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Unix to RHEL Strategic Migration Planning

Taking the RISK out of RISC Migrations

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The Strategic Migration Planning Process

-   **1 Unix to RHEL Ecosystem Analysis** – Mapping the Unix ecosystem into the RHEL ecosystem and creating a RHEL Standard Operating Environment (SOE)
-   **2 Functional Applications Analysis** – High level analysis of business applications to be migrated.
-   **3 Organizational Readiness & Risk Analysis** – Analysis of organizational readiness factors, project risks, and risk mitigation strategies.
-   **4 Strategic Migration Roadmap Creation** – Combining everything into a single, holistic roadmap for migration.
-   **5 Migration Implementation** – Execution of the Strategic Migration Roadmap.

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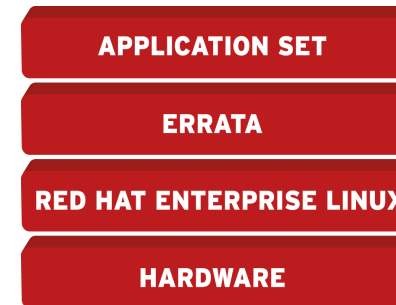
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Phase I: Unix to RHEL Ecosystem Analysis

- Examine existing Unix ecosystem and determine the equivalent capabilities in the RHEL ecosystem.
- Create a gap analysis and plan to address all gaps (if needed).
- Create a Standard Operating Environment (SOE), an organization's standard implementation of RHEL, including base operating system, a custom configuration, standard applications, software updates and service packs.



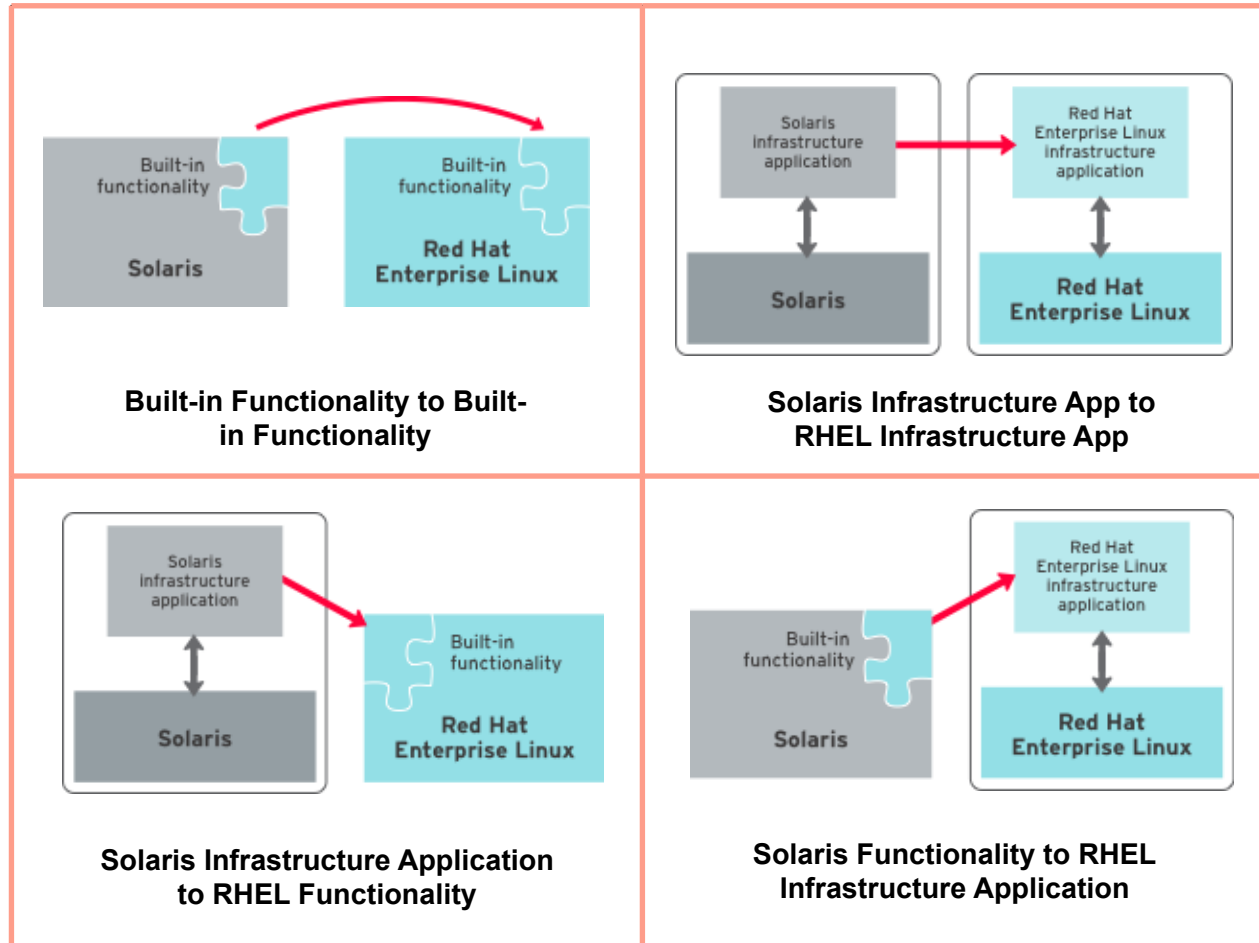
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Ecosystem Mapping Scenarios



