



RED HAT ENTERPRISE VIRTUALIZATION

Giuseppe Paterno'
Solution Architect

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BARRIERS TO ADOPTION OF VIRTUALIZATION

BENEFITS

Server Consolidation

Hardware Abstraction

Resource Flexibility & efficiency (cloud)

PENETRATION

Mission critical High Performance Data Center applications

10 - 30%

Light production, test and development

BARRIERS

- **Performance, scalability and security**
- **Enterprise application (ISV) certifications & support**
- **Cost & licensing issues**



RED HAT ENTERPRISE VIRTUALIZATION (RHEV) PRODUCT PORTFOLIO

- **RHEV MANAGER FOR SERVERS**
 - Enterprise grade server management system
- **RHEV MANAGER FOR DESKTOPS (beta)**
 - Virtual Desktop Infrastructure with SPICE
- **RHEV HYPERVISOR**
 - Small footprint, high performance dedicated hypervisor
Available only with RHEV Manager
- **RED HAT ENTERPRISE LINUX (with KVM)**
 - High Performance, security, integrated hypervisor



RED HAT ENTERPRISE VIRTUALIZATION HARDWARE AND SOFTWARE SUPPORT

Red Hat
Virtualization
Ready

3,000+
Applications

RED HAT®
VIRTUALIZATION
CERTIFIED

IBM

bmcsoftware

SteelEye™
INCANDESCENT, INC.

hp
invent

ca

MICRO
FOCUS

ISVs certified on Red Hat Enterprise Linux are also certified to run on Red Hat Enterprise Linux deployed on Red Hat Enterprise Virtualization

Red Hat
Virtualization
Ready

1,000+
hardware
platforms

AMD

DELL

EMC²

FUJITSU

HITACHI

hp
invent

IBM

intel

NEC

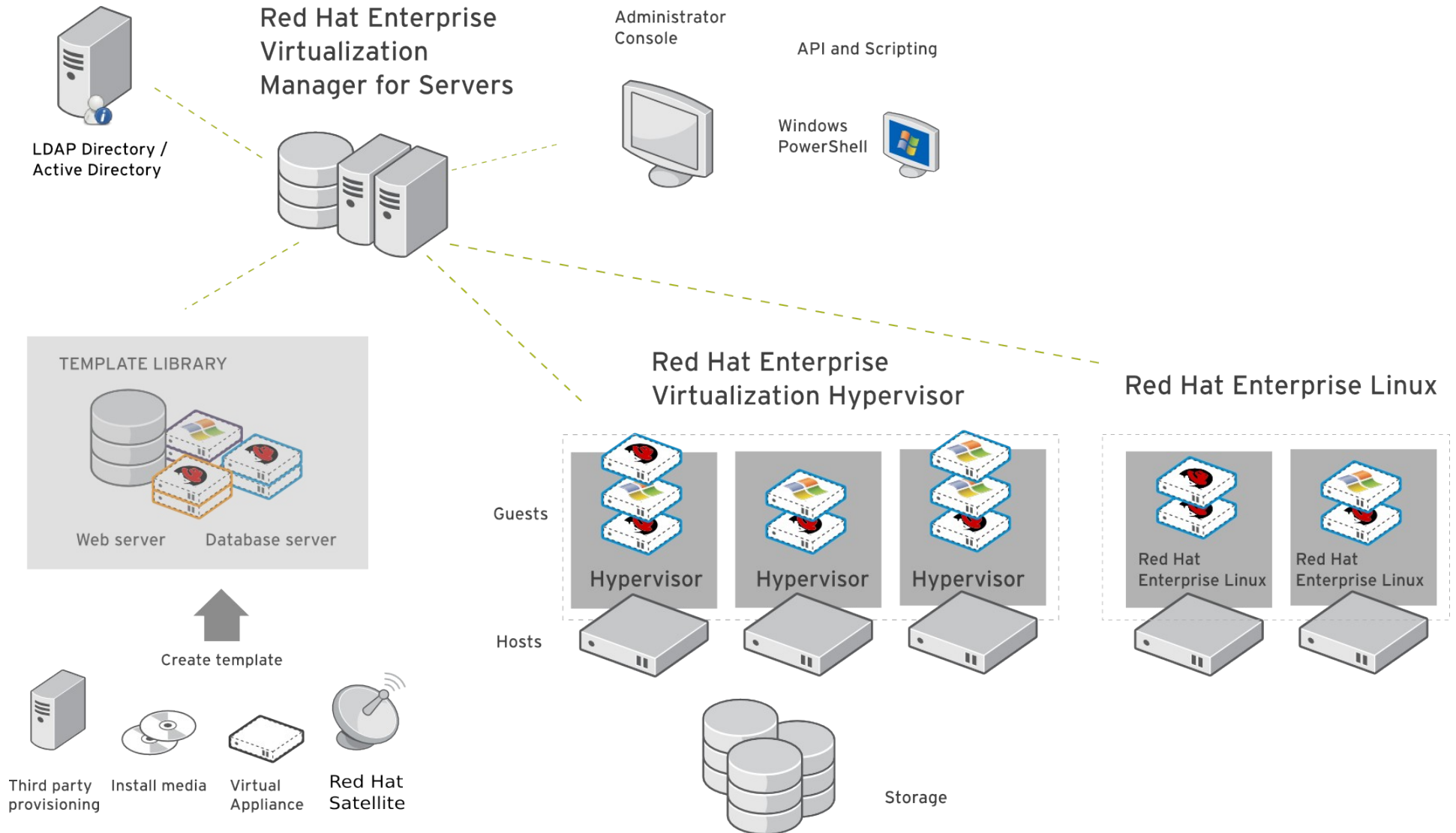
Sun
microsystems

UNISYS

Hardware platforms certified for Red Hat Enterprise Linux 5 with Intel VT/AMD-V capable hardware are certified for Red Hat Enterprise Virtualization

