

RED HAT ENTERPRISE LINUX 7

TECHNICAL OVERVIEW

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2014-07-08

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RED HAT ENTERPRISE LINUX 7 INTRODUCTION

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SUMMARY

RED HAT ENTERPRISE LINUX 7 INTRODUCTION

RED HAT ENTERPRISE LINUX 7

REDEFINING THE ENTERPRISE OS

RED HAT® ENTERPRISE LINUX® 7

FLEXIBILITY to quickly adapt to demands for business agility

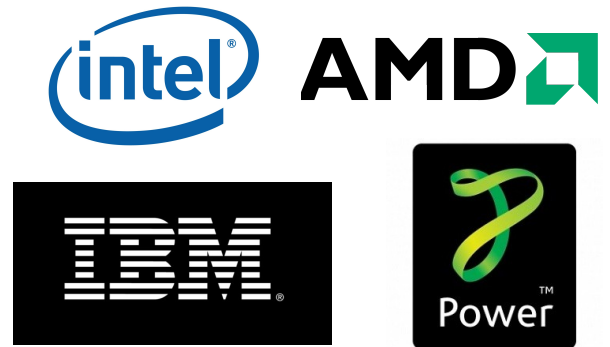
STABILITY to efficiently meet challenges of datacenter virtualization and cloud

CERTAINTY of mission-critical reliability and military-grade security

90% OF FORTUNE 500 COMPANIES TRUST RED HAT ENTERPRISE LINUX FOR THEIR CRITICAL BUSINESS INFRASTRUCTURE.

RED HAT ENTERPRISE LINUX 7 BASICS

- Based on Fedora 19, the upstream kernel version 3.10 and over 4000 patches (additional features, bugfixes, security errata)
- Supported hardware architectures:
 - Intel/AMD 64-bit (x86_64)
 - IBM POWER
 - IBM System z
- Support for 32-bit applications enabled via inclusion of 32-bit libraries (multilib).



RED HAT ENTERPRISE LINUX 7 HIGHLIGHTS

FLEXIBLE

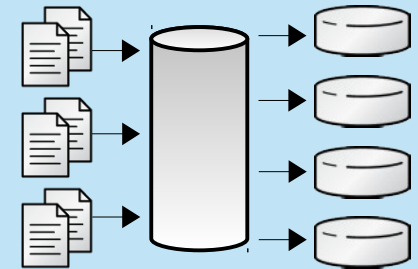
**LIGHTWEIGHT
APPLICATION ISOLATION
(LINUX CONTAINERS)**



**WINDOWS
INTEROPERABILITY**



**SCALABLE
FILE SYSTEMS**

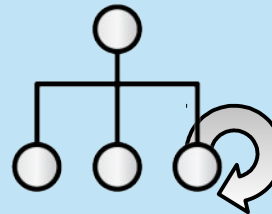


STABLE AND EFFICIENT

**OPTIMAL
PERFORMANCE
VIA PROFILES**



**STREAMLINED
INSTALLATION AND
DEPLOYMENT**



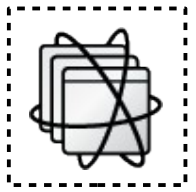
**SYSTEM MANAGEMENT
AND FEATURES**



CERTAINTY OF MISSION-CRITICAL RELIABILITY AND MILITARY-GRADE SECURITY

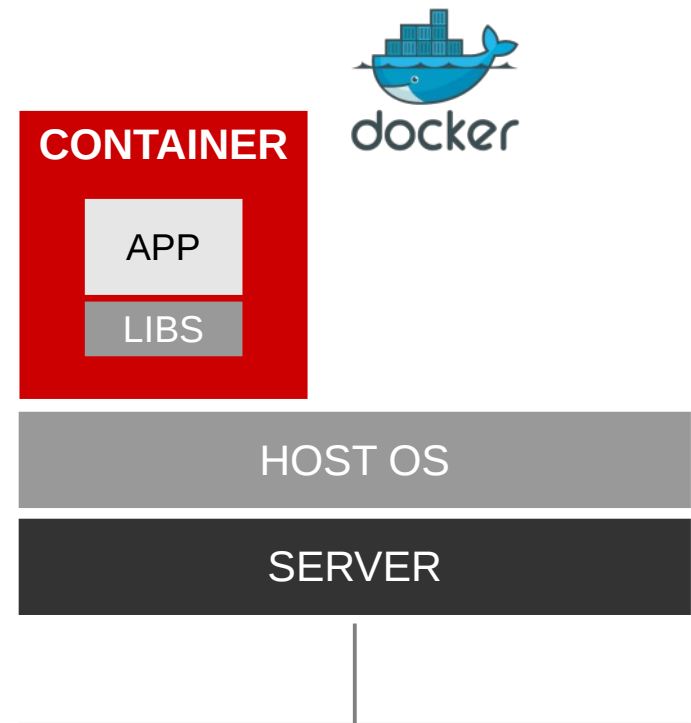
LIGHTWEIGHT APPLICATION ISOLATION via LINUX CONTAINERS

LINUX CONTAINERS

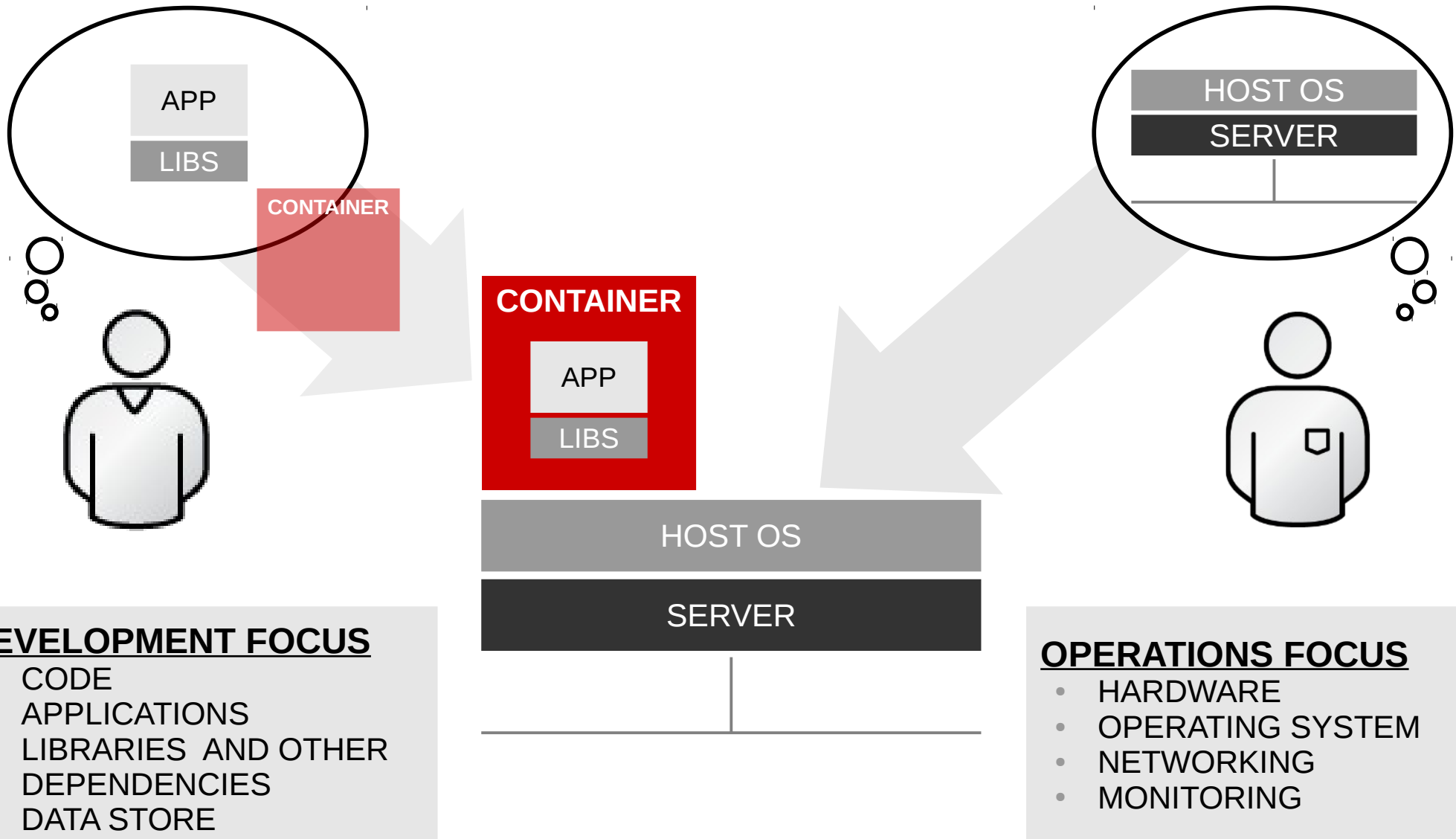
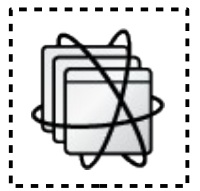


Software packaging concept that typically includes an application and all of its runtime dependencies.

