

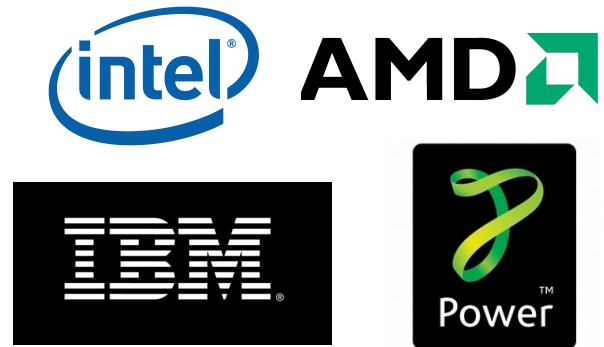
# New tech in RHEL7

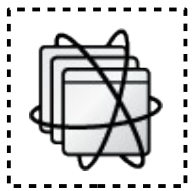
**Marc Skinner**

Principal Solutions Architect  
mskinner@redhat.com

# 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).

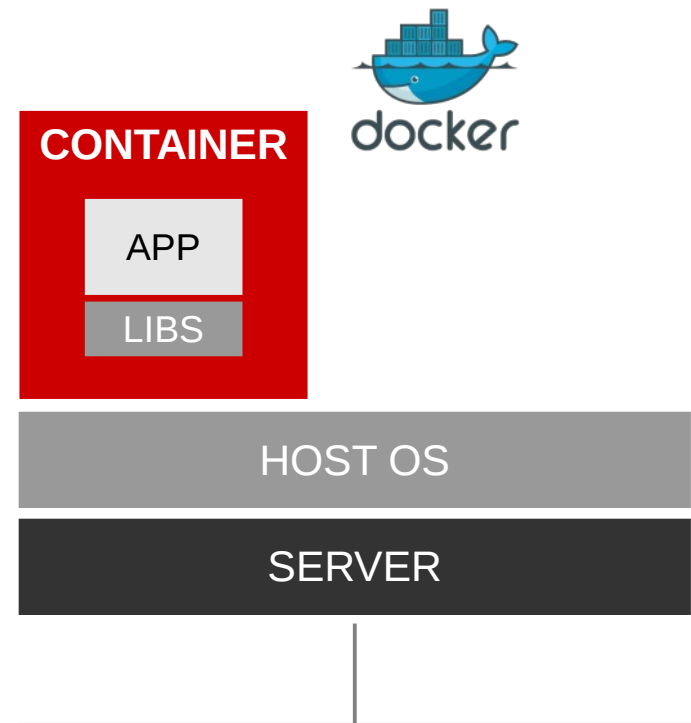




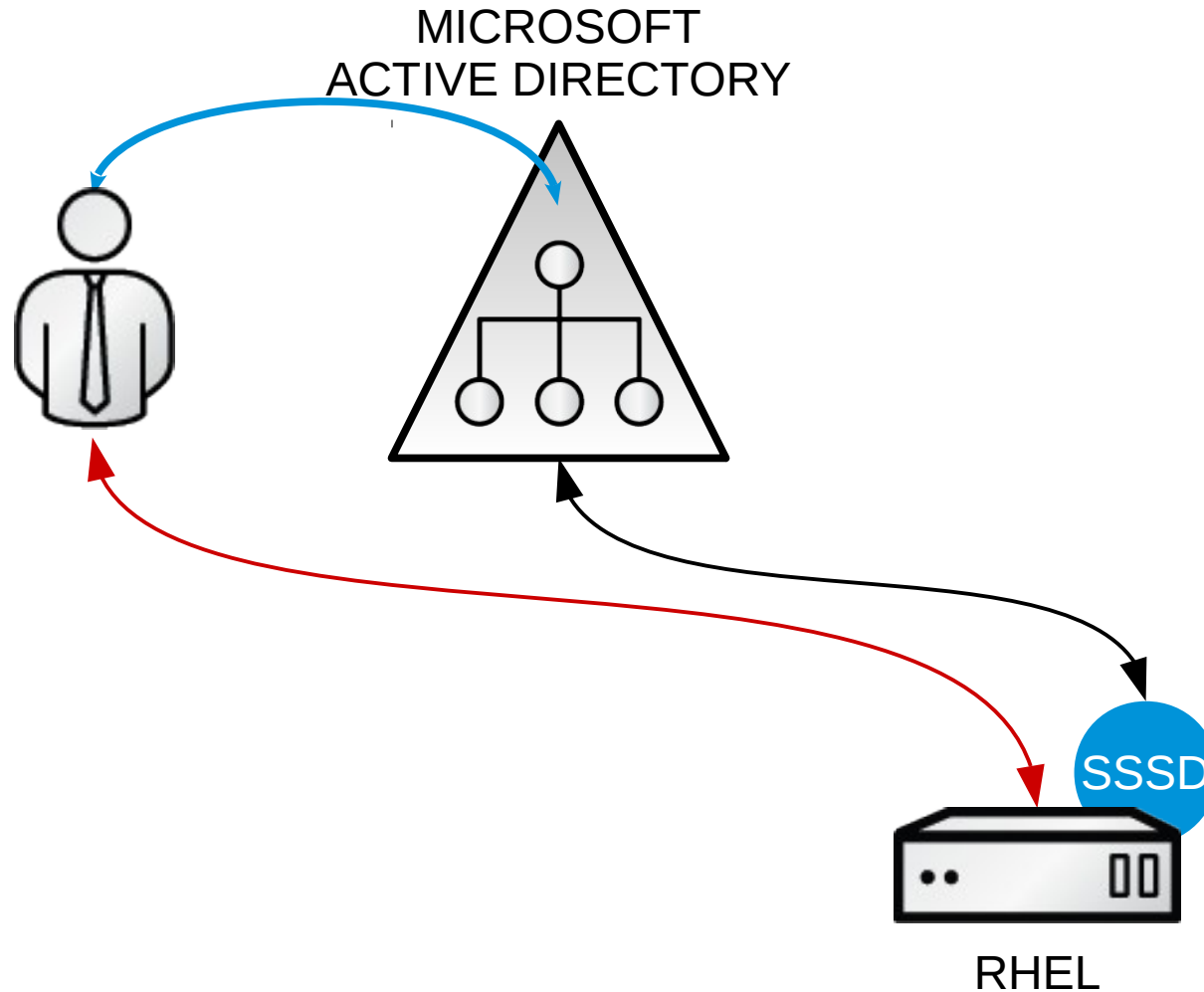
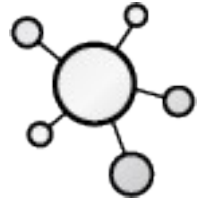
# LINUX CONTAINERS