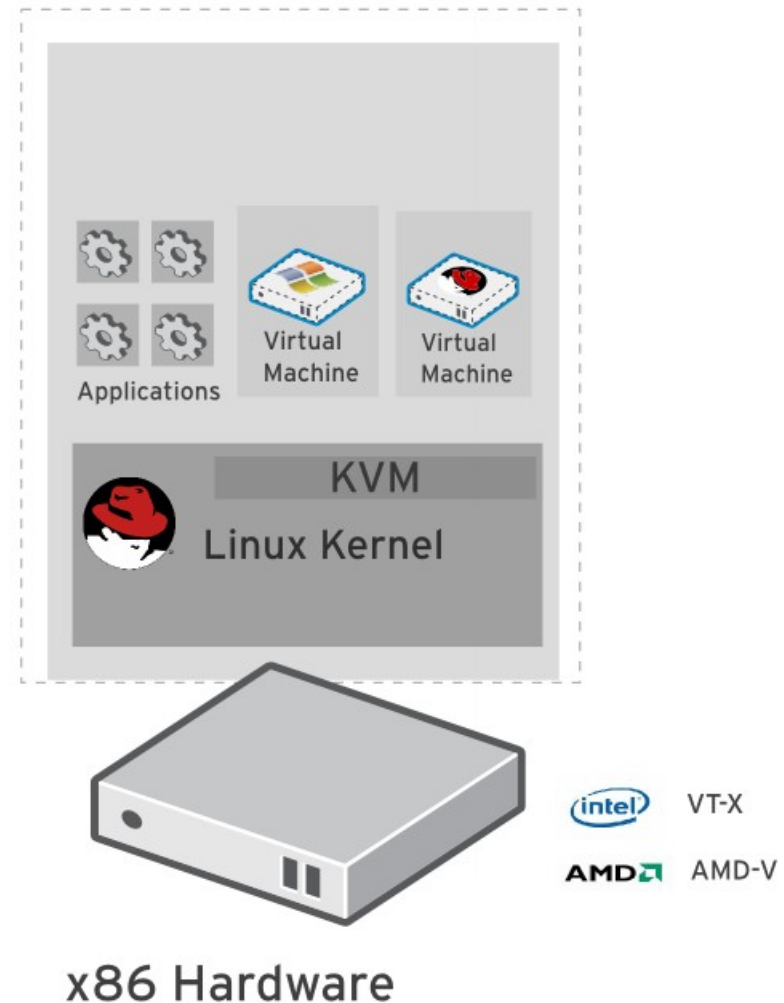


RED HAT ENTERPRISE VIRTUALIZATION ARCHITECTURE



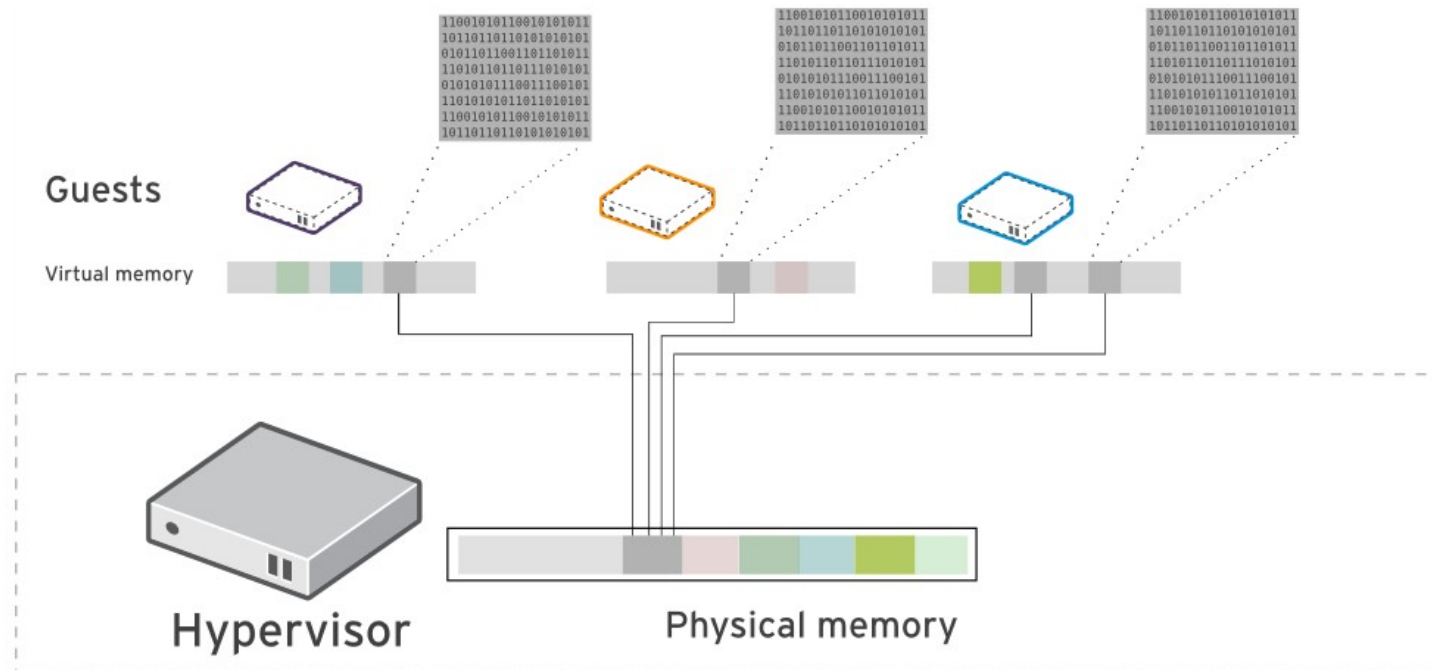
KERNEL-BASED VIRTUAL MACHINE (KVM)

- Included in Linux kernel since 2006
- Runs Linux, Windows and other operating system guests
- Advanced features
 - Live migration
 - Memory page sharing
 - Thin provisioning
 - PCI Pass-through
- KVM architecture provides high “feature-velocity” – leverages the power of Linux



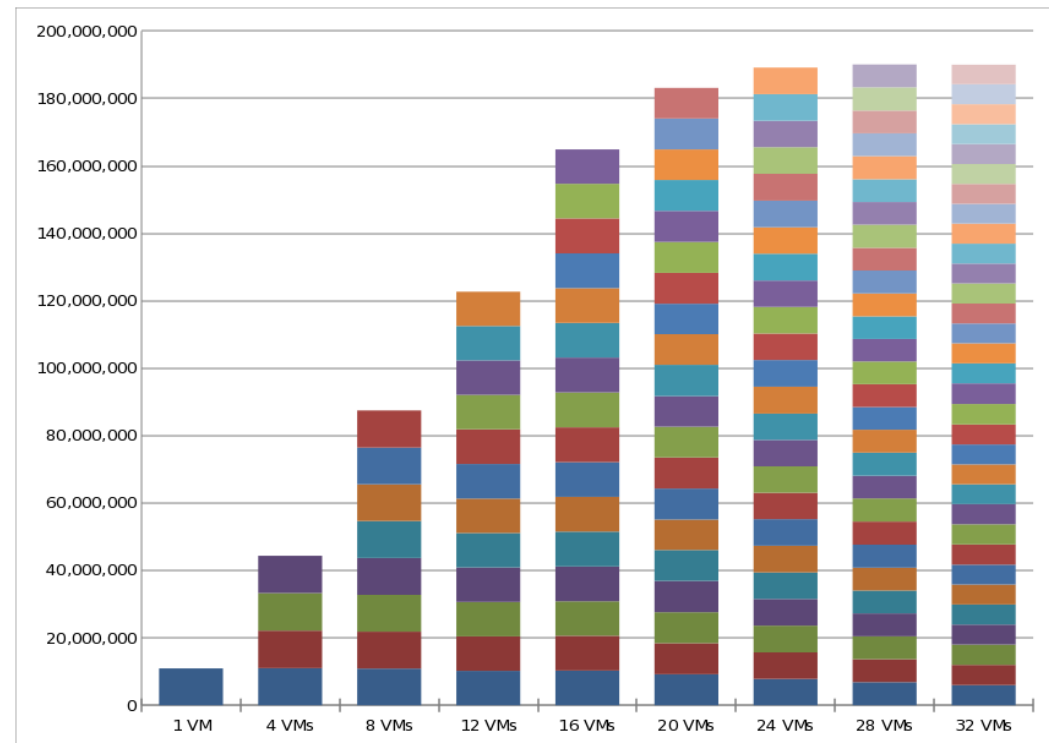
KVM HYPERVISOR – ADVANCED FEATURES

- Kernel Same-Page Merging (KSM)
 - Memory Page Sharing
 - Securely shares identical memory pages between virtual machines