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Common Ecosystem Component Mappings

INFRASTRUCTURE COMPONENT	AS-IS SOLARIS	TO-BE RHEL
Provisioning	Jumpstart	Kickstart, RHN/Satellite
Network File Systems	NFS/NFSv4	NFS/NFSv4
Drive/Directory Mounting	Autofs	Autofs
Package Management	SyS V packages/pkgadm	RPM/YUM
Systems Management	Sun xVM Ops Center	RHN/Satellite
Monitoring	Sun Management Center	RHN/Satellite
Troubleshooting	Dtrace	Systemtap
Packet filtering firewall	IPfilter	Netfilter/IPtables
Intrusion Detection	BART	AIDE
Identity Management	Sun Java System Directory Server	Red Hat Directory Server
	Sun Java System Identity Server	Red Hat Certificate System
File systems	UFS, ZFS, VxVM, VxFS, QFS	Ext3/4, LVM, GFS, XFS
Virtualization	Containers, Zones, Ldoms, Sunfire Dynamic System Domains, xVM	RHEL Virtualization (Xen, KVM), RHEV
Storage Multipath	MpxIO	device-mapper-multipath
Job Scheduling	Sun Grid Engine	Red Hat MRG Grid
Clustering	Sun Cluster	Red Hat Cluster Suite
Bare-metal Recovery	Flash Archive	Kickstart, RHN/Satellite

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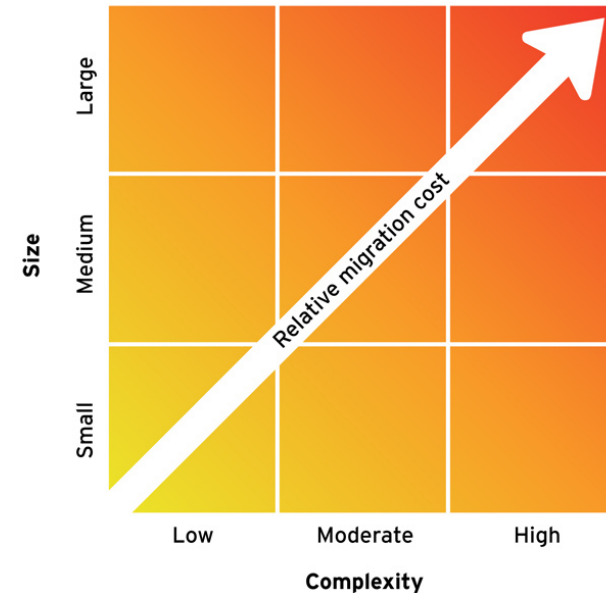
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Phase II: Functional Applications Analysis

- Analyze complexity and size of existing functional applications to determine macro-level migration difficulty.
- Analyze application migration dependencies, including tightly coupled interfaces and co-resident applications.
- Examine possible deployment scenarios for each application and its associated testing and staging environments based on the four generic deployment patterns
- Create high-level functional migration application cost analysis



