RED HAT :: CHICAGO :: 2009
SUMMIT

Red Hat Enterprise Linux Roadmap

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presented by

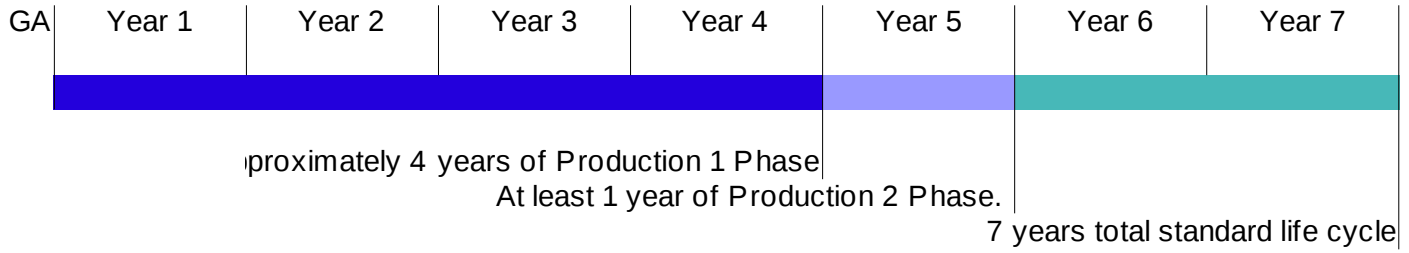
RHEL Roadmap presentation Agenda

- High level major release themes
- Background on RHEL update release lifecycles
  - Brief retrospective release history
- RHEL2.1 & RHEL3 - status
- RHEL4 - recent minor release highlights & whats next
- RHEL5 – feature highlights of 5.3 & 5.4
- RHEL6 – glimpse of high level themes
- References
- (Summit session) – callouts to related sessions appear in red

High level RHEL release theme progression

	RHEL 2.1	RHEL 3	RHEL 4	RHEL 5	RHEL 6
Enterprise core	X	X	X	X	X
hardware ecosystem	X	X	X	X	X
ISV ecoysystem		X	X	X	X
Performance scalability		X	X	X	X
Security			X	X	X
Virtualization				X	X
Messaging Optimizations				X	X
Power savings					X
Virt fine grained control					X
Framework for central mgt					X

Red Hat Enterprise Linux Lifecycle



- Fully supported through standard life cycle of 7 years from GA.
- Async bug, enhancement, and security fixes depending on importance of the issue (e.g. Critical Impact security).

1. Production 1 Phase

- Minor releases, approx. 2 per year, roughly a 6-month cycle, stretching out at the end:
- Hardware enablement
- General bugfixing based on priority
- General features if very strong justification (generally Major releases are the release vehicle for Features)
- ISO images & media kits
- Duration: 4 years of phase

2. Production 2 Phase

- Transition from Production 1 to Production 3
- Concluded by final, bugfix-only minor release on flexible schedule (PCI-IDs are updated – minor hardware enablement).
- Scope: defects reported during phase 1

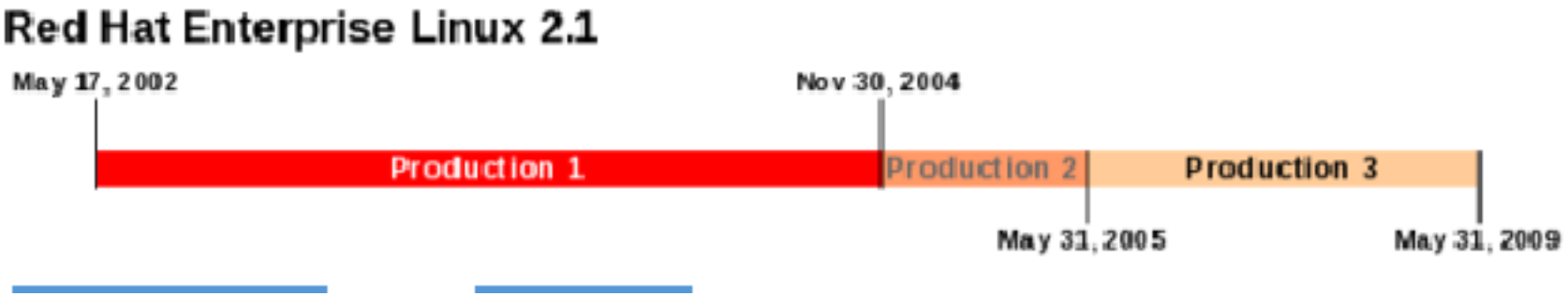
3. Production 3 Phase

- Time between the final update release and the end of the 7-year standard life cycle.
- Critical bug and security fixes only...
- Customers can contact Red Hat sales regarding details for an optional extension beyond the regular 7 years.

