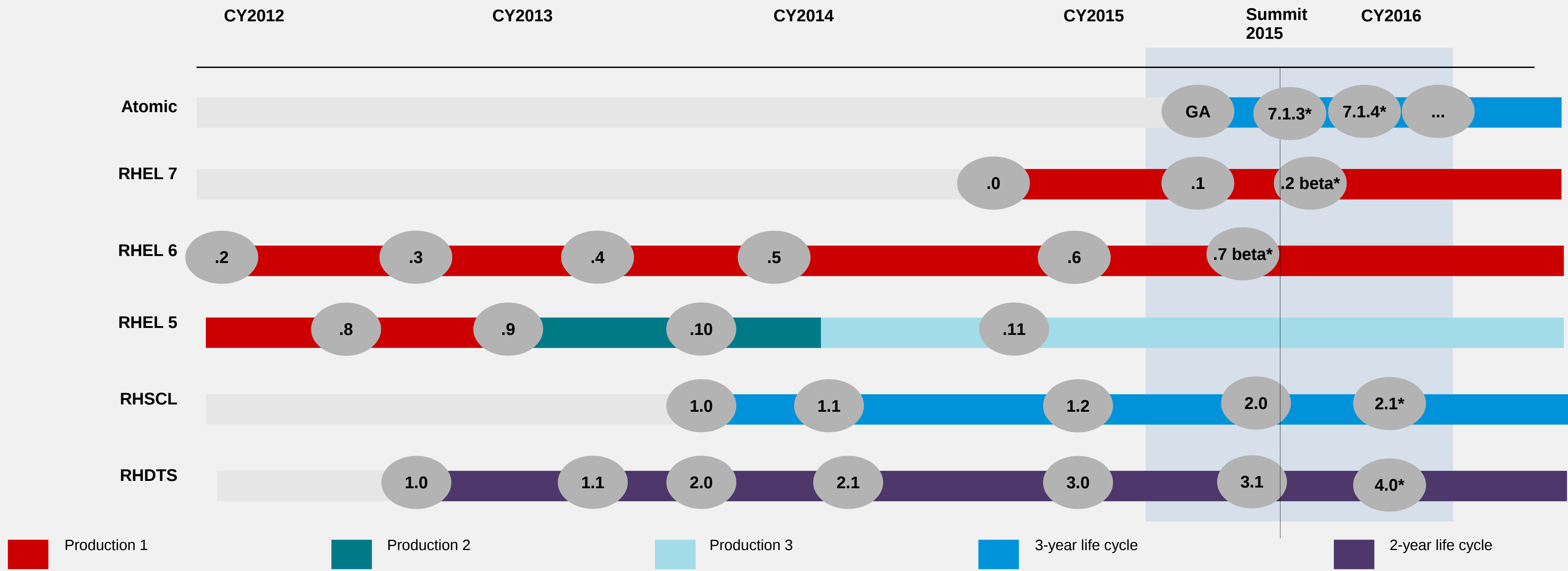# Red Hat Enterprise Linux Roadmap

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VP, Operating System Platform

Ron Pacheco
Director, Product Management
June 2015

THE PAST 12 MONTHS WITH RED HAT ENTERPRISE LINUX
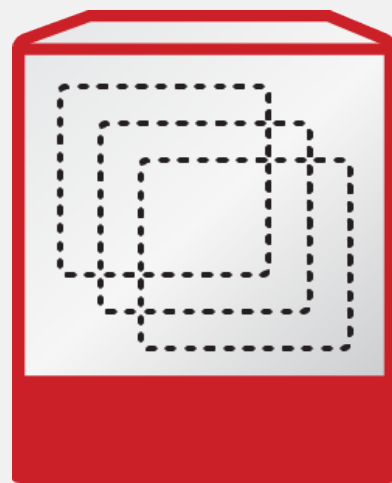
Platform Product / Offering Roadmap*

	CY2012	CY2013	CY2014	CY2015	Summit 2015	CY2016
Atomic				GA	7.1.3*	7.1.4* ...
RHEL 7			.0	.1	.2 beta*	
RHEL 6	.2	.3	.4 .5	.6	.7 beta*	
RHEL 5	.8	.9	.10	.11		
RHSCL		1.0	1.1	1.2	2.0	2.1*
RHDTS		1.0	1.1 2.0 2.1	3.0	3.1	4.0*

■ Production 1	■ Production 2	■ Production 3	■ 3-year life cycle	■ 2-year life cycle

