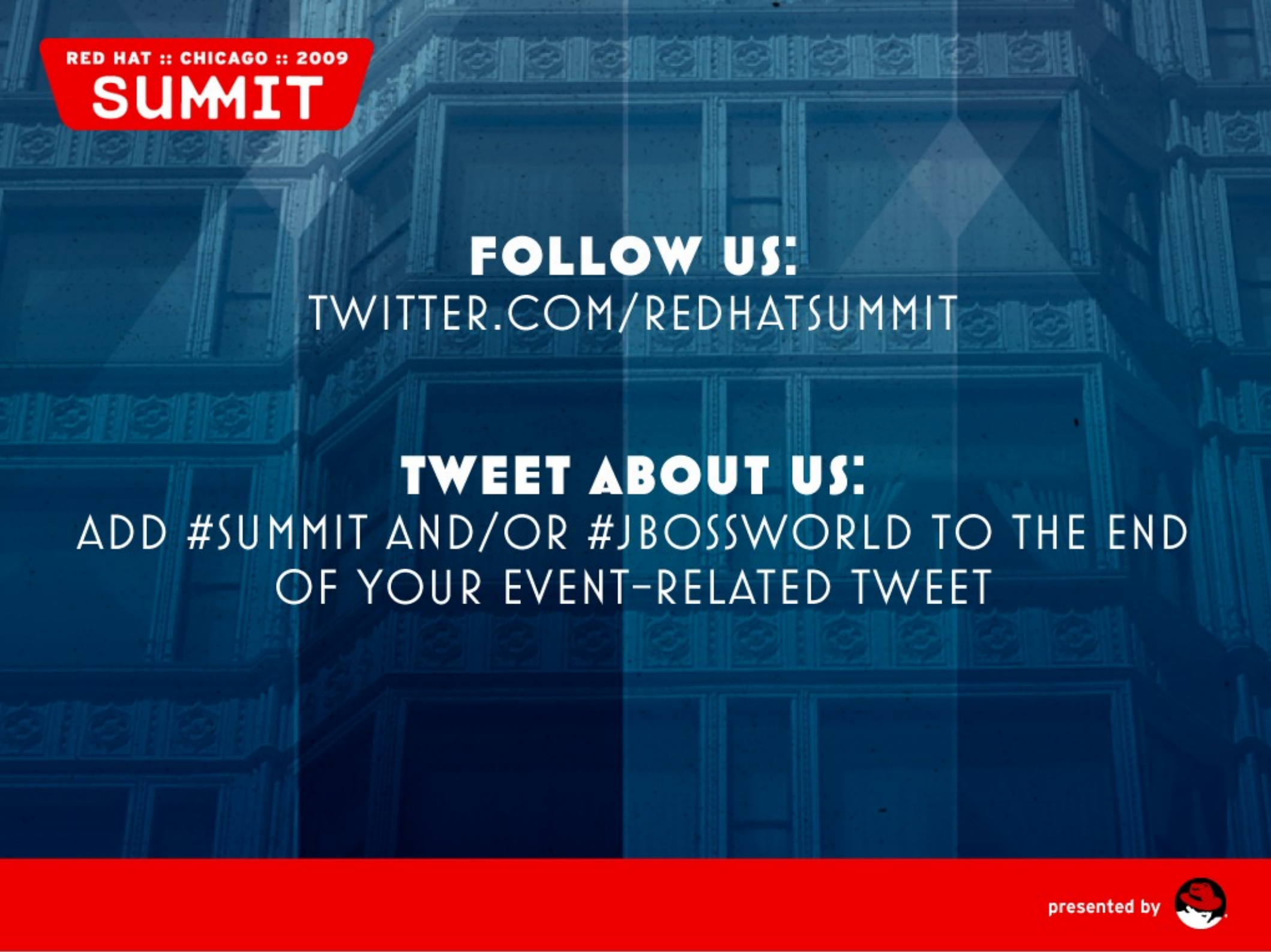
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Red Hat Enterprise Linux 5 Virtualization in Real Life

Vinny Valdez, RHCA
Sr. Product Architect
Red Hat Consulting
September 3, 2009

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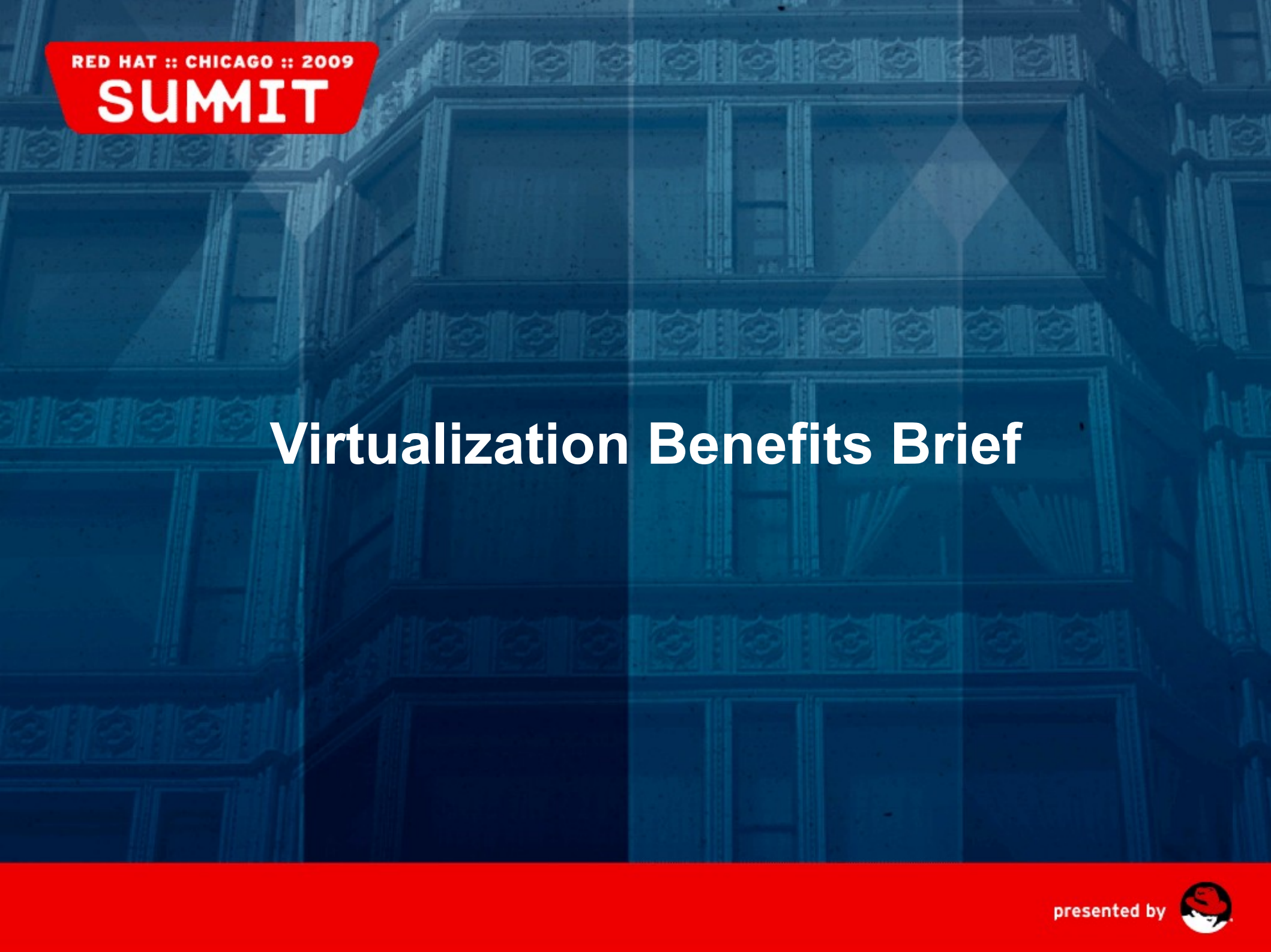
Agenda

- Virtualization Benefits Brief
- Red Hat Enterprise Linux 5.{0-3} Virtualization
- Red Hat Enterprise Linux 5.4+ Virtualization
- The Linux Kernel – Scalability, Security, Performance
- Real Life Use Cases
- Best Practices
- Managing your Virtualization Infrastructure
- Red Hat Enterprise Virtualization



Virtualization Benefits Brief

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Benefits of Virtualization

- Consolidation
- Increased utilization
- Power/Cooling Savings (Green IT)
- Leverage new technologies (FCoE, 10G)
- Rapid provisioning
- Manage risks and minimize costs
- Extend legacy software lifecycle
- Dynamic software fault tolerance
- Hardware fault tolerance through live migration

Red Hat Enterprise Linux 5.{0-3} Virtualization

Xen Virtualization

Red Hat Enterprise Linux 5 includes Integrated virtualization

- Xen Hypervisor
  - Included in 5.0
  - Fully Supported during product lifetime
    - Until at least 2014 (later with Mission Critical program)
  - Using Xen 3.1.2 (with selected backports)
  - Available for x86, x86_64 and IA64
- Red Hat Enterprise Linux Advanced Platform
  - Includes GFS Cluster file system and Red Hat Cluster Suite
  - Unlimited virtualized guests

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Red Hat Enterprise Linux 5.4+ Virtualization

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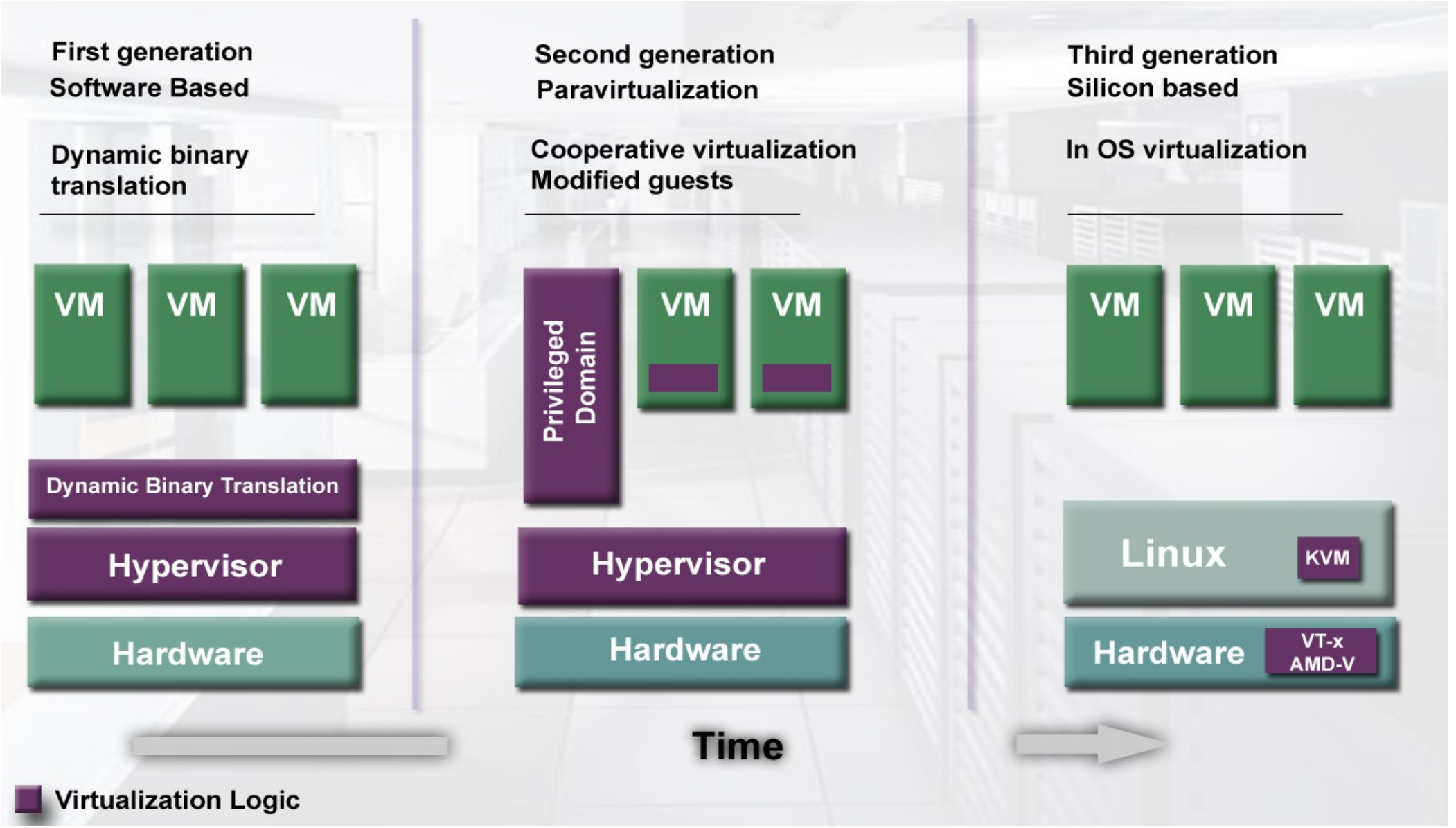
Kernel Virtual Machine