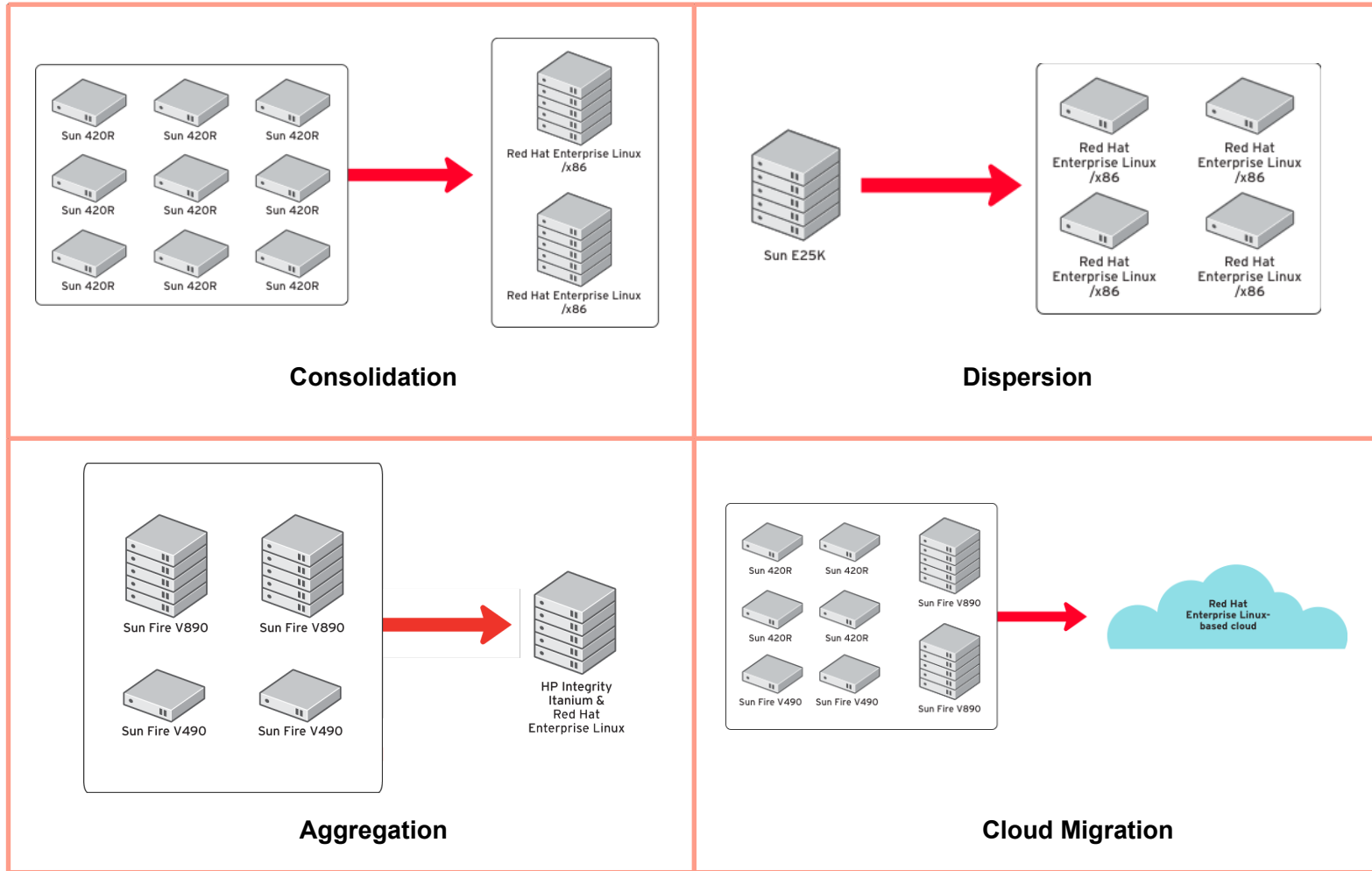
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Deployment Scenarios



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Phase III: Organizational Readiness & Risk Analysis

- Examine organizational readiness factors including skill gaps, IT governance processes, and acceptance factors.
- Perform situational SWOT analysis to determine current-state migration strengths and weaknesses as well as future opportunities and threats.
- Analyze technical risks inherent in many migrations.
- Create Risk Mitigation Strategy to address and limit the impact of identified risks.