All dates are approximate and subject to change

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NEW ADDITIONS TO THE RHEL FAMILY

RED HAT ENTERPRISE LINUX ATOMIC HOST

IT IS RED HAT ENTERPRISE LINUX

OPTIMIZED FOR CONTAINERS

MINIMIZED FOOTPRINT

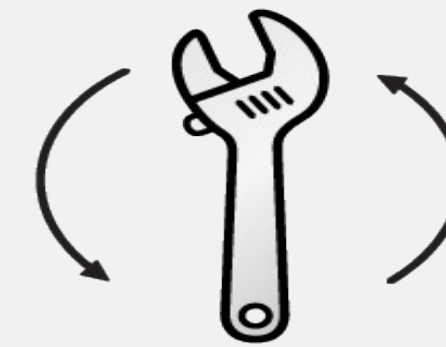### SIMPLIFIED MAINTENANCE

ORCHESTRATION AT SCALE

Inherits the complete hardware ecosystem, military-grade security, stability and reliability for which Red Hat Enterprise Linux is known.
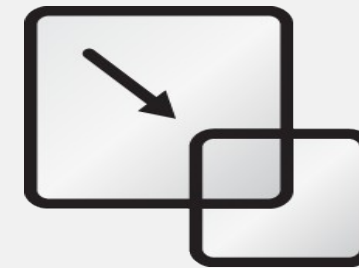
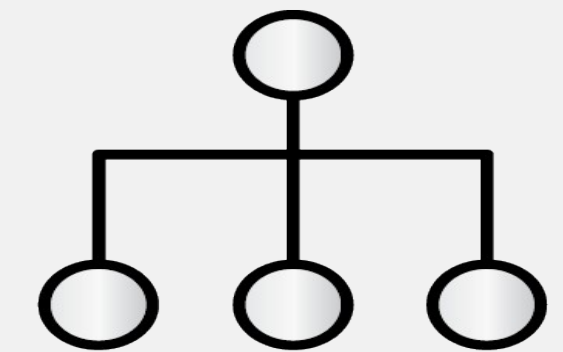Minimized host environment tuned for running Linux containers while maintaining compatibility with Red Hat Enterprise Linux.

Atomic updating and rollback means it's easy to deploy, update, and rollback using imaged-based technology.

Build composite applications by orchestrating multiple containers as micro-services across multiple hosts.

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Red Hat Enterprise Linux for Real Time
When determinism really matters

- Red Hat Enterprise Linux Real Time

  - Standard member of the Red Hat Enterprise Linux family

  - Targeted at workloads that favor a consistent response time (deterministic) over throughput

