabler. IT is so intrinsically a part of business today that the successful CIO is one who embraces change where considered change will not only provide for a more efficiently run data center but in addition will provide the flexibility to evolve rapidly to meet or trigger business opportunities.

Once seen as disruptive technologies, open source and Linux have come of age, in part due to the added value that leading market players such as Red Hat provide. Fifteen years after its creation, Red Hat is partnering with many a successful CIO to create cost effective, highly available, and scalable IT environments; environments offering both the flexibility to transform rapidly to meet changing business requirements and also a relatively high degree of future proofing.

This paper explores Red Hat Enterprise Linux as a refresh option for traditional enterprise UNIX operating systems. In reality the question is less one of operating system preference: UNIX or Linux, and more one of choosing the most appropriate foundation for the business application today that will not impose any unnecessary barriers to evolution in the foreseeable future.

Red Hat Enterprise Linux is an obvious choice to refresh enterprise UNIX environments; they share a common heritage, have comparable functional goals, target similar application environments, and share a common set of technical skills requirements. Indeed, Red Hat Enterprise Linux has been successfully taking on traditional UNIX workloads in the data center on the promise of reduced operating costs, stellar price-performance, hardware vendor neutrality, and increased flexibility from Wall Street to Fortune 500 corporations, and all with a high degree of customer satisfaction.

Reasons for considering a technology refresh are varied, but in all cases the most appropriate time to undertake this is when there is a valid business trigger to do so; a new line of business requiring incremental capacity or a new application, escalating hardware maintenance costs, escalating software license or support costs, a looming end of lease, or perhaps rapid business growth beyond the current IT capacity. Whatever the trigger, the diligent CIO will explore options beyond a same-for-same environment upgrade, weighing up current cost benefits but equally factoring in the future opportunities that each option affords.

### TARGET AUDIENCE

CIO and IT management.

## INTRODUCTION

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### THE CHANGING ROLE OF THE CIO

Fifteen years ago the World Wide Web was starting to emerge in businesses, and key challenges facing the CIO were related to technology-imposed limitations around Reliability, Availability, and Scalability (RAS). Whilst we have witnessed major technological advances in these areas, which now form part of an expected baseline, they are arguably more critical today with the advent of global anytime-anywhere 365x24x7 web-based computing. Today's CIO continues to carry the legacy responsibility of providing a reliable IT service, but as technology has evolved so has our dependence on IT as a business enabler. Current CIO challenges are more likely to be around the business of IT; that is, the business of running an efficient IT



shop, responsibility for transparent fiscal and social accountability, and responsibility for the provision of a flexible IT environment that will not artificially constrain business growth. Today's CIO is required to be both an IT entrepreneur and also a savvy business person.

#### **CIO responsibilities:**

- Fiscal accountability (TCO/ROI)
- Social accountability (power and cooling, green IT)
- Provision of IT as a service (Service Level Agreements)
- Ability to adapt promptly to changing business needs (flexible infrastructure)
- Increasing vigilance regarding security
- Provision of Always Available computing (business continuity)
- Practical and informed use of technologies to control costs and enable innovation (emerging technologies)

#### **EVOLVING BUSINESS CONDITIONS AND THE RISE OF 'OPEN' AND 'STANDARD'**

Intelligent use of technology provides for competitive advantage, and in recent years we have seen the rise and demise of major corporations through mergers and acquisitions. Such corporate consolidation in turn triggers unplanned IT consolidation exercises. When it is the IT provider, that is, the software or hardware vendor themselves who merge, the subsequent vendor streamlining may result in the discontinuation of proprietary product lines currently used by your own company. In part for this reason, as assurance for the future, organizations and governments across the globe are pursuing open standards and implementing solutions based on industry standard commodity hardware such as X86 64 and open source software such as Linux, Apache, and JBoss.

#### **A DISRUPTIVE TECHNOLOGY COMES OF AGE**

Once seen as a disruptive technology, supported by the more passionate technical types within the organization, open source was initially off limits to the data center and well beyond the radar of all but the most open minded and inquisitive CIO.