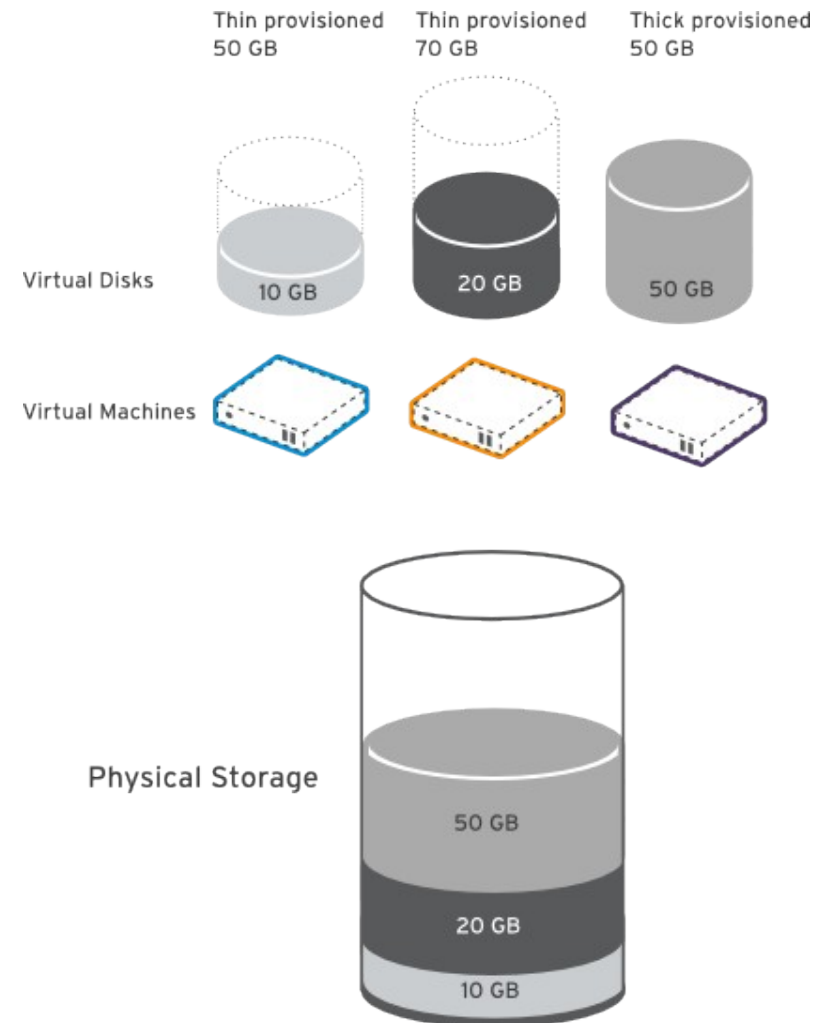
KVM HYPERVISOR – ADVANCED FEATURES

- Kernel Same-Page Merging (KSM)
 - Enterprise Java workload benchmark
 - Intel Xeon Processor X5550 with 24GB ram
 - Running multiple 3GB Windows 2003 VMs
 - Scaling up to 200% over-commit



KVM HYPERVISOR – ADVANCED FEATURES

- Thin Provisioning
 - Allocate storage only when needed
 - Oversubscribe storage
 - Transparent to virtual machine
 - Improve Storage Utilization
 - Reduced Storage Costs
 - Works with NFS, iSCSI and Fiber Channel
 - Storage reporting and alerting



KVM HYPERVISOR – ADVANCED FEATURES

- Security
 - Inherits security features of Linux
- Includes support for SELinux
 - Provides protection and isolation for virtual machines and host
 - Compromised virtual machine cannot access other VMs or host
- sVirt Project
 - Sub-project of NSA's SELinux community
 - Provides “hardened” hypervisors
 - Multilevel security
 - Isolate guests
 - Contain any hypervisor breaches
 - Will be included in RHEL 6



RED HAT ENTERPRISE VIRTUALIZATION CHOICE OF HYPERVISOR PLATFORMS

RED HAT ENTERPRISE VIRTUALIZATION MANAGER FOR SERVERS

Live Migration, High Availability, System Scheduler,
Power Saver, Storage/Snapshots, thin provisioning

WINDOWS
GUESTS

RHEL 3, 4, 5
GUESTS

WINDOWS
GUESTS

RHEL 3, 4, 5
GUESTS

RED HAT ENTERPRISE
LINUX 5.4

RED HAT ENTERPRISE
VIRTUALIZATION HYPERVISOR

← Performance, Scalability, Security →

- RHEL Expertise
- Use hardened RHEL image as hypervisor
- Tuneable, configurable

- No RHEL Expertise
- Easy to use, out of the box configuration
- Small footprint, network boot, stateless