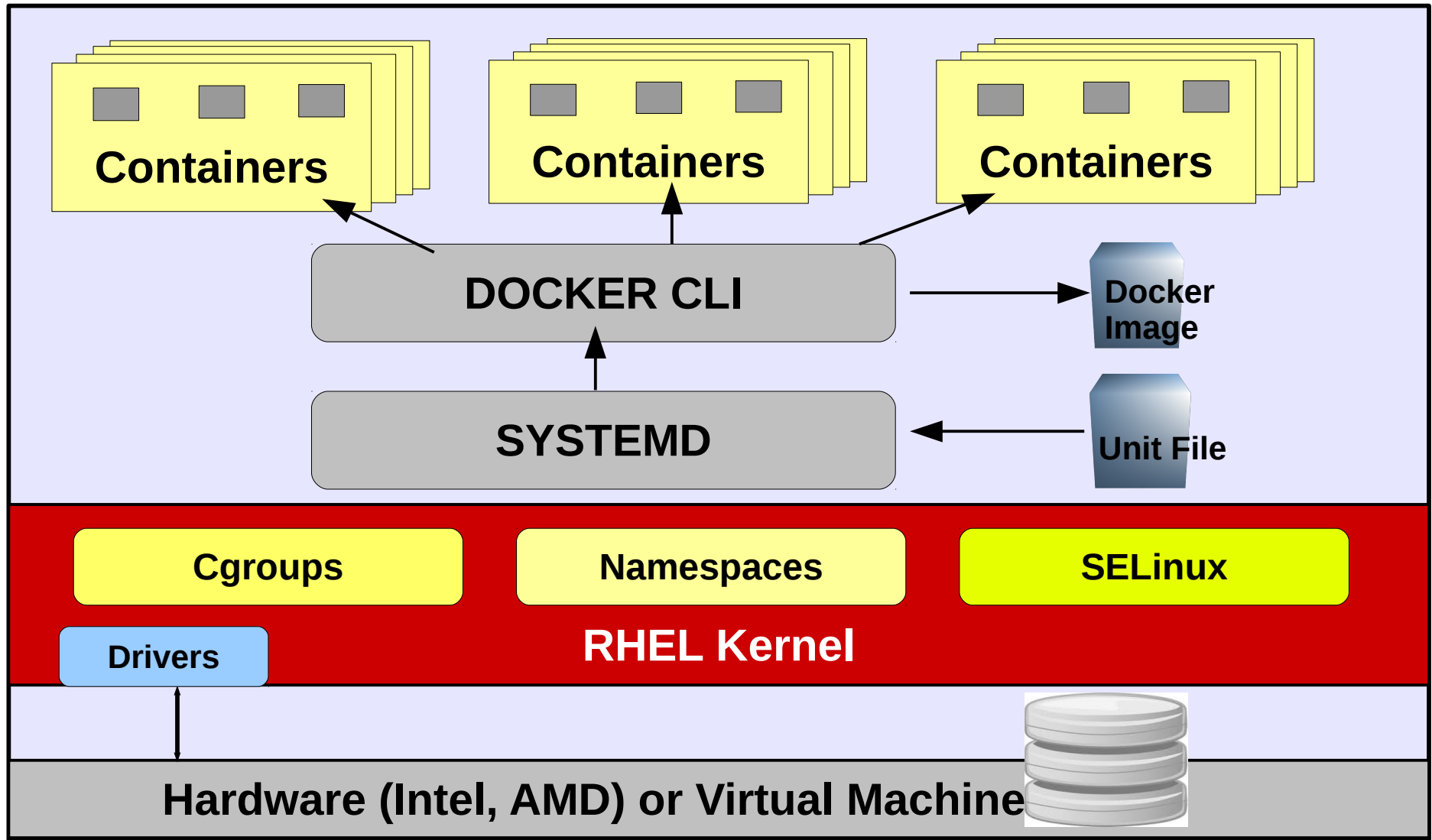
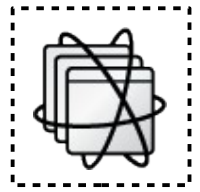
- Easy to deploy and portable across host systems
- Isolates applications on a host operating system. In RHEL, this is done through:
 - Control Groups (cgroups)
 - kernel namespaces
 - SELinux, sVirt



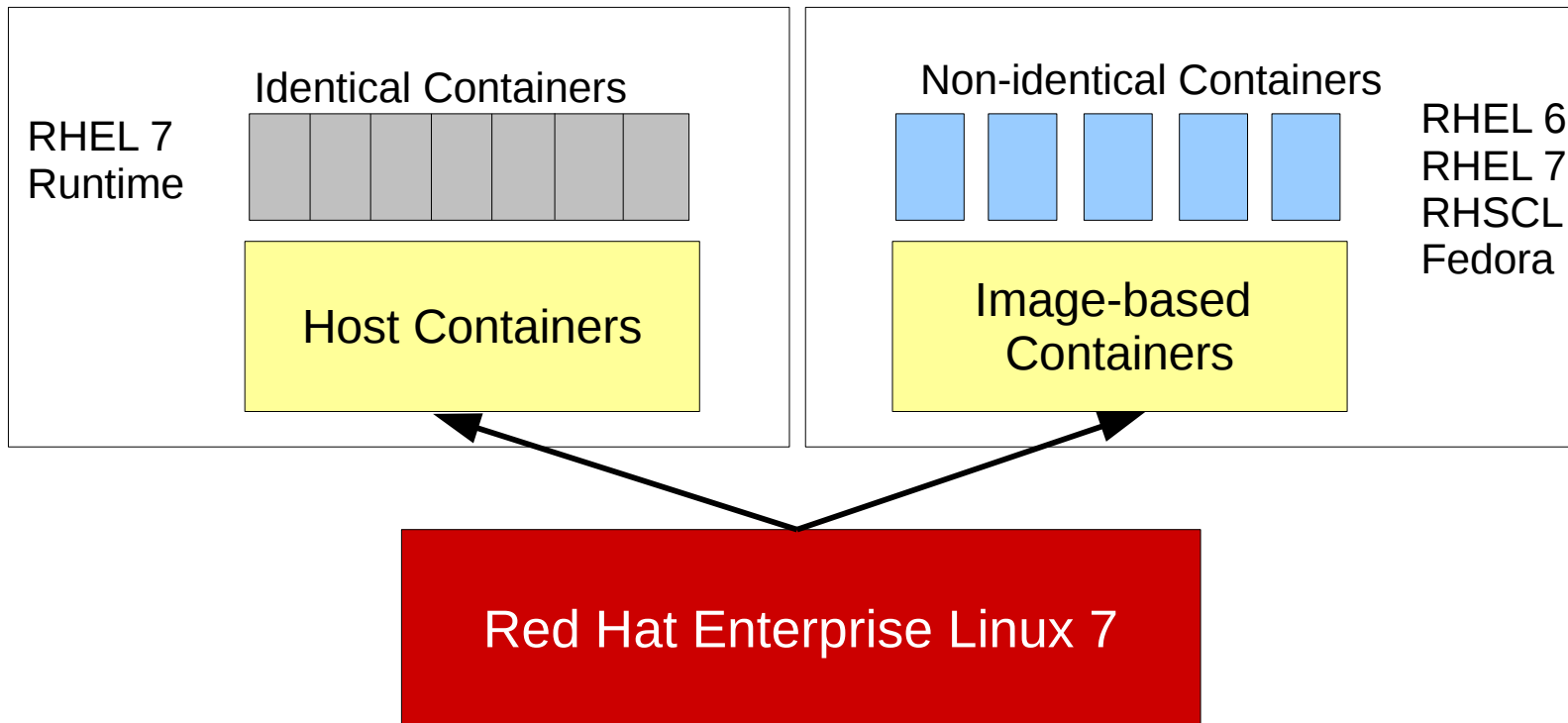
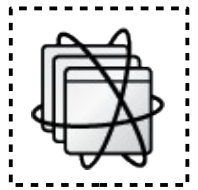
CONTAINERS ENABLE CONTINUOUS DELIVERY



RHEL 7 Containers Architecture with Docker CLI



CONTAINERS IN RED HAT ENTERPRISE LINUX 7



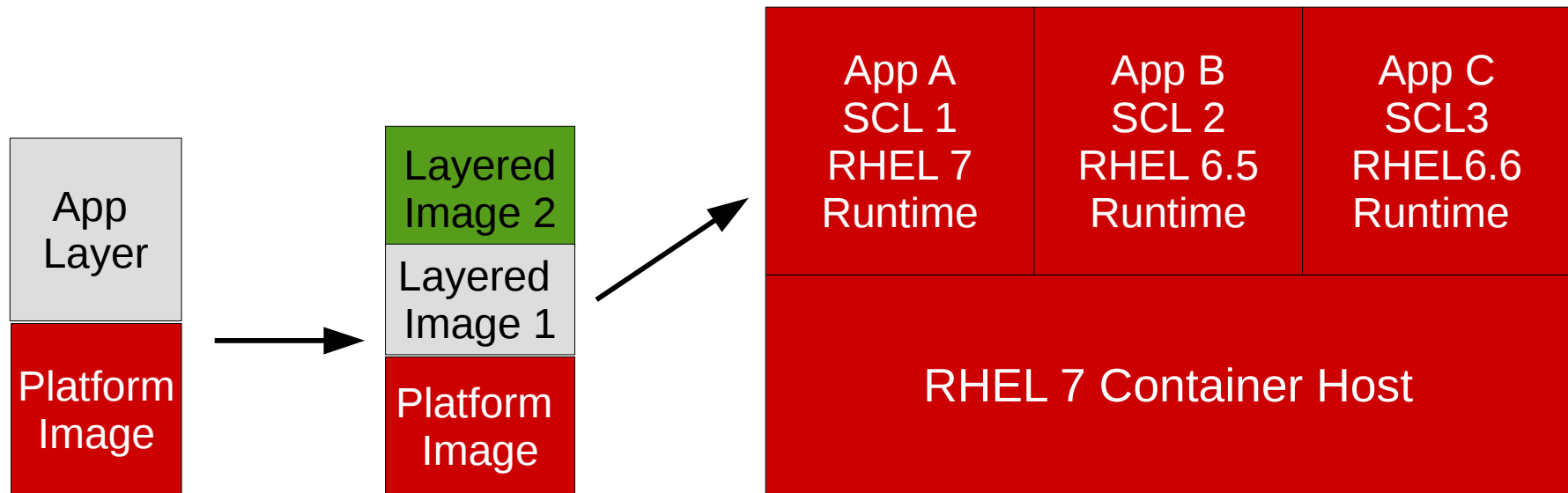
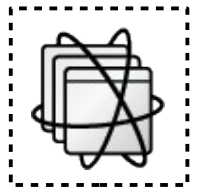
Docker
format