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

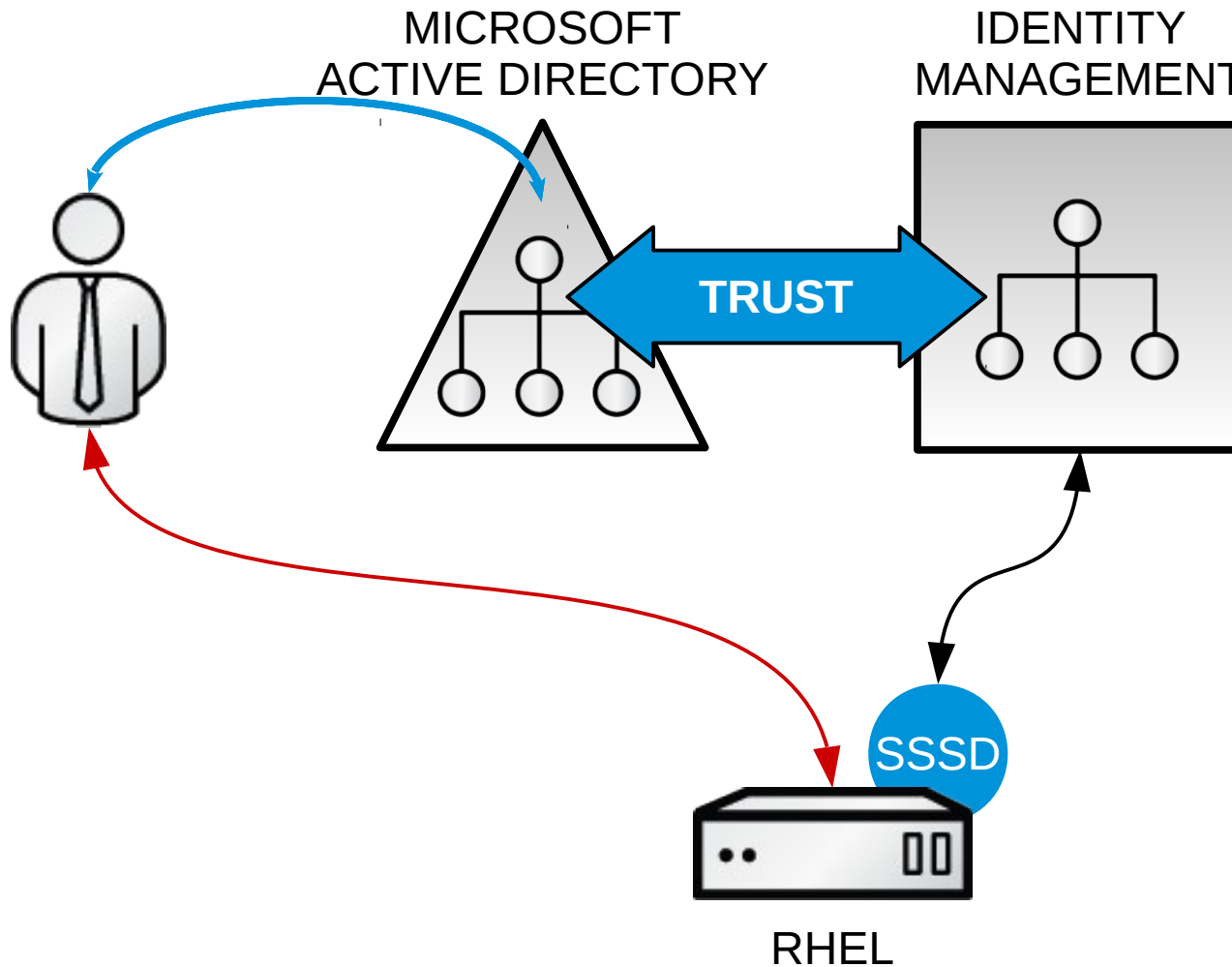
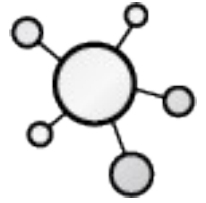


# WINDOWS INTEROPERABILITY VIA DIRECT INTEGRATION



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**

<sup>1</sup> Source: Research by TechValidate: [www.techvalidate.com/product-research/red-hat-enterprise-linux](http://www.techvalidate.com/product-research/red-hat-enterprise-linux)

# CHOICE OF FILE SYSTEMS



- Scale file systems to 500TB with new default filesystem XFS
- Scale to 50TB with ext4
- Btrfs also available<sup>1</sup>
- 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 <sup>2</sup>	50TB	Yes	Yes	
Network/Multi-node				
GFS2	2-16 nodes	Yes	No	Shared-storage file system

<sup>1</sup> Available as a Technology Preview

# STORAGE



- Easy storage configuration with the introduction of *System Storage Manager*. [ssm]
  - 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



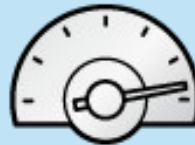
- NFS v4
- Unified management of btrfs and LVM snapshots with the introduction of *snapper*.
  - Allows administrators to create, delete, label and compare snapshots of volumes.



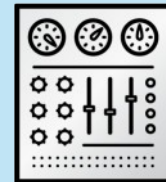
# PERFORMANCE ENHANCEMENTS WITH RED HAT ENTERPRISE LINUX 7