RISK	LIKELIHOOD OF OCCURRENCE	POTENTIAL IMPACT	MITIGATION STRATEGY
Training budget low	High	High	Virtual training greatly reduces cost and allows staff to schedule at their own pace
Provisioning skill gaps	High	Medium	Consultant worked with staff to deploy an Enterprise Core Build that can be managed with new skills gained from virtual training
Previous migration project failed	Low	High	Team with Red Hat Consulting to establish a clear strategy and contingency plan
Budget constraints may lead to using unsupported software	Low	High	RHEL subscription model and errata life-cycle is unmatched, and customer does not want to be left in mission-critical situation unsupported

RISK	LIKELIHOOD OF OCCURRENCE	POTENTIAL IMPACT	MITIGATION STRATEGY
Linux skill gaps	High	High	On-site training and workshops provides quicker knowledge and how-to while limiting travel spend
IT staff not able to fully support new projects in the short term	Medium	Medium	Red Hat Dedicated Engineer will see project to end ensuring timelines and goals are met
Unsupported tools in use	Low	Medium	Enterprise Standard Build ensures supported tools are in place across the environment, and RHN Satellite used to deploy additional tools to address need for consistency throughout the environment
Custom application portability difficulty	High	High	Developers to work closely with consultants to re-write code as needed
IT staff apprehensive	Medium	Low	Training and mentoring from a dedicated Red Hat Engineer will ease concerns while limiting staff productivity by providing real-time guidance and recommendations

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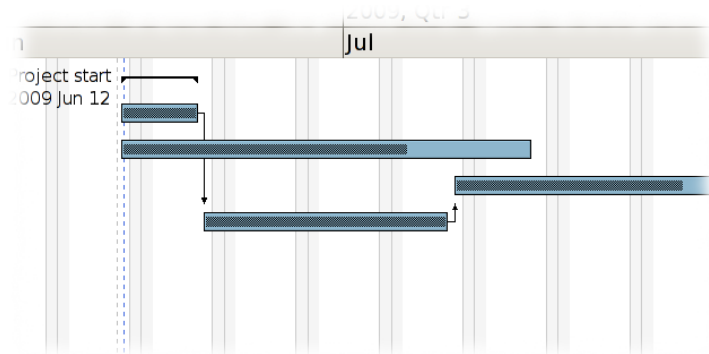
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Phase IV: Strategic Migration Roadmap Creation

- Create final list of application workloads to be migrated.
- Perform consolidated server, deployment, and virtualization analysis.
- Examine hardware redeployment scenarios and opportunities.
- Create detailed training plan to address all identified skill gaps.
- Create detailed direct cost estimate for the entire migration.
- Create master Migration Roadmap



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Unix to RHEL Migration Technical Considerations

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Technical Migration Considerations

- . Development Environment
- . Kernel Tuning
- . Security
- . Filesystems
- . Debugging, Tracing, Profiling
- . Software Management
- . Virtualization
- . 3rd Party Application Considerations



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Development Environment

- Code Compilation
 - Differences in compilers & flags (gcc vs. cc)
 - Versions of make (make, nmake, gmake)
 - Linker option differences
 - System-specific APIs such as Solaris “doors” can cause issues
- Endianness – the “NUXI” problem
 - Systems can be “big-endian”, “middle-endian”, or “little-endian”
 - A date analogy:
 - US date format is middle-endian: 10/06/2009
 - EU date format is little-endian: 06/10/2009
 - Big-endian date format would be: 2009/10/06
 - For the most part, SPARC, PA-RISC, and IBM Power are big-endian
 - Linux / X86 is little-endian
 - Can cause lots of problems, particularly in programs that access large amounts of shared memory.