RHEL 7 supports both host containers (RHEL 7 carved into secure containers) and image-based containers using Docker format

Linux containers can be deployed in baremetal or virtual environments

RHEL 7 supports both Virtualization with KVM and Application Isolation with Linux Containers

IMAGE -BASED CONTIANERS WITH DOCKER TECHNOLOGY

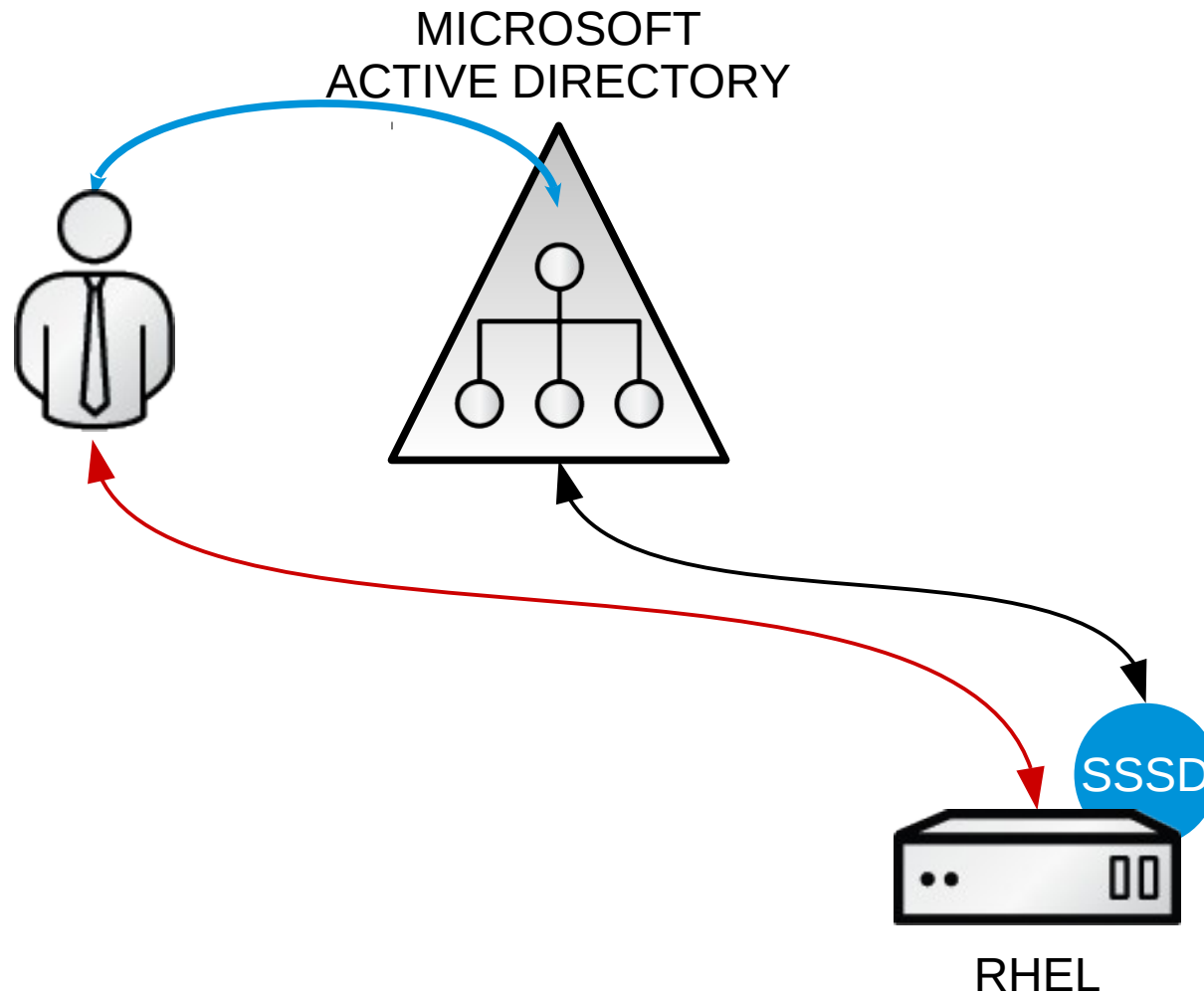
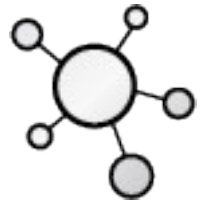


RHEL 7 Container Host provides the capability to run images built with Docker format for content distribution

RHEL runtimes and application dependencies built into a Docker image and run inside the container

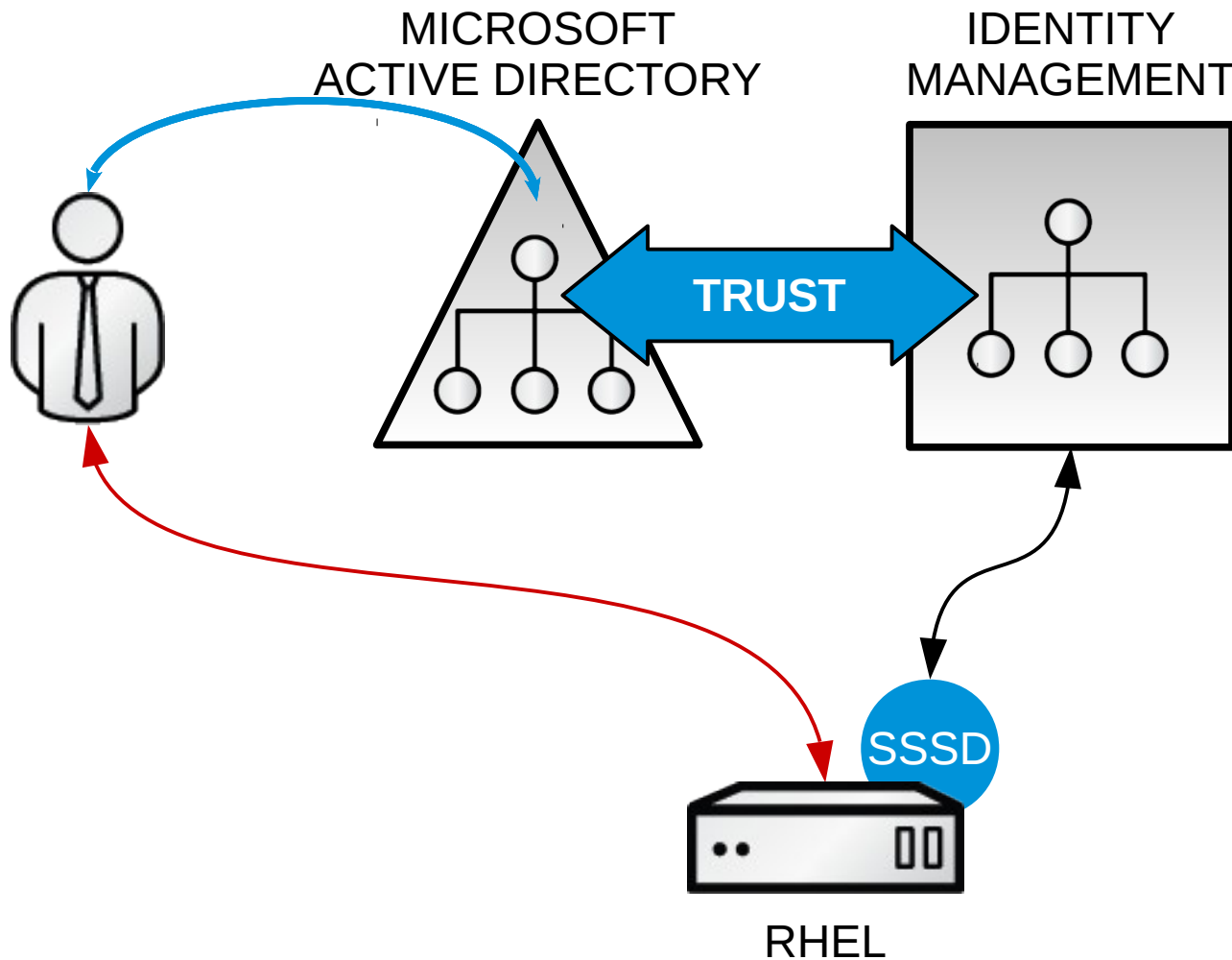
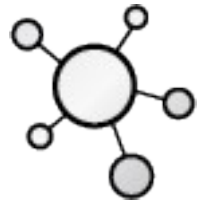
WINDOWS INTEROPERABILITY

WINDOWS INTEROPERABILITY VIA DIRECT INTEGRATION



Easily connect a Red Hat Enterprise Linux client to an existing Windows domain with *realmd*.