RHEL release update themes

- **RHEL2.1** – End of life, past production phase 3
- **RHEL3** – production phase 3 urgent sev1 customer bugfixes & proactive security errata
- **RHEL4** – production phase 2 – customer issues of all severity, proactive security, limited hardware enablement, performance enhancements to enable long-term viability as a virtualized guest on RHEL5 & 6
- **RHEL5** – production phase 1 - customer issues of all severity, proactive security, full hardware enablement, production virtualization advancements, non-distuptive feature enhancements, limited set of technology preview features
- **RHEL6** – currently in development – major new features, package rebases, hardware optimizations for latest generation of hardware (including virtualization)

Red Hat Enterprise Linux 2.1



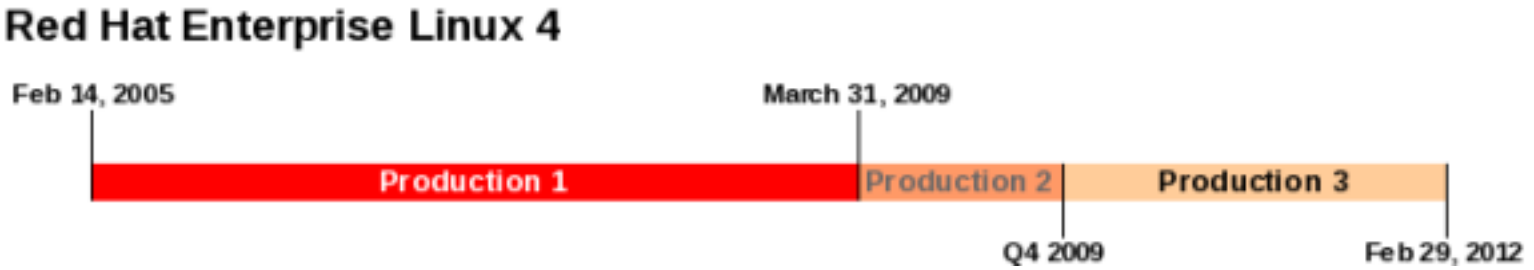
- Shipped: May 2002
- End production phase 1: Nov 2004
- End production 2: May 2005
- End production 3: May 2009
- Consult Red Hat sales for custom lifecycle extension

Red Hat Enterprise Linux 3

- Shipped: Oct 2003
- End production phase 1: July 2006
- End production 2: June 2007
- End production 3: Oct 2010
- Consult Red Hat sales for custom lifecycle extension

Red Hat Enterprise Linux 4

Red Hat Enterprise Linux 4



- Shipped: Feb 2005
- End production phase 1: March 2009
- End production 2: No earlier than Q4 2009
- End production 3: Feb 2012

Red Hat Enterprise Linux 4.8

- Themes of RHEL4.8 development
- Hardware enablement – last major RHEL4 hardware cycle
  - Device Identifiers
  - Driver updates
- Last RHEL4 update addressing all severity of customer issues
  - Concluding production phase1, preparation for maintenance only phases
- Virtualized guest enhancements
  - VirtIO drivers for Xen based guests
  - Optimized network and disk I/O drivers for KVM guests
  - Enabling efficient lifecycle extension utilizing new hardware

Red Hat Enterprise Linux 4.9

- Themes of RHEL4.9 development
- Hardware enablement – last minor RHEL4 hardware cycle
  - Limited, non-invasive hardware enablement
- Production phase 2
  - High priority customer bugfixes
  - No new software features
- Virtualized guest enhancements
  - Final driver optimizations to prepare RHEL4 systems for performance and manageability via RHEV to run as virt guest on RHEL5 based hosts
  - VirtIO drivers for Xen based guests
  - Optimized network and disk I/O drivers for KVM guests
  - Enabling efficient lifecycle extension utilizing new hardware