**BUILT-IN PERFORMANCE  
PROFILES SIMPLIFY  
CONFIGURATION**



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



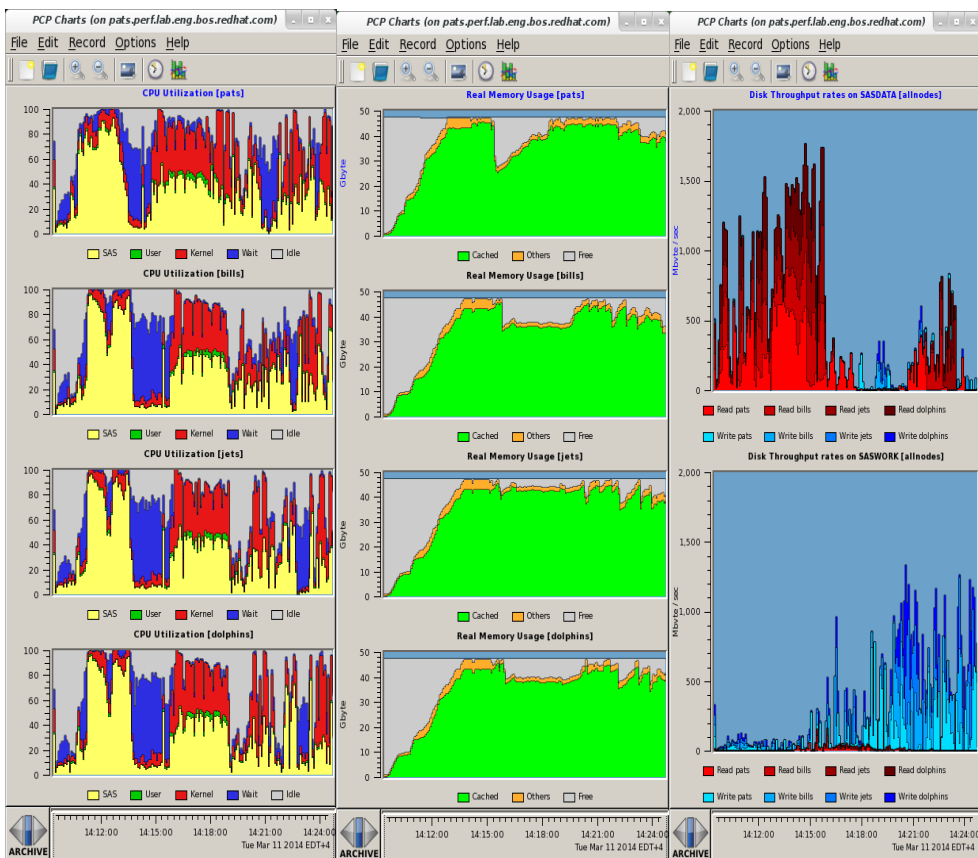
**FINE-TUNE PERFORMANCE  
WITH ENHANCED TOOLING  
VIA TUNA AND TUNED**

# OPTIMAL PERFORMANCE VIA PROFILES

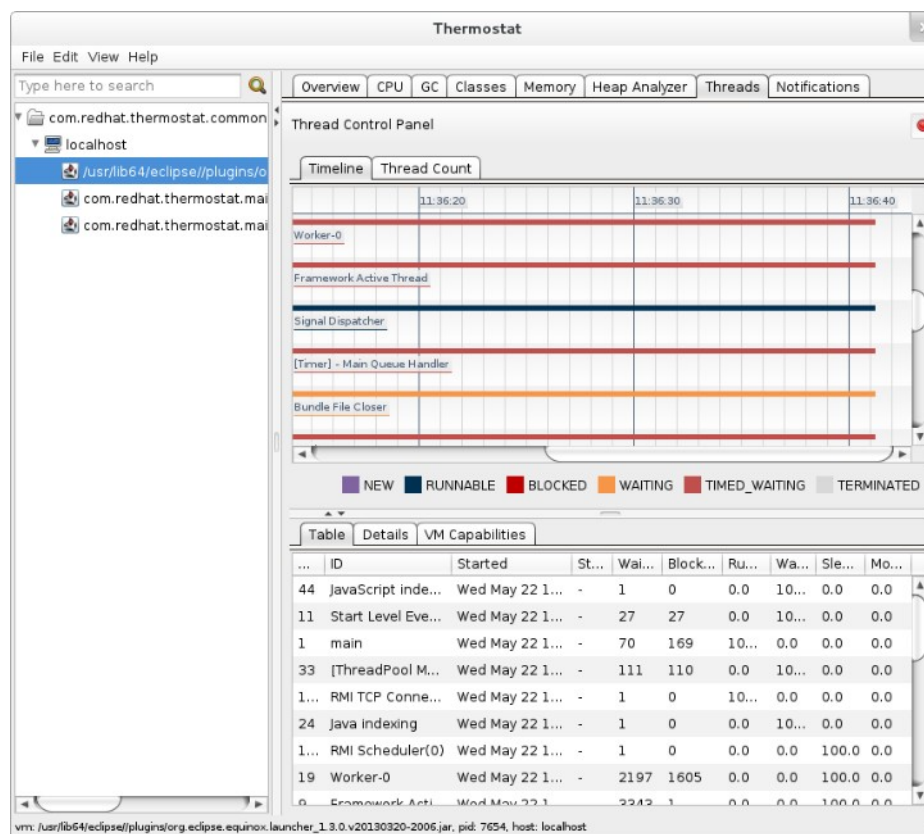


Optimal performance management via enhanced performance tuning at install, simplified instrumentation and tuning features, and performance monitoring tooling

## 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

The screenshot shows the Tuna application window titled "Tuna (on dhcp47-40)". It displays two tables for CPU usage and a list of processes.

Socket 0			Socket 1		
Filter	CPU	Usage	Filter	CPU	Usage
<input checked="" type="checkbox"/>	1	2	<input checked="" type="checkbox"/>	0	12
<input checked="" type="checkbox"/>	3	0	<input checked="" type="checkbox"/>	2	5
<input checked="" type="checkbox"/>	5	0	<input checked="" type="checkbox"/>	4	1
<input checked="" type="checkbox"/>	7	0	<input checked="" type="checkbox"/>	6	3
<input checked="" type="checkbox"/>	9	0	<input checked="" type="checkbox"/>	8	8
<input checked="" type="checkbox"/>	11	0	<input checked="" type="checkbox"/>	10	0
<input checked="" type="checkbox"/>	13	0	<input checked="" type="checkbox"/>	12	0
<input checked="" type="checkbox"/>	15	0	<input checked="" type="checkbox"/>	14	3

IRQ	Affinity	Events	Users
148	0-15	0	p4p2-6
147	0-15	0	p4p2-5
146	0-15	0	p4p2-4
145	0-15	0	p4p2-3
144	0-15	0	p4p2-2
143	0-15	0	p4p2-1
142	0-15	1	p4p2-0
140	0-15	0	p4p1-7
139	0-15	0	p4p1-6
138	0-15	0	p4p1-5