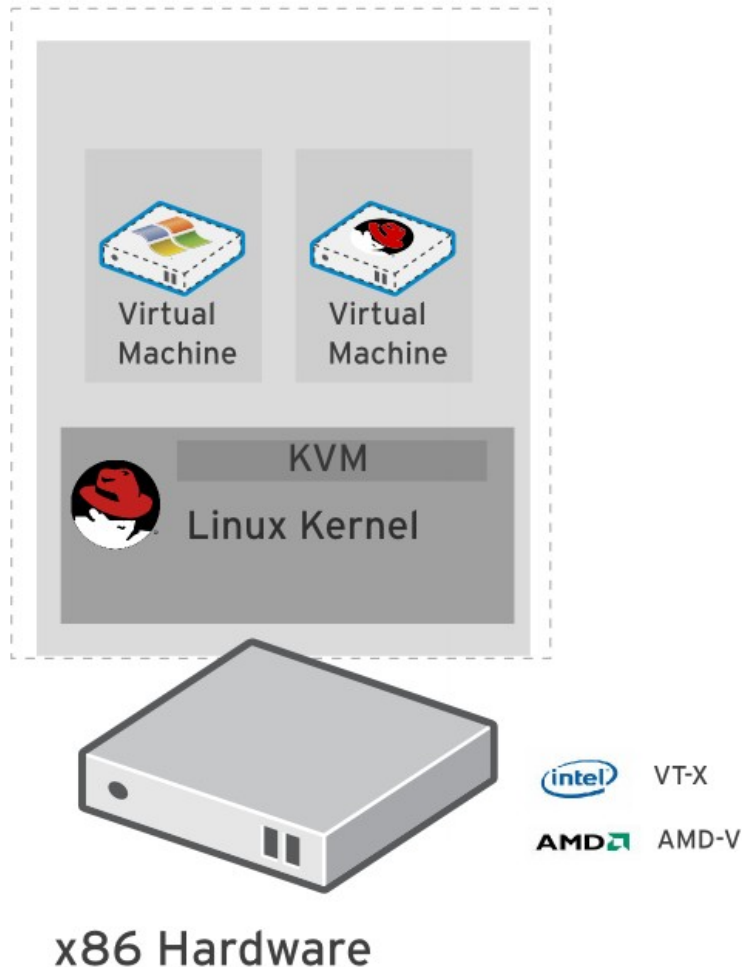
RED HAT ENTERPRISE VIRTUALIZATION

RED HAT ENTERPRISE LINUX 5.4

- Red Hat Enterprise Linux 5.4 includes KVM Hypervisor
- Can be managed by Red Hat Enterprise Virtualization Manager
 - Including network and storage configuration
 - Same feature set as RHEV Manager with RHEV Hypervisor
- Includes guest subscriptions
 - Red Hat Enterprise Linux
 - Includes 4 guest subscriptions
 - Red Hat Enterprise Linux Advanced Platform
 - Includes unlimited guest subscriptions



RED HAT ENTERPRISE VIRTUALIZATION HYPERVISOR



- Standalone hypervisor
 - Small footprint < 100MB
 - Customized 'spin' of RHEL 5
 - Security hardened image
 - Runs on all RHEL5 hardware with VT/AMD-V
 - 'Just enough' RHEL to run virtual machines
 - Easy to install, configure and upgrade
 - PXE boot, USB boot, CD or Hard drive
 - Scalability
 - 96 cores & 1TB ram on Host
 - 16 virtual CPUs and 64GB ram guest

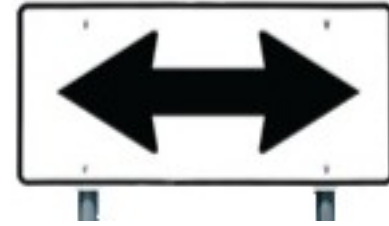


RED HAT ENTERPRISE VIRTUALIZATION GUEST SUPPORT

- Support for Red Hat Enterprise Linux guests
 - Red Hat Enterprise Linux 3 - (32 and 64 bit)
 - Red Hat Enterprise Linux 4 - (32 and 64 bit)
 - Red Hat Enterprise Linux 5 - (32 and 64 bit)
- Para-virtualized drivers for high performance network and disk I/O
 - Uses standard VirtIO interface
 - Included as part of Linux kernels > 2.6.25
 - Backported into RHEL 4.8+ and RHEL 5.3+ kernels
 - Available as download for RHEL 3



RED HAT ENTERPRISE VIRTUALIZATION GUEST SUPPORT & INTEROPERABILITY



- Support for Microsoft Windows Server guests
 - Windows Server 2003 & 2003R2 - (32 and 64bit)
 - Windows Server 2008 & 2008R2 - (32 and 64 bit)
 - Server Virtualization Validation Program (SVVP) Certification from Microsoft
 - Both RHEL 5.4 and RHEV-H Certified on AMD and
 - Ensures fully supported environment
- Para-virtualized drivers for high performance network and disk I/O
 - WHQL Certified “signed” drivers
 - Included on Windows Update for seamless user experience



RED HAT ENTERPRISE VIRTUALIZATION PERFORMANCE AND SCALABILITY

- **APPLICATION THROUGHPUT:**
More than 1 million messages per second in a pair of VMs
- **APPLICATION LATENCY:**
Less than 200 micro-second latency in a VM*
- **VM DENSITY:**
More than 400 active VMs with load on a single x86 server **
- **APPLICATION PERFORMANCE:**
Up to 138% of bare metal depending on workload

** AMQP Workload running on virtual machine
Host – RHEL 5.4 with PCI Passthrough*

*** 8 Socket x 6 Core server with 256 GB ram
Using memory overcommit – with KSM page sharing*



RED HAT ENTERPRISE VIRTUALIZATION MANAGEMENT FEATURES

Feature	Description
High Availability	Restart guest VMs from failed hosts automatically on other hosts
Live Migration	Move running VM between hosts with zero downtime
System Scheduler	Continuously load balance VMs based on resource usage/policies
Power Saver	Concentrate virtual machines on fewer servers during off-peak hours
Maintenance Manager	No downtime for virtual machines during planned maintenance windows
Image Management	Template based provisioning, thin provisioning and snapshots
Monitoring and Reporting	For all objects in system – VM guests, hosts, networking, storage etc.



RED HAT ENTERPRISE VIRTUALIZATION MANAGER

- Management platform for Virtualization
- Single platform for managing virtual servers and desktops
- Server and desktop platforms available in separate bundles or together
 - Red Hat Enterprise Virtualization Manager for Servers
 - Includes Red Hat Enterprise Virtualization Hypervisor
 - Red Hat Enterprise Virtualization Manager for Desktops
 - Includes Red Hat Enterprise Virtualization Hypervisor
 - SPICE remote rendering protocol
 - Connection broker
 - User Portal



RED HAT ENTERPRISE VIRTUALIZATION MANAGER FOR SERVERS

The screenshot displays the RHEV-M web interface. At the top, it shows the user is logged in as Administrator. A search bar at the top left contains the text "Vms:". Below the search bar, there are tabs for "Data Centers", "Clusters", "Hosts", "Storage", "Virtual Machines", "Pools", "Templates", and "Users". The "Virtual Machines" tab is selected, showing a table of VMs. The table has columns for Name, Cluster, Host, IP Address, Memory, CPU, Network, Display, and Status. Below the table, there are tabs for "General", "Users", "Network Interfaces", "Virtual Disks", "Snapshots", and "Applications". The "General" tab is selected, showing details for the selected VM (win2k3).