Red Hat Enterprise Linux 5

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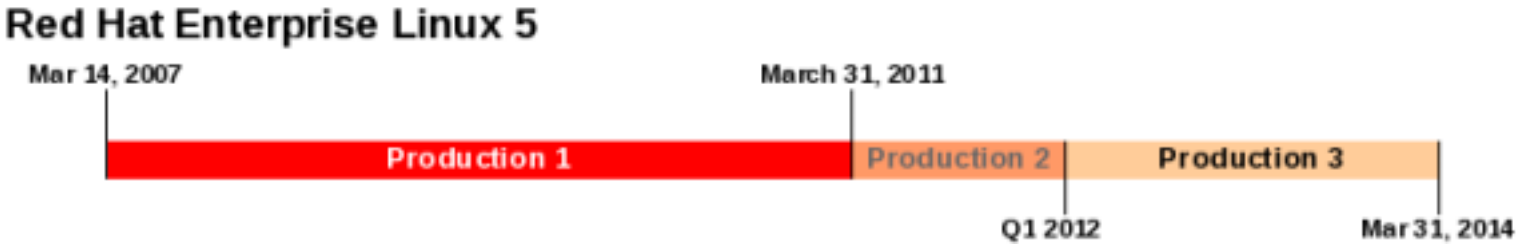
Red Hat Enterprise Linux 5



- Shipped: March 2007
- End production phase 1: March 2011
- End production 2: No earlier than Q1 2012
- End production 3: March, 2014

RHEL5.3 highlights - agenda

- Released in January, 2009
- Virtualization
- Hardware enablement
- Storage management
- Development tools
- System services

Virtualization – scalability enhancements - RHEL5.3

- Scalability enhancements targeting both large number of virtualized guests as well as small numbers of very large guests (CPU, memory, IO resources)
- Support for up to 126 physical CPUs in host hypervisor and 32 CPUs per virtualized guest
- Support for up to 1TB memory on host and 80G per virt guest
- The number of dynamic IRQs was increased for x86_64 to allow for more guests on large systems.
- Support for more than 16 disk devices per guest
- Support for > 4 network adapters per guest

Virtualization – enhancements - RHEL5.3

- Paravirtualized guest optimizations
  - Targeting unmodified pre-existing RHEL deployments with device driver enhancements optimized to new hardware IO bypass capabilities, eliminating the majority of virtualizaiton overhead. Allowing IO intensive applications to be candidates for virt deployment
  - Updated disk & network drivers
  - Support for 2MB backing page tables on x86_64
- **Libvirt-cim** – system management library, increasingly utilized by system management tool vendors
  - CIM (Common Information Model) architecture for managed services
  - Providing CIM compliant interfaces for virt configuration and operational management

Hardware Enablement highlights - RHEL5.3

- Intel Tylersburg / Nelahem EP platform
  - core architecture support, scheduler and virtual memory optimizations
- Power management
  - exploiting of low-power deep C states on Nehalem platform. ACPI-T state support for effective CPU throttling
- I/O Memory Management Unit (IOMMU)
  - AMD processor chipset optimization for data passing between main memory and I/O devices – supporting secure DMA transfers for hardware isolation in virtualized guests
- Device driver updates
  - Disk, network (wired & wireless) – including 10Ge, graphics, audio
  - FCoE (Fibre Channel over Ethernet) – allows convergence of network and storage traffic on a single adapter (Cisco, Emulex, Qlogic)
  - Dmraid – hardware raid features present on many Intel motherboards, includes anaconda installer support

Storage management - RHEL5.3

- Software based FCoE on standard NICs. (tech preview)
  - Prior slide referred to optimized FCoE hardware enablement
- iSCSI initiator enhancements
  - (Summit session) Simplifying Linux iSCSI Management with iSNS
- LVM cluster 2-way mirroring full support
  - Particularly useful for virtualization live server migration
- Speedups in system boot and startup time by improving lvmcache usage
- (Summit Session) Optimize Storage Performance with Red Hat Enterprise Linux

Storage management - RHEL5.3

- Block device encryption – dmcrypt
  - Includes installer support for root & swap
- GFS2 parallel coherent cluster filesystem advances to full support status
  - Foundation of coherent storage for virt live migration and failover
- CIFS – allowing client or server based filesharing to heterogeneous Windows systems – security enhancements enabling use of kerberos credentials
- Samba – Windows interoperability tools – our upstream work for integration with Vista

Development Tools - RHEL5.3

- Systemtap – application monitoring & performance monitoring
  - Facilitating live application monitoring in production environments – runtime tracepoints, dynamic insertion of tracepoints based on runtime conditionals, obviating need to ship debug versions of applications
  - Beginner's Guide to Systemtap – documentation w/ examples
  - (Summit sessions) Understanding computer performance with SystemTap scripts, Creating a low cost Red Hat Enterprise Linux deployment
- General system performance (Summit sessions) Performance Analysis and Tuning of Red Hat Enterprise Linux, parts 1 & 2, Tuning Red Hat Enterprise Linux for Oracle, Maximizing AMD Six-core Opteron Processor Performance