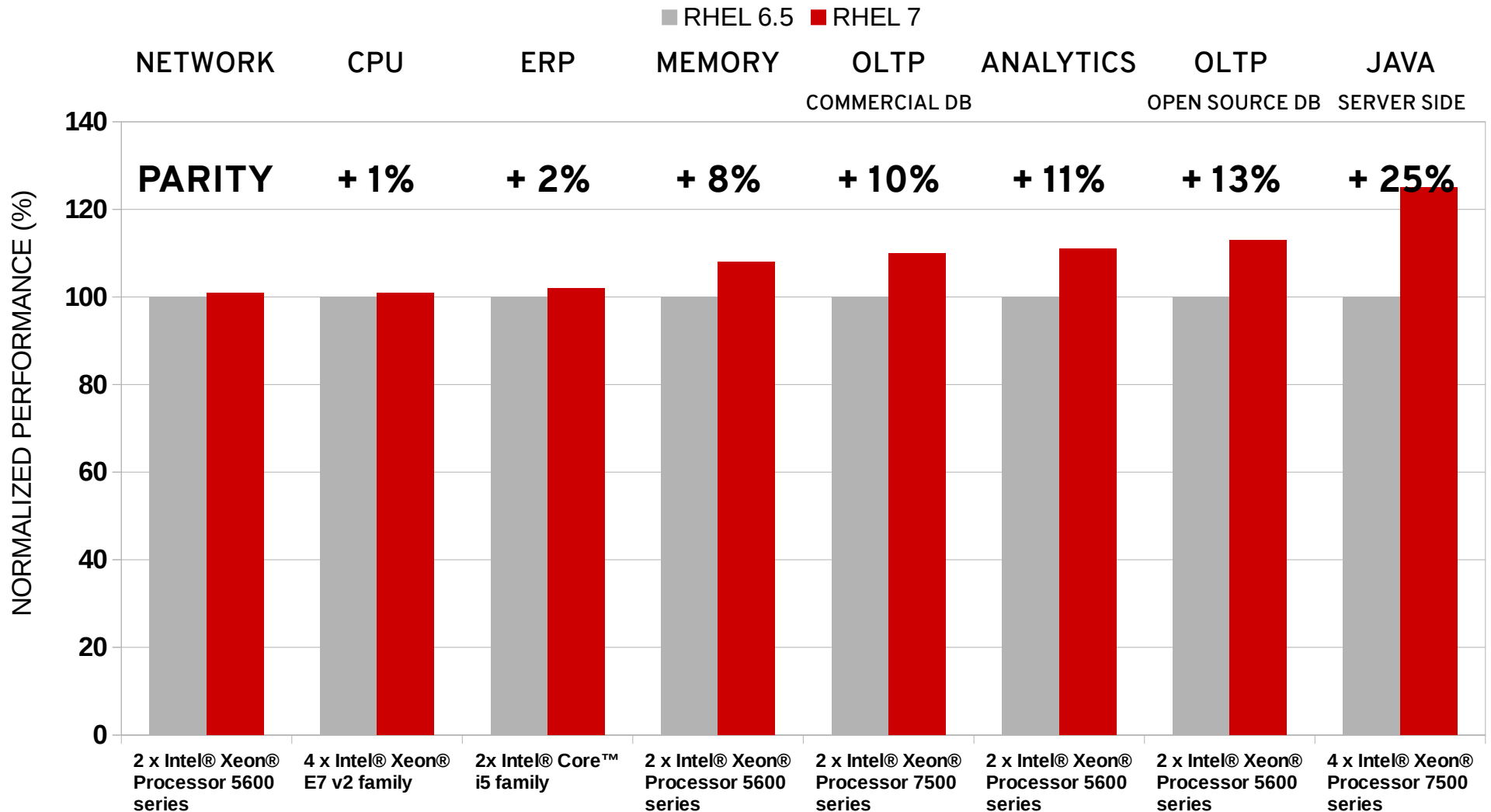
PID	Policy	Priority	Affinity	VolCtxtSwitch	NonVolCtxtSwitch	Command Line
10600	OTHER	0	0-15	437	1	/usr/libexec/notification-area-applet --oaf-activ
10504	OTHER	0	0-15	544	1	/usr/libexec/notification-area-applet --oaf-activ
11065	OTHER	0	0-15	3796	1	/usr/libexec/notification-daemon
11066	OTHER	0	0-15	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	<b>5514763</b>	132	/usr/libexec/qemu-kvm -S -M rhel6.3.0 -enable
26510	OTHER	0	0-15	<b>6018050</b>	146	/usr/libexec/qemu-kvm -S -M rhel6.3.0 -enable
26599	OTHER	0	0-15	<b>366744</b>	88	/usr/libexec/qemu-kvm -S -M rhel6.3.0 -enable
26352	OTHER	0	0-15	<b>400968</b>	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	<b>10875</b>	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	<b>10814</b>	0	/usr/sbin/dnsmasq --strict-order --bind-interfaces
2654	OTHER	0	0-15	49367	2672	/usr/sbin/ehcmm -pidfile /var/run/ehcmm.pid
7387	OTHER	0	0-15	485	3	/usr/sbin/gdm-binary -nodaemon
2108	OTHER	0	0-15	1	0	/usr/sbin/gnome-daemon

# SOLID PERFORMANCE ACROSS WORKLOADS

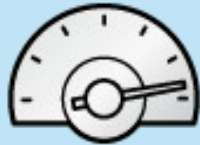
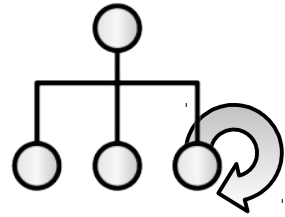
## RHEL 7 VS RHEL 6.5



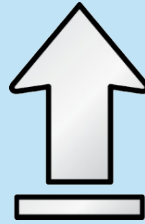
PERFORMANCE GAINS ACROSS WIDE RANGE OF WORKLOADS  
AND MULTIPLE GENERATIONS OF HARDWARE



# STREAMLINED INSTALLATION AND DEPLOYMENT



**SPEED DEPLOYMENT  
WITH SERVER PROFILES**



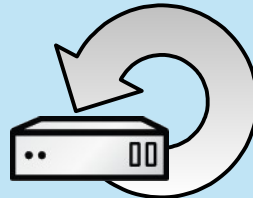
**IN-PLACE UPGRADES  
FROM 6.X TO 7**



**PRIORITIZE CRITICAL  
SERVICES AT START-UP**



**EASILY CREATE CUSTOM  
INSTALL IMAGES**

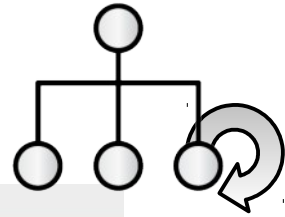


**SAFELY ROLL-BACK  
DURING INSTALL**



**DRAMATICALLY SPEED  
START-UP TIMES**

# Software Selection Example: Infrastructure Server



File View Send key Help

**SOFTWARE SELECTION** RED HAT ENTERPRISE LINUX 7.0 INSTALLATION  
PRE-RELEASE / TESTING

Done us

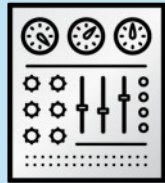
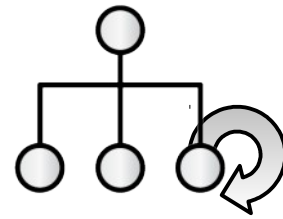
### Base Environment

- Minimal install**  
Basic functionality.
- Infrastructure Server**  
Server for operating network infrastructure services.
- File and Print Server**  
File, print, and storage server for enterprises.
- Basic Web Server**  
Server for serving static and dynamic internet content.
- Virtualization Host**  
Minimal virtualization host.
- Server with GUI**  
Server for operating network infrastructure services, with a GUI.