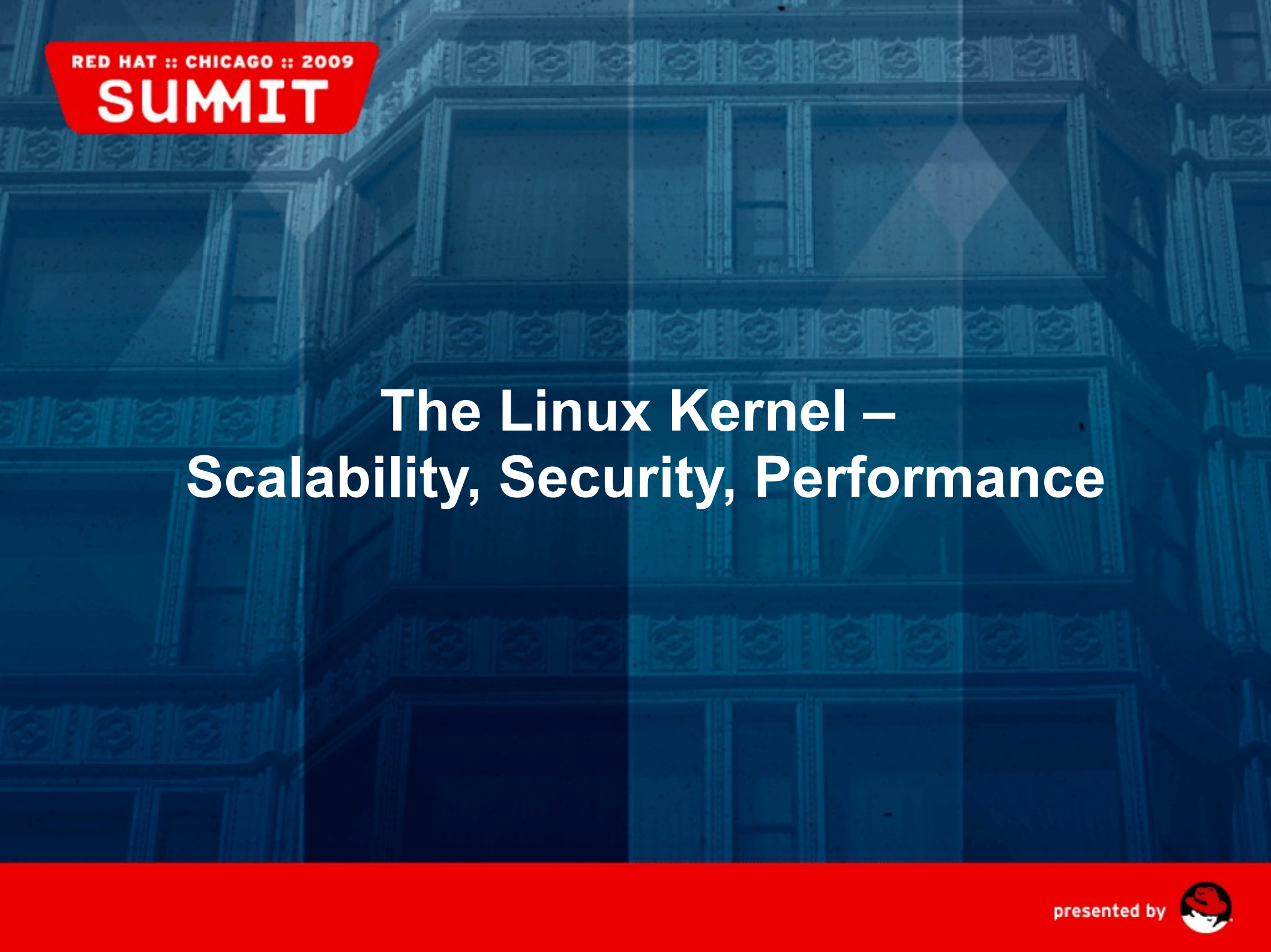
- KVM Hypervisor
  - Added in RHEL 5.4
  - Included in bare metal kernel
  - Hypervisor available for **x86_64 only** (guests can be mixed)
  - Requires Intel VT-x (VMX) or AMD AMD-V (SVM)
  - Support for RHEL {3-5} guests, other Linux distros
  - Support for Microsoft Windows Servers guests (Windows Server 2003, 2008), and Windows XP, Windows Vista
    - Paravirtualized drivers for network and disk (WHQL certified)
    - Microsoft SVVP Certification
- Xen will continue to be shipped and supported in RHEL 5.4+ (2014)

RHEL 5.4 Virtualization

- Support for advanced hardware features for both Xen and KVM
  - VT-d/IOMMU for secure PCI Pass-through
  - SR-IOV for PCI device sharing
  - Hardware assisted virtualization
- Performance and scalability out-of-the-box
- Management compatibility via libvirt
- Virt-tools allow transparent transition
- Tools to transition from Xen to KVM (para or HVM)

Evolution of x86 Virtualization





The Linux Kernel – Scalability, Security, Performance

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Virtualization with the Linux Kernel

- All certifications immediately apply
- Performance tuning done as normal kernel process
- Offload work to hardware
- NUMA, huge pages, Kernel Shared Memory, CPU scheduling, power management, SELinux, etc.
- 256 cores, 1TB RAM
- Xen makes sense for some workloads (hardware without virtualization extensions)
- Xen always needs specialized knowledge to code to
- KVM is just another process

Real Life Use Cases

Typical Use Cases

- Training
- Support
- Development/testing/demos
- Leverage new technologies (FCoE, 10G)
- Kiosks
- VDI
- Compatibility
- High Availability for non-cluster-aware Applications
- Cloud Computing

Customer Deployments

- Amazon EC2
- Electronic Arts
- Dreamworks
- Chicago Tribune (RHCS/GFS)
- US Courts (dom0 mount offline LVM for backup)
- Booze-Allen-Hamilton (Innovation Winner 2008)
- What are YOU doing?

Best Practices

Best Practices

- For performance, use pre-allocated disks
- LVM snapshots to quickly clone
- Shared storage (NFS/iSCSI/Fibre) with GFS for ease of management and live migration
- Use symlinks to common config files
- Red Hat Cluster Suite for resilience and fencing
- Use Satellite 5.3 with cobbler/koan for provisioning
- Script live migrations based on utilization
- Use para-virt drivers for best performance on HVM guests

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Managing Your Virtualization Infrastructure

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libvirt: Stable and Open API

- Management of Hypervisor(s) using standard APIs
- Hypervisor / Platform agnostic
- Stable API for ISV and application developers
  - Isolation from Xen HV instability
  - Isolation from XenD protocol changes
  - Formalized error reporting/handling
- XML definitions for VMs
- Contribution of partners (Fujitsu, SUN, IBM,Scalent, Platform, Enomaly, etc..)
- Core API in C, Python/Perl bindings for scripting
- CLI access via virsh
- Remote management and storage APIs in development
- Addition of CIM capabilities (IBM contribution)

RHEL5 Virt Tools

- Addressing short/mid-term holes in tool suite
  - Focus on “low hanging fruit” tools/capabilities to address common issue
  - Can be CLI or GUI
  - Longer term focus on GUI interface and Virtual Center-like capabilities
  - Tools developed so far
    - “RHEL5 for Dummies” Guide
    - Red Hat Magazine articles
    - Virtualization tools for RHEL5
      - virt-top , top like performance monitoring utility
      - virt-p2v , convert physical instance to virtual machine
      - nagios-virt , integration of virtual machine monitiring into NAGIOS
      - virt-image in progress (to convert VMware images to RHEL5)

RHEL5/Virt Tools (http://et.redhat.com/~jmh/virt-tools/)

- All tools available in Fedora and via EPEL for RHEL
- virt-top
  - Performance monitoring using a 'top' like tool
- virt-p2v
  - Convert physical to virtual instances
- libguestfs / guestfish
  - Library and tools to modify guest images offline
- virt-inspector
  - Generate XML configuration file from existing guest image
- virt-what
  - Determine guest type and hosted Hypervisor
- virt-df
  - 'df' for virtual machines, examine file system usage from Hypervisor
- virt-mem / virt-ps / virt-dmesg / virt-uname etc
  - Tools to inspect running guest from Hypervisor
- Cobbler/Koan (integrated into Satellite 5.3)

virsh

- Exposes libvirt functionality
- Command line administration tool
- Interactive administrator shell (# virsh)
- Scriptable batch operations
- Stable and dependable interface to HV administration
- Distributed with libvirt in Fedora and RHEL5
- Should be used for all interactive/remote/shell/script management tasks
  - Can be used for all management tasks supported by xm(8)
  - Support for remote management via ssh or TLS

virt-manager

- Desktop application for VM management
- Summary view for
  - Running domains
  - Performance & Resource statistics
- Support for domain management
  - Guest Creation, deletion, suspend/resume/start/stop/save/restore
  - Configuration of domain resources
    - vCPUs, Memory, Storage, Network, Bridging
- Live resource utilization graphs
  - CPU, Memory and Networking
- Available in Fedora and RHEL5
- Graphical guest OS console
- Secure console access
- Support for remote management via SSH or TLS

virt-manager

- Initial Overview window
  - Non-root connections open a read-only connection
  - Connection to localhost and/or multiple remote hosts in parallel
- Host Summary Window
  - List of all running Virtual Machines and resource usage
  - Dynamic hiding/showing of fields
  - Detailed domain information via 'Details' tab
  - Domain console via 'Open' or click onto domain entry
  - Create new virtual machine using the 'New' tab
- Virtual Machine Graphical Console
  - Graphical/serial interface for guest console via VNC for PV and FV
  - Supports authentication

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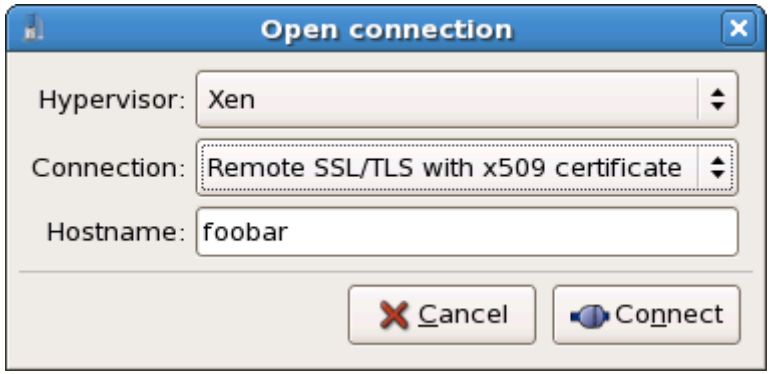
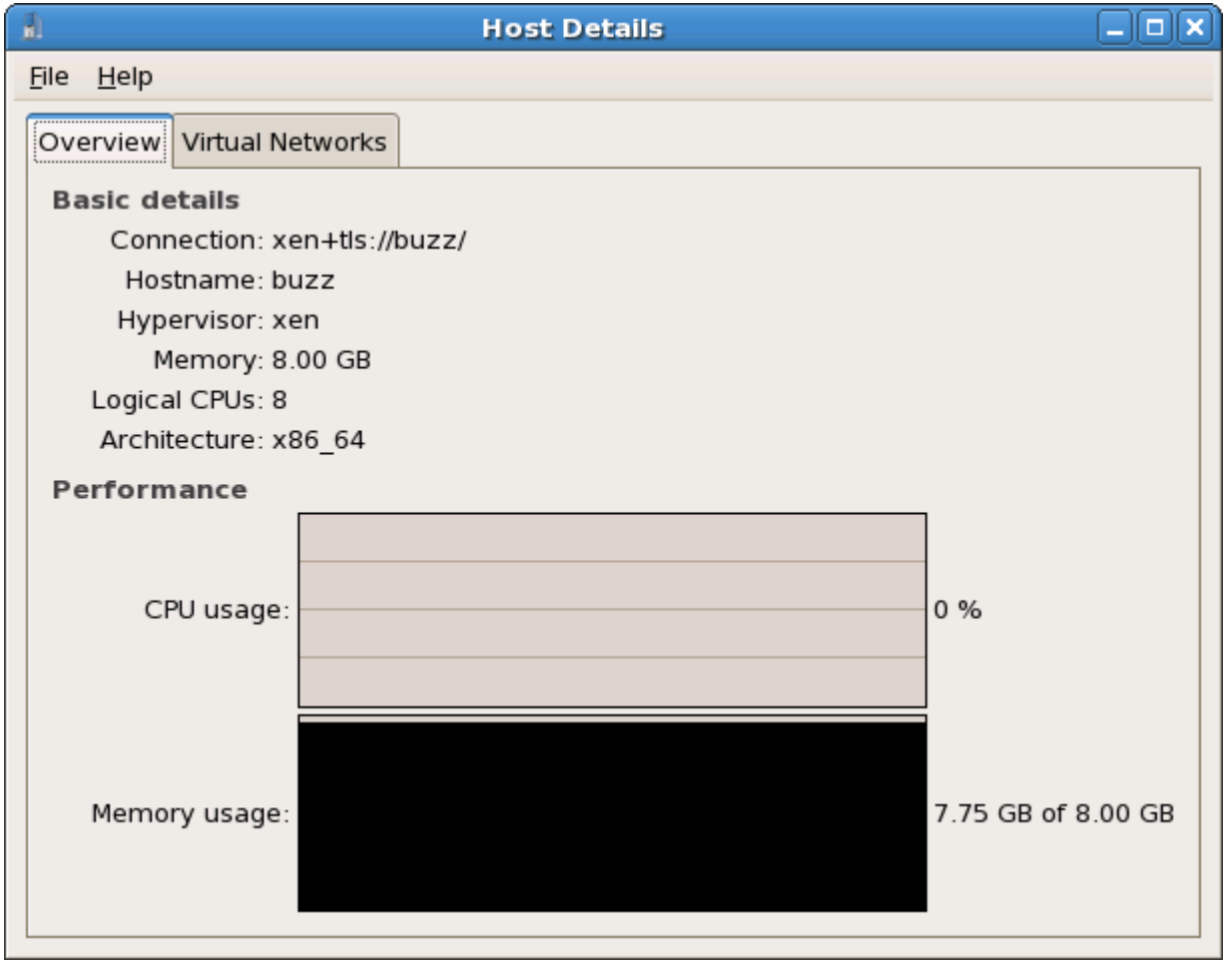
virt-manager