Name	Cluster	Host	IP Address	Memory	CPU	Network	Display	Status
DNS-RHEL4	Default			0%	0%	0%		Down
RHEL3	Default	rhev-1.rhev.redhat.com		0%	0%	1%	VNC	Up
RHEL4	Default	rhev-1.rhev.redhat.com		0%	12%	0%	VNC	Up
RHEL5	Default	sandbox.rhev.redhat.com		0%	0%	0%	VNC	Up
RHEL5_SAP	Default	rhev-3.rhev.redhat.com		0%	0%	0%	VNC	Up
RHEL5_webserver	Default	sandbox.rhev.redhat.com		0%	0%	0%	VNC	Up
RHEL5-Desktop	Default			0%	0%	0%		Down
win2k3	Default			0%	0%	0%		Down
win2k8	Default	rhev-3.rhev.redhat.com	172.16.31.4	42%	0%	0%	VNC	Up
Windows7	Default	rhev-1.rhev.redhat.com	172.16.31.5	69%	51%	0%	Spice	Up
WinXP-1	Default	rhev-2.rhev.redhat.com		0%	0%	1%	Spice	Up
WinXP-2	Default			0%	0%	0%		Down
WinXP-3	Default	rhev-2.rhev.redhat.com	172.16.31.4	38%	0%	1%	Spice	Up
WinXP-4	Default	rhev-2.rhev.redhat.com		0%	0%	1%	Spice	Up
WinXP-5	Default	rhev-2.rhev.redhat.com		0%	0%	1%	Spice	Up

General
Operating System: Windows 2003
Description:
Template: Blank
Number of CPUs: 2
Defined Memory: 512 MB
Domain:
Time Zone: Eastern Standard Time

Search driven UI makes managing thousands of objects easy

Bookmarks – dynamic filters and other advanced GUI functions

Cross-correlate information across users, VMs, hosts, applications, status etc.



RED HAT ENTERPRISE VIRTUALIZATION MANAGER FOR SERVERS

- Search driven interface
- Unique feature
 - Dynamically build lists of servers/vms based on search criteria
 - eg. Find all servers with more than 85% utilization
 - Create bookmarks to “shortcut” to these dynamic lists

Logged user: Administrator, [Sign out](#) | [Configure](#) | [Copyright](#) | [At](#)

Search servers: Desktops.network_usage |

GO

servers: Desktops.network_usage >=
servers: Desktops.network_usage =
servers: Desktops.network_usage !=

Events

Monitoring

All Bo

Add

Edi

et. Uptime Server

0% 9 min vds1

webserver

Down

0%

0%

0%

windows2k3

Down

0%

0%

0%



RED HAT ENTERPRISE VIRTUALIZATION MANAGER FOR SERVERS

- Web based user interface
- Command line interface for scripting and automation
- Graphically manage host configuration
 - Host networking
 - Bridging
 - Bonding
 - VLANs
 - Storage
 - NFS
 - Fiber Channel
 - iSCSI
 - Multipath

ENTERPRISE VIRTUALIZATION

Logged in user: rhadmin Sign out Configure Copyright About

Search: Clusters:

Tags Favorites

New Edit Remove

root

Data Centers Clusters Hosts Storage VServers VDesktops Pools

New Edit Remove

Name	Description
Default	The default server cluster
Cluster1	AMD clustering for Desktops

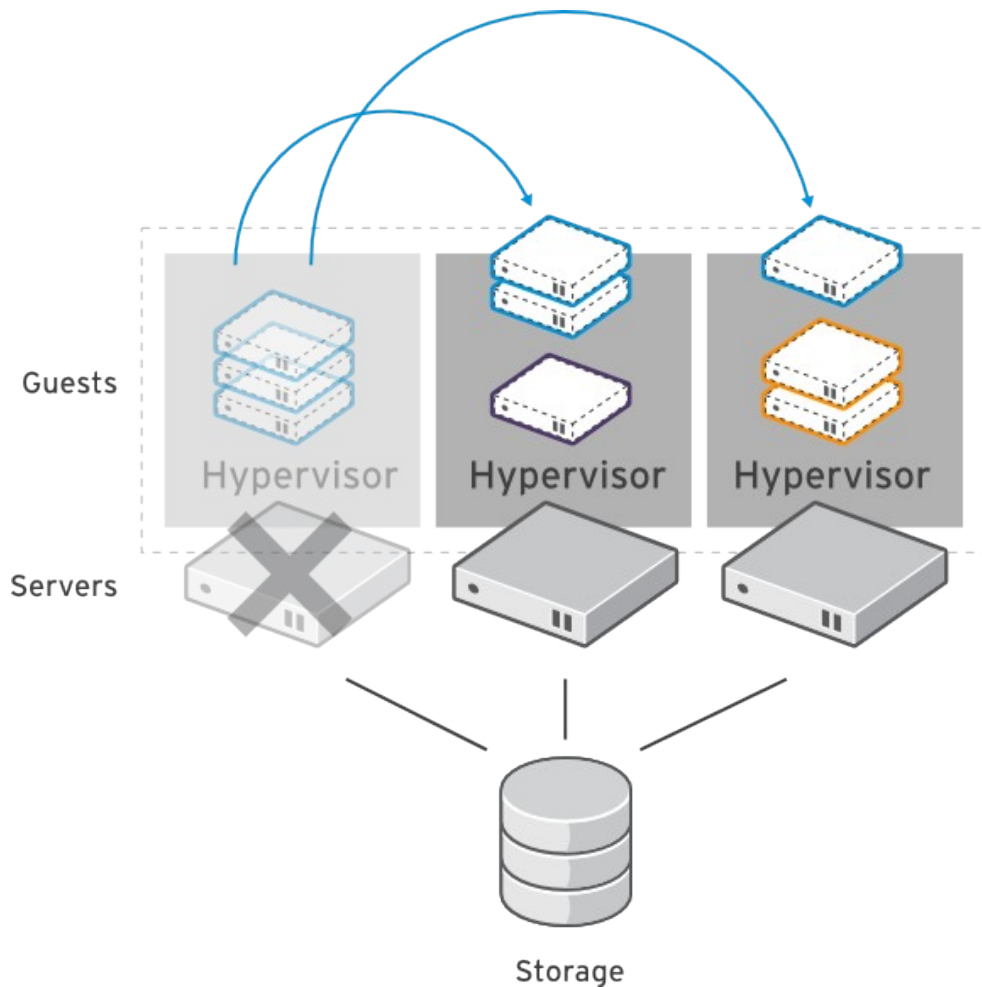
Hosts VServers VDesktops Networks

Name	Host/IP	Status
▲ Fujitsu2	192.168.100.26	Up
▲ Fujitsu3	192.168.100.27	Up
▲ IBM1	192.168.100.10	Up

Last message: Host win2003-1.rhev.com was activated (User: rhadmin).