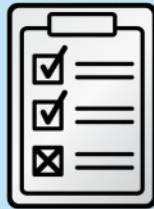
### Add-Ons for Selected Environment

- Backup Server**  
Software to centralize your infrastructure's backups.
- DNS Name Server**  
This package group allows you to run a DNS name server (BIND) on the system.
- Directory Client**  
Clients for integration into a network managed by a directory service.
- Directory Server**  
Machine and user identity servers.
- E-mail server**  
Allows the system to act as a SMTP and/or IMAP e-mail server.
- FTP server**  
Allows the system to act as an FTP server.
- File and Storage Server**  
CIFS, SMB, NFS, iSCSI, iSER, and iSNS network storage server.
- Guest Agents**  
Agents used when running under a hypervisor.
- Hardware monitoring utilities**  
A set of tools to monitor server hardware
- Identity Management Server**

# CENTRALIZED MANAGEMENT AND FASTER BOOT UP



**CENTRALLY MANAGE  
PROCESSES,  
SERVICES, SECURITY**



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



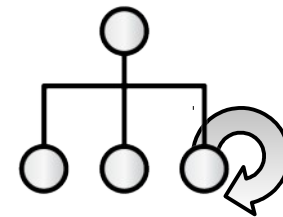
**DRAMATICALLY  
SPEED START-UP  
TIMES**



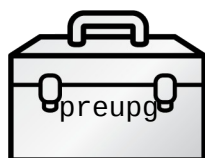
**COMPATIBLE WITH  
EXISTING SCRIPTS  
(SYSV AND LSB)**

- **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

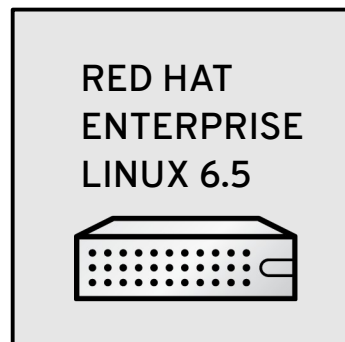


## 1 PRE-UPGRADE ASSISTANT

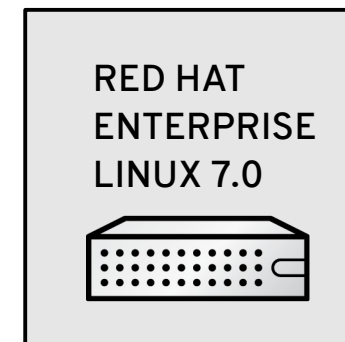


- Audits current OS state vs RHEL 7 profile and creates:
  - HTML report of potential issues
  - DIRECTORY of config files for modification
  - POST-INSTALL script to be run by user after upgrade