  - Based on the stock RHEL 7 kernel

  - Aligned with RHEL release cadence

  - Available via separate subscription
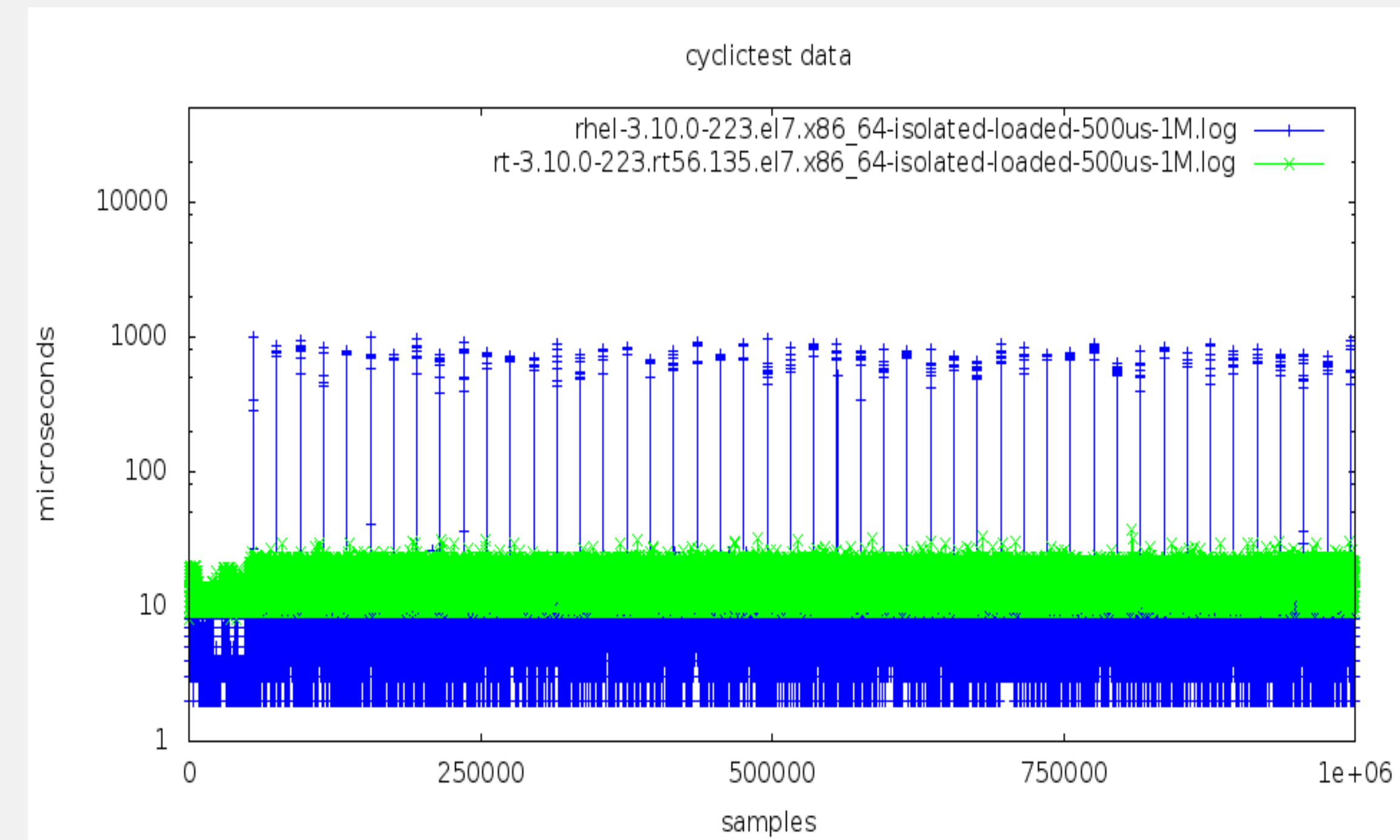
Red Hat Enterprise Linux for SAP HANA

- RHEL for SAP HANA

  - Jointly engineered to deliver highly **R**eliable, **A**vailable, **S**calable and secure data warehouse solutions for the most demanding production environments including Cloud deployments

    - High performance in-memory database management systems for fast, high throughput
    - 99.999% uptime
    - >12PB tested to date

  - Supported by Red Hat, SAP and certified hardware partners

  - RHEL 6.5 and later, RHEL7 in progress

  - Complements RHEL for SAP

Red Hat Enterprise Linux
for IBM POWER8 little endian

- Support for IBM Power Systems POWER8 little endian mode to Red Hat Enterprise Linux 7
  - POWER8 in big endian mode also supported

- POWER8 offers higher performance
  - especially for big data applications
  - multi-threading, more cache and greater data bandwidth
    - See the STAC results with RHEL 7!
      http://www.hpcwire.com/2015/06/09/ibm-power8-outperforms-x86-on-stac-benchmarks/

- Easier for Power Systems to leverage Red Hat's ecosystem of certified applications
  - removes the application portability barrier

Red Hat Enterprise Linux
High Availability Support for IBM z Systems

- Customers asked for RHEL HA support for IBM z Systems
  - We're delivering!
  - Watch for this with RHEL 7.2
  - Join the Beta!

- Uses existing RHEL HA and Resilient Storage Add-Ons
  - Customers in the Financial Services Industry working with us to validate using production workloads

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Red Hat Enterprise Linux Server for ARM Development Preview 7.1

- Support for open and industry standards for 64bit ARM server hardware
  - Extends RHEL ecosystem of innovation to ARM
  - Take advantage of 64-bit ARM architecture and standardize on RHEL

- Based upon RHEL 7.1 userspace
  - Plus kernel optimized for ARM

- Available via ARM Partner Early Access Program
  - 40 partner companies participating in the program
  - To evaluate, contact your hardware vendor
  - http://www.redhat.com/en/about/blog/long-arm-linux-red-hat-enterprise-linux-server-arm-development-preview

SOLVING A KEY CUSTOMER REQUEST: PREDICTABLE ERRATA DELIVERY

Predictable Software Updates

- Customers requested improved predictability of RHEL errata delivery

- Batched updates with new consolidated support stream
  - Kernel and userspace errata now released concurrently
    - Coalesced into the existing kernel cadence (every ~6 weeks)
    - Starting with RHEL 6.7 and RHEL 7.1 support streams

