MAKING THE MOVE: WHEN, WHAT, AND HOW TO MIGRATE FROM UNIX TO LINUX

Mid-sized and large organizations have run their web, FTP, firewall, and communications servers on Linux® for years. Increasingly, database, DNS, e-mail, ERP, and other core business applications that have traditionally run on UNIX® are also being moved to Linux-based systems.

A combination of business, economic, and technological factors are making the switch from UNIX to Linux an easy choice.

WHEN: NOW IS THE TIME FOR A MOVE

Economic conditions are forcing virtually all companies to re-examine costs. And corporate management is applying more pressure on IT organizations to reduce expenses. In a 2009 *CIO Insight* survey of 219 IT executives, 80% of the respondents said they were under more pressure to reduce costs this year than they were last year. But just because they have been asked to reduce costs doesn't mean IT has been given the okay to reduce performance or renege on service-level agreements.

In spite of, and perhaps because of, the current business and economic environments, IT is expected to "do more with less." Specifically, IT is being called on to reduce costs AND to maintain or improve performance. But businesses are not just hoping to weather the current storm. They hope to emerge stronger, nimbler, and more competitive.

These goals have most organizations examining their IT infrastructure choices. In particular, they must determine which technologies will bring the needed cost savings while providing the means to deliver the required services.

To that end, the requirements that made RISC/UNIX a good choice when installed have not changed. Organizations still demand performance, scalability, reliability, security, and support from their IT environment. For many years, RISC/UNIX solutions met these requirements. But today there are more choices, and many organizations are finding that open standards-based solutions, using Intel®-architecture based servers and Linux, are providing all the required characteristics — performance, scalability, reliability, security, and support — and more.

These standards-based solutions offer all this at lower capital and operating costs (TCO) with better performance, price/performance, and performance per watt (to save on power and cooling costs). These benefits are realized using the latest technologies and advancements including virtualization, multi-core processors, advanced I/O options, and large memory support. Additionally, the standards-based solutions offer a robust development and applications environment, without the proprietary lock-in of a single vendor, which is typical for RISC/UNIX implementations.

Simply put, IT shops that migrate from UNIX to Linux get the features and functionality they need to run their businesses — with similar or better performance, scalability, reliability, security, and support at lower costs — plus the flexibility, choice, and control to manage their environments on their own terms and timeframes.

The technology prowess and features of open systems make now an ideal time to migrate from UNIX to Linux. For example, server performance and efficiency has never been greater with Intel-based servers. In recent benchmarks, the Dell™ PowerEdge™ R710 server with two Intel® Xeon® processor 5500 series (eight cores) running at 2.93GHz had a SPECint_rate2006 value of 252. A Sun Fire™ V490® server with four UltraSPARC™ IV+ CPUs and eight cores had a SPECint_rate2006 value of 78. Sun's latest two-socket SPARC server, the Sun SPARC Enterprise™ T5240 with two CPUs and eight cores per chip (sixteen cores) had a score of 157[1]. This means that on a per core basis, the latest Intel Xeon processor-based servers have over 3.2 times the performance of the SPARC-based servers.

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The operating environment of open systems is equally impressive. In August 2008, Red Hat® Enterprise Linux became the first operating system for the Intel architecture to exceed one million transactions per minute (TPM), running on an Intel Xeon processor X7460[2]. There are over 3000 certified vendors providing applications, tools, and other resources for Red Hat Enterprise Linux, giving enterprises of all sizes the eco-system needed for solutions and support.

The economic, performance, and capability advantages of migrating from UNIX to Linux point to NOW as the right time to migrate. But determining WHAT to migrate and HOW to conduct the migration are the key first steps to actually getting started.

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

WHAT: DETERMINING WHICH APPLICATIONS AND ENVIRONMENTS TO MIGRATE

There are usually a variety of applications and application types running in RISC/UNIX environments. These applications vary from basic infrastructure, such as DNS servers, email servers, and web servers to business- and mission-critical applications including OLTP applications, financial systems, business process and integrated/automated applications, and the key databases of an organization.

Some of these applications may be managed on a daily basis, with ongoing monitoring and planned development/upgrades to maintain peak performance and availability. Others may have been ignored or forgotten for the most part — simply continuing to run in some dark corner of the data center. In either case, depending on whether the application was built from scratch or provided by an ISV, which applications to migrate and what will be involved will vary.

To determine what applications to migrate requires a rigorous process that takes into account a variety of business and cost factors. Obviously the mission-criticality of any given application must be considered and carefully planned around. The relative ease or difficulty of a given migration helps establish some basis for which applications might be migrated first. And, most importantly, the business impact of each migration — how it impacts users, customers, and the IT staff itself — must be considered.

And while these tasks might sound daunting for an IT shop with little UNIX-to-Linux migration expertise, experience has shown that with good planning and execution these migrations can occur smoothly and can quickly start delivering the desired benefits. In fact, many organizations have found that the migration process itself can become self-funding, with the savings from previous migrations utilized to fund additional migrations.