With the gradual acceptance of open source applications like Apache (now the world's most popular http server) and the support of a large and dynamic open source community, Linux has evolved considerably over the past decade and earned its way into the data center. Introduced as a foundation for infrastructure services (file and print, DNS, and web servers), today Red Hat Enterprise Linux is providing a foundation for key business applications (OLTP, BI, and CRM) in some of the world's most respected organizations – from the majority of financial institutions on Wall Street to an increasing number of government agencies and all with a high degree of customer satisfaction. A recent CIO Insight Magazine survey on 'Vendor Value' stated that 97% of Red Hat customers surveyed would choose to continue to do business with Red Hat<sup>1</sup>. In the fiercely competitive domain of software vendors few enjoy such open loyalty.

Red Hat is not resting on its laurels; on the contrary, Linux is a dynamic market with a dedicated community that provides for relatively rapid uptake of new technologies both in the operating system itself and also by the application vendors for whom Red Hat Enterprise Linux is frequently a first tier port, if not the development platform of choice. This is an important point; it is the application that is critical to the business and less so the underlying technology. A poor choice of underlying technology can inadvertently provide for constraints at the application level down the track. Constraints may include delayed availability

1 [www.redhat.com/promo/vendor/](http://www.redhat.com/promo/vendor/)



of new versions or even discontinued support, both of which can impact the core business competitive positioning. Software vendors are increasingly under pressure to reduce the number of underlying platforms they support to reduce porting and maintenance costs.

Red Hat Enterprise Linux, having reached a critical mass of adoption and enjoying significant momentum, today provides an underlying foundation that proposes a platform for innovation and offers a certain level of future proofing.

Indeed Linux environments feature heavily in such future looking initiatives as Software as a Service (SaS) and Amazon's Elastic Cloud (EC2). Whether your organization is ready for this level of innovation today or tomorrow, the point is that utilizing future-looking technology will provide the greatest scope for improved IT functions and business growth in future.

## THE SIBLINGS: UNIX AND LINUX

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### SAME HERITAGE, DIFFERENT PHILOSOPHY

Enterprise UNIX and Linux share a common heritage. A significant benefit of this shared heritage lies in the ability to leverage existing in-house skills. The most significant differences lie in the underlying philosophy surrounding ownership, development, and provisioning.

Enterprise UNIX operating systems have traditionally been owned, designed, and developed by the hardware vendor selling them. The vendor ultimately retains control over the strategic direction, the release cycle, and responsibility for the support and maintenance of their own implementation of UNIX. The operating system ships in executable format. UNIX is frequently one of many lines of business the vendor maintains, indeed today the major UNIX vendors also offer Red Hat Enterprise Linux on their platforms.

Linux is open source. Open source software is often provided (but not always) at no cost, not necessarily community developed, but always with source code. Linux is community developed, which means that the community at large has a vested interest in the successful evolution of the operating system. Linux benefits from the collaborative effort of some of the world's smartest software engineers. This has resulted in exceptional agility and an often faster uptake of new features than its enterprise UNIX counterparts. Linux is thus exceptionally versatile and in addition, transparent.

### INITIAL CHALLENGES TO ADOPTION

Linux is free in the sense that it adheres to a mantra of sharing, is owned by nobody, and can be enhanced by many – the community. It is freely distributed, and hundreds of variants of Linux can be downloaded at no cost from the web.

Indeed the cost (potentially zero) and versatility (ability to run on a wide range of server platforms) aspects were almost immediately appealing and contributed to a high level of interest, but herein lay some of the initial inhibitors to adoption in business-critical environments specifically. This freedom introduced a level of discomfort that was not acceptable in the data center, the stronghold of mainframes and UNIX. It raised too many questions:

- **Variant:** Which should we use?
- **Support:** Who would provide it?
- **Evolution:** How could new features be introduced in a controlled manner?
- **Security:** Was there increased exposure through code transparency?
- **ISV:** Would my ISV provide support?