- Exceptions:
  - Fixes to urgent security issues
  - Resolution for critical business impacting issues

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PATHS TO RHEL 7
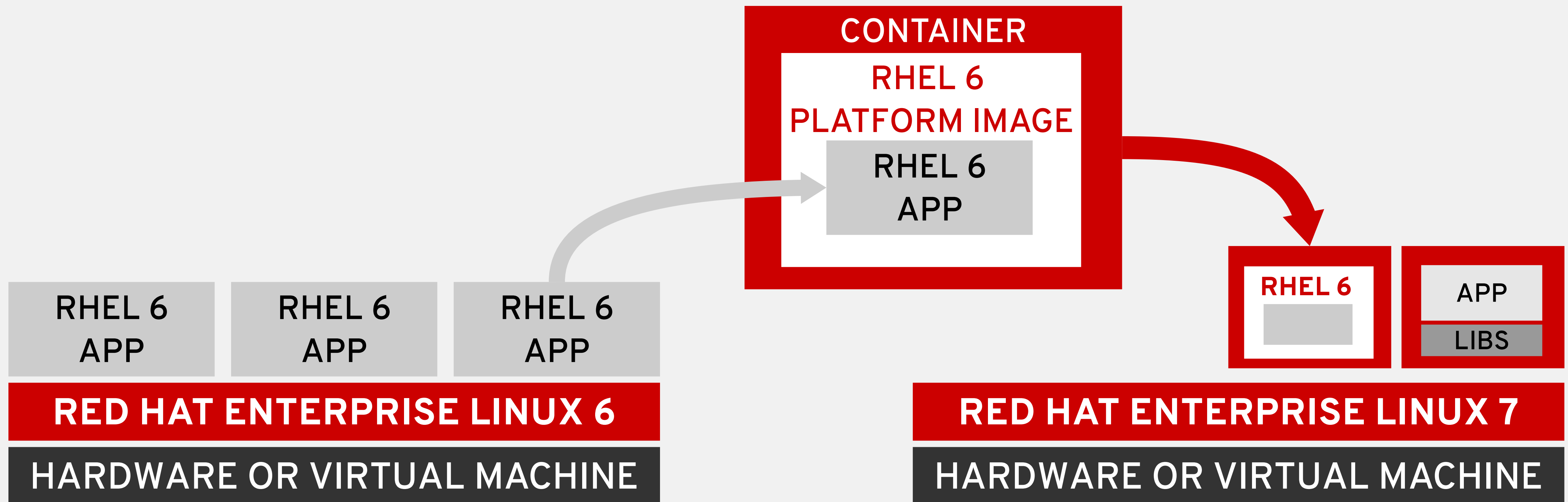
Many choices to upgrade existing deployments & optimize your business to run on one of

Red Hat's IaaS or PaaS offerings

Virtualize your apps & run on RHEL-based KVM VMs on RHEL, RHEV, RHEL OpenStack Platform & Certified Cloud Providers

Containerize your apps & run on RHEL-based containers on RHEL7,

RHEL Atomic Host,

Red Hat Atomic Enterprise Platform or OpenShift

In-Place upgrade from RHEL 6

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RUN RHEL 6 APPLICATIONS ON RHEL 7

CONTAINER

RHEL 6
PLATFORM IMAGE

RHEL 6
APP

RHEL 6
APP

RHEL 6
APP

RHEL 6
APP

RHEL 6

APP

LIBS

RED HAT ENTERPRISE LINUX 6

HARDWARE OR VIRTUAL MACHINE

RED HAT ENTERPRISE LINUX 7

HARDWARE OR VIRTUAL MACHINE

- **Deploy containerized RHEL 6 applications to RHEL 7 without porting or changing source code**
- **Make use of innovations in Red Hat Enterprise Linux 7 without compromising the reliability and security of existing Red Hat Enterprise Linux 6 apps**
- **Available as part of your Red Hat Enterprise Linux subscription**

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EASIER INSTALLATION AND DEPLOYMENT IN-PLACE UPGRADES FROM 6.X TO 7.X

