



Simplifying UNIX Migration — Dell and Red Hat Pave the Way

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Management Summary

The typical data center is facing a series of shortages due to the failings of an old, legacy infrastructure that controls both the mission- and business-critical applications that drive the enterprise. The total cost of ownership (TCO) of this proprietary UNIX® environment is putting a strain on the operational budget of the data center. Unfortunately, combined with a surge in the growth of corporate data, the legacy platforms powering the mission- and business-critical applications have been driving up the operational costs of the data center due to lagging performance, a lack of flexibility, inefficient floor space utilization, and excessive power consumption. This forces the IT staff to review the paradigm of legacy data center operations.

In an effort to modernize, most enterprises have already deployed a network of open systems platforms to better handle infrastructure and other applications. Now the TCO for mission- and business-critical applications - including maintenance, administration, software licensing, staffing costs, as well as power consumption and floor space - is leading the enterprise to change the paradigm of its data centers. A choice needs to be made: either upgrade the existing legacy servers to a newer proprietary platform; or migrate the legacy environment to an open architecture, typically through the deployment of Intel®-based servers with an open Linux® operating environment. Many proprietary shops have already made the decision to deploy on open systems with Linux and have seen the successes of these efforts. For them, the only questions that remain are *which platform and which operating environment?* For others yet to make this decision, their questions include not only *which platform and which operating environment*, but also *what applications, when, and how?* In order to make the decision easier for the IT staff, Dell has teamed-up with Intel and Red Hat, and developed a migration strategy to simplify the consolidation of the enterprise data center from an outdated, proprietary architecture to easily managed open systems platforms running on Dell™ PowerEdge™ servers based on Intel Xeon® processors and Red Hat® Enterprise Linux®. To learn more about how easy it is to migrate from UNIX to Red Hat Enterprise Linux on Dell PowerEdge servers, please read on.

TCO Issues in the RISC Data Center

The enterprise data center populated with a variety of proprietary UNIX/RISC servers is rapidly approaching a crossroads. The IT staff can try to limp along by throwing money at an aging, perhaps obsolete, architecture in the face of budget reductions. Or, they can migrate away from the legacy platforms that have been the backbone of their mission-critical environment for decades. *Can the new Intel-based open system platform provide them with the performance they need with the reliability, availability, and serviceability (RAS) that their proprietary servers have been delivering?*

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Can the enterprise afford to retain an environment plummeting towards end-of-life where the TCO continues to rise every year in response to annual maintenance increases, expensive support costs, and excessive software licensing, not to mention rapidly increasing expenses for power consumption and floor space? The answer to the first question is a resounding “yes”, while the answer to the second is an equally resounding “no”!¹

In an effort to lower costs, increase productivity and competitiveness, and improve the flexibility of the IT infrastructure, the enterprise data center has already been deploying a mix of open systems servers for their business-critical and infrastructure requirements: email, web interface, and file/print services, to name a few. Unfortunately, many of these platforms have been deployed at a utilization rate far below their maximum capability. In fact, some data centers have been wasting about 80% to 85% of the IT resources at their disposal, and this includes basic TCO factors such as power consumption and floor space, for under-utilized servers. Efforts are underway in many enterprises to improve resource utilization through the consolidation and virtualization of the enterprise application set onto fewer, lower cost, multi-core servers².

This heterogeneous environment has resulted in a wide variety of applications running on different servers, adding to both capital expense and operational expense budgets. By migrating some, or all, of the UNIX applications to open systems, the IT staff can take advantage of economies of scale to eliminate the maintenance costs completely for their proprietary UNIX platforms, as well as lowering application-licensing fees by moving from expensive UNIX applications to lower cost Linux software. Additionally, the data center can improve total resource utilization and lower the TCO of the data center by changing the paradigm of the data center to a completely open architecture.

¹ See the issue of **Clipper Notes** dated May 27, 2009, entitled *Migrate from a Proprietary Server Architecture? – Open Systems Provide Way to Exit Money Pit*, and available at <http://www.clipper.com/research/TCG2009023.pdf>.