RED HAT ENTERPRISE VIRTUALIZATION HIGH AVAILABILITY

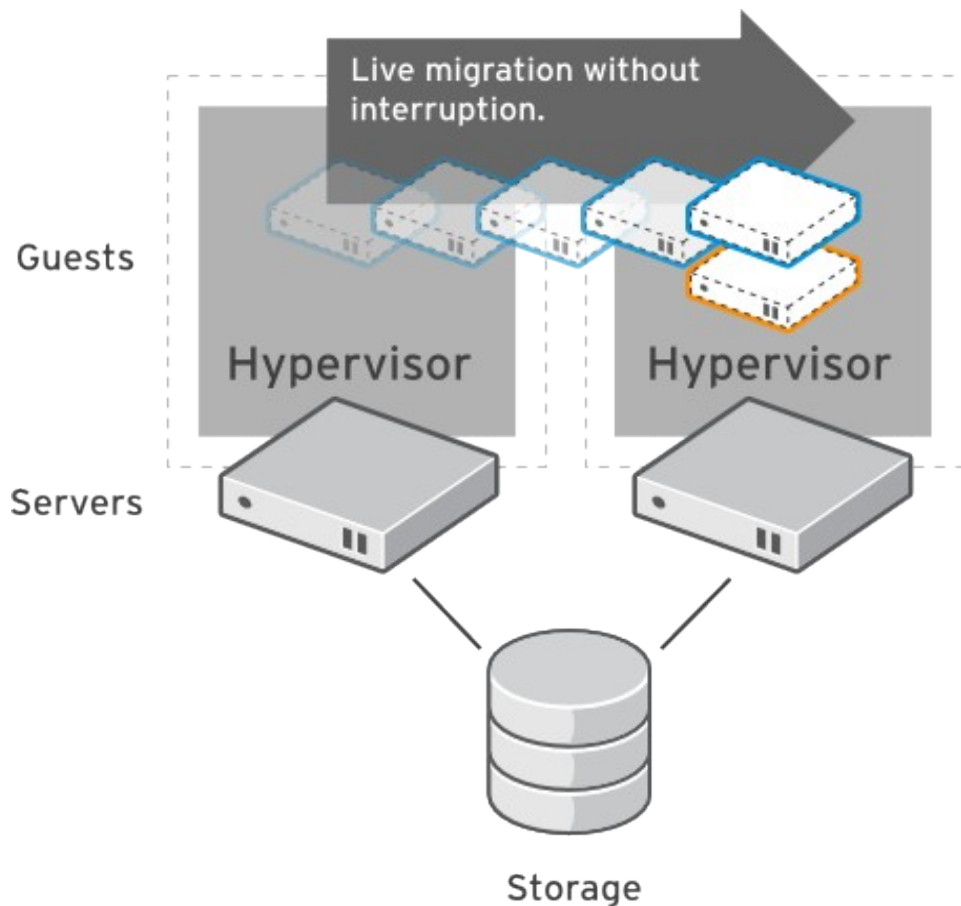


- Build a highly available enterprise infrastructure
- Continually monitor host systems and virtual machines
- Automatically restart virtual machines in case of host failure
 - Restart virtual machine on another node in the cluster
 - No user intervention required
- Use live migration to “fail-back” a VM to it's original host when the server is restored



RED HAT ENTERPRISE VIRTUALIZATION

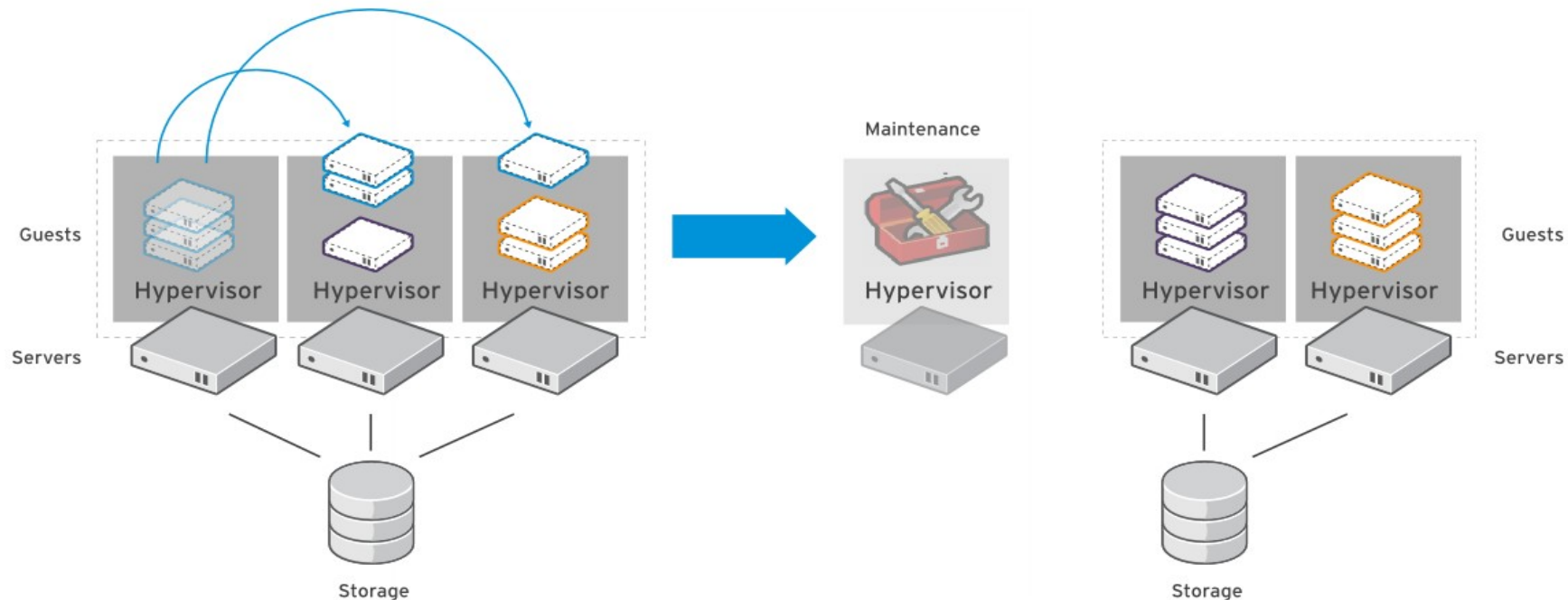
LIVE MIGRATION



- Dynamically move virtual machines between hosts
 - No service interruption
 - Applications continue to run
- Migrate even I/O intensive workloads such as databases
- Perform hardware maintenance without application downtime
- Dynamically balance workloads between host systems



RED HAT ENTERPRISE VIRTUALIZATION MAINTENANCE MANAGER



- Perform maintenance on hosts without guest downtime
- Place host in “maintenance mode”
 - Automatically live migrate guests from host
- Alert administrator when Hypervisor upgrade is available
- Automate upgrade of Hypervisor Software



RED HAT ENTERPRISE VIRTUALIZATION MAINTENANCE MANAGER

- Hypervisor Upgrade
 - RHEV Manager alerts the user when a new RHEV Hypervisor is available
 - Upgrade RHEV Hypervisor over the network from RHEV Manager