To determine which applications to migrate, it is helpful to group the applications into various categories or tiers. Dell's consulting services group, Dell ProConsult™, groups the applications into five functional categories (see Table 1: Migration Tiers). Most organizations could use this categorization or something similar.

For each group, Dell's experience has shown that each migration requires different levels of effort and time (see Table 2: Migration Effort Key and Migration Time Estimates). The effort and time parameters can range from fairly easy and quick (being fully Linux compatible, requiring little or no code remediation) to very difficult and taking much longer.

In general, infrastructure applications, edge applications, and packaged applications will be the easiest to migrate, in that order. Typically, applications that have the least amount of modification or custom coding are easier to migrate.

However, no matter how complex or customized the application is, in almost all cases there is a process, toolset, and expertise to migrate from UNIX to Linux. Dell's experience has shown there are a number of critical factors for a successful UNIX-to-Linux migration including:

- Success is the result of addressing people, operational process, and technology requirements
- Operational effectiveness is based on having a risk mitigation plan that takes into account the impact of the transformation upon operational processes
- A thorough analysis of workloads and application dependencies reduces migration time, clarifies the business case, and identifies technology requirements
- Extensive multi-discipline planning is required for effective project execution
- Realization of benefits is proportional to the adoption rate over time. In other words, migrate as many applications as is feasible in the shortest, but most effective time to achieve maximum results.

In practice, a good example of determining what applications to migrate can be seen in Dell's work with a large financial institution. This customer had over 459 business applications running on 1,565 proprietary RISC/UNIX servers that they were considering for migration to Linux. Using a process similar to the above (Table 1) and migration task templates, it was determined that 72% of the proprietary UNIX servers could be migrated to Linux within 24 months, resulting in $32 million in infrastructure savings over three years.

TABLE 1: MIGRATION TIERS – DELL PROCONSULT™ METHODOLOGY

Tier	Description	Major Applications	Migration Effort*	Effort Impacted By...
Infrastructure	File and network core services	DNS, DHCP, LDAP, MQ	1-3	Generally straightforward unless use of exotic 3rd party applications
Presentation	Web, cache, and proxy servers	Apache, SunOne, HIS, iPlanet	2-4	Straightforward although validation needs to occur with application layer
Application	Engines or logic layers to massage or tweak data	Websphere, Weblogic, mainstream 3rd party applications, C/C++	3-5	Size of application; Java/J2EE, straight C, and major 3rd party applications are easier with everything else more complex
Database	Information repositories	Oracle, DB2, Sybase, Informix	2-4	Excessive use of stored procedures can increase migration difficulty
Other	Large, complex 3rd party applications	SAP, PeopleSoft, Oracle, Siebel	2-5	Difficulty ranges from easy to hard depending on amount of customization

**See Table 2 for Migration Effort Key*

TABLE 2: MIGRATION EFFORT KEY AND MIGRATION TIME ESTIMATES

Migration Effort Key	Approximate Migration Effort per Application/Database
1 – Little or no code remediation, full Linux compatibility	2 weeks
2 – Minor code remediation, replace selected utilities for Linux, high Linux compatibility	3 weeks
3 – Moderate code remediation, replace selected utilities, medium Linux compatibility	4 weeks
4 – Moderate code remediation, assembler code replacement, new utilities required	6 weeks
5 – Significant code remediation, assembler code replacement, new utilities required	8+ weeks

HOW: DISCIPLINE, A PHASED APPROACH, AND PROJECT GOVERNANCE THROUGHOUT

When the benefits are well understood and there has been a review of the best migration candidates, the next and most important step is to actually do the work. It is here that many organizations fail to act and remain handcuffed by older, slower, and more expensive RISC/UNIX solutions.

Some common factors that often stop migrations include a lack of experience, fear of the unknown, insufficient resources, or some combination of the three. Organizations must break through this "getting started" roadblock to actually deliver on the promise of UNIX-to-Linux migration. Fortunately, there have been many successes, which means there is lots of experience to draw from, and there are skilled resources to help make each migration go well.

At the core of these successes is a disciplined, phased approach. Dell and Red Hat use the following key phases for a UNIX-to-Linux migration:

1. Assessment
2. Design
3. Validation
4. Implementation
5. Management

These phases are similar to those used by others and serve as a good set of guidelines for successful migrations. Across all of these phases Dell and Red Hat use a strict and documented governance process to enable project integration and coordination among various constituencies, and to ensure agreement and transition from one phase to the next.

Project governance, through a formal project manager or group, acts as the key interface between the executive sponsor, vendor teams, and project teams; provides and manages the project plans and definition; manages risk and deliverables; and provides a framework for communication, training, logistics, and procurement. It is critical that this project governance and structure be present throughout all phases of the migration project.

Let's take a look at each phase.