## 2 UPGRADE TOOL



IF REPORT IS ACCEPTABLE



*See documentation for valid configurations*

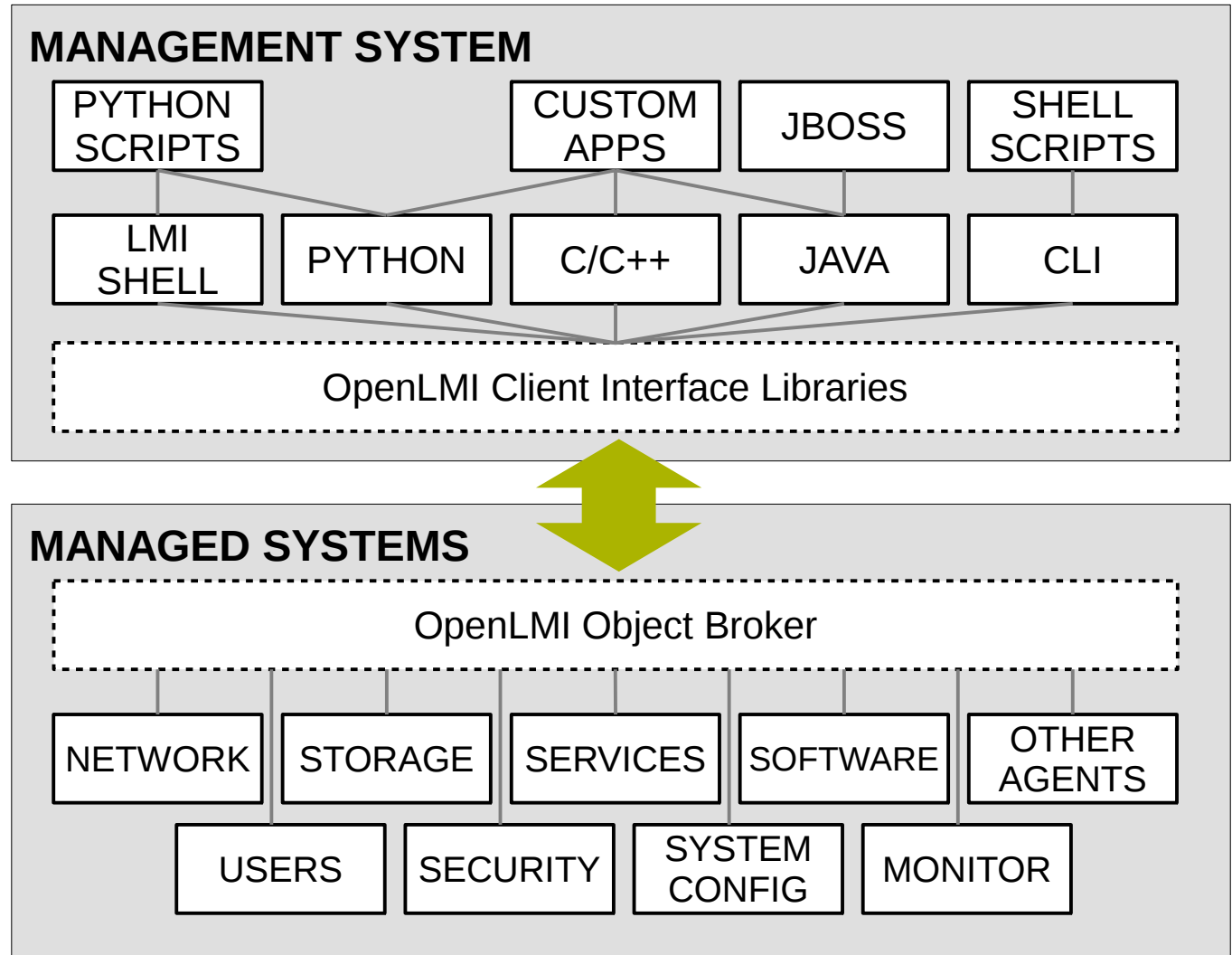




# SYSTEM MANAGEMENT VIA OPENLMI

- 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”*

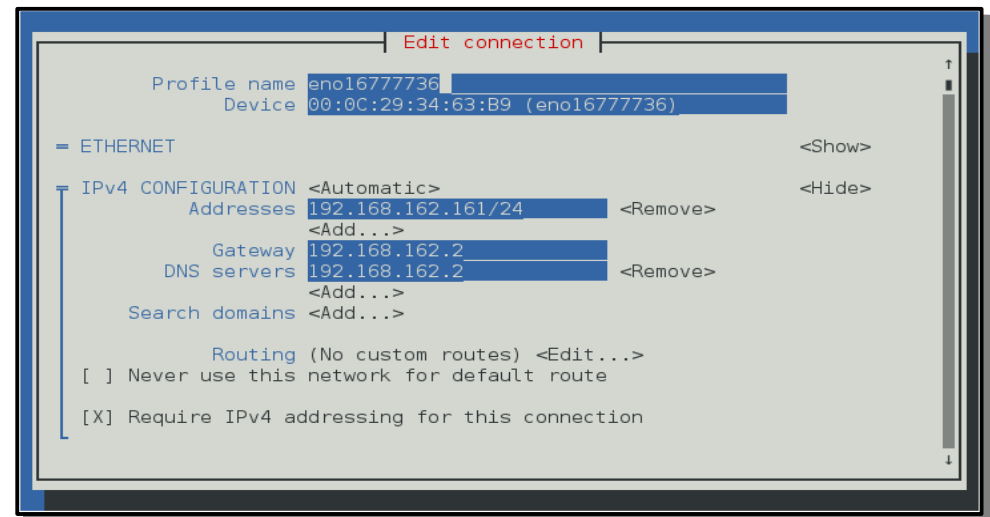


# NETWORK MANAGEMENT



- **NetworkManager [nmcli, nmtui, nmce]**

- 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.

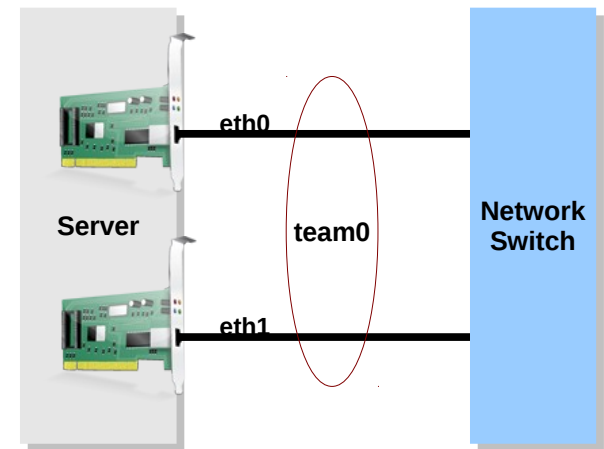


# NETWORK FEATURES





## • 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***





# NETWORK FEATURES

- **40G Ethernet (IEEE 802.3ba)** 
  - Support for 40G Ethernet link speeds enabling faster network communication for applications and systems.
- *Highly accurate network time synchronization using:* 
  - **Precision Time Protocol (IEEE 1588v2)**
    - Method for precisely synchronizing distributed clocks.
    - Capable of achieving clock accuracy in the sub-microsecond range when used in conjunction with PTP hardware support.
  - **Chrony**
    - Enables faster clock synchronization with better accuracy than ntpd especially in cases where network connectivity is not always constant.

# 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.



# VIRTUALIZATION ENHANCEMENTS



- Guest integration for VMware vSphere
  - *Open-VM-Tools* bundled in this release



# VIRTUALIZATION ENHANCEMENTS

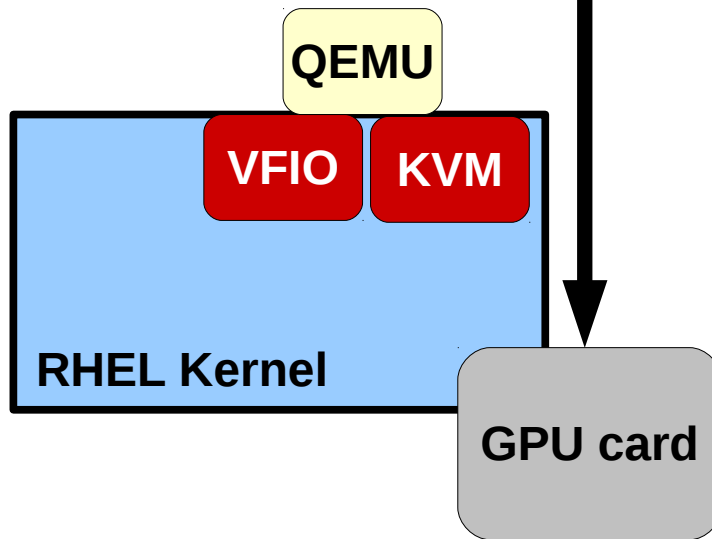
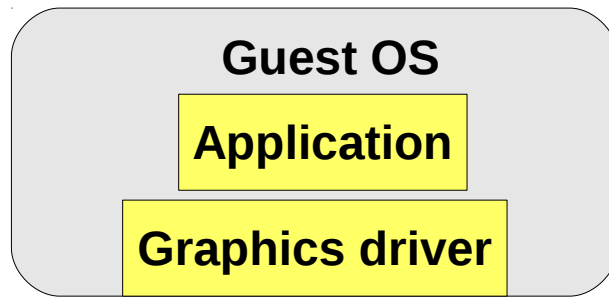
- RHEL7 enables Para-Virtual Random Number Generator (RNG)
  - Provide improved randomness in the guest for cryptographic purposes
  - RHEL with KVM feeds entropy to the virtual machines
  - Helps alleviate entropy starvation in guest