² See **The Clipper Group Navigator** dated March 30, 2009, entitled *Simplifying and Optimizing I.T. – Dell Helps Control Data Center TCO*, available at <http://www.clipper.com/research/TCG2009016.pdf>.

The IT staff needs to implement a migration strategy that will enable the enterprise to grow with flexibility while at the same time simplify the IT infrastructure to effectively manage all of the TCO variables. The data center needs to improve performance, price/performance, and performance/watt as well. *What needs to be done?*

First, *someone* needs to identify all of the process steps which have to be addressed, such as:

1. Select applications to be migrated;
2. Determine new hardware requirements;
3. Identify and resolve problems through a pilot process; and
4. Migrate applications and data.

Unfortunately, many enterprises lack the human resources with the skills necessary to accomplish these tasks in a timely fashion. A third party may be necessary to assist the data center staff in evolving to their new environment. Fortunately, there are a many vendors and ISVs with a full set of open systems servers and the tools to assist the IT staff in migrating their UNIX/RISC applications, especially now a SPARC®/Solaris™ application set, to Linux on an Intel-based server. Some even have the right services to guide the data center through the migration process. Who is the best bet for your enterprise? Dell may be your best answer.

Why Dell?

You want a professional leading the way, with the experience needed to get the job done right. Dell is that professional resource that your data center needs to migrate from a UNIX environment built on a RISC architecture to an open systems solution built upon Intel-based servers and the Linux operating system. Dell has established partnerships with Intel and Red Hat, as well as many of the leading application vendors, forming a team to provide the best Linux environment for application migration, or development, and deployment.

Dell has a long-term relationship with Intel, including most recently the introduction of a series of two-socket platforms – racks, towers, and blades – based upon the Intel Xeon processor 5500 series (formerly known as

Nehalem-EP)³, and a four-socket rack server based upon the Intel Xeon processor 7400 series (formerly known as Dunnington). These high-performance, efficient multi-socket servers provide an ideal virtualization environment to consolidate business-critical applications, along with infrastructure applications, to provide the best resource utilization. Combined with Red Hat Enterprise Linux, Dell can deliver all of the critical components required to migrate mission-critical applications from a RISC/UNIX environment to a reliable open architecture.

Unlike other vendors offering migration services, Dell has no legacy RISC/UNIX platform to justify or protect. **They have no vested interest in the RISC/UNIX game and, therefore, can take an objective view of how best to deliver an open solution to the data center.** It is to their advantage to assist the IT staff in a smooth and swift migration. There is no need to discuss an upgrade from HP-UX®/HP-PA RISC to an HP Integrity™ platform; no conflict with upgrading AIX® to the latest POWER® platform; and certainly no confusion over upgrading a Sun Solaris platform to the latest SPARC technology⁴.

What Dell does have, besides a complete line of server and storage platforms, is a complete set of services to guide the IT staff through the migration process, while avoiding the twists and turns which can cause an embarrassing misstep on the data center dance floor. Dell can help to implement a more efficient and effective infrastructure, giving the IT staff the flexibility that they need to drive innovation throughout the enterprise. Dell has the experience, and ISV relationships, to initiate the process by helping the IT staff select the applications that need to be migrated and can easily transition to a Red Hat Enterprise Linux environment. Dell is familiar with those applications, which were initially developed in a UNIX-only data center and are now available under an umbrella of operating environments, with Linux usually the environment of choice for new rollouts. This is especially true for

applications based on Oracle® database, one of the pillars of the UNIX data center.

Dell Services can then assist in assessing migration readiness, not only identifying which applications should be migrated first, along with identifying potential costs and savings, but they can also help to identify those applications which should *not* be migrated at this time due to costs, complexity, and/or other business issues. Or, these applications may be able to run in a virtualized environment, allowing for the benefits of migration and retaining existing functionality. Dell ProConsult™ can also assist with power and thermal evaluations, and virtualization assessments along with design, deployment, and implementation assistance.