WINDOWS INTEROPERABILITY VIA INDIRECT INTEGRATION



**ALLOWS FOR
EASIER
CENTRALIZED
NATIVE LINUX
MANAGEMENT
OF MULTIPLE
LINUX CLIENTS**

¹ Source: Research by TechValidate: www.techvalidate.com/product-research/red-hat-enterprise-linux

FILE SYSTEMS AND STORAGE

CHOICE OF FILE SYSTEMS



- Scale file systems to 500TB with new default filesystem XFS
- Scale to 50TB with ext4
- Btrfs also available¹
- Parallel NFS v4 provides improved performance and throughput

Type	Supported Limit	Root	Boot	Comments
Single-node				
XFS	500TB	Yes	Yes	System default
ext4	50TB	Yes	Yes	Driver allow access to older versions (ext2, ext3).
btrfs ²	50TB	Yes	Yes	
Network/Multi-node				
GFS2	2-16 nodes	Yes	No	Shared-storage file system

¹ Available as a Technology Preview

FILE SYSTEMS



- Global File System (*GFS2*) improvements include:
 - Better scalability and performance as tools are now aware of device topology and handle RAID stripe alignment, placement of journal and resource groups more efficiently.
 - Improved journaling.
 - Integrated profiling with *Performance Co-Pilot* with the introduction of a *GFS2* module for PCP.
- Samba v4.1 includes support for SMB 3.0 protocol resulting in better performance and security.

STORAGE



- Premier support for enterprise storage arrays.
- Scalable storage stack supporting large scale configuration.
- Implementation of LVM snapshots based on thin provisioning.
 - Storage allocated only when needed.
 - Faster performance for recursive snapshots.

STORAGE



- Easy storage configuration with the introduction of *System Storage Manager*.
 - Provides easy to use command line interface for configuration of file and storage. Reduces the learning curve for junior system administrators.
- Support for tiered storage for improved performance.
 - New target *dm-cache* that allows high-speed solid state drives (SSD) to serve as a cache for slower rotational media.
- New and improved software-based iSCSI target mode (RFC-3720). Implemented in the kernel compared to older implementation which was in user-space.

STORAGE



- Dynamic detection of new LUNs. Reduces the amount of system down-time and manual intervention.
- LibStorageMgmt * provides the ability to manage external storage devices from the RHEL system.
 - Simplified provisioning of storage volumes on Linux shared storage appliance with the help of a new service called *targetd*.
- Unified management of btrfs and LVM snapshots with the introduction of *snapper*.
 - Allows administrators to create, delete, label and compare snapshots of volumes.

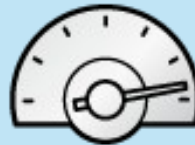
* Technology Preview

OPTIMAL PERFORMANCE MANAGEMENT AND TOOLING

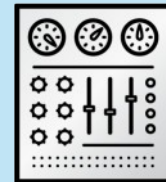
PERFORMANCE ENHANCEMENTS WITH RED HAT ENTERPRISE LINUX 7



**BUILT-IN PERFORMANCE
PROFILES SIMPLIFY
CONFIGURATION**

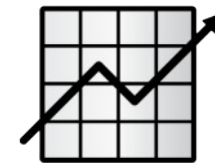


**MONITORING WITH
PERFORMANCE CO-PILOT
AND THERMOSTAT**



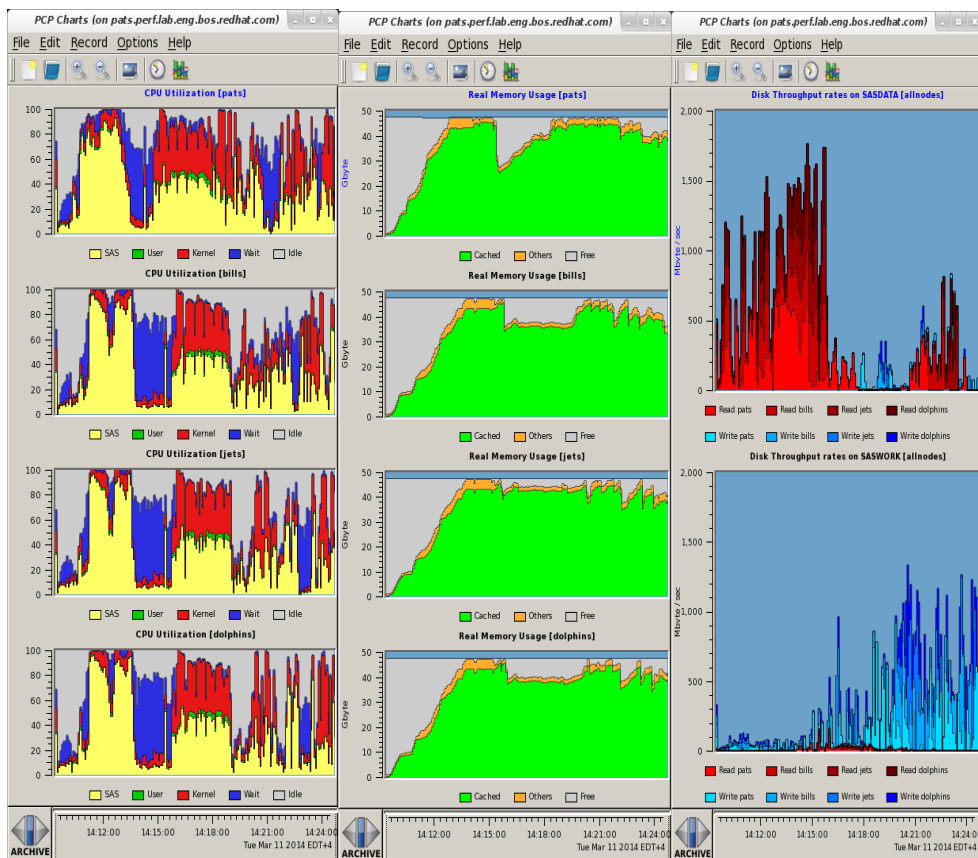
**FINE-TUNE PERFORMANCE
WITH ENHANCED TOOLING
VIA TUNA AND TUNED**

OPTIMAL PERFORMANCE VIA PROFILES

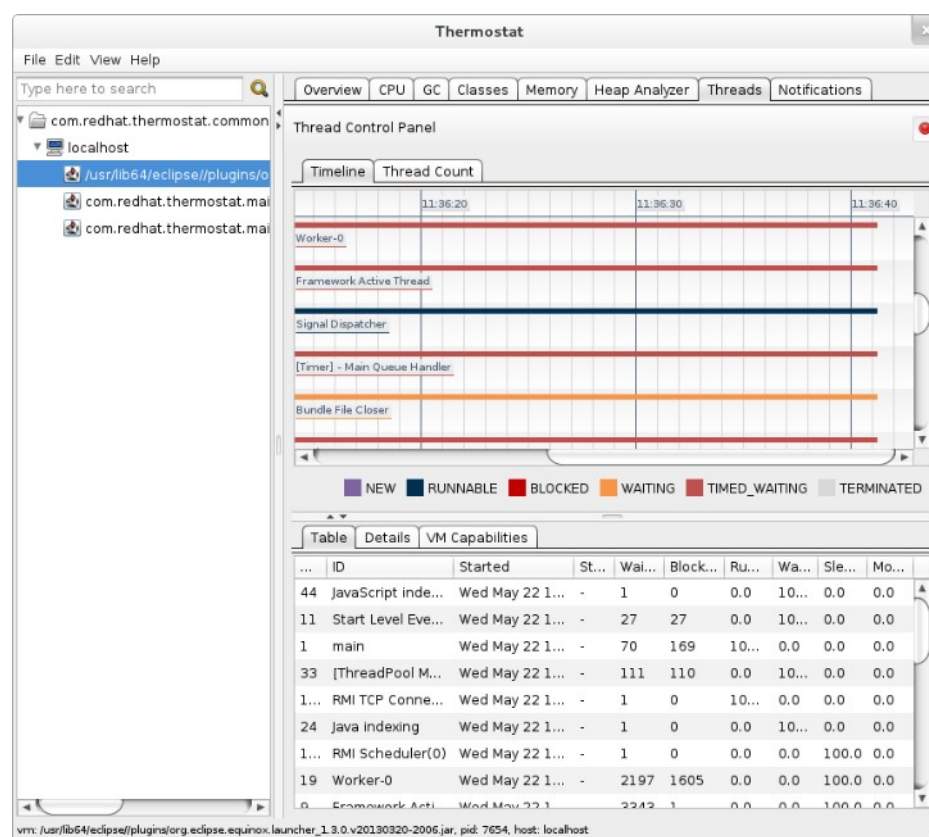


Optimal performance management via enhanced performance tuning at install, simplified instrumentation and tuning features, and performance monitoring tooling

PERFORMANCE CO-PILOT (PCP)



THERMOSTAT (FOR JVMs)



PROFILING AND MONITORING WITH *TUNA*



- Tool for fine grained control
- Display applications / processes
- Displays CPU enumeration
- • Socket (useful for NUMA tuning)
- • Dynamic control of tuning
 - Process affinity
 - Parent & threads
 - Scheduling policy
 - Device IRQ priorities, etc

Tuna (on dhcp47-40)

Socket 0			Socket 1			IRQ	Affinity	Events	Users
Filter	CPU	Usage	Filter	CPU	Usage				
<input checked="" type="checkbox"/>	1	2	<input checked="" type="checkbox"/>	0	12	148	0-15	0	p4p2-6
<input checked="" type="checkbox"/>	3	0	<input checked="" type="checkbox"/>	2	5	147	0-15	0	p4p2-5
<input checked="" type="checkbox"/>	5	0	<input checked="" type="checkbox"/>	4	1	146	0-15	0	p4p2-4
<input checked="" type="checkbox"/>	7	0	<input checked="" type="checkbox"/>	6	3	145	0-15	0	p4p2-3
<input checked="" type="checkbox"/>	9	0	<input checked="" type="checkbox"/>	8	8	144	0-15	0	p4p2-2
<input checked="" type="checkbox"/>	11	0	<input checked="" type="checkbox"/>	10	0	143	0-15	0	p4p2-1
<input checked="" type="checkbox"/>	13	0	<input checked="" type="checkbox"/>	12	0	142	0-15	1	p4p2-0
<input checked="" type="checkbox"/>	15	0	<input checked="" type="checkbox"/>	14	3	140	0-15	0	p4p1-7
						139	0-15	0	p4p1-6