- **Governance:** How would updates and fixes be managed?
- **Maturity:** Where is the evidence of ability to handle my workload?

#### **Variants:**

Linux and open source are attractive in the enterprise if the risk element can be contained. This is where Red Hat has succeeded in making Linux an attractive and viable option for enterprise computing. Red Hat's business model is to provide subscriptions to a packaged, qualified, and supported Linux variant or distribution. Red Hat Enterprise Linux is that distribution, and a fee-based subscription provides entitlement to media, updates, and support. Subscriptions are relatively inexpensive in comparison to the more traditional procurement of enterprise UNIX equivalents. Furthermore Red Hat Enterprise Linux includes access to software products and features that are typically expensive optional extras elsewhere, including high availability, virtualization, and cluster file system software.

#### **Evolution and governance:**

Sharing the enterprise UNIX goal of simplified management, a Red Hat subscription includes access to Red Hat Network (RHN) to facilitate complete lifecycle management including:

- Inventory and asset management
- Provisioning of systems
- Manage updates and software channels
- Manage configuration changes
- Monitor system performance.

#### **Support:**

Red Hat subscriptions provide support at a selection of price points to cater to all audiences. Support levels range from a cost effective Basic offering through to an enterprise grade Premium option suited to business critical environments offering 24x7 support with response time guarantees.

Red Hat also offers Technical Account Managers (TAM) on request.

#### **Application vendors / ISVs:**

Over time, Red Hat has evolved to become the leading commercial distribution with the lion's share of the Linux market. This makes Red Hat Enterprise Linux an attractive foundation for an ISV to port their application to, or increasingly frequently, to develop on. This has contributed to a large and fast growing application portfolio while UNIX vendors rally to retain their existing portfolio. For an ISV the return on investment of using Red Hat Enterprise Linux as the underlying platform is greater due to the breadth of hardware platforms on which it can be deployed.

#### **Security:**

Linux has seen considerable uptake in government, financial, and security sectors, all of which have the most demanding security requirements. This would seem to indicate that security of Linux is not a concern for those who need it most. Indeed many government agencies now cite open source and Linux as the platforms of choice for new deployments. Security-Enhanced Linux (SELinux) provides an even greater level of security.

Implementation of security has been notoriously synonymous with complexity of configuration. Sharing the enterprise UNIX goal of simplified management, Red Hat has demonstrated that it is not about



providing just a good enough solution; on the contrary, in the latest release of Red Hat Enterprise Linux, Red Hat took the initiative to simplify the security configuration process considerably through the provision of wizards and templates.

### Enterprise maturity:

With many Fortune 500 listed customers running business critical workloads on Red Hat Enterprise Linux and openly talking about the benefits, Red Hat has proven that it has both the experience and the maturity to address the requirements of the enterprise UNIX customer<sup>2</sup>.

Whilst Enterprise UNIX and Red Hat Enterprise Linux are similar in many ways, one should be aware that being open source, Linux source code is freely available, and this difference may require the introduction of appropriate controls within your organization. The availability of source code will be irrelevant to the majority of end users, particularly in the enterprise UNIX replacement scenario, as access to the source code for modification was not an option in the past. However, if you do plan to modify the source code be aware of the following. Open source operates on the mantra of sharing and if you plan on making modifications to the source in house, you may be obliged to contribute your modifications back to the open source community as part of an open source licensing agreement such as GPL<sup>3</sup>. The availability of Linux source does make it an attractive base to jump-start product development, but legal advice should be sought prior to embarking upon Linux code modifications. Red Hat also assists customers in this process.