- Virtual Machine Performance Details
  - Live graphs of various machine and HyperVisor resources
    - Network, CPU, Memory, Disk usage
  - Current view is from the HyperVisor, will include guest OS view
    - Allows CPU time to be broken down to user,system,idle,iowait and nice categories
  - UUID is a globally unique identifier
    - Persistent across migrations
- Virtual Machine Configuration
  - Allows changes to various resources
    - Memory, Virtual CPU count
    - Dynamic tunables for immediate changes
    - Static tunables will be saved and applied during next reboot of virtual machine
    - Network and Storage management (adding/removing components)

virt-manager / Connection & Host Overview





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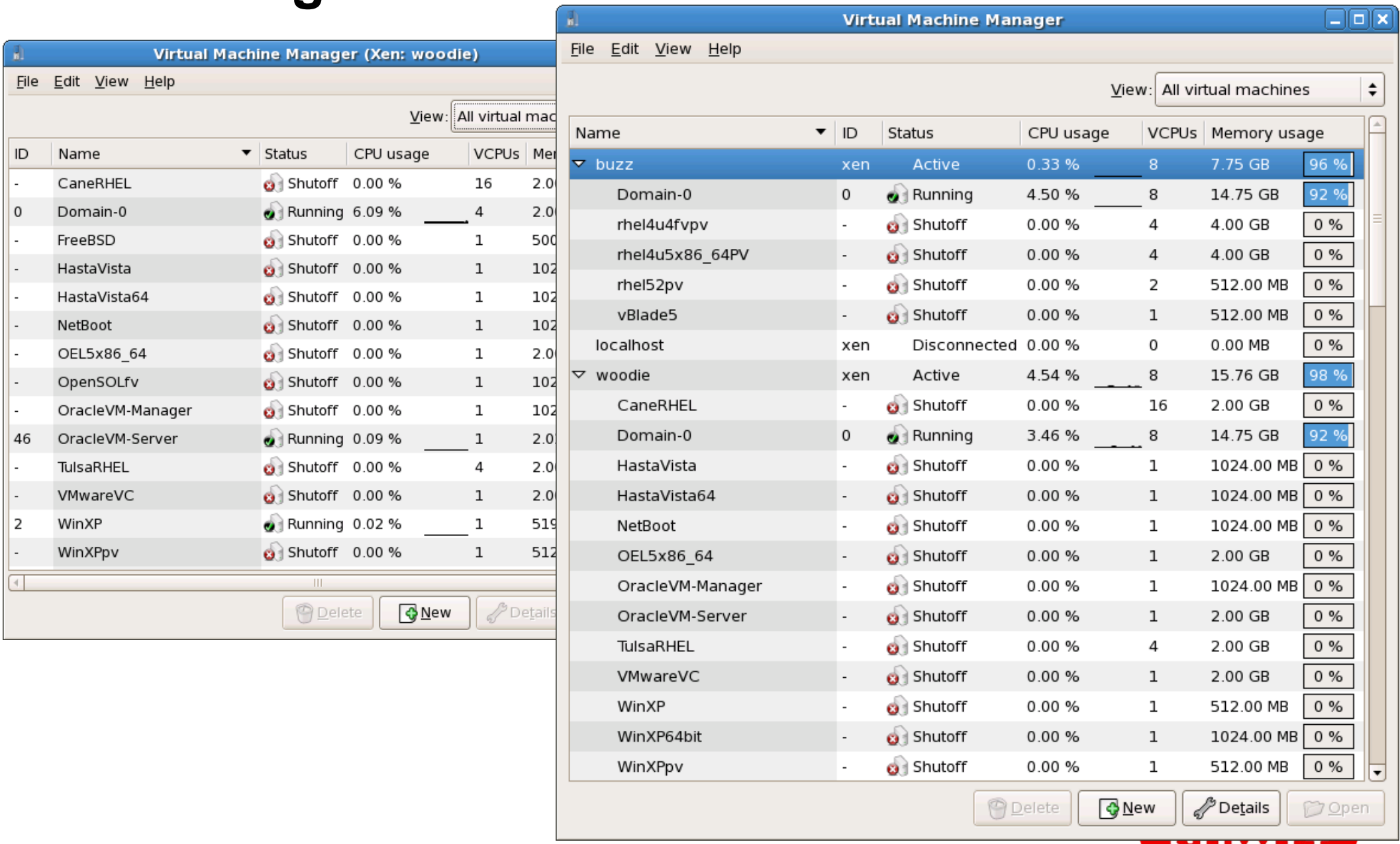
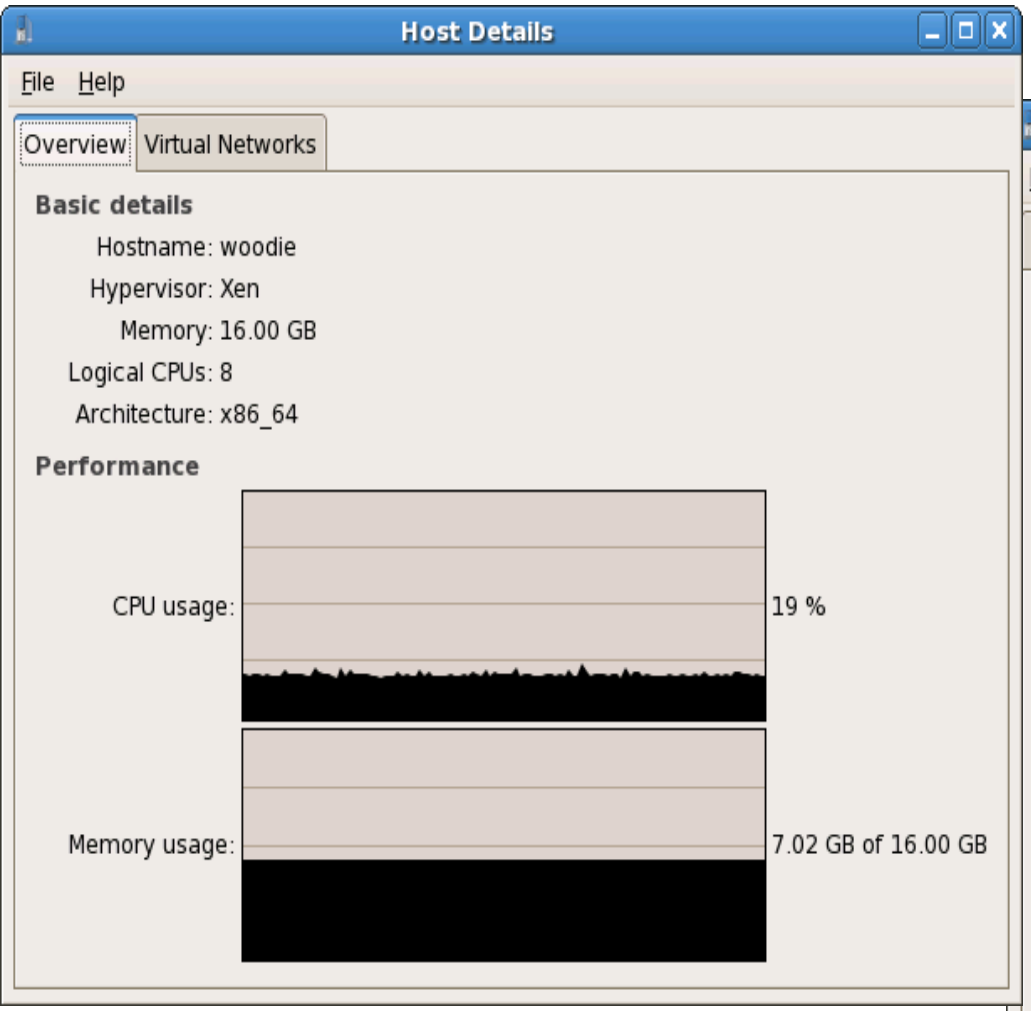
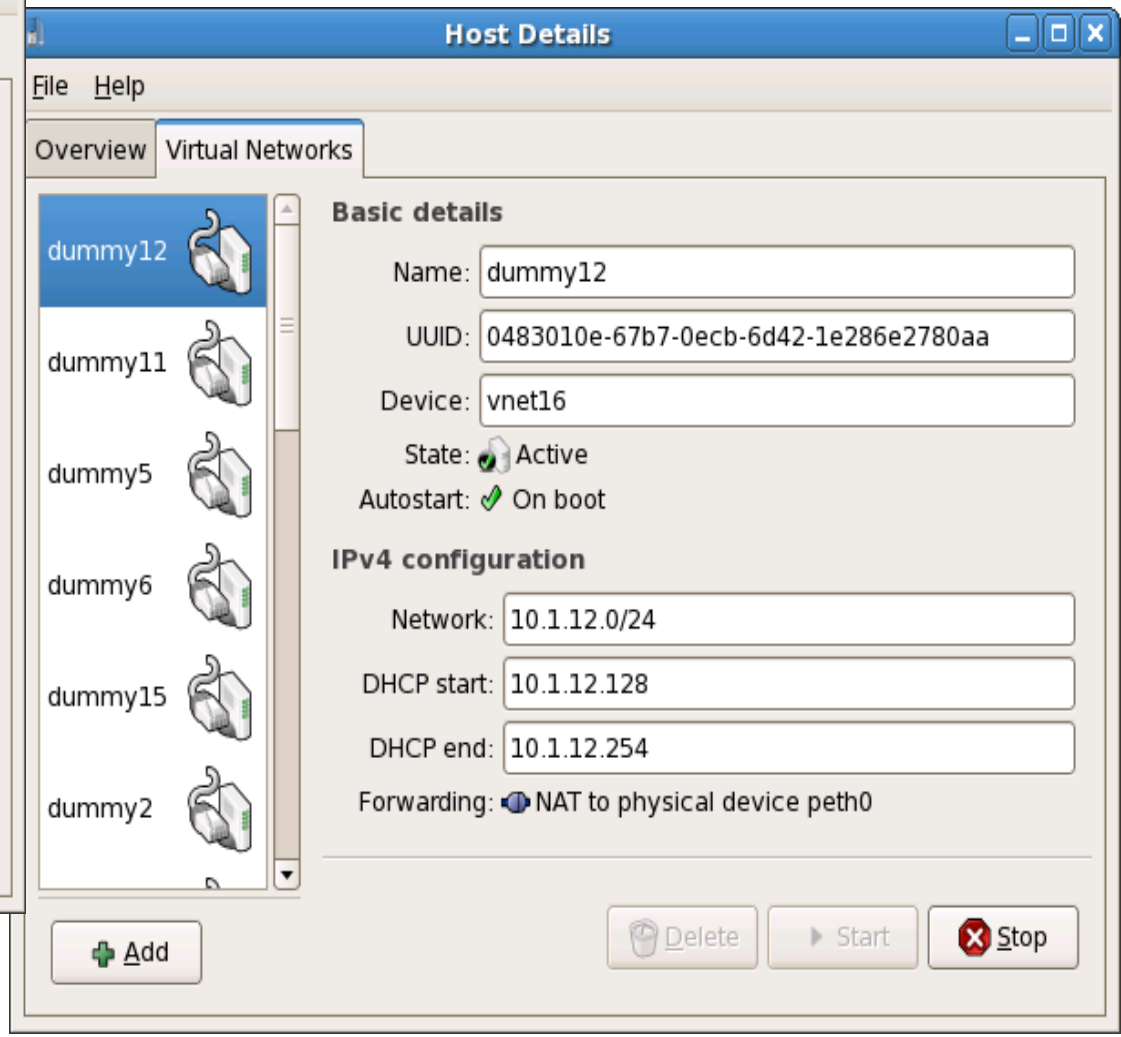
virt-manager / VM Overview