1 **PRE-UPGRADE ASSISTANT**

2 **UPGRADE TOOL**

preupg

redhat-upgrade-tool

- Audits current OS state vs RHEL 7 profile and creates:
- HTML report of potential issues
- DIRECTORY of config files for modification
- Understands RHEL 6 and RHEL 5
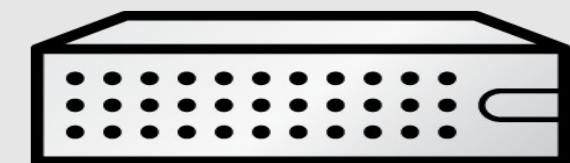- POST-INSTALL script to be run by user after upgrade

RED HAT ENTERPRISE LINUX 6.6
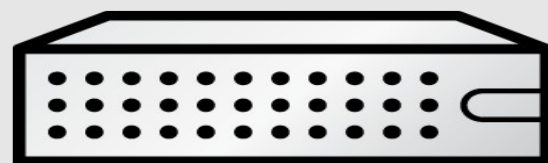
IF REPORT IS ACCEPTABLE

RED HAT ENTERPRISE LINUX 7.1

See documentation for validated configurations

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LOOKING FORWARD TO RHEL 7.2

Security Certifications and Software Assurance

SCAP

- National Institute of Standards and Technology (NIST) Security Content Automation Protocol (SCAP) 1.2

  - **Planned for RHEL 7.2: SCAP integrated with installation, systems can be provisioned into pre-configured security baselines created from SCAP Security Guide or custom SCAP profiles with the SCAP Workbench**

  - For RHEL 7: PCI-DSS v3, STIG (draft)

Certifications

- Common Criteria

- FIPS-140-2

- USGv6 - Standard required for IPv6 networking

- US Government Configuration Baseline (USGCB)

Unprecedented Security at Every Level

- Binary Hardening Measures
  - All apps compiled with -fstack-protector-strong and partial RELRO
  - Daemons and setuid apps additionally compiled with PIE and full RELRO

- UEFI Secure Boot

- Protection against Denial of Service (DDOS) attacks enhanced at multiple levels of the network stack

- Crypto enhancements in Libreswan (IKEV2, new ciphers), PT-EAP for Trusted Network Connect, OpenSSL (Curve25519, Ed25519 elliptic-curve signature for user/host keys)

- Containers secured by proven technologies: SELinux & sVirt
  - User Namespaces now available in kernel as Technology Preview
  - Future: OpenSCAP for containers (scan & measure)

Uptime
# KPATCH Live Patching for the RHEL Kernel

Critical security fix available but you can't afford the downtime?

- Patch your kernel dynamically with Kernel Live Patch

- Hot patch modules available for RHEL 7

- Delivered via Red Hat support organization

- Ask your TAM or Sales representative to join the Kpatch Special Interest Group

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Speed
Enhancing Kernel, Virt and Network Performance

- Core networking path performance **accelerated by 35% for RHEL7.2**

- Control Groups

  - Memcgroup integrated with Unified Hierarchy

  - Future: Swap/file cache cgroup

- Spinlock optimizations

  - added to mutex, epol, futex & scheduler

  - eliminated from futex wakeup code paths

  - added MCS locks, which eliminates inter-node cache-line bouncing on NUMA systems

- Newidle balance support in scheduler

- Per-process transparent huge pages

- HugeTLBFS improvements; allocation at runtime, on specific NUMA nodes, page-fault scalability