FIG. 1: CHARACTERISTICS AND BENEFITS OF LINUX

LINUX CHARACTERISTIC	CUSTOMER BENEFIT
UNIX-like operating system	Reuse of existing UNIX skills.
Open source	Transparency and availability of source code makes Linux a common teaching tool in universities and subsequently provides for cost effective readily available skills. Community driven, not a line of business within a corporation. Large development community has a vested interest in progression and provides for rapid evolution / uptake of new technologies.
Extensive platform support	Versatility. Ported to almost every major platform (X86, Power, Integrity, AMD, Intel...) offers a large choice of new server and server re-hosting options. Flexibility. No hardware vendor lock-in. Choice of price-performance cost point.
Extensive ISV support	Availability of thousands of open source and commercial applications. Fast growing ISV portfolio. Benefit to ISV is in having one operating system that runs on so many platforms. Development and qualification ROI better than for an operating system that runs on only one platform – wider reach for less effort.
Good scalability and price-performance across the range	Industry standard benchmarks show very good price-performance data points from entry level through high end. Customer's choice of price point (i.e. X86 or RISC) to meet their specific needs.

<sup>2</sup> See [www.customers.press.redhat.com](http://www.customers.press.redhat.com)

<sup>3</sup> GPL - GNU General Public License is used for the Linux kernel and many other open source software projects. Purpose: to ensure that the freedom of source code is not abused and that those who benefit from open software contribute their changes for others to use



# THE PATH FROM UNIX TO LINUX

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## TRANSITION TRIGGERS ARE VARIED

The trigger for considering the refresh of an operating environment may be business or technology driven but should always be in support of a business objective and undertaken at a time that is convenient for the business, rather than on the terms of an eager hardware or software vendor.

### Typical transition triggers:

- End of server lease
- Expanding business requirements (i.e. new line of business)
- Corporate merger or acquisition
- Cost reduction
  - Escalating maintenance costs
  - Control software licensing costs
  - Power and cooling
- Replacement of retiring or discontinued software
- Server consolidation
- Application consolidation
- Data center consolidation
- Leverage new technologies (i.e. virtualization, utility computing)

The greatest trigger for an environment refresh or transition is undeniably that of cost, whether it is driving cost reduction through consolidation of servers or applications or the use of virtualization and adaptive infrastructure technologies to increase average server utilization.

Server consolidation reduces server sprawl and thus space, power, and cooling requirements, which are of growing concern in an age where the cost of power and data center floor space is on the rise, and the pressure to be more socially responsible or green are front of mind. Server sprawl was the natural result of the historical trend to provide a dedicated platform to host a single application environment. The use of virtualization technologies came about to address this, the idea being that by hosting multiple operating environments, or logical server environments, on a single physical server, the infrequently used excess capacity could be shared amongst them, thus reducing the overall server count and increasing or optimizing the overall average server utilization.

Operating systems with a UNIX heritage such as Red Hat Enterprise Linux make good platforms for application consolidation. Application consolidation or application stacking is another, arguably simpler means of reducing server sprawl, power, cooling, and space requirements. Here applications with similar resource configuration requirements share a server and run within a single operating system. Likely candidates for application stacking might be applications whose peak periods are opposed such as an



overnight batch run with a 9-5 application. This can result in license cost savings for like applications where license costs are based on processor count. Generically replacing older slower technology with newer faster technology can result in significant savings for per processor licensed applications. In addition the older servers may be suitable for redeployment as another Linux platform.

Linux is particularly good for scale out applications and has been a popular choice for grid computing by virtue of the ability to leverage older re-hosted platforms combined with newer faster commodity hardware. However, Linux has also been proven to run larger SMP applications, and Red Hat Enterprise Linux is showing stellar scalability on the larger heavy lifting 64 bit SMP platforms such as the HP Integrity Servers with workloads of 16 and 32 processors<sup>4</sup>.