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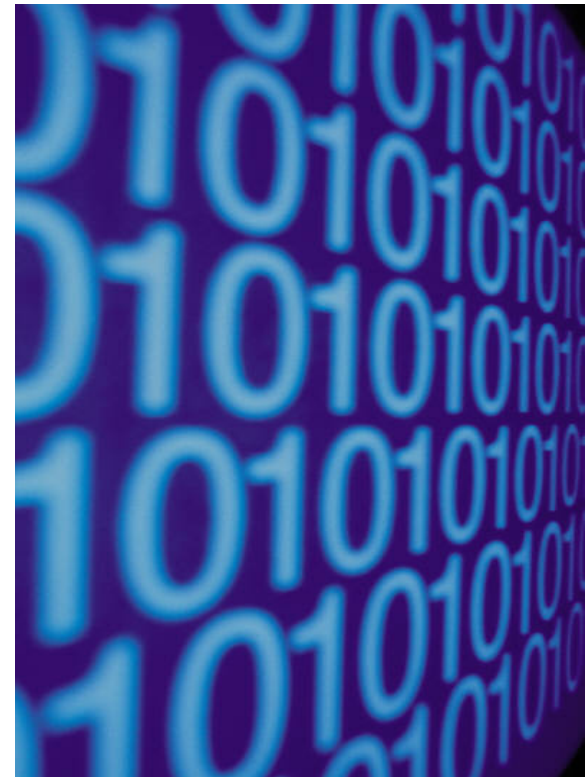
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Kernel Tuning

- . In many cases, RHEL's kernel can be tuned dynamically without rebooting
- . In Solaris, kernel changes are done in `/etc/system` and require a reboot to take effect
- . Some instant changes are possible in Solaris through tools such as `ndd`, `adb`, `Dtrace`
- . In Linux, pseudo-filesystem `/proc` is the kernel's memory, available for instant modification
- . Changes can persist reboots in `/etc/sysctl.conf`



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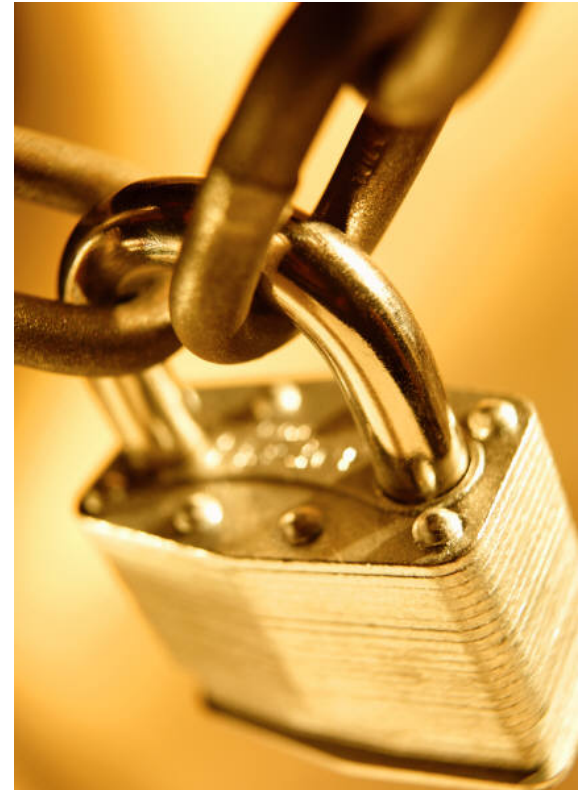
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Security

- BART-like functionality available through AIDE (Advanced Intrusion Detection Environment)
- Tripwire also available
- Security Enhanced Linux (SELinux) co-developed by the NSA is included with all versions of RHEL
- No separate “insecure” version of RHEL (Solaris vs. “Secure Solaris”)
- Common Criteria/EAL4+ certification
- Services are disabled by default even after installed or configured to listen to localhost