- SR-IOV, NUMA, huge pages, vCPU pinning
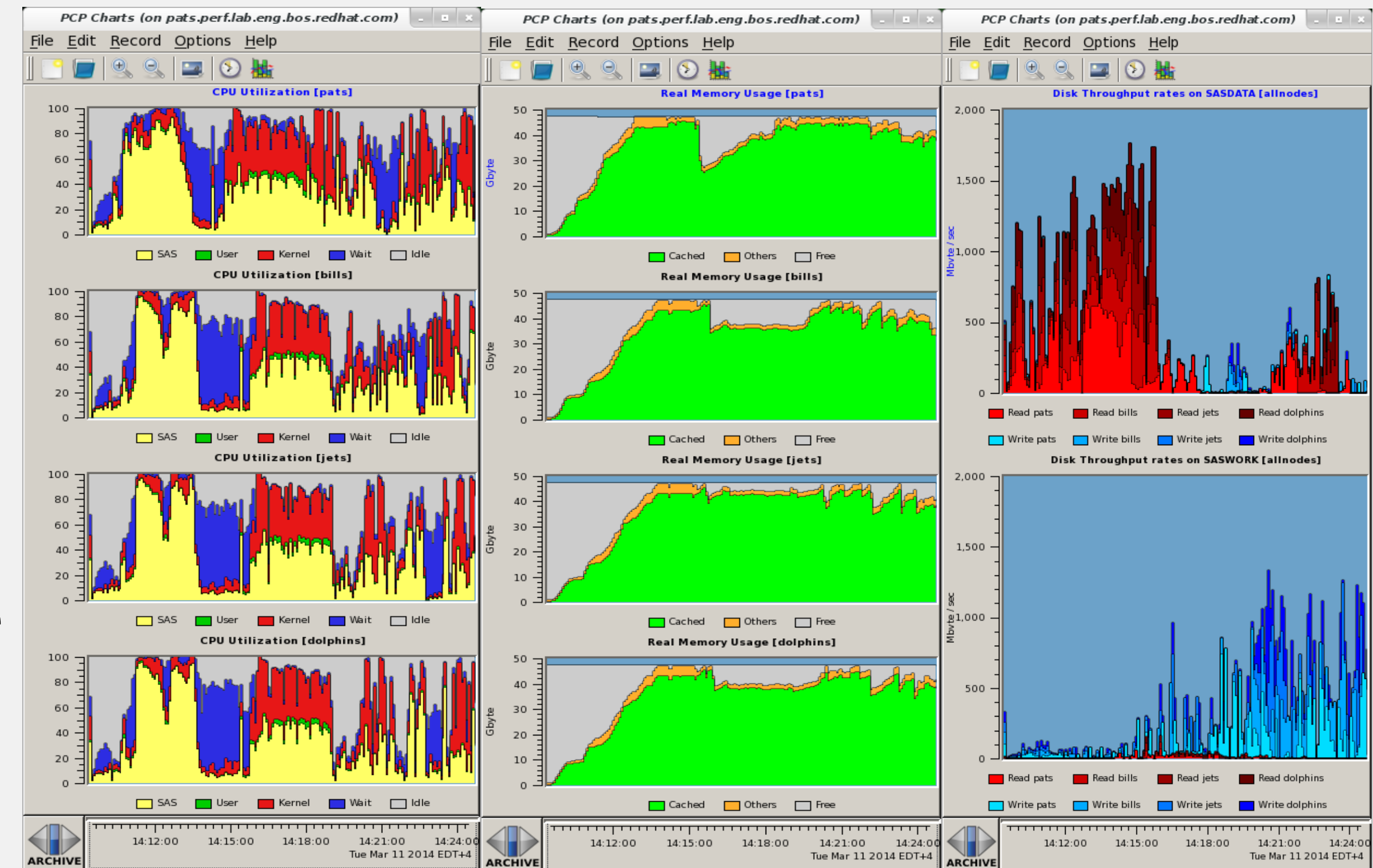
Getting to Line Rate
Accelerated Packet Processing with DPDK

Data Plane Development Kit (DPDK) 2.0

- Accelerated network packet processing in user space

- <u>Works with bare metal, virtual machines and containers</u>

- Integrates with vhost-user and Open vSwitch 2.4

- Performing at **97% of line rate**
  - Application-specific, trusted network

- Available via the RHEL 7 Extras channel

Enabling Network Functions Virtualization

OpenStack & Cloud Deployments through RHEL

Realtime KVM for OpenStack (planned)

RHEL for Realtime in host and now ...

Run Realtime applications **in** a KVM virtual machine!