Development Tools - RHEL5.3

- GDB debugger
  - Package rebase, now based on version 6.8 (previously based on Version 6.5)
  - Multiple location breakpoints for C++ templates, constructors, inlined functions, etc.
- OpenJDK – the industry's first product version of an open source Java runtime
  - Full implementation of the Sun Java SE 1.6 spec
  - Open source Java invites optimizations for JBoss middleware and MRG messaging

System services enhancements - RHEL5.3

- CUPS print server - now fully Kerberized
- dhcpv6 enhancements
- **ktune**, a service that sets several kernel tuning parameters to values suitable for specific system profiles. Currently, ktune provides a profile for large-memory systems running disk-intensive and network-intensive applications. New package, tech preview.
- RPM & yum update – bugfixes and performance enhancements
- Audit – subsystem enhancements facilitating remote logging
- (Summit session) SELinux for Mere Mortals
- NetworkManager – supports sharing multiple active connections
  - Ie, bridging other laptops through a common bluetooth phone
  - Mobile broadband for select devices
  - Static IP addresses can be configured

RHEL5.4 highlights - agenda

- Released in September, 2009
- Virtualization
- Hardware enablement
- Network enhancements
- Storage management
- Development tools
- System services

Virtualization - RHEL5.4 highlights

- RHEV (Red Hat Enterprise Virtualization) – KVM based hypervisor
  - **KVM** is a linux kernel module – benefiting from power management, VM, NUMA aware scheduler and standard process management utilities
    - Xen based virtualization remains fully supported in RHEL5
  - Includes device drivers to manage virtualization hardware
  - LVM enhancements for snapshot efficiency
  - (Summit sessions) SPICE: Enabling the Standard Desktop Remoting Protocol, Introducing Red Hat Enterprise Virtualization
- **VMware timer** clock enhancements – selecting optimized clock interfaces
- **Libvirt** – system management library allowing configuration of above mentioned hardware resources per guest

Virtualization - RHEL5.4 highlights

- Virtualization Hardware enablement – reducing overhead
  - **SR-IOV** (Single Root I/O Virtualization) – allowing a single PCI device to be efficiently shared among multiple virtual machines – rather than requiring dedicated devices
  - **NPIV** – N_Port ID Virtualization – allowing multiple virt guests to share physical devices – allowing direct access safely. Similarly PCI direct access pass-through
  - **VT-d & IOMMU** – performance boost to avoid remapping I/O DMA operations – additionally furthers guest isolation by preventing other guests from being able to write into another guest's device mapped memory
  - **Hugepages** – previously 2MB page size limitation increased up to 1GB for database efficiency – reducing TLB misses and nested page table traversal
  - **Max CPU** support of virt host increased from 126 to 192 based on successful testing and performance enhancements
  - (summit sessions) Red Hat Virtualization Leadership series – Breaking Performance and Scalability Barriers, Red Hat Enterprise Linux Virtualization in Real Life, Desktop Virtualization – achieving real TCO savings

Hardware enablement - RHEL5.4 highlights

- Platform enhancements for Intel's Nehalem EP and AMD's Istanbul
- Device driver updates for disk, network (wired & wireless), graphics, audio
- OFED 1.4 – Infiniband stack update
- Hugepages coredump support

Network enhancements - RHEL5.4 highlights

- **10GE** – new drivers. Also accompanying GRO (Generic Recieve Offload) which aggregates inbound packets before they are processed by the network software stack – resulting in lower CPU consumption and higher throughput – necessary to drive 10GE.
- **IPV6**
  - add support DSCP (Differentiated Service Code Point) in ipv6 via ip6tables - used to set a priority within the packets so that switches and routers can process traffic at designated priority
  - Ipv6 configuration added to NetworkManager
- **FCoE** – FibreChannel over Ethernet
  - driver updates, transitioning to fully supported (formerly tech preview)
  - SNIA standard library allowing 3rd party tools to configure the interfaces

Storage Management - RHEL5.4 highlights

- **Blktrace** – block IO layer tracing mechanism – providing info on request queue operations
- **I/O accounting** – per-process I/O accounting data /proc/<pid>/io – not impacted by cached data, also added to iostat
- **FUSE** (Filesystems in user space) kernel infrastructure and utilities.
- **Clustered CIFS** – updated Samba 3.3, configured with clustered GFS provides scalable active-active CIFS fileserver.
- **Ext4** - refreshed the backport for our tech preview to bring in bug fixes and support for delayed allocation. Remains tech preview.
- (Summit sessions) Red Hat Enterprise Linux Filesystems: today and tomorrow, It's Not Your Father's NFS