Many customers are speaking publicly about procurement (hardware, software, licence) cost savings, and increased system usage is feeding the charge. Companies like McKesson, a Fortune 500 health care corporation publicly talks about TCO savings of one million US dollars after transitioning their clinical information systems from a mainframe environment to Red Hat Enterprise Linux<sup>5</sup>. Penoles, a large mining corporation, talks of cost savings in excess of 70% per server and a four times performance increase after migrating older legacy UNIX environments to Red Hat Enterprise Linux on commodity servers.<sup>6</sup>

#### **FIRST DEFINE THE BUSINESS OBJECTIVE**

With the fast pace of technology evolution and the increasing dependence of the business on IT, the target environment should provide a solid foundation for today's requirements and a comfortable level of future proofing in anticipation of new requirements. The scope of the project may vary from the refresh of a single element (server, operating system, application) to an entire redesign of the architecture to make use of newer technologies as a foundation for innovation. Whatever that scope, the business objective should be clearly stated and agreed upon before the ever increasing range of technical options are assessed.

#### **DETERMINE SCOPE AND EVALUATE OPTIONS**

Any change brings with it an element of risk, whether the change is an application upgrade, a UNIX upgrade, or a transition from enterprise UNIX to Linux. The key to a successful transition is in the planning. A combination of transitioning to Linux, adopting virtualization, upgrading to a later version of the current application, and introducing a new platform might be the end goal but a conservative user will keep it simple and prioritize simultaneous proposed changes with the knowledge that reducing the level of complexity contains the level of risk. For example, after a corporate merger, the primary goal of a project might be to consolidate data centers and consolidate core business applications to provide for a single business view. The project becomes increasingly more complex with the addition of secondary, longer term goals to adopt virtualization and replace underlying hardware platforms in parallel.

The basic building basic blocks to be considered when scoping a UNIX to Linux transition remain the same irrespective of the business goal behind the transition.

<sup>4</sup> IDEAS International paper: [www.hp.com/wwsolutions/linux/products/servers/itanium.html](http://www.hp.com/wwsolutions/linux/products/servers/itanium.html)

<sup>5</sup> [customers.press.redhat.com/?b=customers&s=mckesson](http://customers.press.redhat.com/?b=customers&s=mckesson)

<sup>6</sup> [customers.press.redhat.com/?b=customers&s=penoles](http://customers.press.redhat.com/?b=customers&s=penoles)



FIG. 2: UNIX TO LINUX TRANSITION - GREATER ARCHITECTURAL CONSIDERATIONS

ARCHITECTURAL LAYERS	CONSIDERATIONS
Hardware platform	Options: <ol style="list-style-type: none"> <li>1. Retain existing server</li> <li>2. Redeployed server</li> <li>3. Same vendor server upgrade</li> <li>4. New vendor server</li> </ol>
Operating system	Source: i.e. enterprise UNIX Destination: i.e. Red Hat Enterprise Linux
Applications	Options: <ol style="list-style-type: none"> <li>1. Retain existing application and version</li> <li>2. Retain existing, newer version</li> <li>3. Replace with new commercial application</li> <li>4. Replace with new open source application</li> <li>5. Port of in-house application (if port required)</li> </ol> Verify and plan for all complete applications
Data	Storage options: <ol style="list-style-type: none"> <li>1. Retain existing</li> <li>2. New</li> </ol> Consider transfer of application data (i.e. configuration and database?) Plug and play or db tools required to export and import?
Management	Ensure new environment will plug in to existing management framework as expected.

Any transition project should be scoped and planned to an accepted level of risk for the organization in question.

**PLAN AND IMPLEMENT**

Transitions from enterprise UNIX to Linux are not new. There are many well documented cases of corporations moving to Linux and public statements of the ensuing cost and performance benefits to be found on hardware and software vendor websites and in the trade magazines. A simple Google search provides many such cases as does a search on Red Hat’s own website.

**Skills:**

Whether there is a preference to utilize in-house skills to manage the transition or to outsource, the breadth of platform support for Linux means that there are many partnerships that can be leveraged. Hardware vendors want customers to run Linux on their platforms and thus provide collateral such as whitepapers, tools, and checklists for no cost to assist in a self service transition. IBM and HP are just



two of the vendors vying for Red Hat Enterprise Linux business, and both have websites and transition frameworks complete with transition toolkits available for free download. For those preferring to outsource the transition, Linux skills are readily available, and as RHCE (Red Hat Certified Engineer) has become the de-facto certification process for Linux, RHCE resources provide a good benchmark for skills.