- Virtualized Realtime hardware configurations

Visualize Complex Network Configurations

Easily view a diagram of your host's entire networking setup with plotnetcfg

- Supports all kinds of network interfaces
- Understands VLANs, bridges, virtual Ethernet (veth) pairs and Open vSwitch
- Understands Openstack and containers
- See it integrated into Cockpit GUI in the Demo area
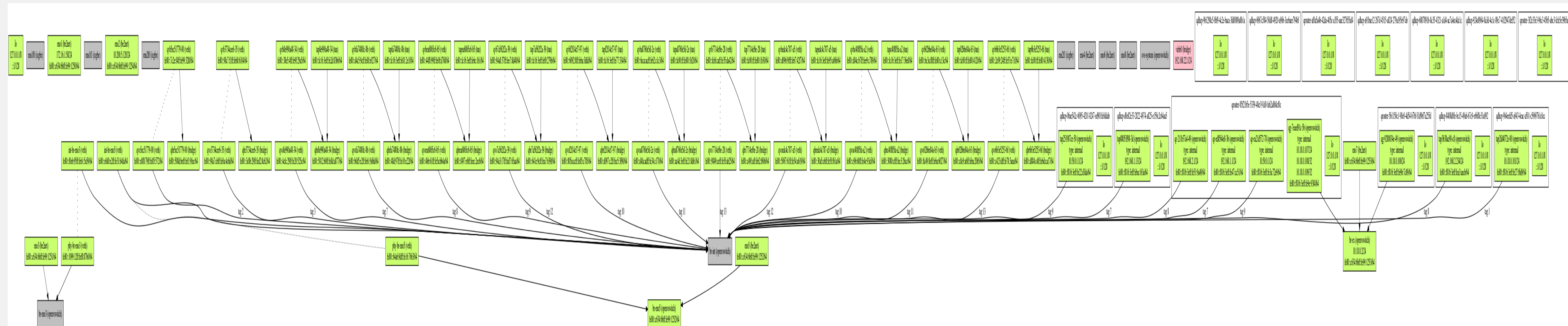
Empowering DevOps

Red Hat Software Collections 2.0

- Latest stable versions of dynamic languages, web servers and open source databases for users to create modern applications that can be confidently deployed into production
- *Ruby 2.2, Rails 4.1, node.js 0.10.33, Python 3.4, PHP 5.6 ,Perl 5.20,MySQL 5.6, MariaDB 10, Nginx 1.6, Java Common & **more**!*
- *https://access.redhat.com/documentation/en-US/Red_Hat_Software_Collections/index.html*

Developers Toolset 3.0

- Latest stable versions of GCC with C, C++. and Fortran support as well as debugging and developer performance monitoring tools
- *GCC V 4.9, Eclipse V.4.4, ltrace 0.7.91, gdb 7.8, binutils 2.24, elfutils 0.159, Valgrind 3.9.0 & **more**!*
- *https://access.redhat.com/documentation/en-US/Red_Hat_Developer_Toolset/index.html*

Containers Development Kit

- Collection of tools and resources that enable developers to easily build and maintain containerized applications based on Docker for the Red Hat ecosystem (including RHEL Vagrant Boxes)
- Part of Red Hat Connect for Technology Partners
- *https://connect.redhat.com/zones/containers-red-hat-enterprise-linux/red-hat-container-development-kit*

Optimizing Storage Performance for Speed and Efficiency

- Tier your fast and slow storage

- Maximize performance with flash in the top tier with LVM Caching

- Optimize storage by provisioning only as needed with LVM thin provisioning. Alerts and actions selectable when thin volume is becoming full

- Improve performance and efficiency with point-in-time-copy with LVM snapshots; store only a single shared copy of data