Development tools - RHEL5.4 highlights

- **Systemtap** – instrumentation / analysis utility
  - Static marker support (tracepoints) – supporting probing of pre-defined events. Kernel tracepoints added to: networking, VM, NFS. Obviating the need for full debuginfo.
  - Profiling and monitoring enhancements for C++
  - Flight recorder mode – systemtap scripts running in background, collecting data to file/disk. Logrotate style file size limits
  - Automatic conversion of DTrace marker to SystemTap markers – build tools and header files to automatically convert dtrace to systemtap for markers that exist in RHEL.
  - Secure remote script compilation – allowing systemtap scripts to be compiled on devel system with debuginfo packages, without requiring debuginfo on system being monitored. The recent enhancement is to pass info securely.
  - Introductory guide with examples

Development tools - RHEL5.4 highlights

- **malloc** – application memory allocation library rewrite – using per-thread pools for reduction in memory contention (requires enabling per process). Optimized for multicore
- **GCC compiler** – tech preview of GCC 4.4
  - OpenMP 3.0 conformance (base gcc is OpenMP 2.5)
  - improved inlining

System Services - RHEL5.4 highlights

- Updates to remote system management agents – OpenHPI, OpenIPMI, new SBLIM for enhanced CIM management
- **SAP resource agents** – for managing high availability for SAP applications and databases

Red Hat Enterprise Linux 6

Note: this information is high level planning projection and does not constitute formal product commitment.

RHEL6 Major Theme

- RHEL6 is an optimized foundation OS for large scale centrally managed enterprise deployments. Lower TCO.
  - Virtualization focused for deployment provisioning and flexibility for dynamic workloads – datacenter to desktop. With emphasis on performance, storage flexibility, security, and guest isolation.
  - Improve Manageability
    - Major system services and user permission enablers for optional centralized management of Identity, Policy, Audit
    - Leveraging our strengths in messaging middleware as a foundation component for systems management infrastructure
  - Green IT – via power management and dynamic virt migration
    - (Summit session) Green IT – a Red Hat perspective
  - Integration of latest enterprise ready components – access to innovation – technology leadership

RHEL6 Foundation Initiatives

- Virtualization – making RHEL an optimized host & guest
  - Performance & scalability optimized
  - Resource containment, guest resource isolation & security containment
- Optimized integration with RH's enterprise system management initiative, centrally managed security mechanisms and high speed messaging
- Power Management
  - For virt, bare metal, laptop
  - Hardware level as well as dynamic system service startup and suspend
- Scalability
  - Larger max CPU, mem, IRQs, filesystem – both virt & bare metal
- RAS
  - data integrity enhancements
  - Improved diagnostic tools

RHEL6 Illustrative Use Case

- Foundation for centralized system management of virtualized deployments
  - **Policy** – control which administrators (and users) are authorized to provision virt resources and applications deployed.
  - **Resource utilization SLAs** – new kernel resource control group capability allows SLAs on cpu cycles (scheduler), memory utilization as well as disk & network IO. Allowing fine-grained virt guest containment.
  - **Green IT** - New kernel power management interfaces allowing high level virt policy to coalesce rack full down to a single server when idle in evening. KVM advanced integration with kernel allows for rapid advancement of power saving capabilities.
- (Summit session) Secure Virtualization with SELinux – SVIRT

Conclusion / Takeaways

- Ongoing progression of subscription value:
  - Customer targeted maintenance stream
  - Hardware enablement – bare metal & virtualization optimizations
  - Innovation – new features from Red Hat developers & community collaboration
  - Lowering TCO
    - RHEL core features facilitating datacenter virtualization management
    - RHEL core features enabling cost effective middleware:
      - MRG (Messaging, Realtime, Grid)
      - OpenJDK, Eclipse
      - JBoss

Additional online information resources

- http://www.redhat.com/rhel/resource_center/
  - Red Hat Enterprise Linux 5.3 Technical Overview
  - 5.4 also
- Red Hat Enterprise Linux Life Cycle
  - http://www.redhat.com/security/updates/errata/
- This presentation
  - Will be placed with the online archive of Summit presentations
- RHEL6 feature previews – appearing in Fedora 11 & 12
  - fedoraproject.org
  - (Summit session) The Red Hat-Fedora-OSS Development Model

QUESTIONS?

TELL US WHAT YOU THINK:
REDHAT.COM/SUMMIT-SURVEY

We'd love to hear your input – good and where we can be doing better. Feel free to catch us after this session, in the campground and in the social functions. Be part of the OPEN in open collaborative development!

(Summit Session) Birds of a feather: Red Hat Enterprise Linux, Wednesday 5:45 pm