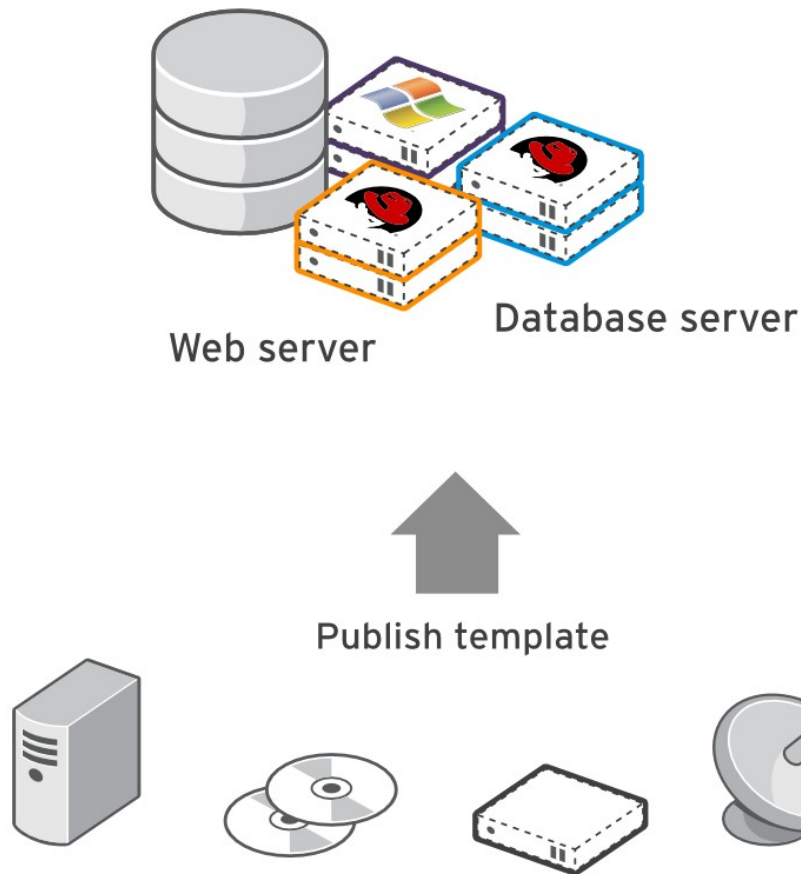
General	Virtual Machines	Network Interfaces	
Software Version:	2.1.0.33098	CPU Name:	64-bit Intel with NX
Host type:	RHEV-H	CPU Type:	Intel(R) Core(TM)2 CPU
Active VMs:	2	Number of CPUs:	2
		Memory:	2889 MB

Alerts

! A new RHEV-Hypervisor version is available. [Upgrade](#)



RED HAT ENTERPRISE VIRTUALIZATION IMAGE MANAGER



- Rapidly deploy new VMs based on templates
- Create VM templates by hand, automatically from existing VMs, with Red Hat Network Satellite, or with 3rd party tools
- Thin Provisioning
- Virtual machine snapshots



RED HAT ENTERPRISE VIRTUALIZATION IMAGE MANAGER

- Snapshots
 - Create “point in time” images of virtual machines
 - Support multiple snapshots per virtual machine
 - Multiple restore points
 - Roll back virtual machine to previous state
 - Use snapshot preview to view previous virtual machines status

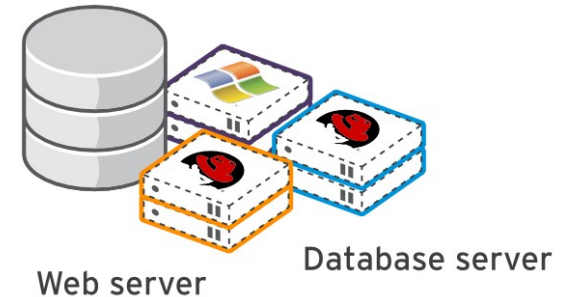
August, 2009						
Su	Mo	Tu	We	Th	Fr	Sa
26	27	28	29	30	31	1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31	1	2	3	4	5

Time	Description	Disks
3:49 PM	Base image	1
5:50 PM	DC_w2k3	1



RED HAT ENTERPRISE VIRTUALIZATION IMAGE MANAGER

- Templates
 - Create library of preconfigured virtual machine images
 - Including OS, configuration and applications
 - Rapidly provision new virtual machines from templates
 - Uses thin provisioning to improve storage utilization



New Virtual Machine

Template:	Blank
Name:	Blank
Description:	rhel3_i386 rhel4_i386 rhel5_desktop rhel5_i386 win2k3_r2 WinXP_sp3
Host Cluster:	
Default Host:	
Storage Domain:	
Memory Size:	512 MB
Number of CPU cores:	1
Operating System:	Unassigned
	<input type="checkbox"/> Highly available

OK Cancel



RED HAT ENTERPRISE VIRTUALIZATION ROADMAP

1H10

2H10+

Red Hat Enterprise Virtualization 2.2

Red Hat Enterprise Virtualization 3.0

- Virtual Desktop Infrastructure (VDI)
- OVF Import and Export
- Reporting Engine
- Prioritized High Availability
- V2V

- VM-PM Scheduler (Hybrid model), Physical and Virtual system scheduler
- VM Secure – Host firewall, guest firewall, SELinux and SELinux profiler
- SLA Manager – CPU, memory, network and disk IO SLAs per VM and reporting
- Integration with MRG workload scheduling



RED HAT ENTERPRISE VIRTUALIZATION ROADMAP 2.2

- Prioritized High Availability
 - Specify ordering for restart of failed Vms.
eg. High priority VMs are restarted first, followed by medium, then high.
- RHEV Manager High Availability
 - Cluster RHEV Manager instances
 - Run as virtual machines RHEL 5 host with Red Hat Cluster Suite
- Backup Certification
 - Testing and certification with leading backup vendors
 - CA, EMC, IBM and Symantec

Road map features are subject to change



RED HAT ENTERPRISE VIRTUALIZATION ROADMAP 2.2

- Import and Export
 - Import and Export Virtual Machines and templates
 - Uses OVF Standard for compatibility and interoperability
- V2V – Virtual Machine Conversion
 - Tools to convert Xen and VMware images to native RHEV Images
 - Supports Windows XP, 2003, 2008, RHEL 3, RHEL 4 and RHEL5
 - Automated process including installations of drivers and configuration

Road map features are subject to change



RED HAT ENTERPRISE VIRTUALIZATION ROADMAP 2.2

- Guest Support
 - Added Windows 7
- RHEV Manager Platform
 - Support for running RHEV Manager on Windows Server 2008
 - Support for non-English Windows Server installations
- Expanded Fence Agent Support
 - Including WTI and APC power switches
- Reporting
 - Data warehouse including historic data for hosts, virtual machines and storage