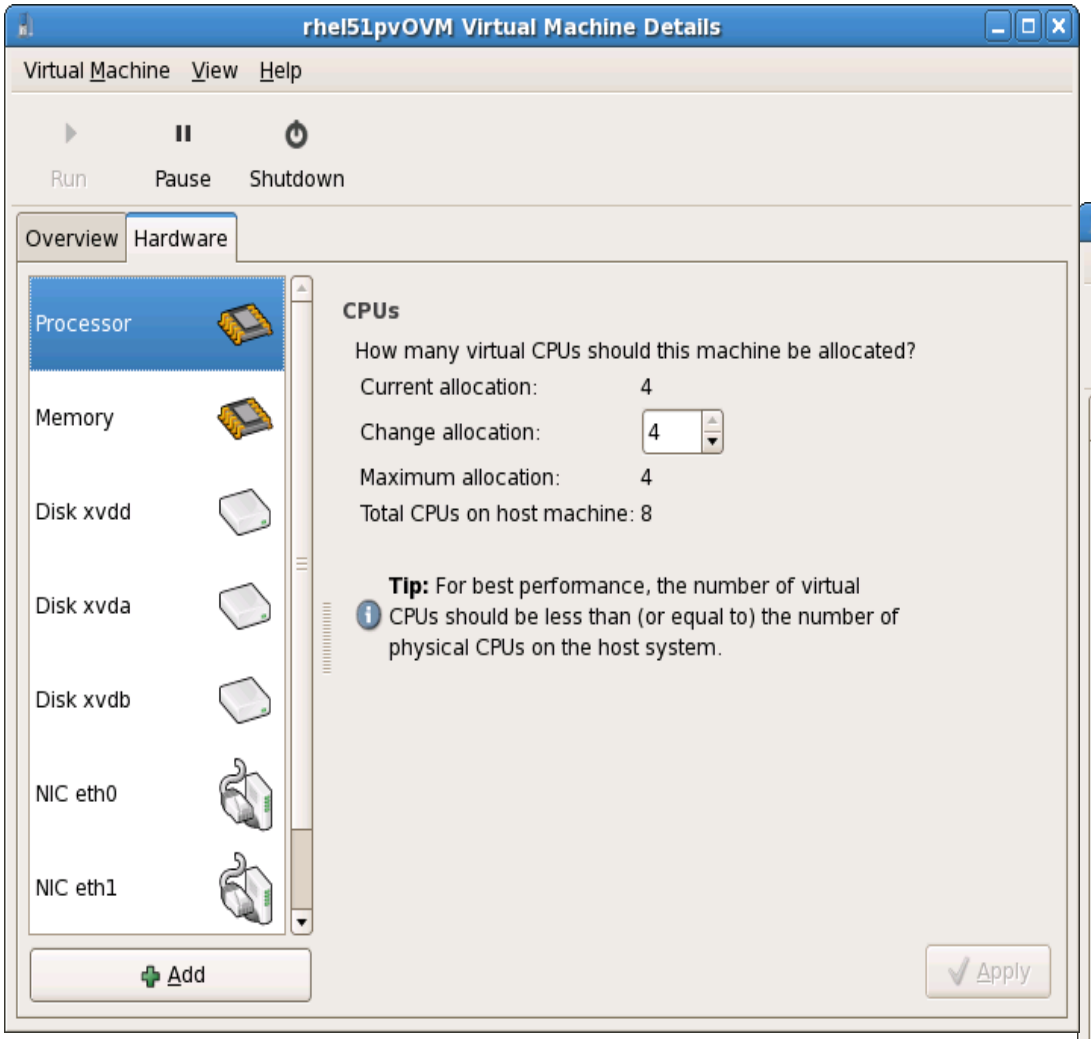
virt-manager / Host Details

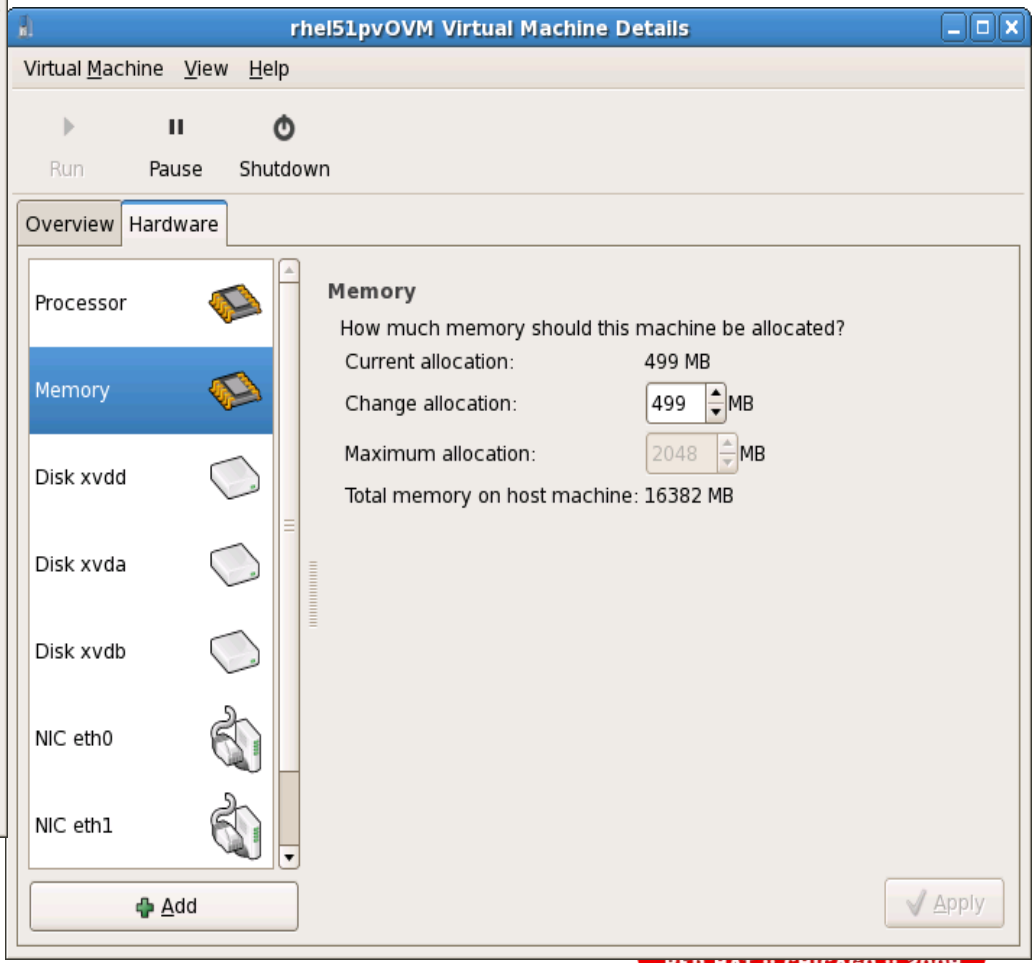




virt-manager / Resource Management

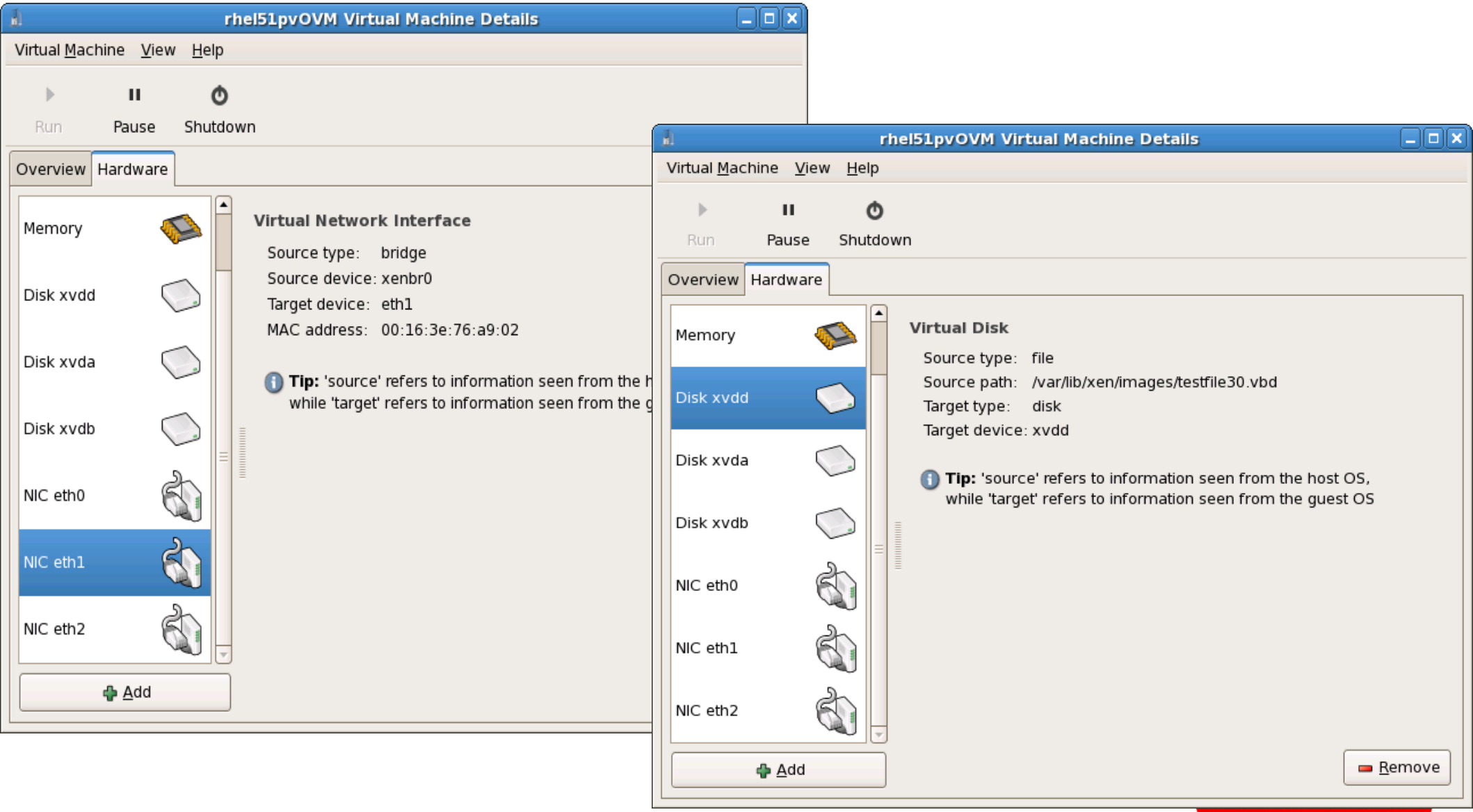
PV Guest





virt-manager / Hardware Management

Guest hardware resources

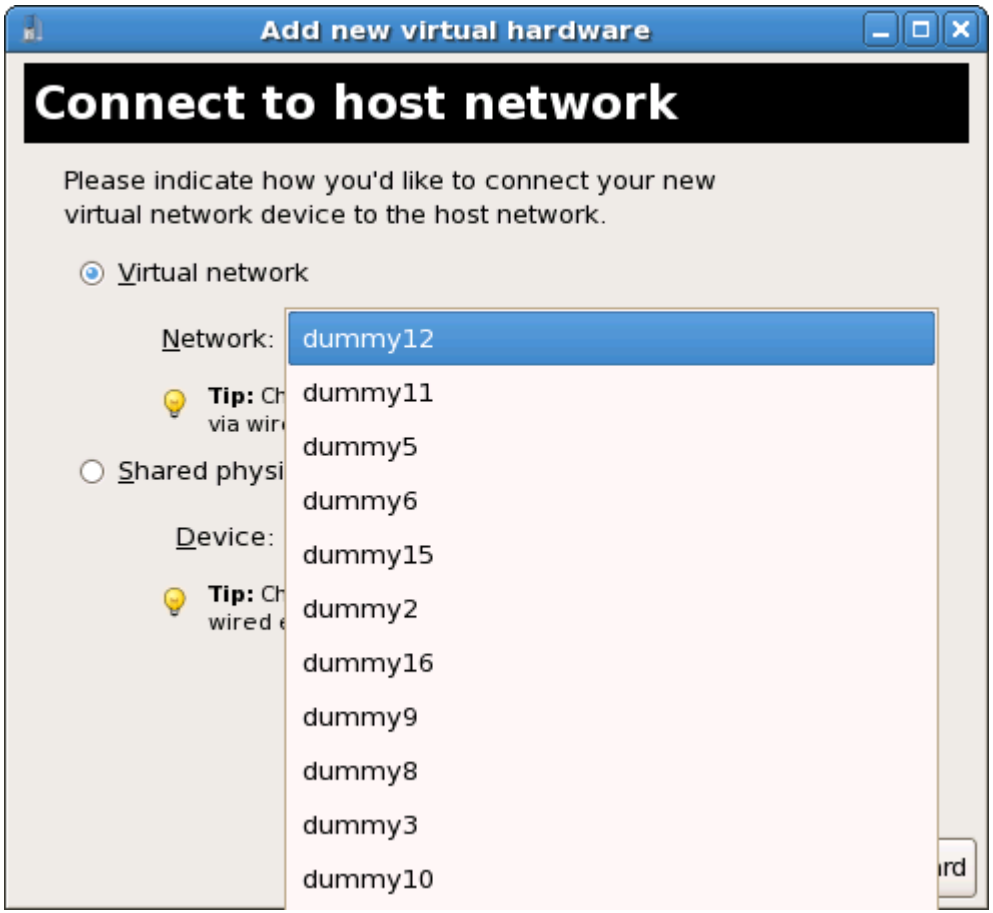