The Dell Solution

Many enterprise data centers have deployed their mission-critical applications on a RISC/UNIX environment because of the perception that this architecture was more performant, more scalable, more reliable, and more secure than an open systems solution. Ten years ago, this was true. Five years ago, this may or may not have been true. Now, it is not. Migration to an open system environment has been perceived to be a huge source of risk in the eye of the RISC data center. With Dell, that perception is equally untrue. Today, the data center has a new generation of open systems platforms available, a generation with the same, or better, performance, efficiency, reliability, and security as the latest UNIX platforms, with lower acquisition cost and, more importantly, lower TCO. Open systems platforms that were once looked at with disdain by the mission-critical data center can now out-perform some of the scale-up SMP servers that have been the heart of the enterprise. Now is the time to commence that long-delayed migration.

Dell's strategy for migration is to simplify the process with a commitment to standards. These standards apply to both the hardware and software aspects of the solution, with reliance on Dell's PowerEdge family of servers to provide hardware standards, and on Red Hat Enterprise Linux for operating environment standards.

Dell Server Platforms

Dell provides a variety of two- and four-socket servers based upon Intel Xeon pro-

³ See [The Clipper Group Navigator](#) dated April 5, 2009, entitled *Dell PowerEdge with Xeon 5500 – Simplifying an Optimized Data Center*, available at <http://www.clipper.com/research/TCG2009018.pdf>.

⁴ Dell does have a relationship with Sun for Solaris on Intel if the IT staff desires to maintain their Solaris environment on an open platform.

processors. The two-socket servers are built around Intel Xeon processor 5500 series, with a dual- or quad-core design. They are available in blade, rack, and tower formats, providing an ideal target architecture for the workloads currently running on hundreds of thousands of two-socket Sun SPARC/Solaris servers. Dell also offers a powerful four-socket rack server, the PowerEdge R900, based upon Intel Xeon processor 7400 series quad- or six-core processors. The Intel Xeon processor 5500 series-based servers are the PowerEdge M610 and M710 blade servers, the PowerEdge R610 and R710 rack-mounted systems, and the PowerEdge T610 tower.

- The **PowerEdge M610** is a half-height blade supporting up to two Intel Xeon processor 5500 series, with options for running at 60W, 80W, and 95W. It has 12 DIMM slots to support up to 96GB of ECC DDR3 memory, 50% more than previous models – effective in support of virtualization.
- The **PowerEdge M710** is a full-height blade supporting up to two Intel Xeon processor 5500 series, also running at 60W, 80W, and 95W. It has 18 DIMM slots to support up to 144GB of ECC DDR3 memory. The PowerEdge M710 Blade provides exceptional I/O capacity with full-fabric redundancy.
- The **PowerEdge R610** is a general-purpose two-socket server in a 1U package for enterprise data centers or remote offices that require a highly-available single- or dual processor server in a dense environment. The R610 supports up to two Intel Xeon processor 5500 series and up to 96GB of ECC DDR3 memory over 12 DIMMs. The R610 has two embedded Broadcom NetXtreme® II 5709c Gigabit Ethernet NICs with failover and load balancing, with optional 1GbE and 10GbE add-in NICs.
- The **PowerEdge R710** is a general-purpose two-socket server in a 2U package that enables the data center to scale organically, based upon the evolving requirements of the enterprise. The R710 supports up to two Intel Xeon processor 5500 series CPUs and up to 144GB of ECC DDR3 memory over 18 DIMMs. The R710 has four embedded Broadcom NetXtreme II 5709c Gigabit Ethernet NICs with failover and load balancing for high availability.

- The **PowerEdge T610** is a key element for any smaller data center seeking the highest level of performance and scalability with outstanding RAS features. The T610 is a key building block for IT professionals seeking the highest level of performance, availability, and scalability in a 2-socket platform. It supports up to two Intel Xeon processor 5500 series and up to 96GB of ECC DDR3 memory over 12 DIMMs.
- The **PowerEdge R900** is Dell's four-socket, six-core platform, based on the Intel Xeon processor 7400 series, ideal for virtualization, RISC migration, and data-demanding applications. The R900 is a 4U rack-mounted server with the highest level of scalability, with up to 24 processing cores and up to 256GB of memory. With this flexibility, the R900 is an ideal solution for migration from a proprietary RISC/UNIX environment to an Intel standards-based system.