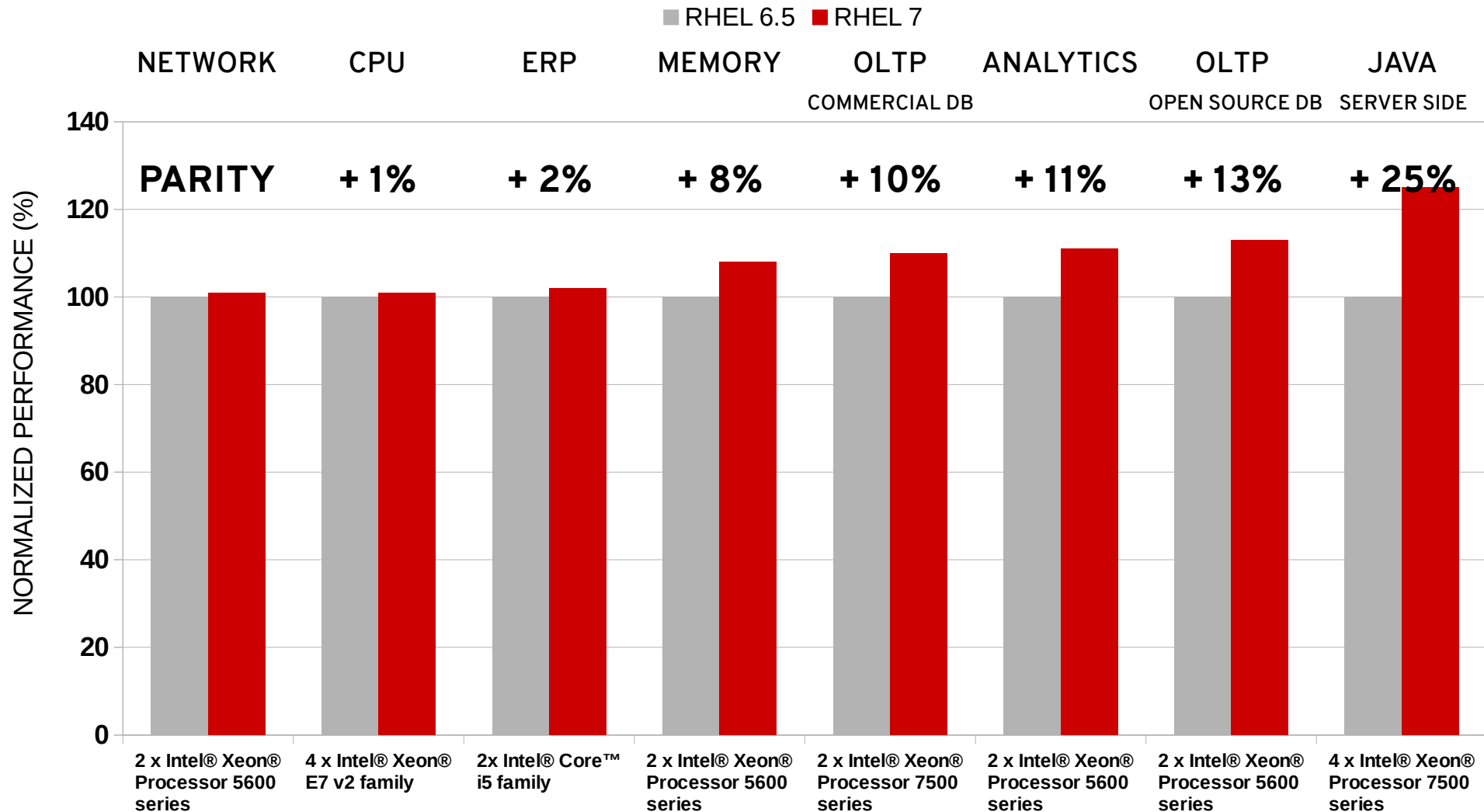
PID	Policy	Priority	Affinity	VolCtxtSwitch	NonVolCtxtSwitch	Command Line
10600	OTHER	0	0-15	437	1	/usr/libexec/notification-area-applet --oaf-activ
10504	OTHER	0	0-15	544	1	/usr/libexec/notification-area-applet --oaf-activ
11065	OTHER	0	0-15	3796	1	/usr/libexec/notification-daemon
11066	OTHER	0	0-15	781	1	/usr/libexec/notification-daemon
7487	OTHER	0	0-15	2113	2	/usr/libexec/polkit-1/polkitd
8669	OTHER	0	0-15	120	1	/usr/libexec/polkit-gnome-authentication-agent
3286	OTHER	0	0-15	3502	1	/usr/libexec/postfix/master
7641	OTHER	0	0-15	35	2	/usr/libexec/pulse/gconf-helper
26428	OTHER	0	0-15	5514763	132	/usr/libexec/qemu-kvm -S -M rhel6.3.0 -enable
26510	OTHER	0	0-15	6018050	146	/usr/libexec/qemu-kvm -S -M rhel6.3.0 -enable
26599	OTHER	0	0-15	366744	88	/usr/libexec/qemu-kvm -S -M rhel6.3.0 -enable
26352	OTHER	0	0-15	400968	126	/usr/libexec/qemu-kvm -S -M rhel6.3.0 -enable
7497	OTHER	0	0-15	23	2	/usr/libexec/rtkit-daemon
10573	OTHER	0	0-15	238	1	/usr/libexec/trashapplet --oaf-activate-iid=OAF
10473	OTHER	0	0-15	231	1	/usr/libexec/trashapplet --oaf-activate-iid=OAF
7596	OTHER	0	0-15	1626	7	/usr/libexec/udisks-daemon
10470	OTHER	0	0-15	1124	1	/usr/libexec/wnck-applet --oaf-activate-iid=OAF
10567	OTHER	0	0-15	1155	1	/usr/libexec/wnck-applet --oaf-activate-iid=OAF
3310	OTHER	0	0-15	154	0	/usr/sbin/abrt
2856	OTHER	0	0-15	2	0	/usr/sbin/acpid
3371	OTHER	0	0-15	21	0	/usr/sbin/atd
3500	OTHER	0	0-15	10875	1	/usr/sbin/certmonger -S -p /var/run/certmonger
6561	OTHER	0	0-15	1814	2	/usr/sbin/console-kit-daemon --no-daemon
3512	OTHER	0	0-15	10814	0	/usr/sbin/dnsmasq --strict-order --bind-interfac
2654	OTHER	0	0-15	49367	2672	/usr/sbin/ehcnd --pidfile /var/run/ehcnd.pid
7387	OTHER	0	0-15	485	3	/usr/sbin/gdm-binary -nodaemon
2108	OTHER	0	0-15	1	0	/usr/sbin/mcman-daemon

SOLID PERFORMANCE ACROSS WORKLOADS

RHEL 7 VS RHEL 6.5

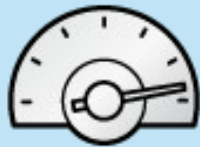
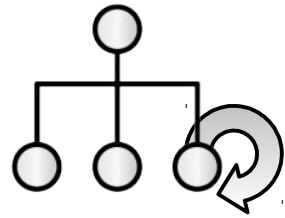