virt-manager / Hardware Management

Guest hardware resources

virt-manager / Hardware Management

Guest hardware resources



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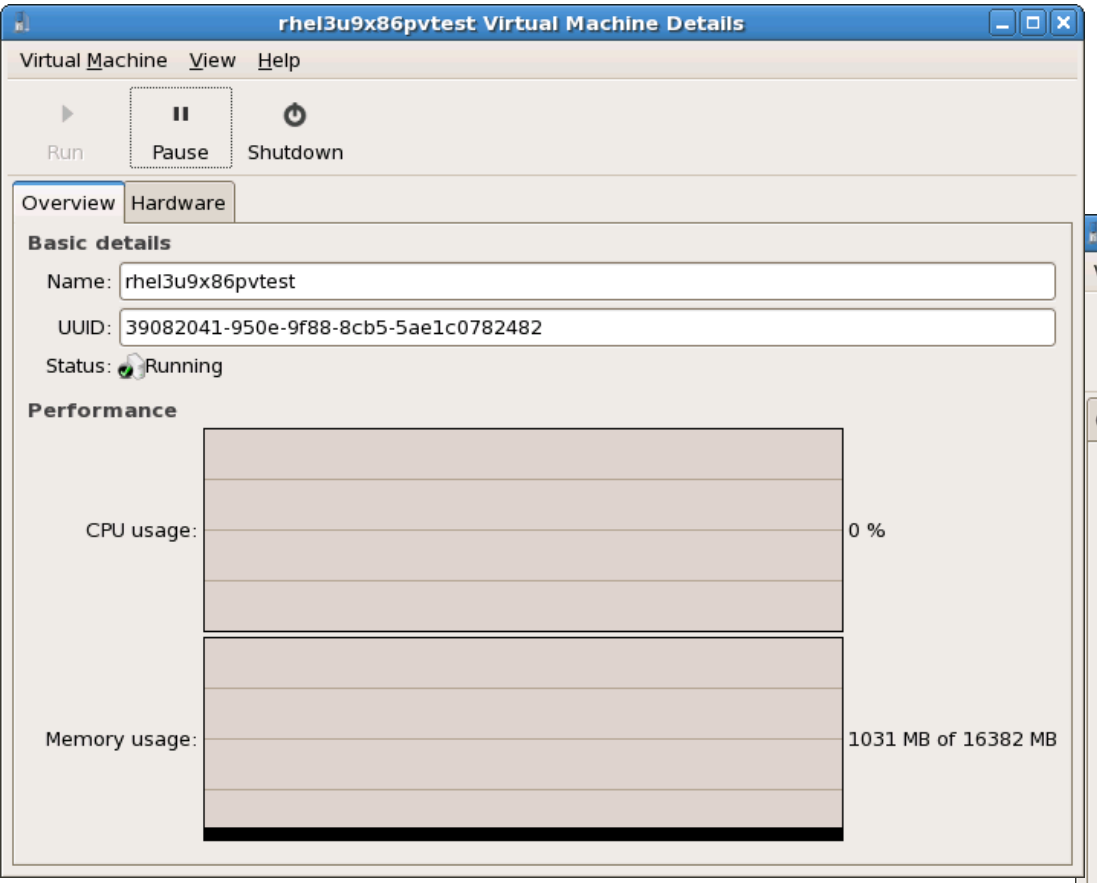
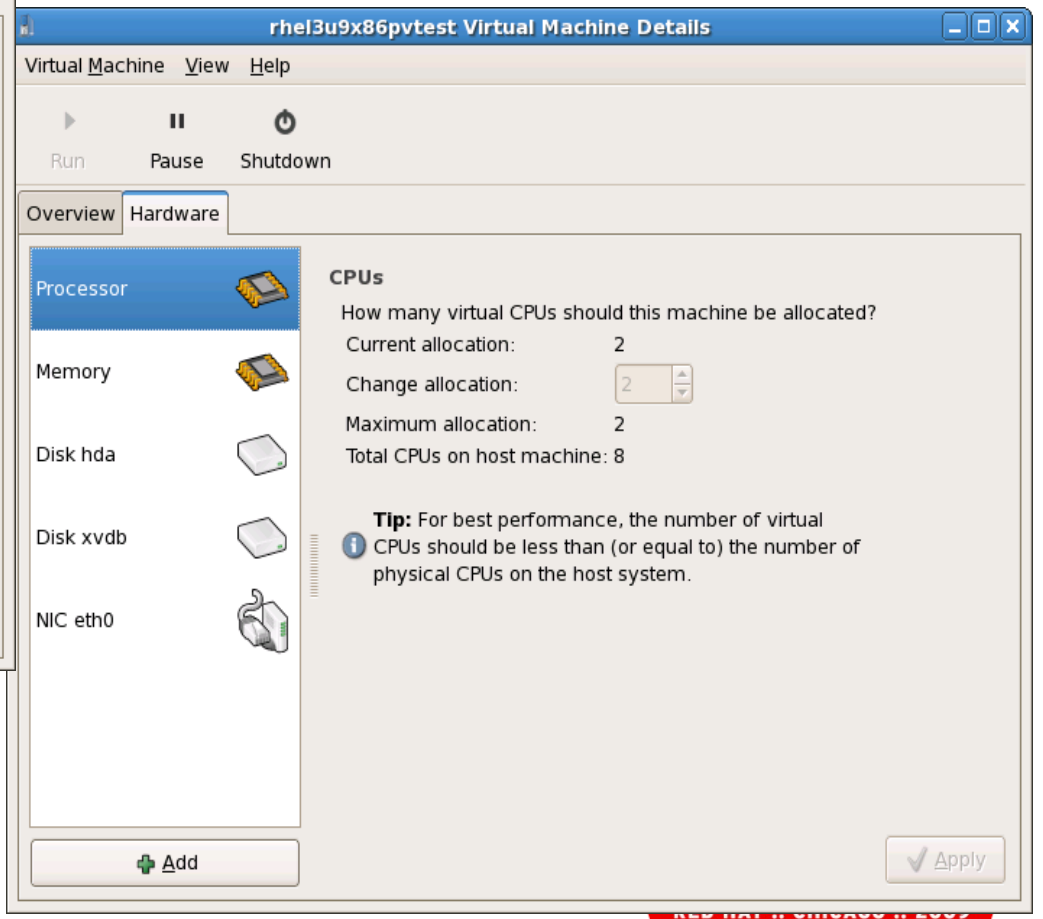
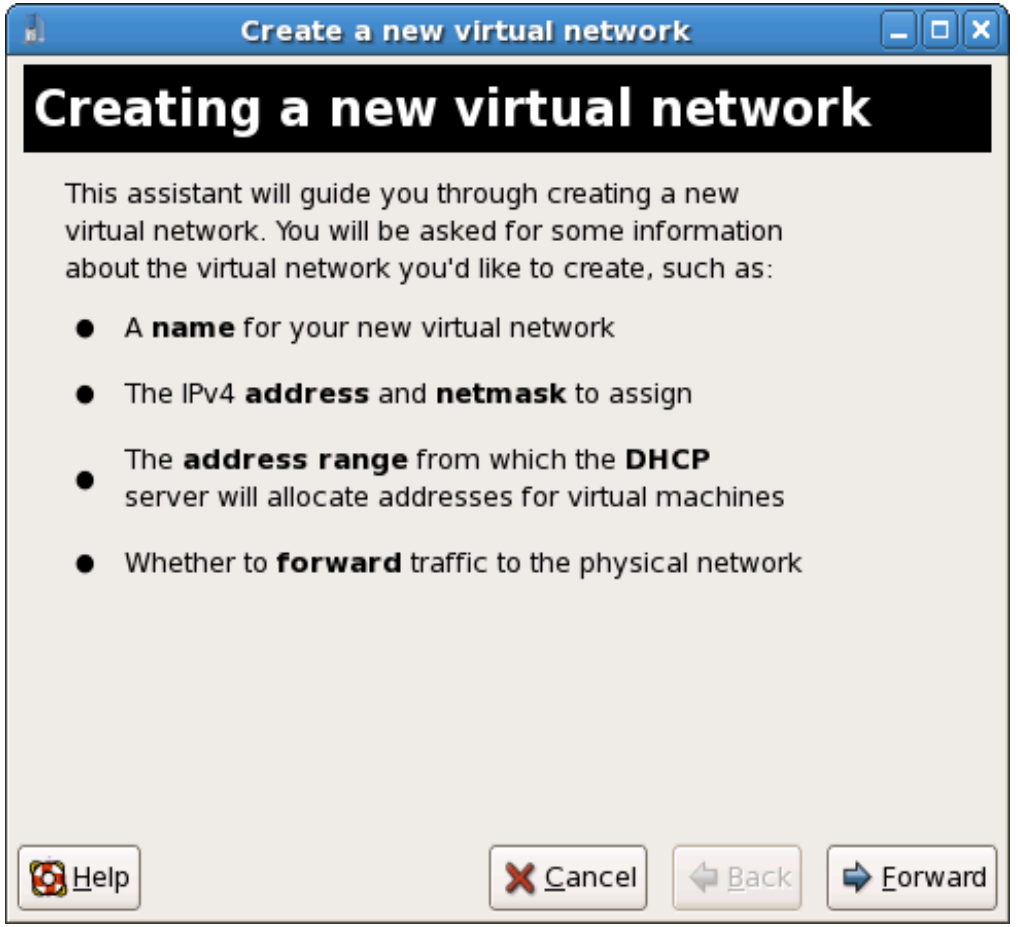
virt-manager / Resource Management