The **Assessment Phase** provides a good look at the migration and is the key first step to ensuring readiness across all affected parties and departments. A *readiness assessment* is done first to understand the timelines and interdependencies of the move from old to new. Then comes *discovery*, which is a detailed review of how an application is used, its associated resources, and the expected requirements of the new environment. Next is the *risk/trend analysis* to make sure that all known variables are accounted for and that different scenarios can be planned for within the migration process. Finally, as the last part of the Assessment Phase, there is *assessment documentation* prepared with all the findings from the above, along with planned and recommended *next steps*.

The **Design Phase** follows the Assessment Phase. Here, a *discovery and phase review* to envision the steps and activities is needed to carry out a migration. At this point, the technical details and specifications required for the migration are drawn up. This is followed by the development of *formal design documentation* to make sure all elements of the spec and process are accounted for and in logical order. Once this is complete, attention is focused on planning migration *lab/pilot* activities. Here, the idea is to formalize what testing methodologies, acceptances, and physical requirements will be needed for the Validation Phase. Then thought must be given to the implementation approach that will be used to conduct the migration. For this, organizations must think through the step-wise process of the migration itself and develop recommendations and documentation for the *next steps*.

Validation Phase is where real results start to show themselves. This starts with *test scenarios* to best model the real-world production/transaction environment that these applications need to support. *Benchmarking* is then used to compare before and after performance, along with other important areas such as availability, scalability, and security. Here, tweaks can be made to deliver the optimum results for the new environment. From this, *migration process validation and documentation* is created to provide the step-by-step guidance and roadmap for the actual production migration. This is followed by a *knowledge transfer* between all affected groups to help uncover any overlooked items or opportunities, along with recommended and documented *next steps*.

Working through these phases, there should now be high confidence and readiness for the **Implementation Phase**. It starts with *building the production infrastructure*, which involves getting all the systems, processes, and people in place for the actual migration. This team can then *perform the validated migration process* and move from the old RISC/UNIX production environment to the new Linux production environment. As this occurs, it is important to *capture and communicate metrics* around the

migration. Items to be captured include an assessment of the performance, key lessons learned, and best practices. This communication is key, as it ensures all affected parties are made aware of the migration efforts and outcome. *Final migration and/or implementation documentation* can then be prepared for use on future migrations and to help wrap up the project.

Finally, the **Management Phase** takes over. In this phase, the newly migrated environment is up and running, and it's time to finalize and formalize the project completion, and the transfer to "business as usual" operations. This should include an *operational overview* to make sure all parties, including those not directly part of the migration, are familiar with the new environment. This should be followed by an *operational internship or onsite engineer* to oversee operations in the early days and weeks following the migration, and to finalize the knowledge transfer.

As the move from a migration to an operational stage continues, *performance tuning and optimization* should take place as the newly migrated environment goes through extended use, and is placed under the normal ebbs and flows of business. And finally, any additional *training* should be provided to ensure the ongoing continuity of operations.

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The adherence to this, or a similar, phased approach, with a well-established governance process within and between phases, will help ensure very successful UNIX-to-Linux migrations. And while the list of activities above may appear daunting, the reality is that this has been done thousands and thousands of times before with much success. In fact, many enterprises find the migration much simpler than expected using this disciplined approach.

The benefits in terms of cost savings, performance and efficiency gains, and future flexibility make these efforts well worth it. For example, a large telecommunications provider found itself with an aging UNIX environment with key AS/400- and Sun-based business applications that were too old, customized, and fragile to provide the agility they needed. They worked with Dell, Red Hat, Intel, and Oracle to migrate this environment to Oracle's E-Business Suite running on Red Hat Enterprise Linux on Dell PowerEdge servers. With Dell and Red Hat providing consulting and project management, this large project went very smoothly — on time and on budget — and provided a 50% savings for this environment as well as additional savings on software licensing, user training, help desk support, and more.

WHEN, WHAT, AND HOW TO MIGRATE – FINAL THOUGHTS

The time is now to migrate remaining RISC/UNIX environments to an open systems environment. The benefits are clearly known by almost all organizations, and yet they have been resistant to migrate parts of their IT infrastructure to Linux. If the benefits, especially in terms of cost savings, performance and efficiency, and flexibility are well known, then the issues must be with the actual migration efforts themselves.

This is understandable, given that these RISC/UNIX environments run key business and mission-critical applications in many organizations. For those concerned about making the migration to open systems, there are known best practices and resources to help all organizations determine what to migrate when, and how to do it. The successes far outweigh the risks, and every day spent waiting is another day of missed economic and performance opportunity.

Dell and Red Hat provide many of these best practices and resources. They can help enterprises make the move that they know they need to make, but haven't been able to undertake. Their combined expertise in systems and processes will help deliver successfully migrated environments with all the benefits desired. They also provide the latest technologies, ISV relationships, expertise, and customer experience, helping to ensure the performance, efficiency, scalability, reliability, security, and support required for business- and mission-critical computing. ●

For more information and to learn more about Dell and Red Hat RISC migration solutions, visit **www.dell.com/riscmigration**, **www.dell.com/redhat**, and **www.redhat.com/intelligence/dell**.