PERFORMANCE GAINS ACROSS WIDE RANGE OF WORKLOADS
AND MULTIPLE GENERATIONS OF HARDWARE

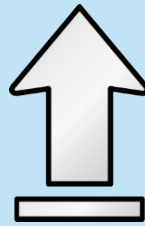


STREAMLINED INSTALLATION AND DEPLOYMENT

STREAMLINED INSTALLATION AND DEPLOYMENT



**SPEED DEPLOYMENT
WITH SERVER PROFILES**



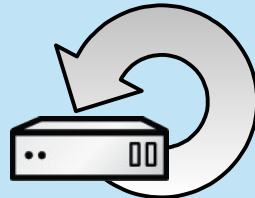
**IN-PLACE UPGRADES
FROM 6.X TO 7**



**PRIORITIZE CRITICAL
SERVICES AT START-UP**



**EASILY CREATE CUSTOM
INSTALL IMAGES**



**SAFELY ROLL-BACK
DURING INSTALL**



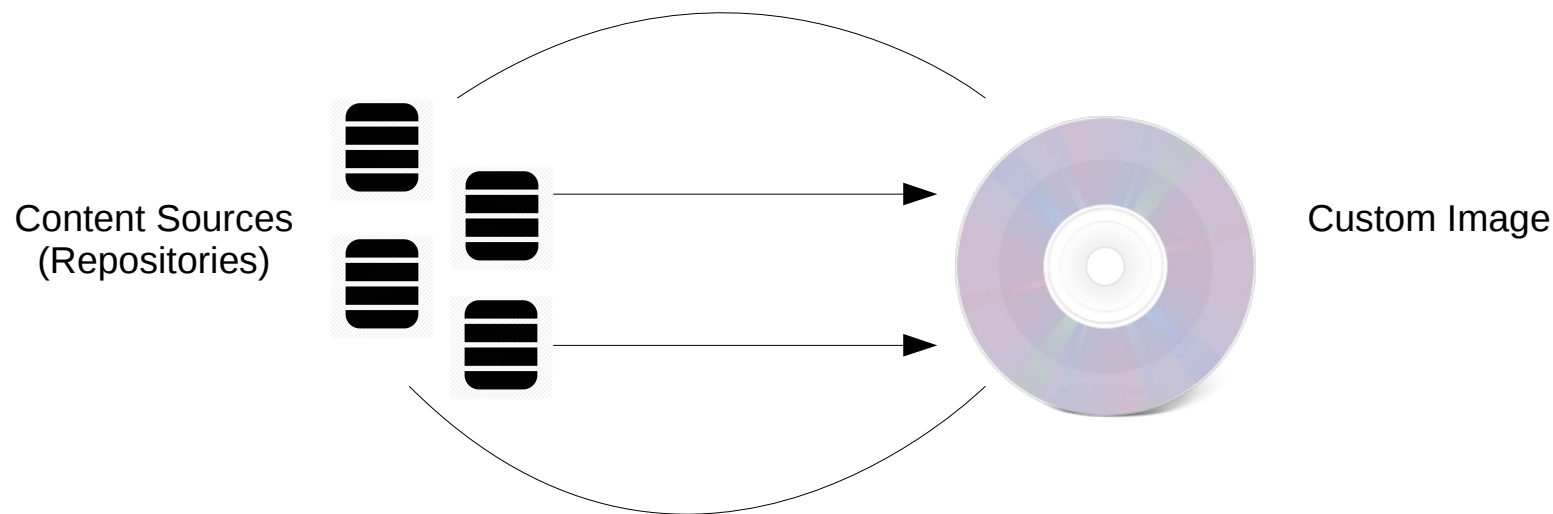
**DRAMATICALLY SPEED
START-UP TIMES**

EASILY CREATE CUSTOM INSTALL IMAGES WITH ANACONDA AND KICKSTART



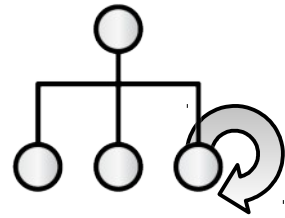
- RHEL 7 introduces the ability to create, install and manage custom images for physical, virtual and cloud deployments

Live Media Creator



- This is alongside existing capabilities to create yum repositories
- Install and manage images using the same anaconda and Kickstart code used for bare metal installs
- Automate custom images using Kickstart

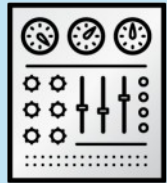
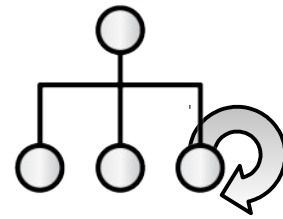
Installation and Deployment



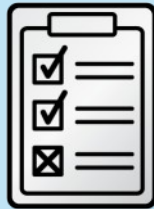
- Software selection provides pre-configured package selections for quicker deployment.
- Spin custom installable images and Live images with the help of Live Media Creator.
- Provision of system roll-back at install time. Customers doing a Kickstart installation and using LVM can reserve a specific size or percentage of their volume group for roll-back or snapshots



CENTRALIZED MANAGEMENT AND FASTER BOOT UP



**CENTRALLY MANAGE
PROCESSES,
SERVICES, SECURITY**



**PRIORITIZE AND
ORDER SERVICES
AT START-UP**



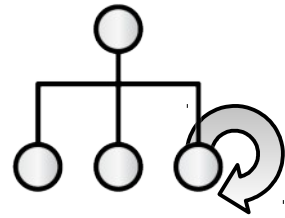
**DRAMATICALLY
SPEED START-UP
TIMES**



**COMPATIBLE WITH
EXISTING SCRIPTS
(SYSV AND LSB)**

- **Next generation system and service manager, systemd, provides on-demand service start-up and better transactional dependency.**
- **Compatible with SysV and LSB init scripts.**

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



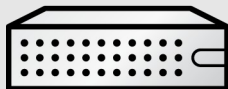
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PRE-UPGRADE ASSISTANT



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

RED HAT
ENTERPRISE
LINUX 6.5



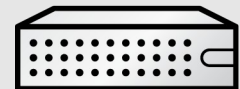
IF REPORT IS ACCEPTABLE

2

UPGRADE TOOL



RED HAT
ENTERPRISE
LINUX 7.0



See documentation for valid configurations

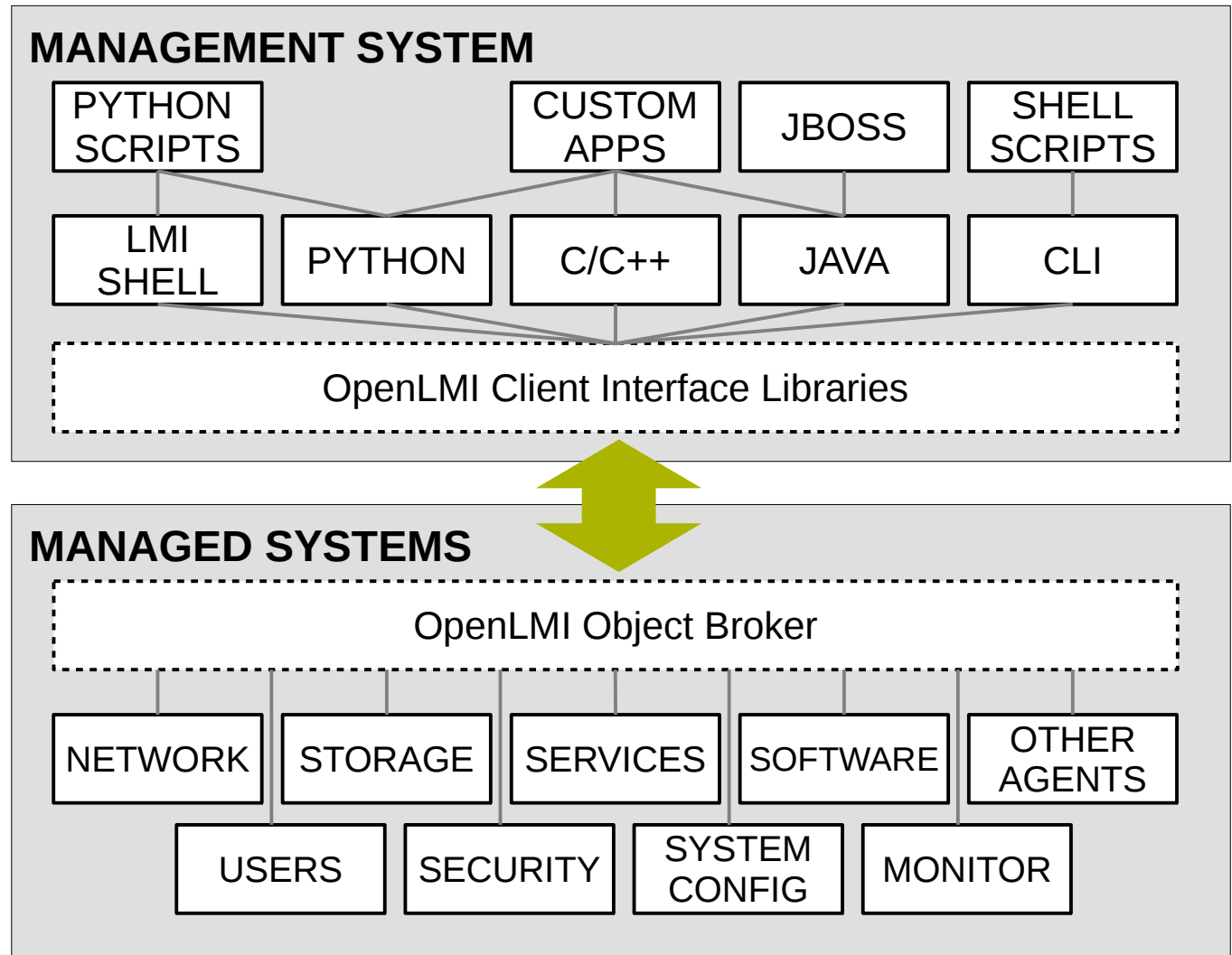
SYSTEM MANAGEMENT AND FEATURES

SYSTEM MANAGEMENT VIA OPENLMI



- Open standards-based management framework for low-level system configuration
- Unified management tools and system-wide resource management allow users to streamline administration
- Supports traditional Linux tools: CLI, scripts & SW tools
- Example: create 5 drive RAID5 array on remote server example.com:

*"lmi -h example.com storage
raid create name=R1 5 sdb
sdc sdd sde sdf"*

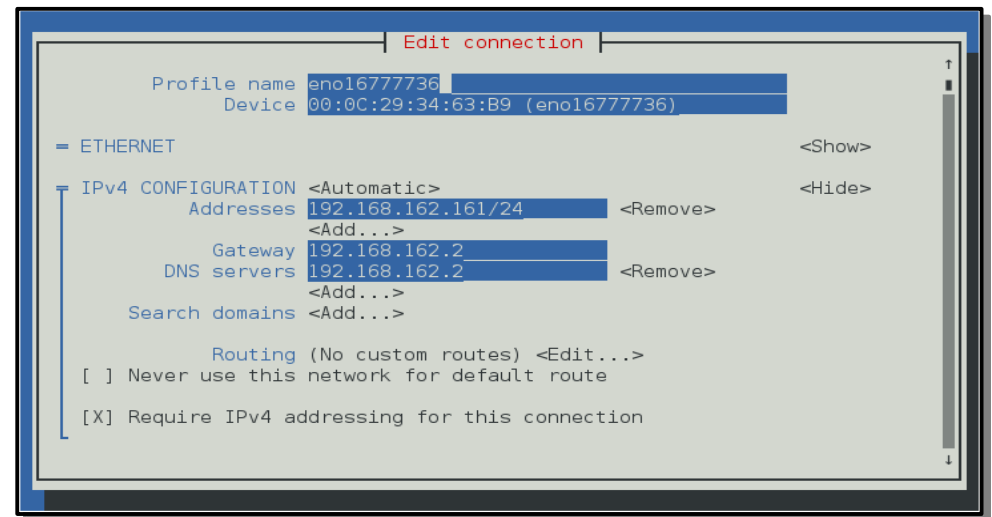


NETWORK MANAGEMENT



- **NetworkManager**

- Easy to use yet comprehensive network management suite designed to provide painless network configuration.
 - Eliminates the need to manually edit network configuration files by hand.
- Flexible interface options with GUI, (new) CLI, and (new) TUI for managing local, remote, or even headless systems.
- Supports a broad array of many common network interface types, including:
 - Ethernet, IPoIB, VLANs, Bridges, Bonds, Teams, WiFi, WiMAX, WWAN, Bluetooth, VPN, and ATM-based DSL.