Based upon performance statistics listed on the SPEC®.org website, the Dell PowerEdge R900 compares quite favorably to Sun SPARC servers. A 24-core R900 has a SPECint_rate_base2006 score of **268**, while a 32-core Sun SPARC Enterprise T5440, using the UltraSPARC T2+, has a value of **270**.⁵ While the performance level is similar, the pricing is significantly different. Sun's T5440 had a price of \$173,400, while the Dell R900 price was \$31,200 – 82% less. **This results in 74% better price/performance for the R900 than that of the T5440.**

The results for performance/watt are similarly impressive. Using the SPECjbb2005 benchmark, a Sun SPARC Enterprise T5440 with 32 cores had a performance of 693K BOPS⁶; a Dell R900 with 24 cores had a performance of 508K BOPS⁷. While the T5440 has a higher performance rating, it consumes 1,525 watts, as compared to only 772 watts for the R900, resulting in a performance/watt

⁵ Based on comparison of published SPECint_rate_base2006 scores of the Dell PowerEdge R900 with Intel Xeon processor X7460 2.67GHz vs. the Sun SPARC Enterprise T5440 with UltraSPARC T2 Plus processor 1.414GHz. See www.spec.org for more details and latest information.

⁶ Business Operations Per Second.

⁷ Based on comparison of published SPECjbb2005 scores of the Dell PowerEdge R900 with Intel Xeon processor X7460 2.67GHz vs. the Sun SPARC Enterprise T5440 with UltraSPARC T2 Plus processor 1.414GHz. See www.spec.org for more details and latest information.

rating of 454 BOPS/watt for the T5440 and a rating of 658 BOPS/watt for the R900. **In a data center looking to save power but maintain performance wherever possible, the R900 delivers 45% more performance per watt than a similar SPARC server.**

Red Hat Enterprise Linux

As with the multiple variants of proprietary UNIX implementations, Red Hat Enterprise Linux has been built with *performance, reliability, and security* in mind, to deliver a mission-critical operating environment. Red Hat Enterprise Linux is developed for the service level requirements of the mission-critical data center.

The **quality** inherent in Red Hat Enterprise Linux has been acquired from a series of mature and stable open source developments, using the Fedora Project⁸ as a development and test platform, taking advantage of Q.A. testing from a diverse eco-system. As a result of this open source effort, the quality of Red Hat Enterprise Linux far exceeds that of other proprietary operating systems as measured in terms of bugs per 1000 lines of code. As reported by the Department of Homeland Security⁹, the Linux 2.6 kernel – the kernel that Red Hat Enterprise Linux 5 uses - had 0.127 bugs/1000 lines, as compared to proprietary software, which had 1.00 bugs/1000 lines.

This quality can also be seen and measured in terms of **performance**. Red Hat Enterprise Linux was the first operating system for Intel architecture to exceed 1 million transactions per minute (TPM), reaching 1.2 million TPM in August, 2008 using an Intel Xeon processor X7460, proving its capability to handle challenging OLTP environments supporting mission-critical, transaction-intensive jobs¹⁰. Red Hat has taken advantage of the vast improvements in Intel technology with hundreds of new kernel I/O features and improved memory management in support of the new multi-core designs

In terms of **security**, Red Hat Enterprise

Linux is recognized as one of the most secure operating systems available today, with Red Hat contributing over 15% of the innovation in the Linux kernel. Red Hat Enterprise Linux has passed the Common Criteria¹¹ (CC) process 12 times on a variety of platforms. CC originated out of three standards: TCSEC, the United States DoD standard (the Orange Book); CTCPEC (the Canadian standard), and ITSEC (the European standard). It provides assurance that the process of specification, implementation, and evaluation of a computer security product has been conducted in a rigorous and standard manner. Red Hat Enterprise Linux has received CC certification at Enterprise Assurance Level 4 for several different profiles¹². Security-Enhanced Linux is integrated into the Red Hat Enterprise Linux kernel.