Road map features are subject to change



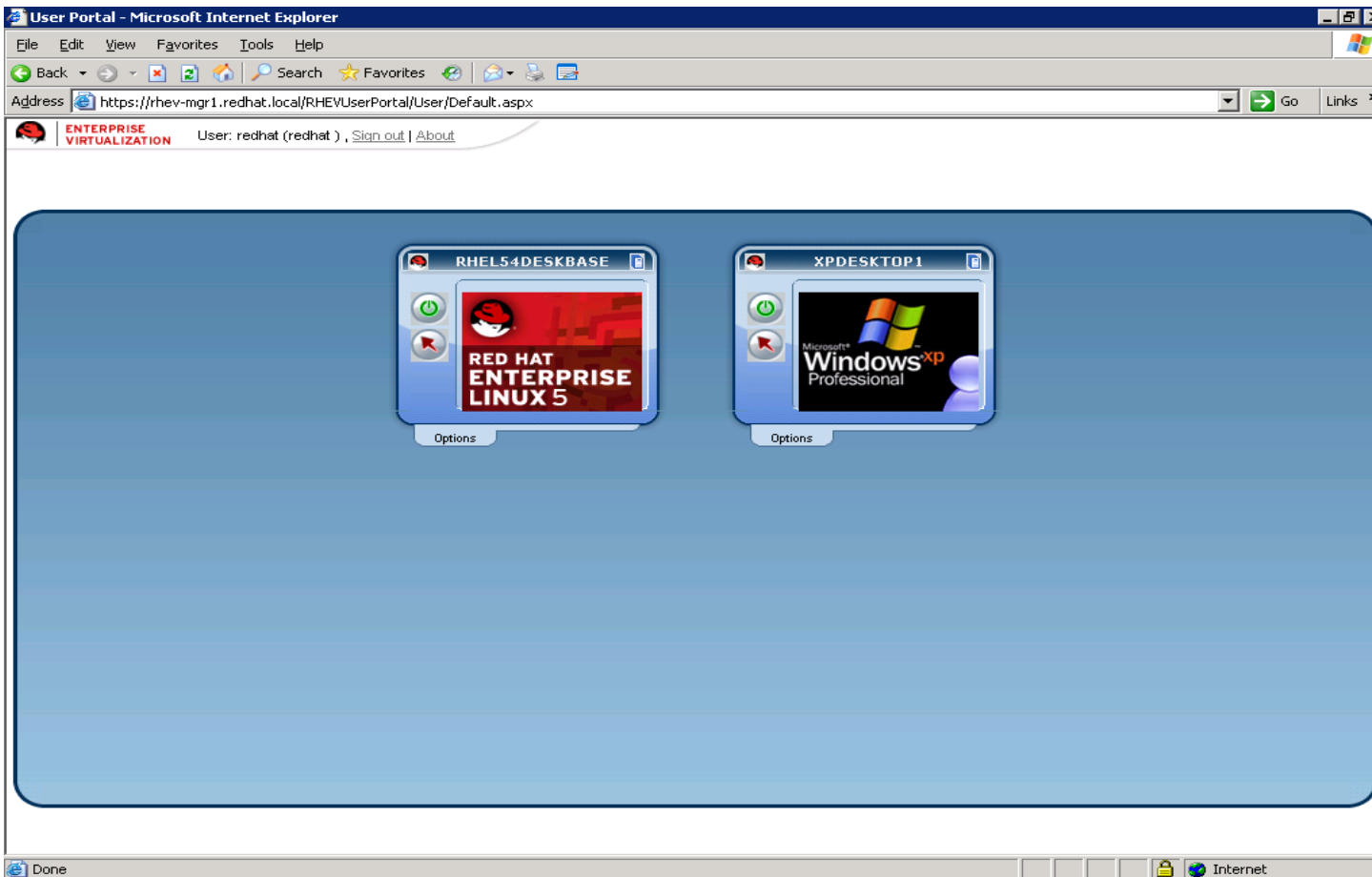
RED HAT ENTERPRISE VIRTUALIZATION ROADMAP 2.2

- Performance and Scalability
 - Support for 256GB memory in virtual machines
 - Improved I/O performance for thin provisioned virtual machines
 - Improved memory page sharing for Linux virtual machines
 - Extended CPU family support for modern CPUs
 - Optimizations for latest AMD and Intel CPUs
 - Including enhanced CPU compatibility for Live Migrations
- Many UI improvements including
 - New “Create VM” Wizard
 - Clone VMs from templates
 - Specify custom MAC addresses
 - Allow VMS to persistently boot from CD or Network



RED HAT ENTERPRISE VIRTUALIZATION USER PORTAL

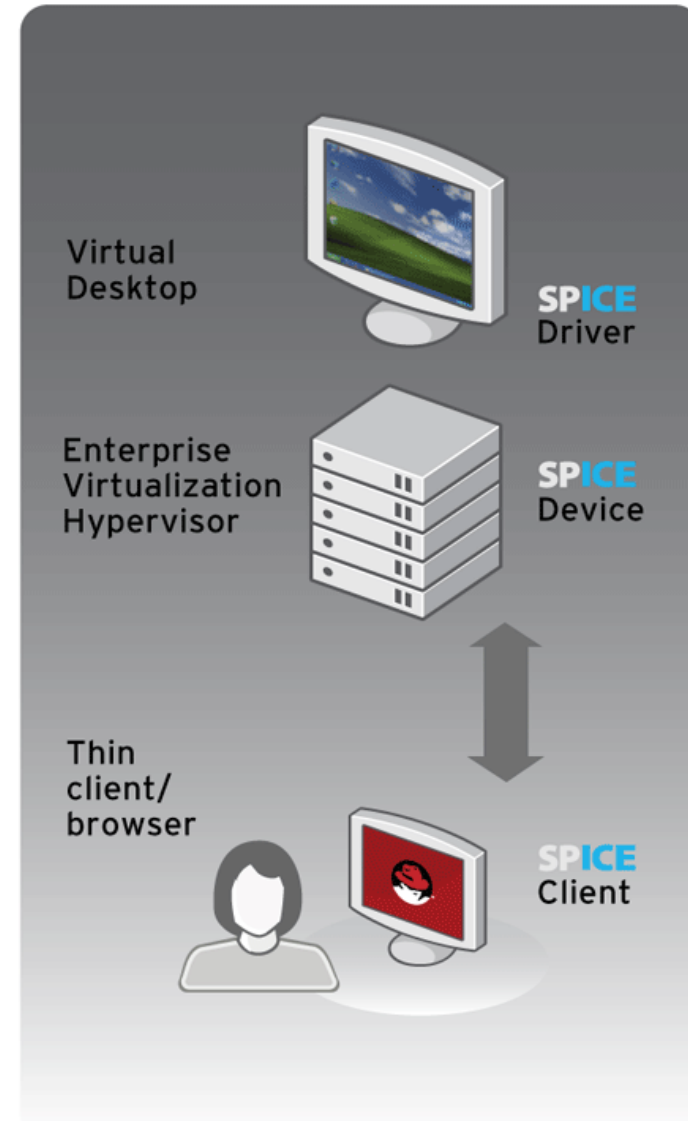
Web-based portal from which end users can log into their virtual desktops.



RED HAT ENTERPRISE VIRTUALIZATION

SPICE PROTOCOL

- **S**imple **P**rotocol for **I**ndependent **C**omputing **E**nvironments
- An adaptive remote rendering protocol
- Able to deliver an end user experience indistinguishable from that of a physical desktop





THANK YOU!