# VIRTUALIZATION ENHANCEMENTS



## Virtual Machine



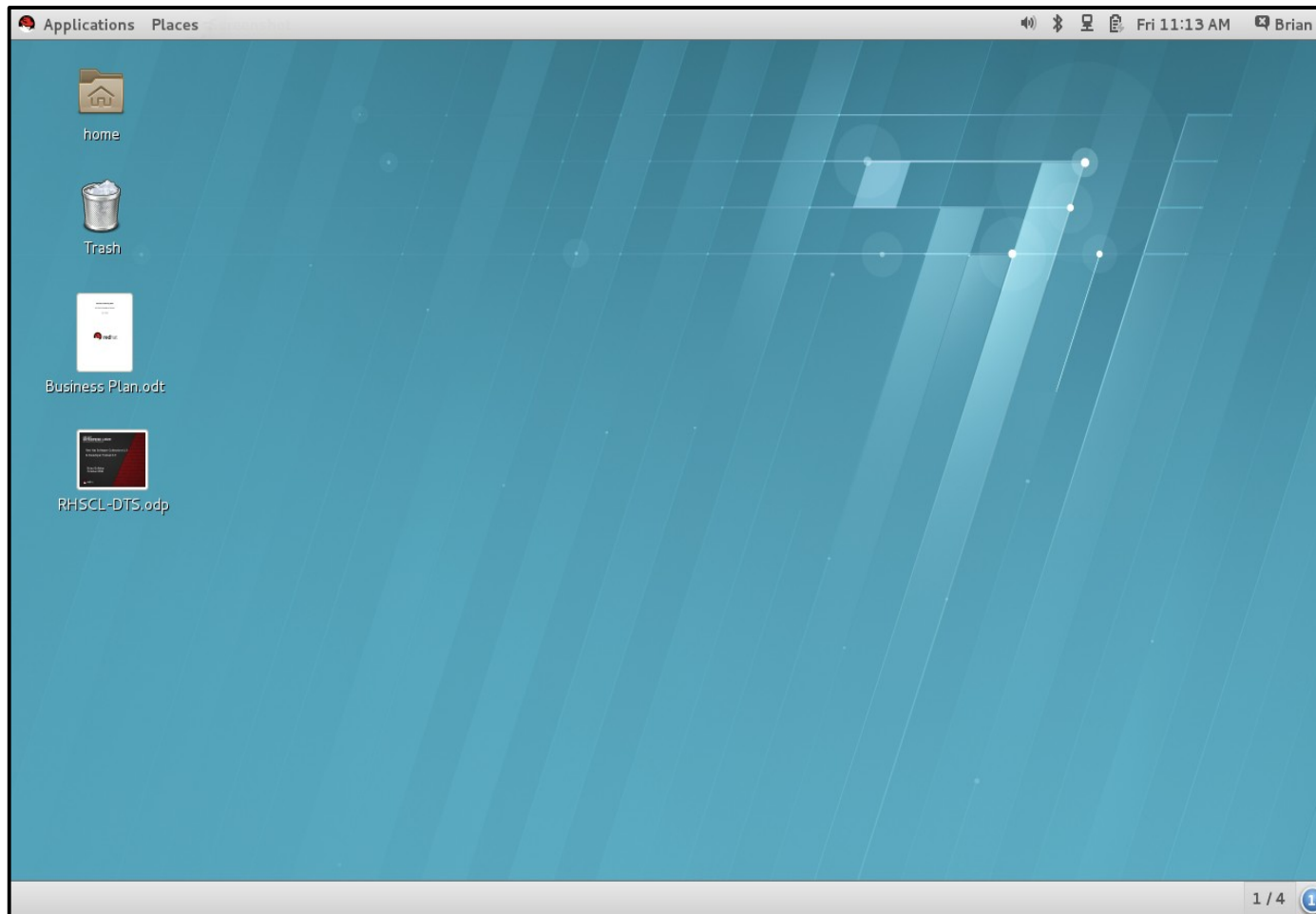
- RHEL7 with KVM enables dedicated GPU passthrough access to a single VM
- Compatible with Nvidia Quadro K5000, Nvidia GRID K1/K2