The IT staff expects improved Service-Level Agreements (SLAs) from their operating environment. Enterprises may want to remain on a specific operating system release for longer periods. Red Hat Enterprise Linux enables the enterprise data center to maintain a continuity level with their operating environment, maintaining support for minor releases for at least six months, and support for major releases for seven years, reducing the requirement to recertify the same application repeatedly or to upgrade at the vendor's convenience rather than the enterprise's. Even longer support periods may be contracted directly with Red Hat.

When you deploy Red Hat Enterprise Linux, you get more than just updates, patches, extensive training programs, and world-class support. You also gain years of knowledge, experience, and creativity accumulated by Red Hat, their customers, and the open source community in their common quest to solve business problems. More eyes find better solutions faster, and each successful innovation leads to the next.

Dell and Red Hat Migration/Support Services

Together, Dell and Red Hat offer the enterprise data center a variety of migration and sup-

⁶ Fedora is a Linux-based operating system that showcases the latest in free and open source software. Fedora is free for anyone to use, modify, and distribute. It is built by people across the globe working together as a community: the Fedora Project.

⁹ Information Week, January 7, 2008.

¹⁰ Based on TPC-C metrics (TPMc). See www.tpc.org for details and more information.

¹¹ The Common Criteria for Information Technology Security Evaluation is an international standard (ISO/IEC 15408) for computer security certification. It is currently in version 3.1

¹² Controlled Access Protection Profile, Label Security Protection Profile, and the Role-based Access Control Protection Profile.

Exhibit 1 – Dell Migration Services

- **Systems Management** – to provide manageable, standards-based architectures that allow proactive, streamlined management of your environment;
- **Messaging** – to assist in the planning and implementation of an infrastructure that enables your messaging system to scale as your needs grow;
- **Database and Applications** – to simplify the planning, design, implementation, and optimization of your database and application environment;
- **Virtualization/Consolidation** – to enable the IT staff to consolidate underutilized servers so that they can flexibly allocate computing resources and reduce data center TCO; and
- **Storage** – to enable the data center with a common platform to allocate and manage growing demands for data storage.

port services to facilitate the transition from a RISC/UNIX environment to an open platform. Through Dell *ProConsult Migration Services* and Red Hat Consulting, the data center can acquire a comprehensive set of services, tools, guidelines, and other resources to *analyze* the existing RISC environment for risk/reward and cost/benefit, *transform* the environment to an open platform using proven methodologies and best practices, *virtualize* and *consolidate* the new application set, and complete *validation testing* and *acceptance testing*. These services identify high-impact, short-duration projects that deliver measurable ROI quickly, using standards-based technologies. Dell and Red Hat can provide end-to-end project management and streamlined deployment to drive the project. (See Exhibit 1, above.)

In addition, Dell can provide services for asset discovery, application packaging, image management, custom factory integration, and installation. They can also provide asset recovery and recycling services, training services, and a full set of maintenance and support services.

Dell Storage Platforms

In addition to open systems services and ProConsult services, Dell can support the mi-

gration with a full offering of storage devices and services, including Dell PowerVault™, Dell/EMC®, and Dell EqualLogic™ products. Whether the data center is a fully-committed fibre channel shop or would prefer to consolidate all storage on a common 10GbE pipe using iSCSI devices, Dell has a solution. Through a long-term agreement with EMC, Dell can provide the enterprise with a full set of storage arrays sized to meet the needs of your data center. In addition, through the EqualLogic family of iSCSI SANs, Dell can supply the data center with iSCSI storage arrays, scalable from entry-level up to the needs of the largest enterprise.

Conclusion

The move from UNIX to Linux makes sense in almost any environment, and now, with today's economic environment and every budget being cut, it makes more sense than ever before. The TCO of the proprietary RISC/UNIX data center is going up. With the ROI of migrating to an open systems platform being measured in months, you can become a corporate hero. The time to change the data center paradigm is now!

The question of whom to partner with in this effort is equally clear. With Dell, Intel, and Red Hat, the enterprise has the ideal team to provide the data center with the platforms and services required for successful migrations and improved TCO.



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