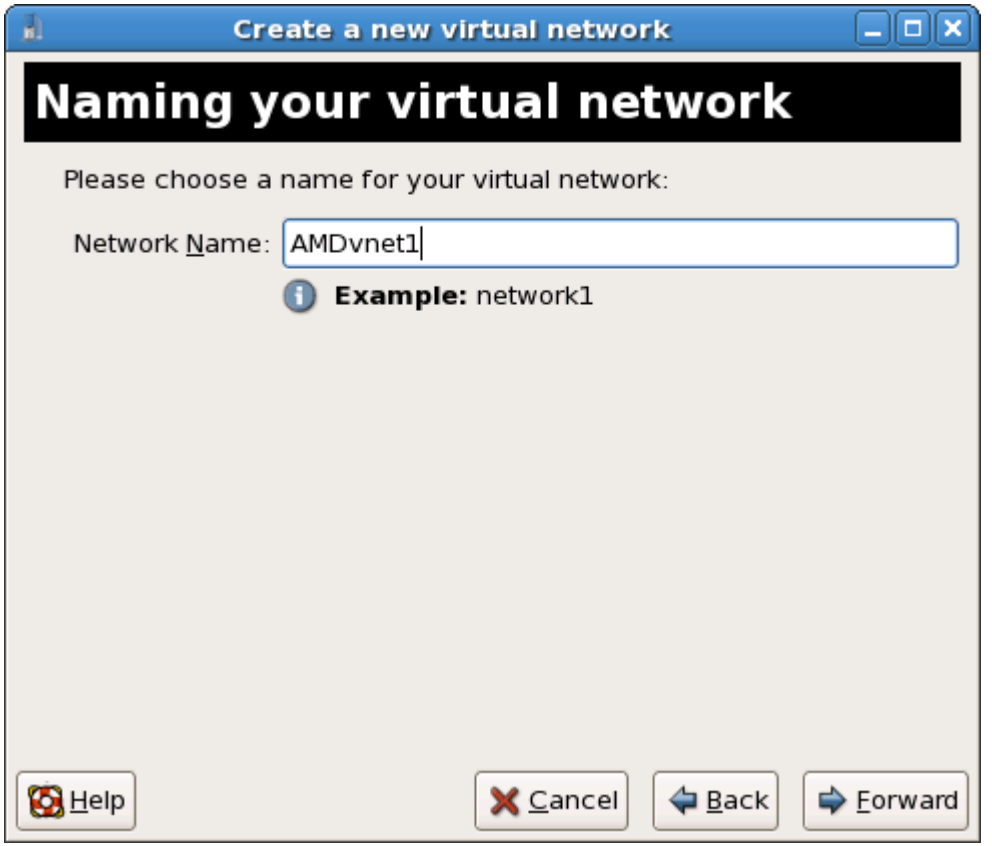
HVM Guest





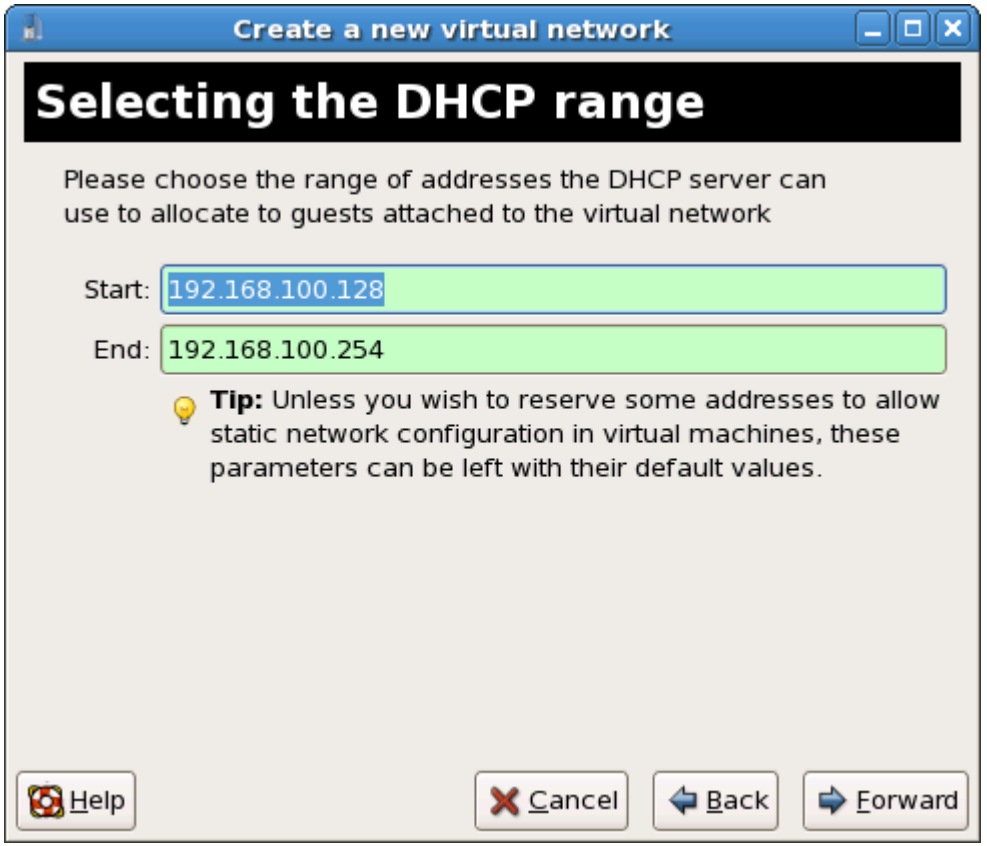
virt-manager / Virtual Network Management HyperVisor