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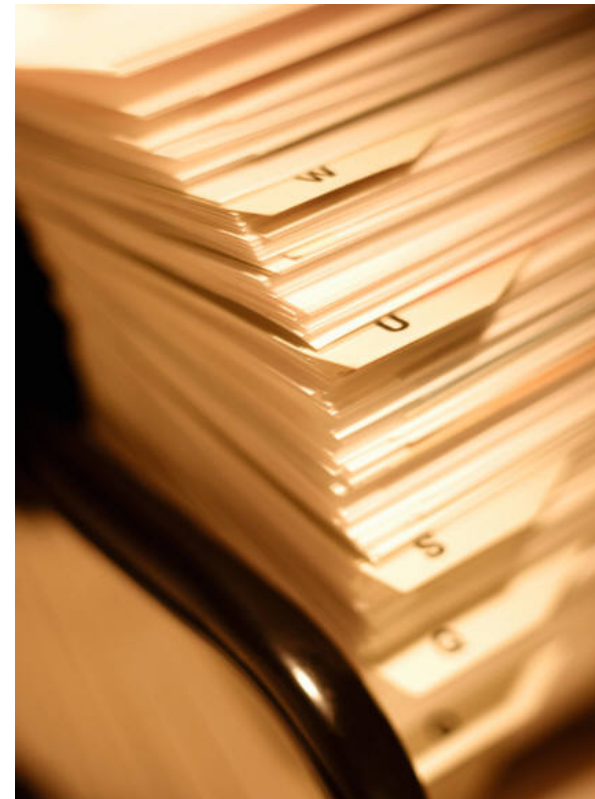
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File Systems

- Solaris: Primarily ZFS and UFS
- RHEL: EXT3/4, LVM, GFS, XFS
 - LVM – Logical Volume Manager
 - Physical Volume = physical partition / disk
 - Volume Group = collection of volumes / disks
 - Logical Volume = allocated “slice” from the Volume Group pool of available space
 - Filesystem is then created on the LV
 - Can be resized live (extend/reduce) and extra PVs can be added or removed live
 - Snapshot capability
 - GFS – Global File System
 - Clustered LVM



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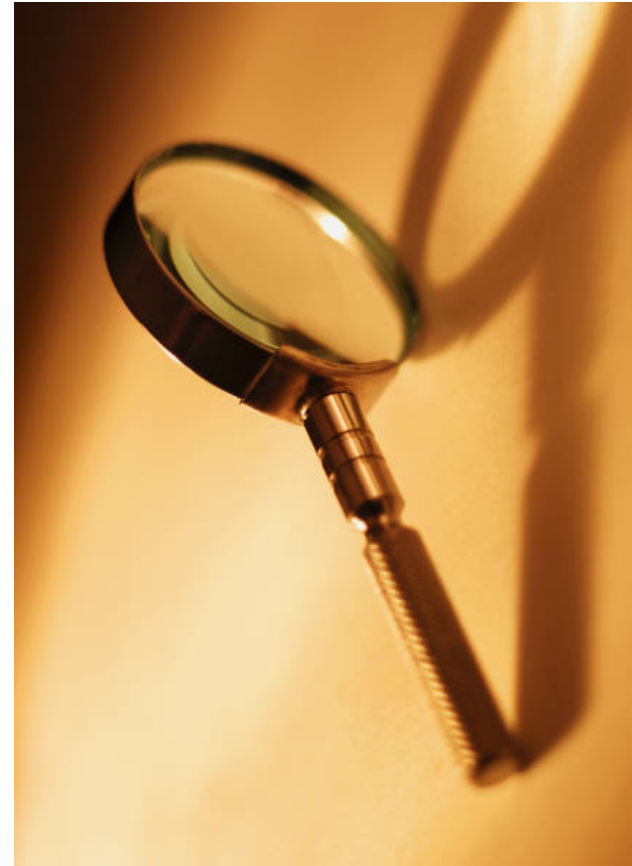
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Debugging, Tracing, Profiling

- **Solaris** – Dtrace is very popular and powerful
- **RHEL** and Linux community use SystemTap and Oprofile – RH has core developers on both teams
- SystemTap:
 - Scripting language with full control structures
 - Millions of probe points in kernel & user spaces
 - Probe arbitrary statements in code
 - Symbolically extract arbitrary data at probe point
 - End-user extendable probe library (tapsets)
 - Protected probe execution environment
 - Division by zero, null pointer, infinite loop protection
- Oprofile:
 - System-wide profiling of all running code
 - Unobtrusive, low overhead, no recompilation
 - Post-profile analysis