#### Hardware:

Depending on the scope of the project it may be appropriate to retain existing servers, to use redeployed servers, or to provision new servers. The X86-64 platforms are providing stunning price-performance today and make up a large portion of Linux platforms. However, this is no longer a reflection of the ability of Linux to scale in larger SMP environments, but rather a reflection of the price tag of large SMP servers combined with the ability of X86-64 servers to handle more demanding workloads. Today there is evidence of exceptional (in some cases, near linear) scalability on large 64 bit platforms with 16 and 32 cores in Oracle, SAP, computer server, and shared services workloads.<sup>7</sup>

#### Applications:

In the simplest case the UNIX to Linux transition will retain the same application and version, thus preserving a common end user interface experience. Red Hat Enterprise Linux enjoys a large application portfolio, so it is highly likely that the desired application is available, however there may be a need to upgrade to a later version of the application if the existing environment has not been upgraded in some time or if there is a desire to take advantage of functionality enhancements. Always verify the entire application stack including small completer applications to confirm availability and highlight any version differences.

Applications fall in to three major categories:

- Database
- Home-grown
- Other third-party

A current Red Hat Enterprise Linux certification is provided by all the major enterprise database vendors today. They can provide advice and tools to assist in the transfer of application data from source to destination.

Home-grown applications or custom code may require a porting exercise. Free tools provided by vendors such as IBM and HP on their Linux transition websites will assist with scanning code and with the identification of required modifications should a port even be necessary.

There are also a number of third parties such as Transitive who offer transition assistance, tools, and products should these be deemed necessary. For older applications where the source code may no longer be available, Transitive's product might provide a viable means of facilitating re-hosting.<sup>8</sup>

An open source equivalent to the current application may be worthy of consideration. Just as Linux has served to keep UNIX vendors honest, open source applications are doing the same in the application software market. It may well be that there is an attractive open source option to consider at some future point.

<sup>7</sup> IDEAS International paper on HP web site: [www.hp.com/wwwolutions/linux/products/servers/itanium.html](http://www.hp.com/wwwolutions/linux/products/servers/itanium.html)

<sup>8</sup> See Transitive's website at [www.transitive.com](http://www.transitive.com)



## CONCLUSION

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### UNIX TO LINUX - A ROAD WELL TRAVELLED

The way IT is provisioned is changing. Server consolidation and virtualization initiatives aspire to increase average server utilization rates and thus improve TCO. Service-Oriented Architectures and the mainstream deployment of open source and commodity hardware are becoming commonplace. The software industry is maturing and open source will undoubtedly continue to shape the software market in the future as mergers and acquisitions continue. The maturation of virtualization technologies and the apparent reluctance of commercial software vendors to embrace an appropriately structured licensing mechanism, to benefit their customers, will only fuel the exploration of open source alternatives.

Companies such as Red Hat have succeeded in making open source a viable option for enterprise computing by the reduction of perceived risk. Through the provision of enterprise grade support levels and the introduction of enterprise UNIX features, Red Hat has demonstrated a clear understanding of enterprise computing and in particular the needs of the traditional enterprise UNIX customer. Red Hat has succeeded in bringing the power of UNIX to a broader base and thus provides for an attractive selection of price-performance options that are being enjoyed by major corporations who have transitioned and are talking willingly about the subsequent cost benefits.

The new breed of CIO; IT entrepreneur and businessman, is tasked not only with the provision of an efficient data center but also with enabling business through IT. Such a CIO will be seeking to lay the foundation for innovation and will thus look to low risk, future looking technologies that will not create unnecessary barriers to business evolution. Linux is a dynamic UNIX equivalent that can provide such a foundation. The critical mass and momentum will ensure that it continues to evolve. This momentum coupled with Red Hat's experience in taking the value of open source to the data center in a controlled and supported manner makes for a powerful combination and a compelling enterprise UNIX refresh option.

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