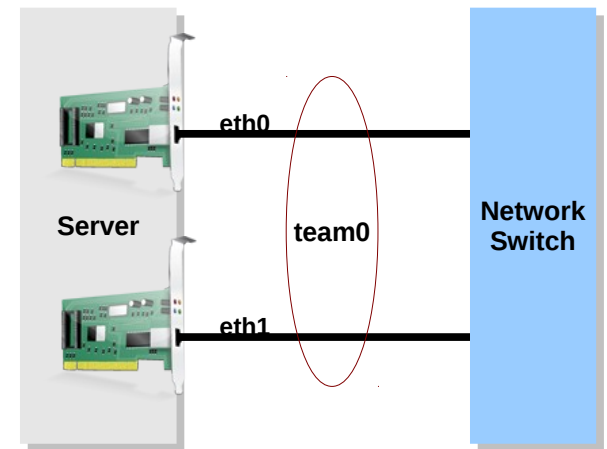


NETWORK FEATURES



- **Team Driver**

- Mechanism for bonding multiple network devices (ports) into a single logical interface at the data link layer (L2)
 - *Provides an increase in maximum bandwidth and link redundancy*
- Alternative to the existing Linux Bonding driver
 - *Provides a number of advantages over traditional bonding while providing equal or even slightly better performance in some cases.*
- Implemented mostly in user space with only the necessary data fast-paths in the kernel.
 - *Moves most of the work and logic into a user space daemon making it:*
 - ***more stable***
 - ***easier to debug***
 - ***much simpler to extend***



SECURITY FEATURES



- New dynamic and protocol independent firewall service, **firewalld**, provides greater flexibility over traditional iptables.
 - Unified firewall management service for IPv4 (iptables), IPv6 (ip6tables), and Ethernet Bridges (ebtables).
 - Eliminates service disruptions during rule updates.
 - Supports different network trust zones for per-connection firewall settings.
 - Simple yet powerful XML-based configuration file format with nearly 50 built-in pre-defined settings for many common system services.
- Easier analysis of log files with the help of structured logging that provides additional context in the logs.
- Extension of SELinux access controls to NFS with the help of labeled NFS.





HIGH AVAILABILITY FEATURES

- Simplified cluster management :
 - Reduced number of software components
 - Ability to clone resources streamlines deployment across nodes.
- Addition of fine-grained monitoring for components which include core daemons, fence agents, system services. All aspects of the infrastructure are treated as a service.
- Consistent cluster management experience between two major releases (Red Hat Enterprise Linux 6 and 7).



HIGH AVAILABILITY FEATURES

- Better cluster resource management with the introduction of *Pacemaker*.
 - No longer necessary to edit configuration files directly.
 - Policy engine now allows the cluster to manage both virtual guest(s) and the applications contained within those guests.

VIRTUALIZATION



VIRTUALIZATION ENHANCEMENTS

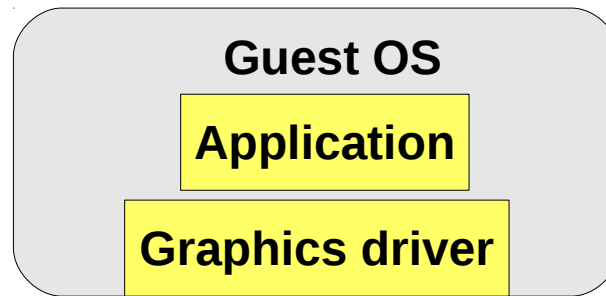
- RHEL7 enables Para-Virtual Random Number Generator (RNG)
 - Provide improved randomness in the guest for cryptographic purposes
 - RHEL with KVM feeds entropy to the virtual machines
 - Helps alleviate entropy starvation in guest



VIRTUALIZATION ENHANCEMENTS



Virtual Machine



QEMU

VFIO

KVM

RHEL Kernel

GPU card



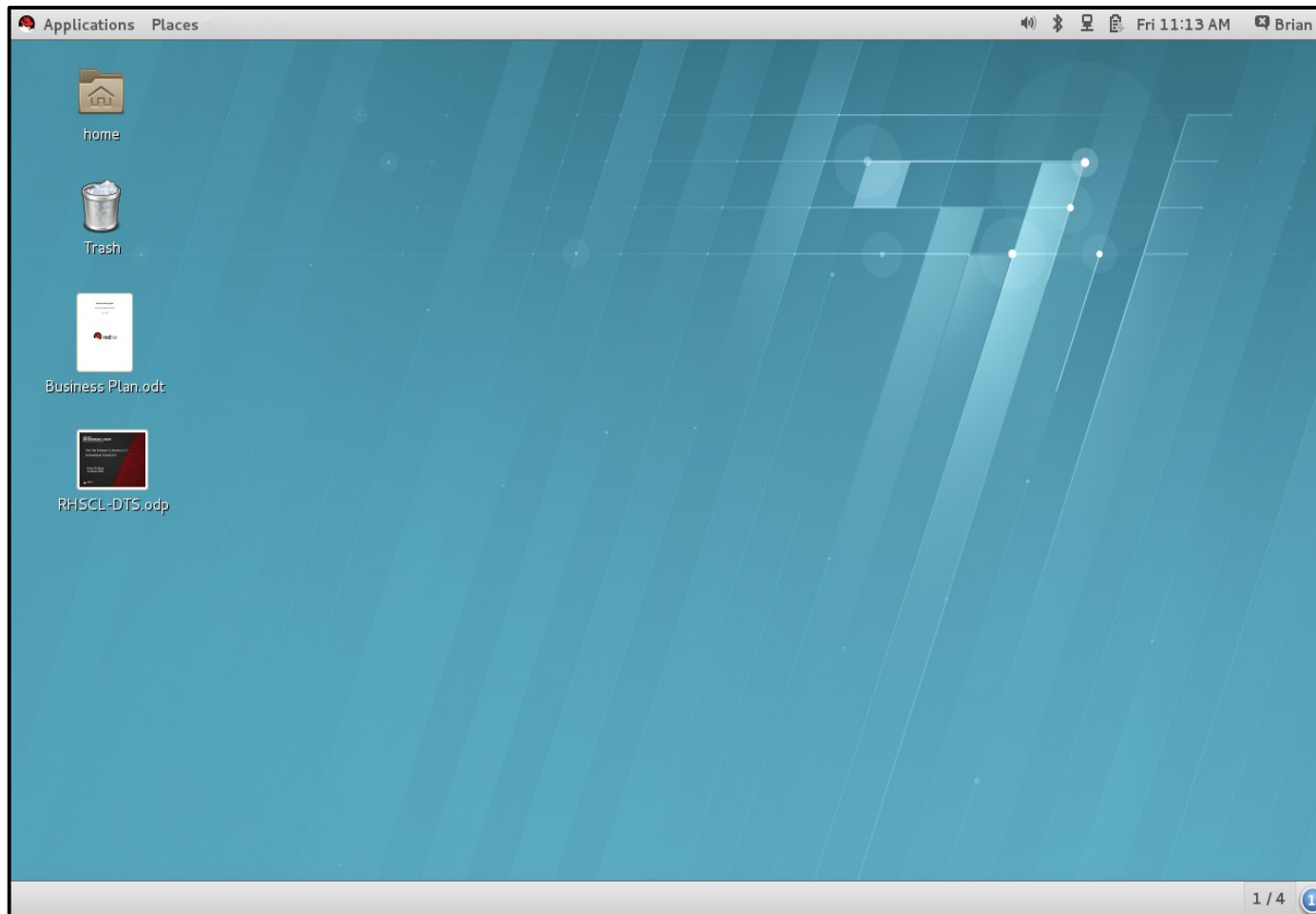
- RHEL7 with KVM enables dedicated GPU passthrough access to a single VM
- Compatible with Nvidia Quadro K5000, Nvidia GRID K1/K2

DESKTOP AND DEVELOPER FEATURES

EASE OF USE: CHOICE OF DESKTOPS



GNOME CLASSIC (DEFAULT)