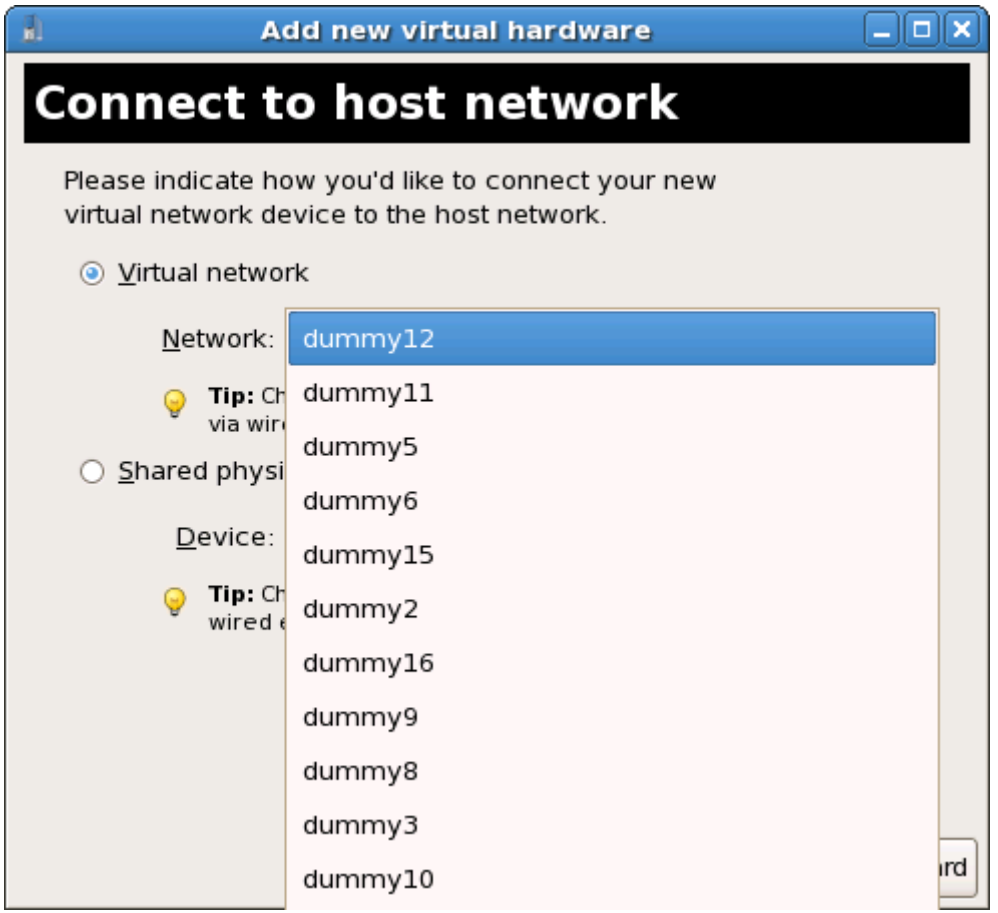




virt-manager / Virtual Network Management

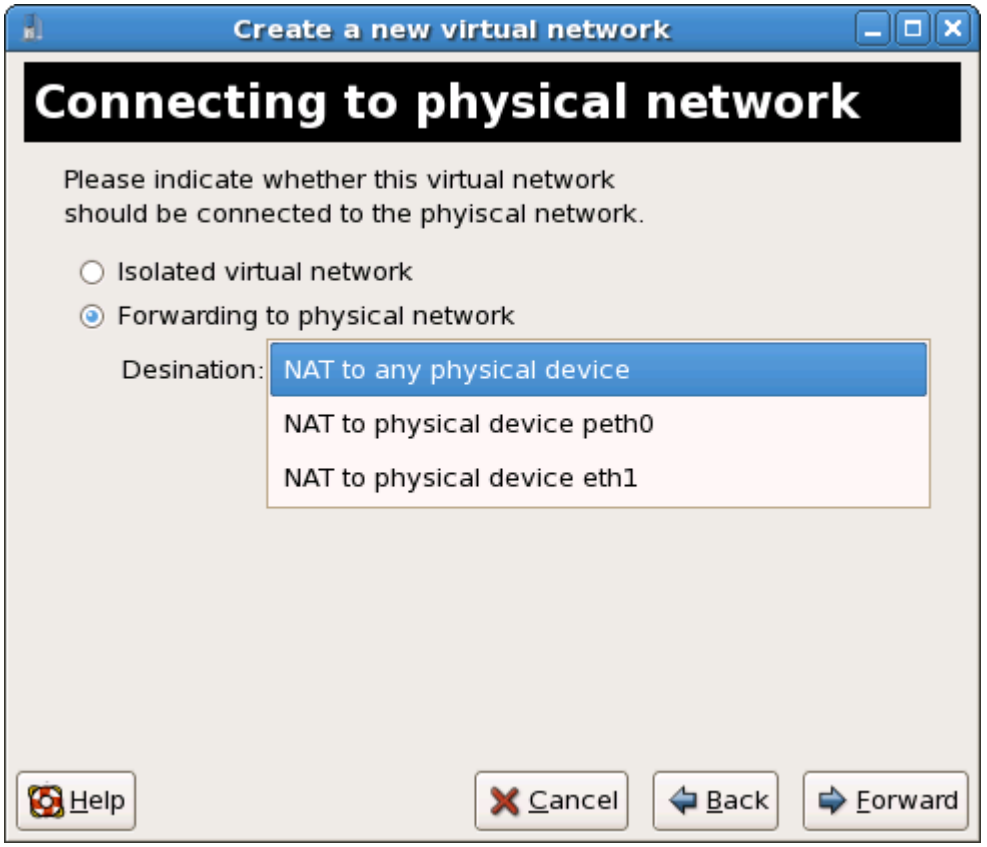
HyperVisor

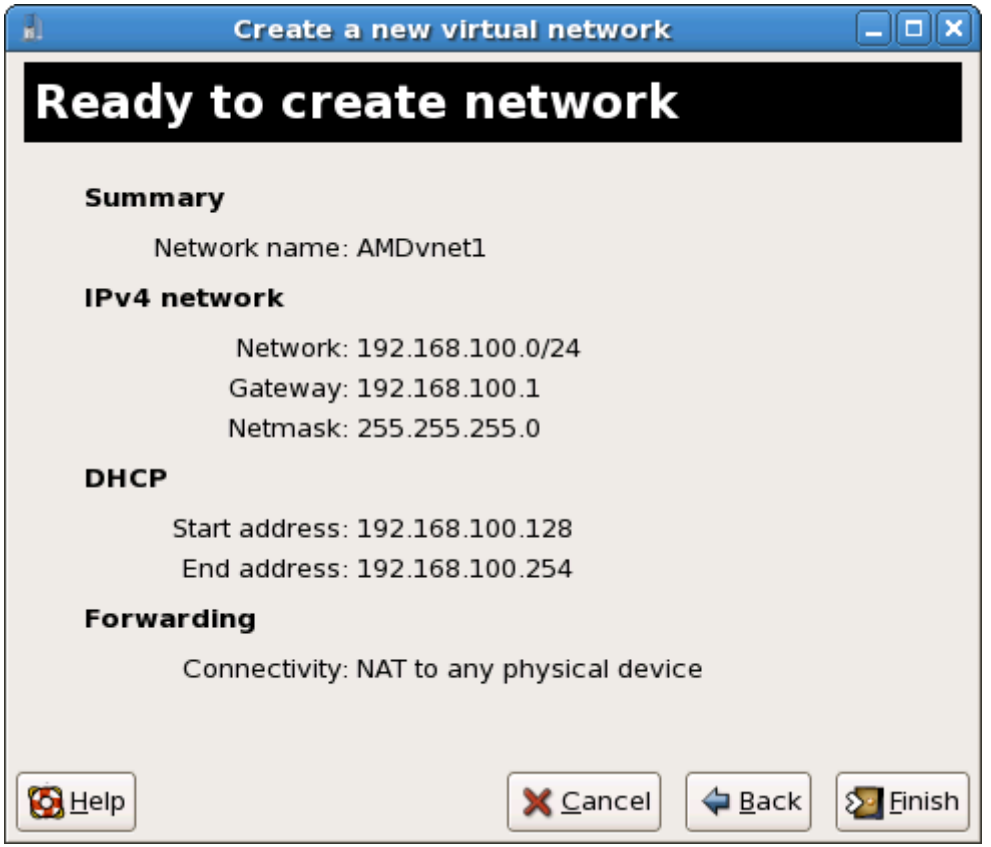




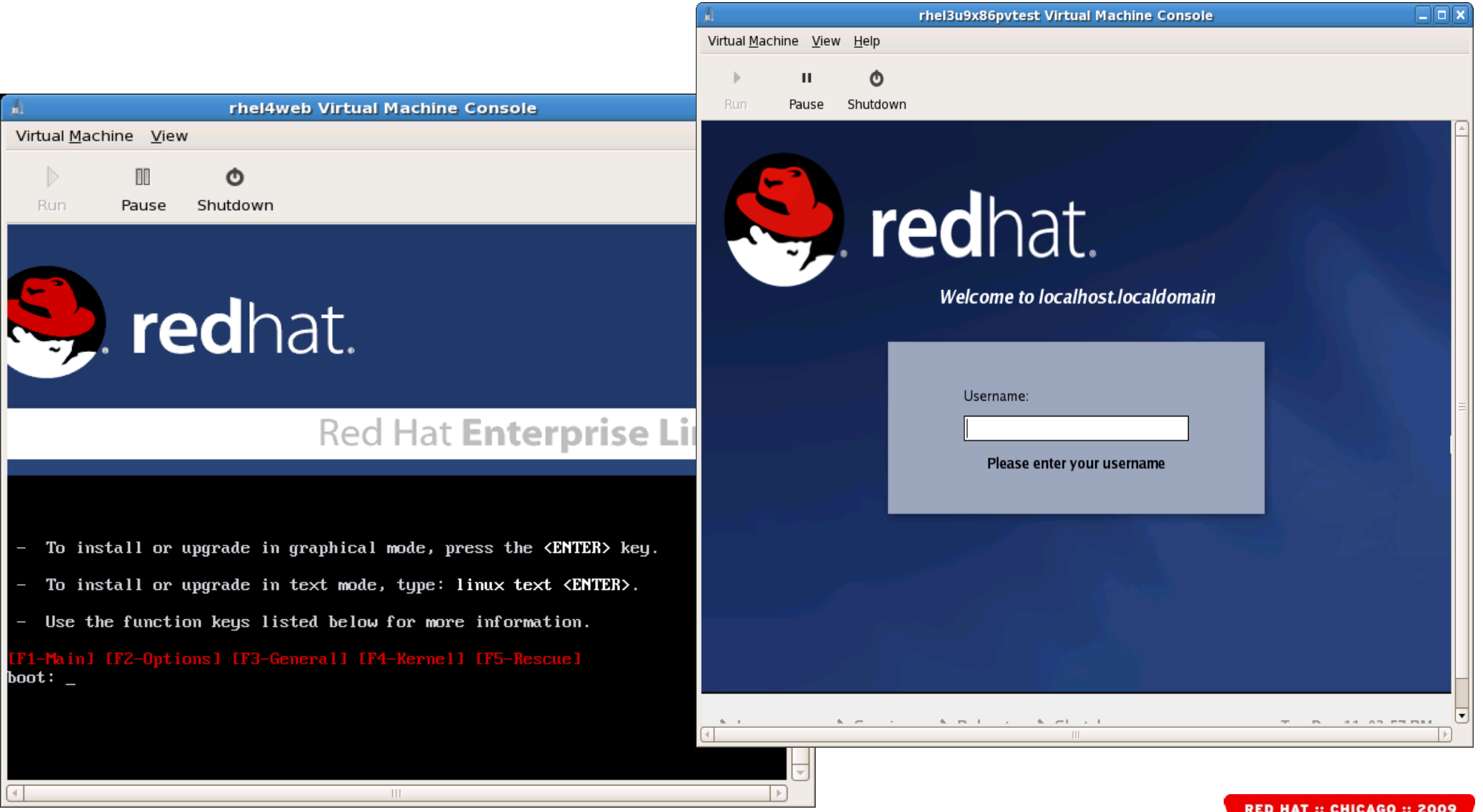
virt-manager / Virtual Network Management