LVM cache

PCI flash

LVM thin provisioning

Pool

LVM snapshots

Pool

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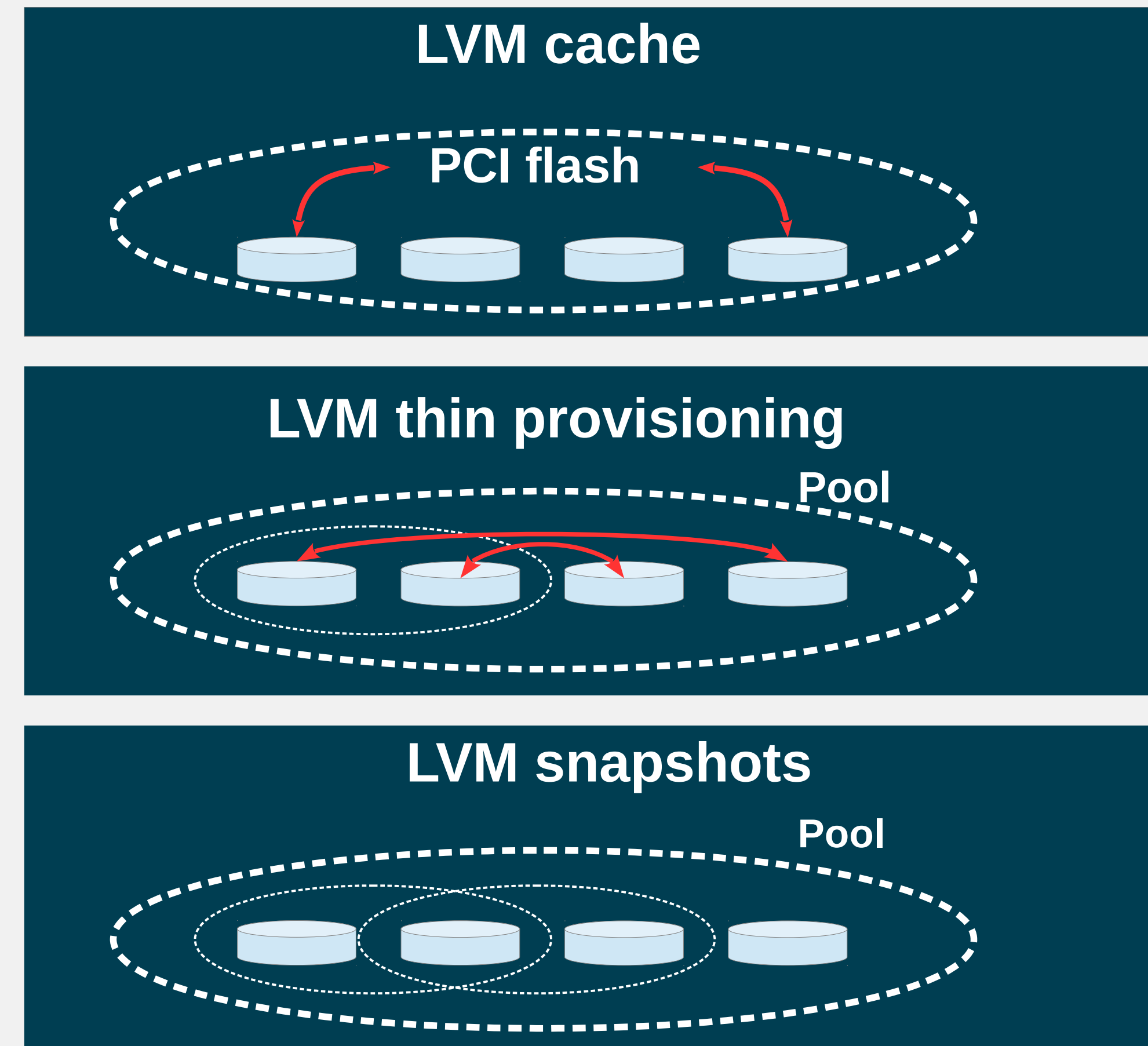
Improving Storage Ease-of-Use

- Open source, vendor-agnostic API and CLI to manage external storage

  - LibStorageMgmt lets you provision a LUN, export an NFS mount-point, take a hardware snapshot, monitor status...

- Reduce human errors with improved syntax checking for multipath devices, and world wide IDs for identification

- Snapper utility for managing LVM and Btrfs snapshots

  - create and compare snapshots

  - revert between snapshots

  - automatic snapshots timelines

- Move multiple logical volumes as a unit (pvmove --atomic)

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Contemporary Desktop Refreshed in RHEL 7.2

More rapid desktop update cycle

- RHEL 7.2 will update to GNOME 3.14
  - GNOME Software package manager
  - Usability improvements for **WACOM tablets**
  - Improved touchscreen support, with **multi-touch gestures for both the system and applications**
  - Shell bug-fixes and **improvements for multi-monitors**, and better integration with apps-dialogs
- Also planned
  - Improved handling of **HiDPI displays**
  - Wayland Technology Preview

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Further Innovation in Tools and Features

- OverlayFS - persistent stacking filesystem
  - Page cache sharing, fast container startup
  - EXT4 now, XFS next
- NFSoRDMA server in tech preview
  - For workloads with larger I/O sizes
  - Less CPU consumption than Ethernet
- Highly available PTP configuration
  - Failover between multiple PTP domains and NTP sources
- Checkpoint/Restore in Userspace (CRUI)
  - Testing additional enterprise applications
  - Integrated with clustering!

- Java 8 Support for RHEL 6 and 7
  - lambda / functional programming, Nashorn JS engine, new Date/Time API
- SystemTap
  - New sampling profiler, additional thread monitoring information, better multi-user JVM monitoring
- Kexec kdump & Crash
  - Kdump support >16T physical memory system
  - Crash support > 16T core file
  - Kdump integration in Atomic Host

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BEYOND RHEL 7

FOR MORE DETAILS ON RHEL TECHNOLOGIES & ENHANCEMENTS
Join us tonight at the 7PM BOF
Visit us at the Demo Pods

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