# EASE OF USE: CHOICE OF DESKTOPS



## GNOME CLASSIC (DEFAULT)

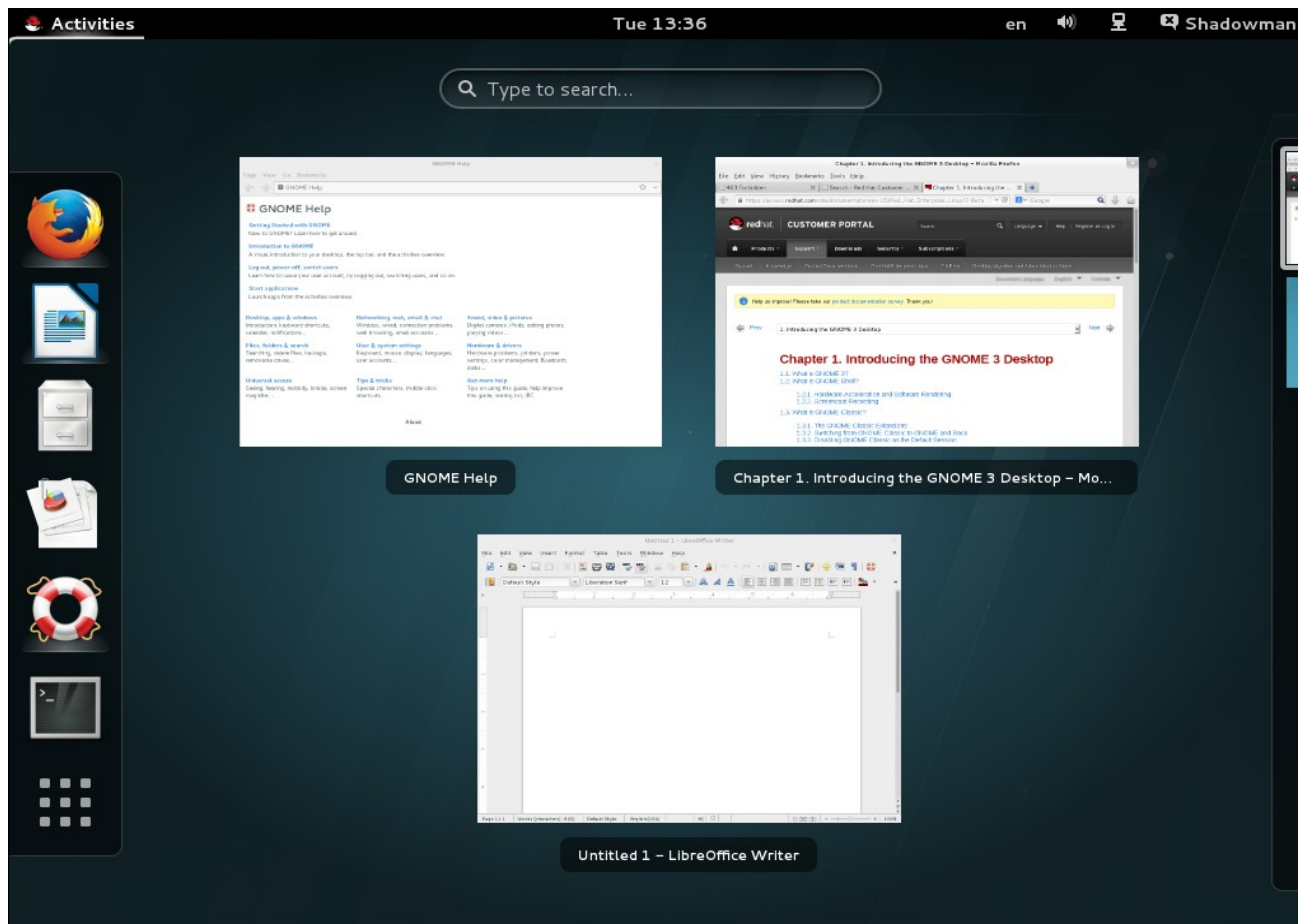


- Familiar and intuitive
- More traditional look and feel
- Preserves investments in training



# EASE OF USE: CHOICE OF DESKTOPS

## GNOME 3 (GNOME SHELL)

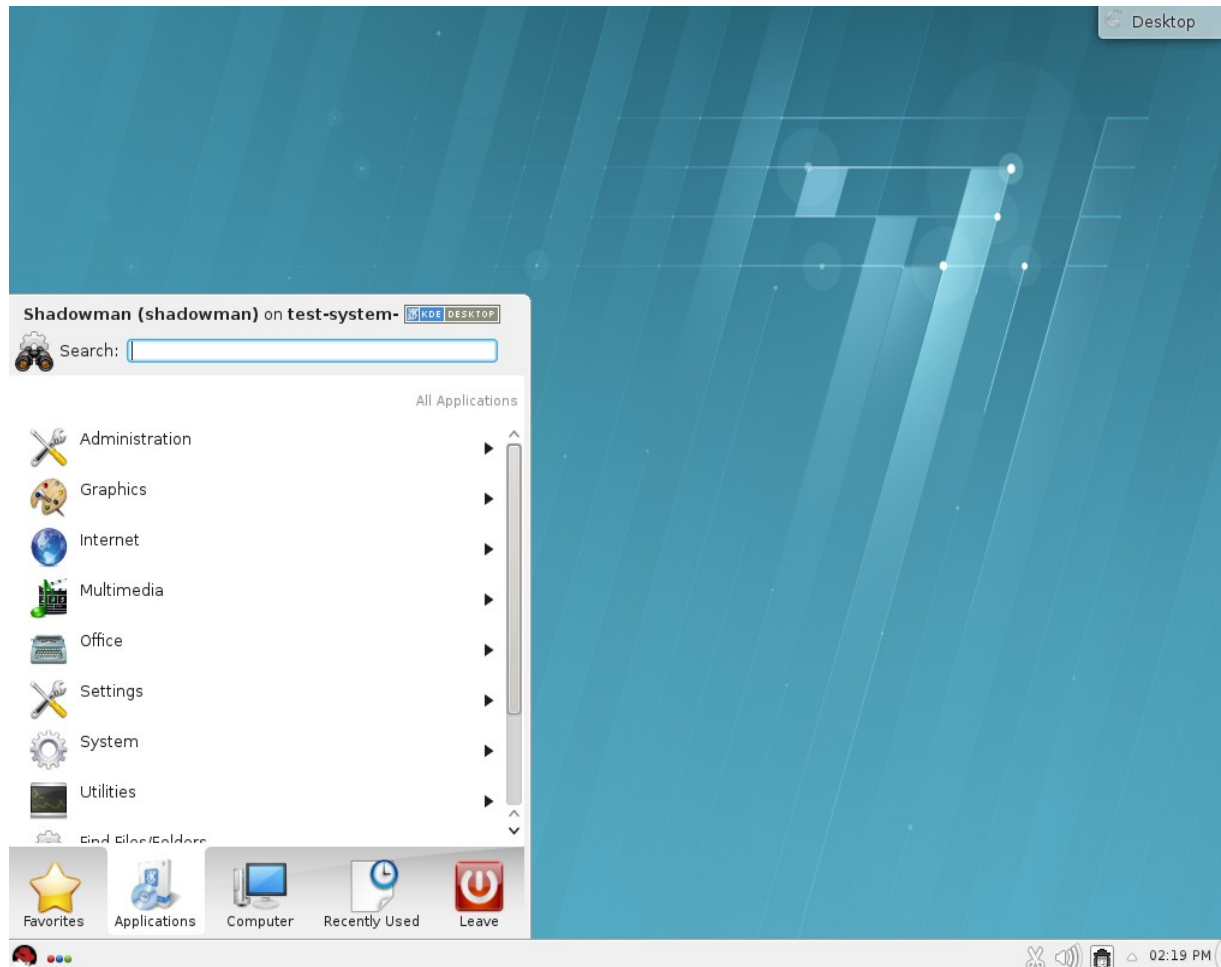


- ELEGANT AND INTUITIVE USER INTERFACE
- FOCUS ON END-USER PRODUCTIVITY

# EASE OF USE: CHOICE OF DESKTOPS



## KDE V4.10



- AN ALTERNATIVE TO GNOME FOR USERS WHO PREFER KDE

# Technology Preview

- Kpatch – apply kernel patches without reboot
- BTRFS
- KVM support for USB 3.0 devices
- SCAP-workbench



**Questions?**

**Any RHEL 7 stories?**