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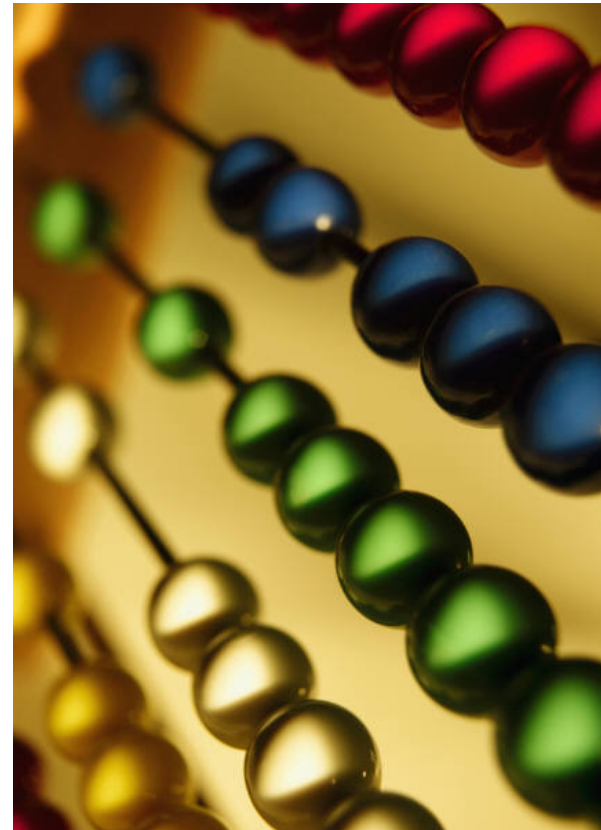
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Software Management

- Linux software is packaged for ease of administration in RPM format
 - Was “Red Hat Package Manager” now just “RPM Package Manager”
 - RPM contains all patches, scripts, documentation, information
 - Database keeps track of changes, time stamps, checksums, etc.
- Built on dependency mechanism
 - Try to install Package_A. It depends on Package_B. Both will automatically be installed if needed.
- GUI frontend and YUM available to solve dependencies
- Satellite can handle updates, rollbacks, etc.



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Virtualization

- Kernel Virtual Machine uses Intel's VT-x CPU extensions to offload virtualization tasks to the CPU
- Effectively provides new privilege level
- Removes need for hypervisor to scan and rewrite kernel code
- Extended Page Tables in Nahalem
- I/O Offloading (VT-D) – PCI Pass-through
- Single Root I/O Virtualization (SR/IOV) – Split PCI devices into virtual ones
- Uses mature, stable, and proven kernel
- Same security and performance as RHEL



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3rd Party Application Considerations

- Thousands of 3rd party applications are certified on RHEL
 - <https://www.redhat.com/wapps/partnerlocator/web/home.html>
- Check Red Hat Software Catalog:
 - <https://www.redhat.com/wapps/isvcatalog/home.html>
- Check ISV site

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Unix to RHEL Migration Customer Success Stories

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Customer Success Stories

City of Chicago

Carving Out Cost

Migrated their mission critical Oracle database environment to Red Hat Enterprise Linux on HP servers because they needed to:

- Reduce server hardware, maintenance and operating costs
- Prove Linux could effectively run enterprise-level applications
- Increase flexibility in choosing hardware vendors for significant potential cost savings

Red Hat solution successfully delivered in the original environment, addressing all the initial migration drivers and has further enabled City of Chicago to expand these benefits to other areas.

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Customer Success Stories (cont.)

Whole Foods

Management and Scale

Migrated to a Red Hat solution to obtain an easy-to-use and reliable systems management solution that enabled increased productivity and reduced costs. Whole Foods needed:

- A cost-effective operating platform
- A complementary management solution
- Scalability to keep with the company's rapid growth
- Increased security, manageability, and availability of business-critical applications
- Cheaper, faster, more reliable system
- Added enhanced capacity
- A system that guarantees security and reliability

Experienced increased performance and internal-user satisfaction of homegrown applications, including order processing applications.

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Customer Success Stories (cont.)

NYSE Euronext

Innovating For Success

Migrated to Red Hat solutions so NYSE Euronext could focus on diversifying its product base and developing a global platform for trading. To achieve this, they needed:

- To overcome the challenges with integrating varied trading platforms from multiple acquisitions
- Produce a simplified and optimized technology architecture
- Enhance the effectiveness of its technology through incorporation of features needed
- Have a solution that was reliable and flexible enough to produce the fast-paced performance demanded by the industry.

Hear about their results at

<http://customers.redhat.com/2008/05/12/nyse/>

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