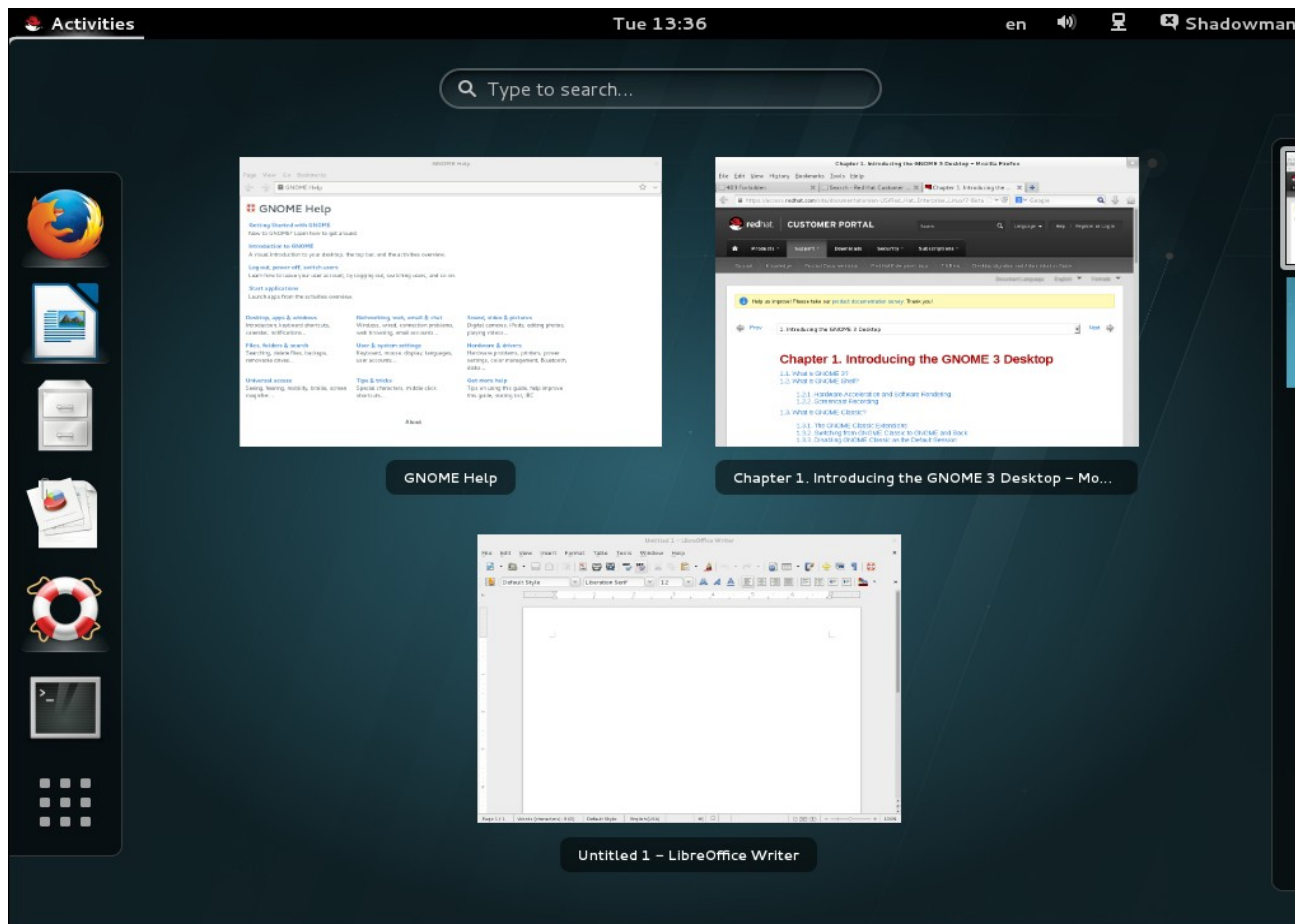


- Familiar and intuitive
- More traditional look and feel
- Preserves investments in training

EASE OF USE: CHOICE OF DESKTOPS



GNOME 3 (GNOME SHELL)

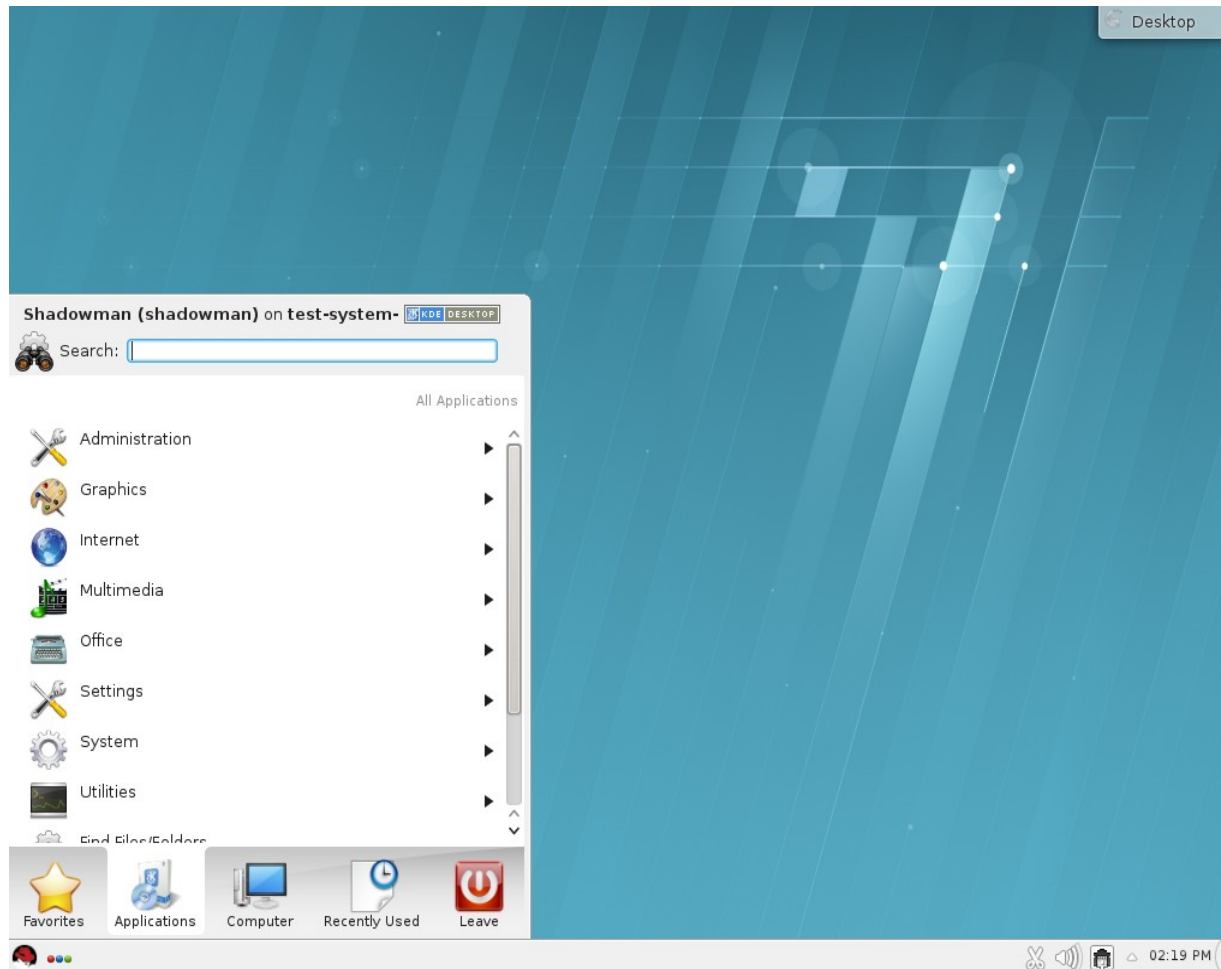


- ELEGANT AND INTUITIVE USER INTERFACE
- FOCUS ON END-USER PRODUCTIVITY

EASE OF USE: CHOICE OF DESKTOPS



KDE V4.10



- AN ALTERNATIVE TO GNOME FOR USERS WHO PREFER KDE

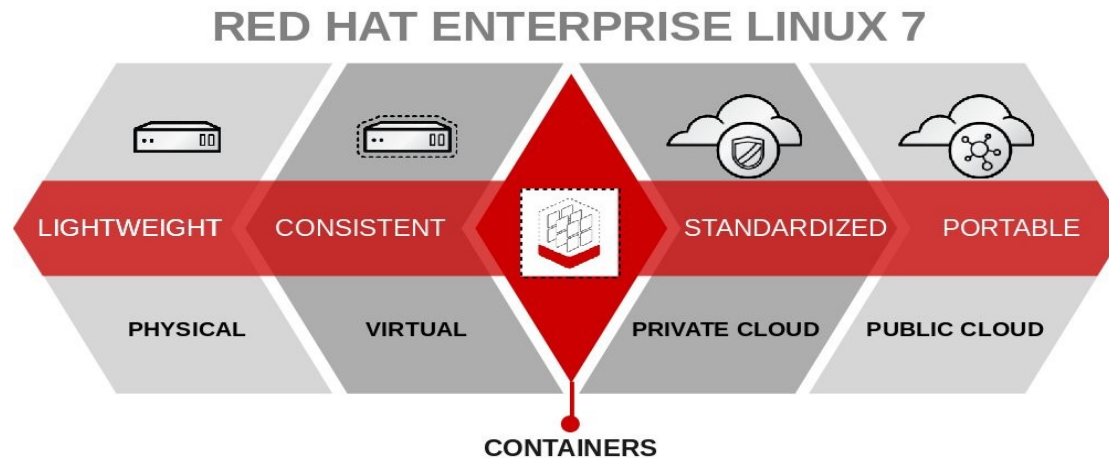


DEVELOPER FEATURES

- Build and concurrently install multiple versions of custom software using *scl-utils*.
- Access to updated versions of compilers, debuggers, and related tools (gcc-4.8, gdb-7.6, etc.), providing enhanced support for parallelism and concurrency and extensive new optimizations.
- Support for the latest version of Java with *OpenJDK 7*
 - To profile and compare performance across multiple JVMs, users can now install different minor versions of Java 7 (e.g. OpenJDK7 u40 and OpenJDK7 u45) in parallel, with the default version selectable through alternatives.

SUMMARY

REDEFINING THE ENTERPRISE OS



1

Delivers a flexible, stable, and secure foundation for your infrastructure from existing deployments to next generation solutions.

2

Increases the efficiency of IT operations with scalable filesystems, Windows interoperability, and OpenLMI management.

3

Improves IT agility via containers, streamlined deployment, and optimal performance profiles.

4

Continues Red Hat Enterprise Linux's proven track record of delivering superior reliability and security.



THANK YOU