HyperVisor

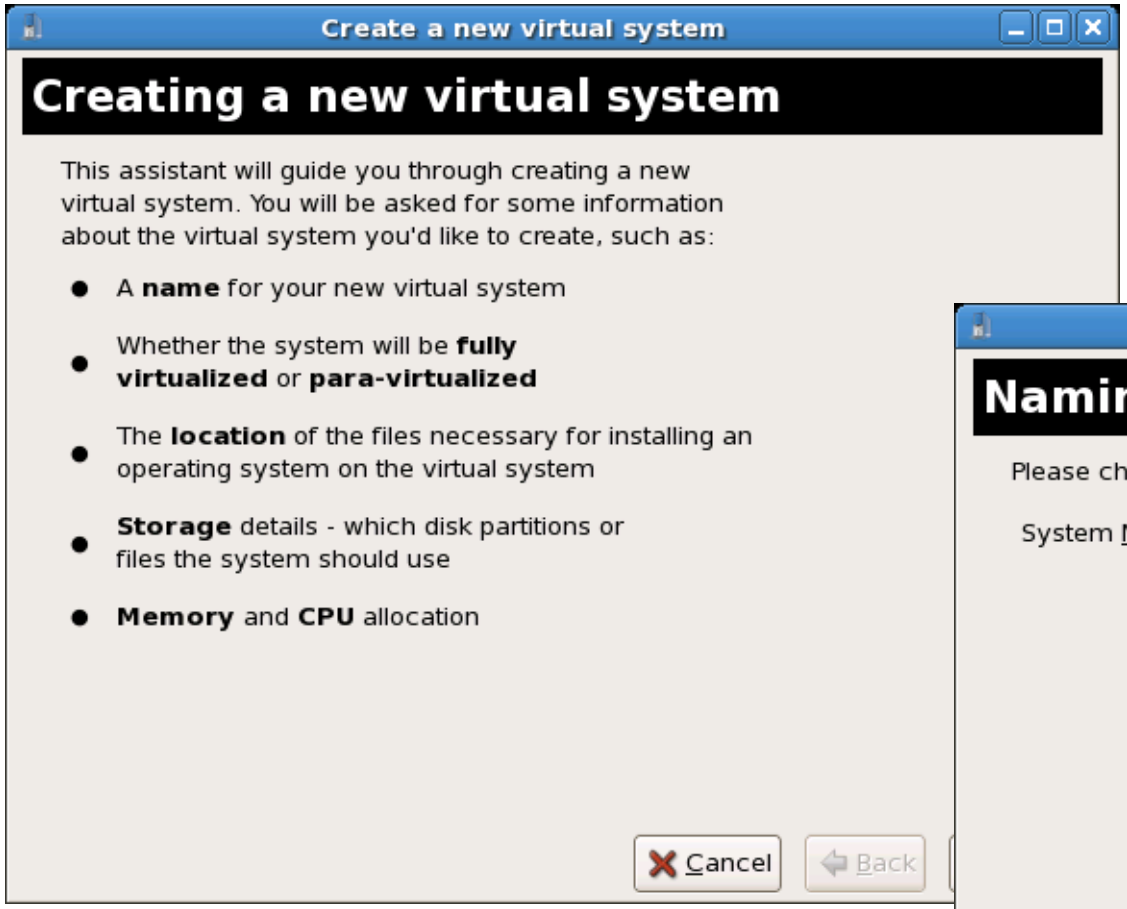


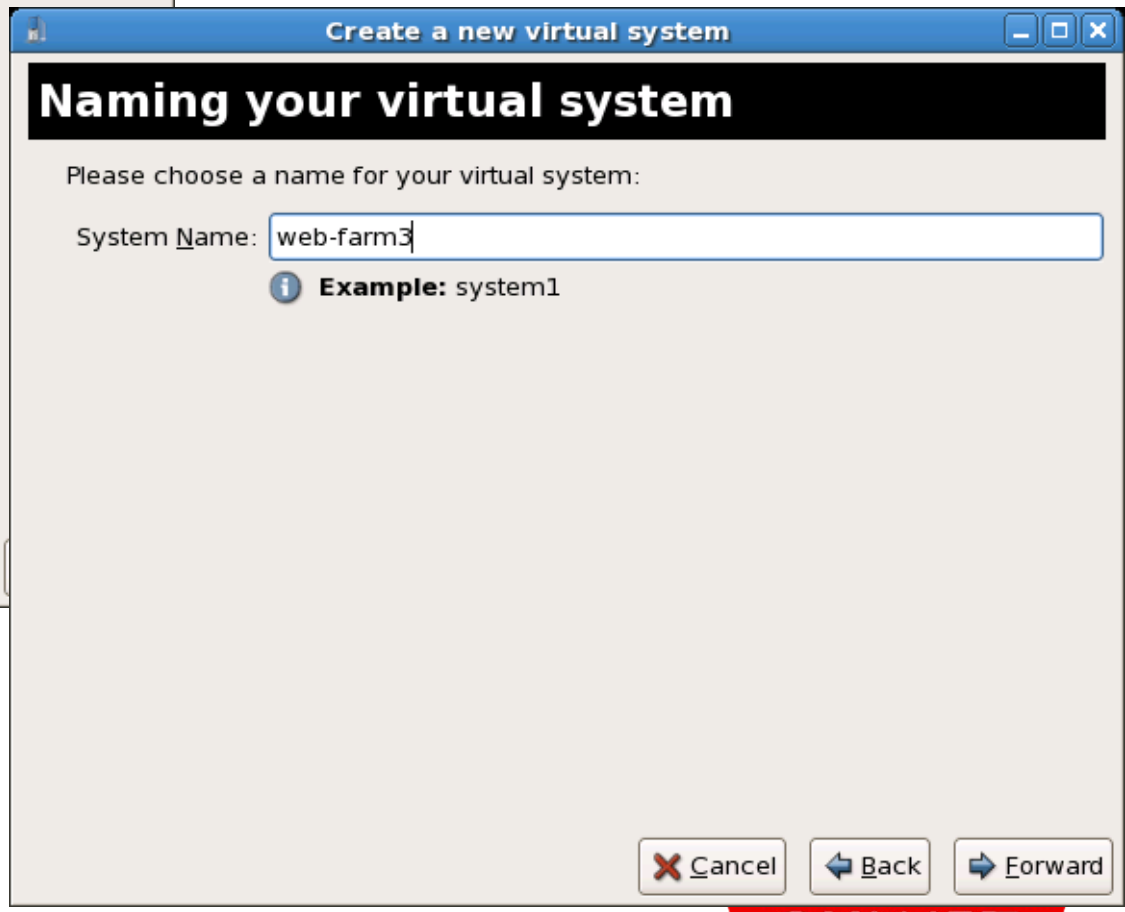


virt-manager / Console Window
Guest

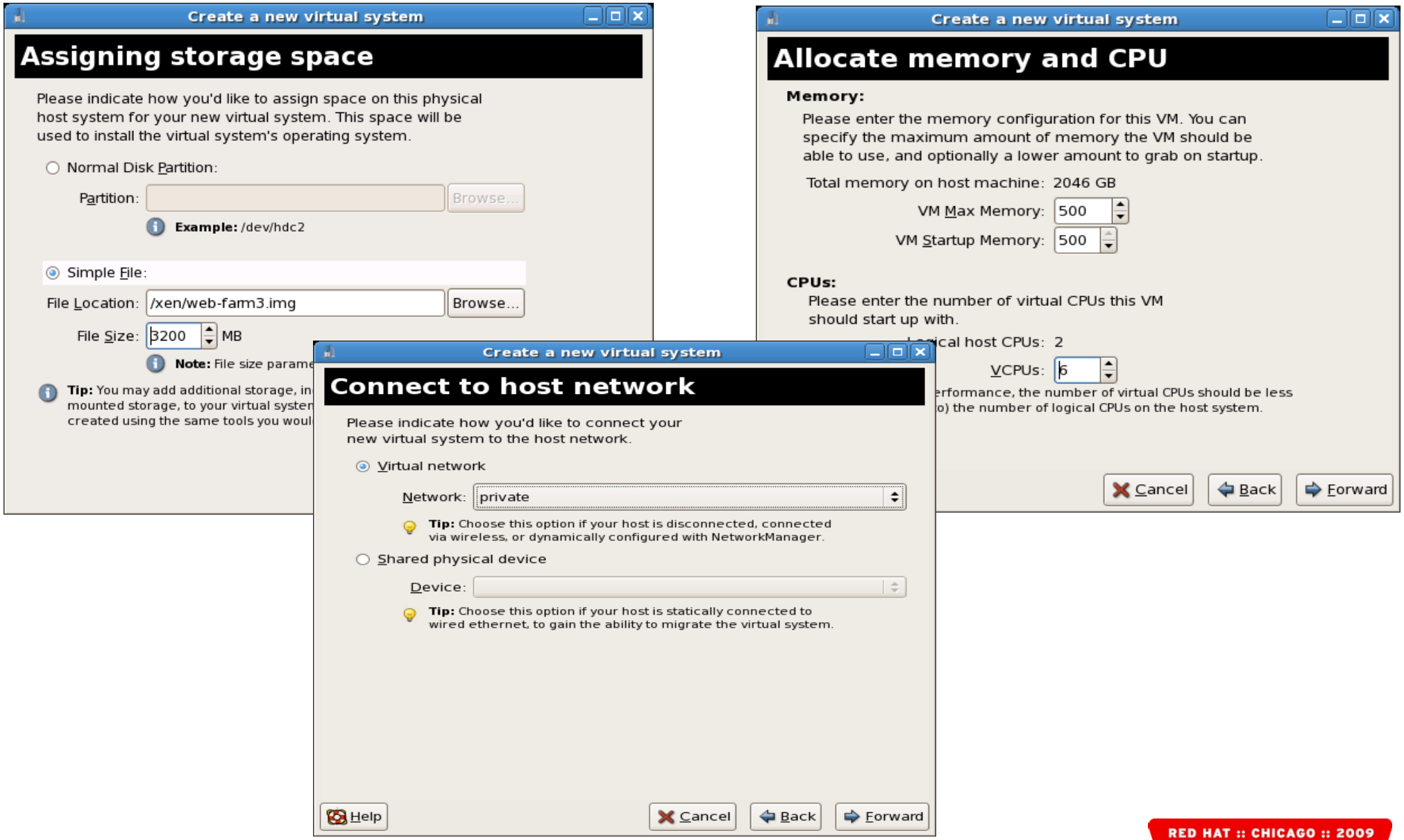


virt-manager / VM Creation Wizzard

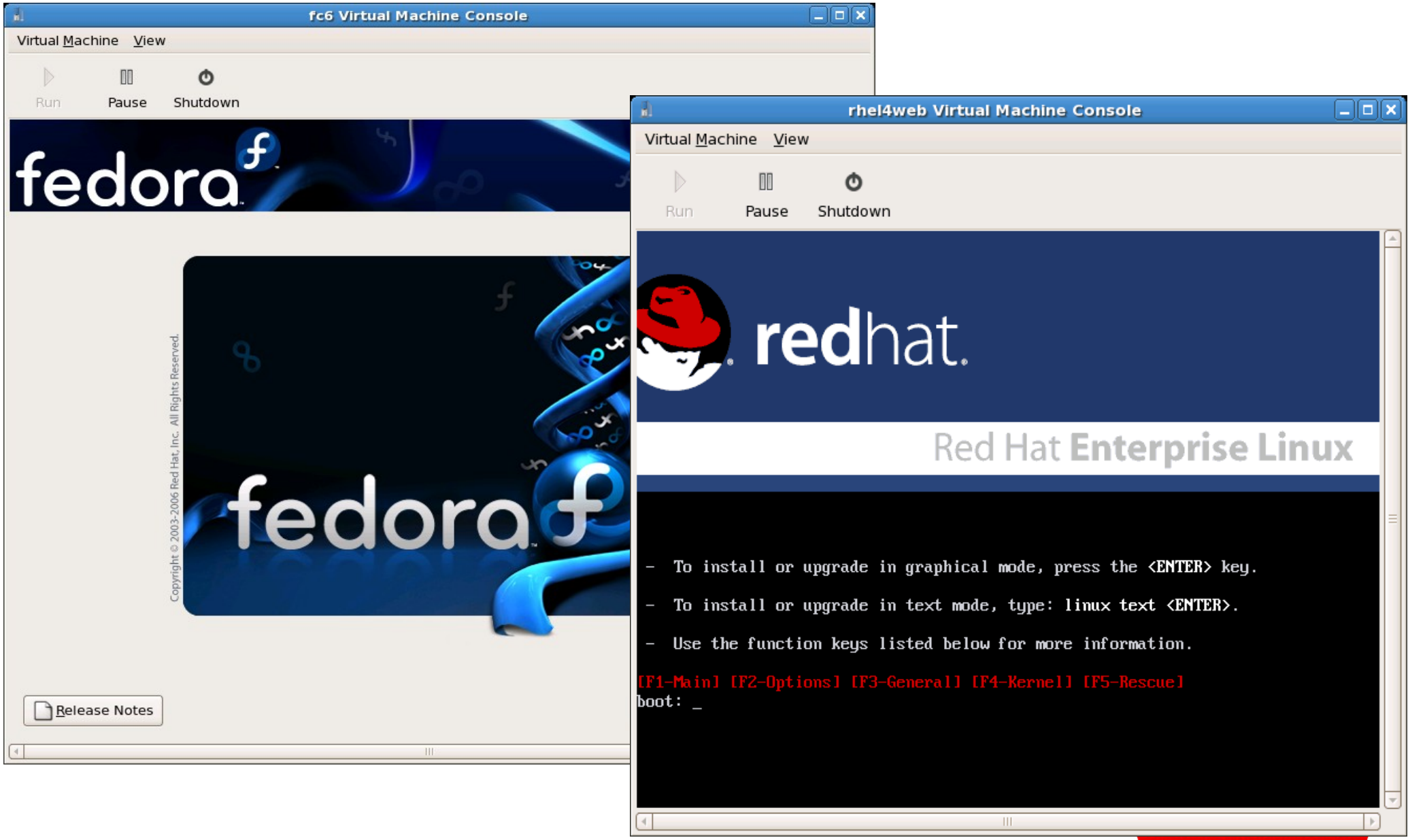




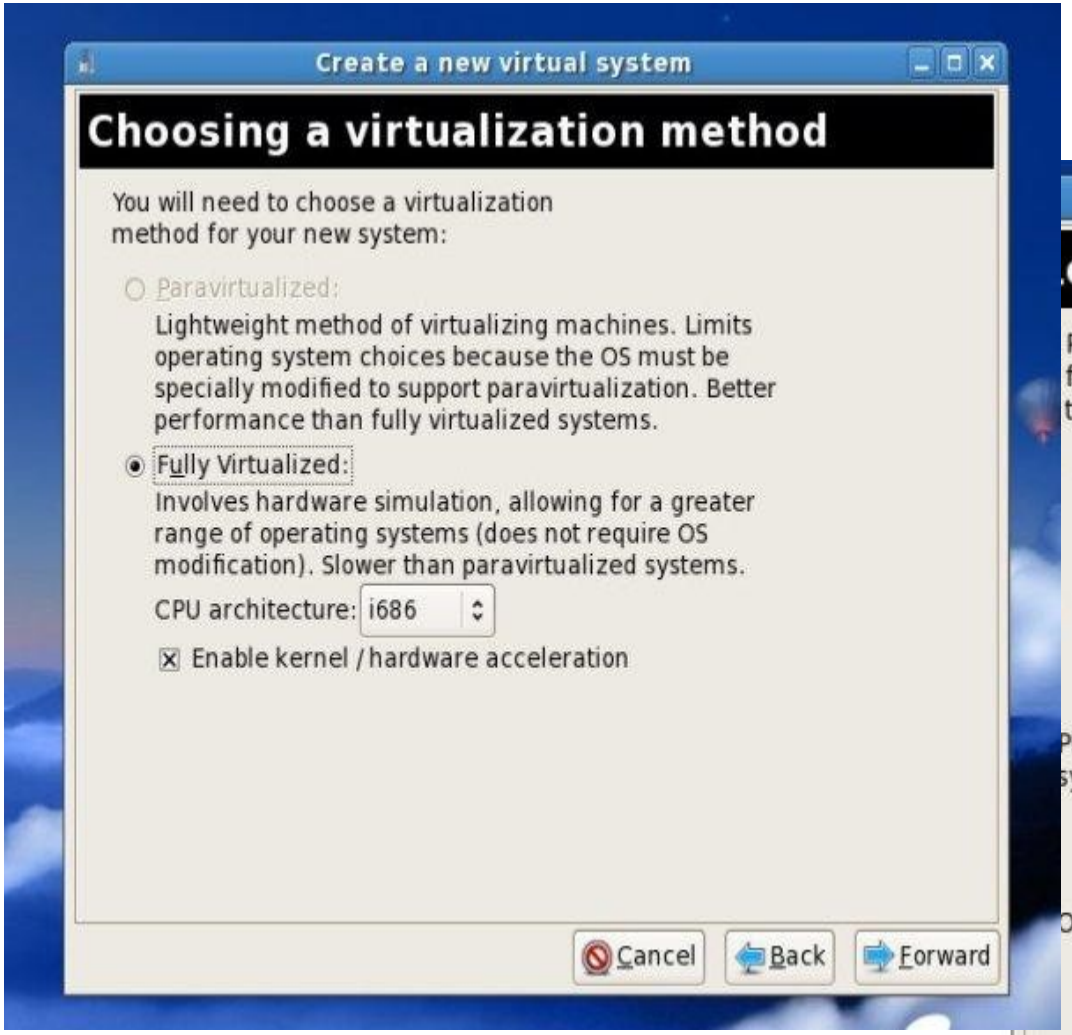
virt-manager Install Wizard (Resources)

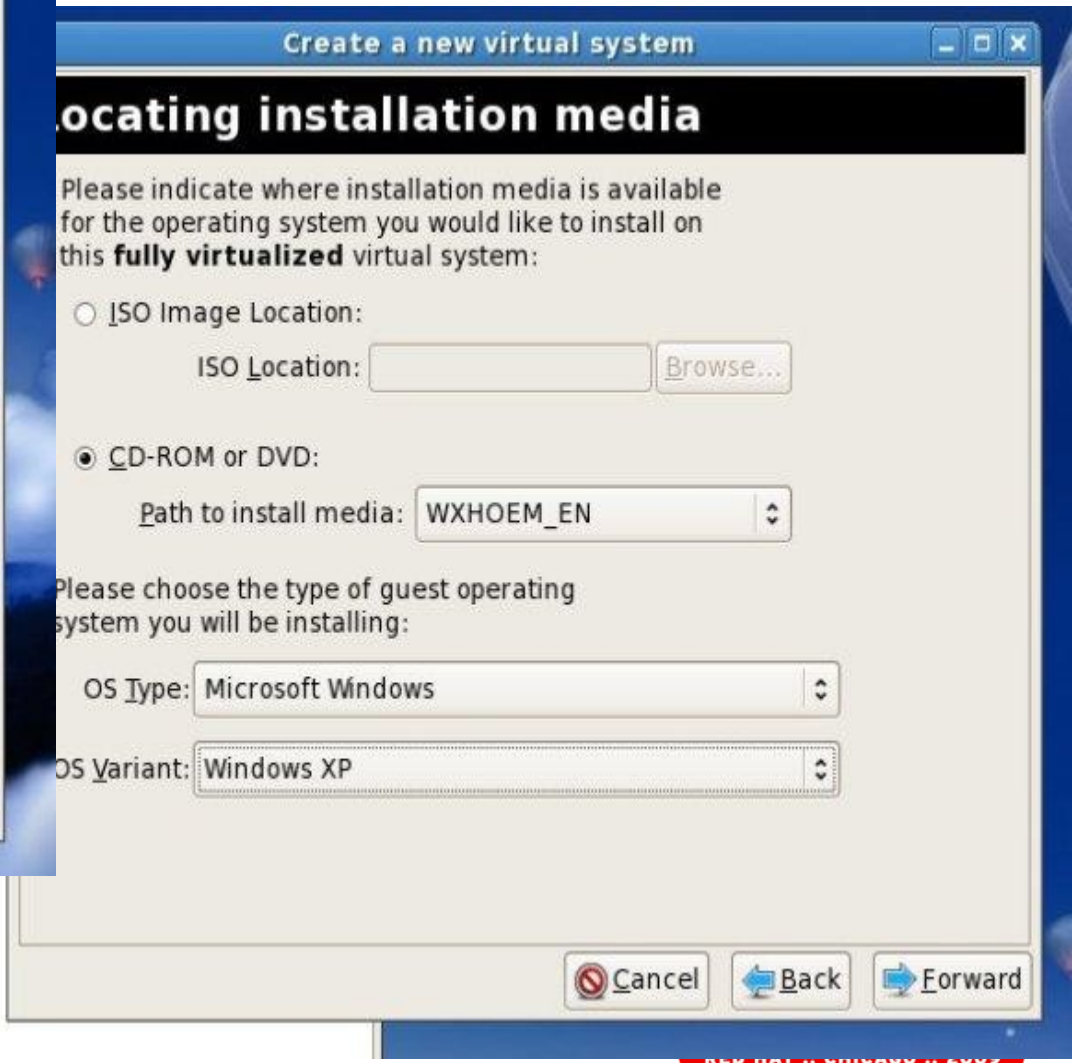


virt-manager Install (console)

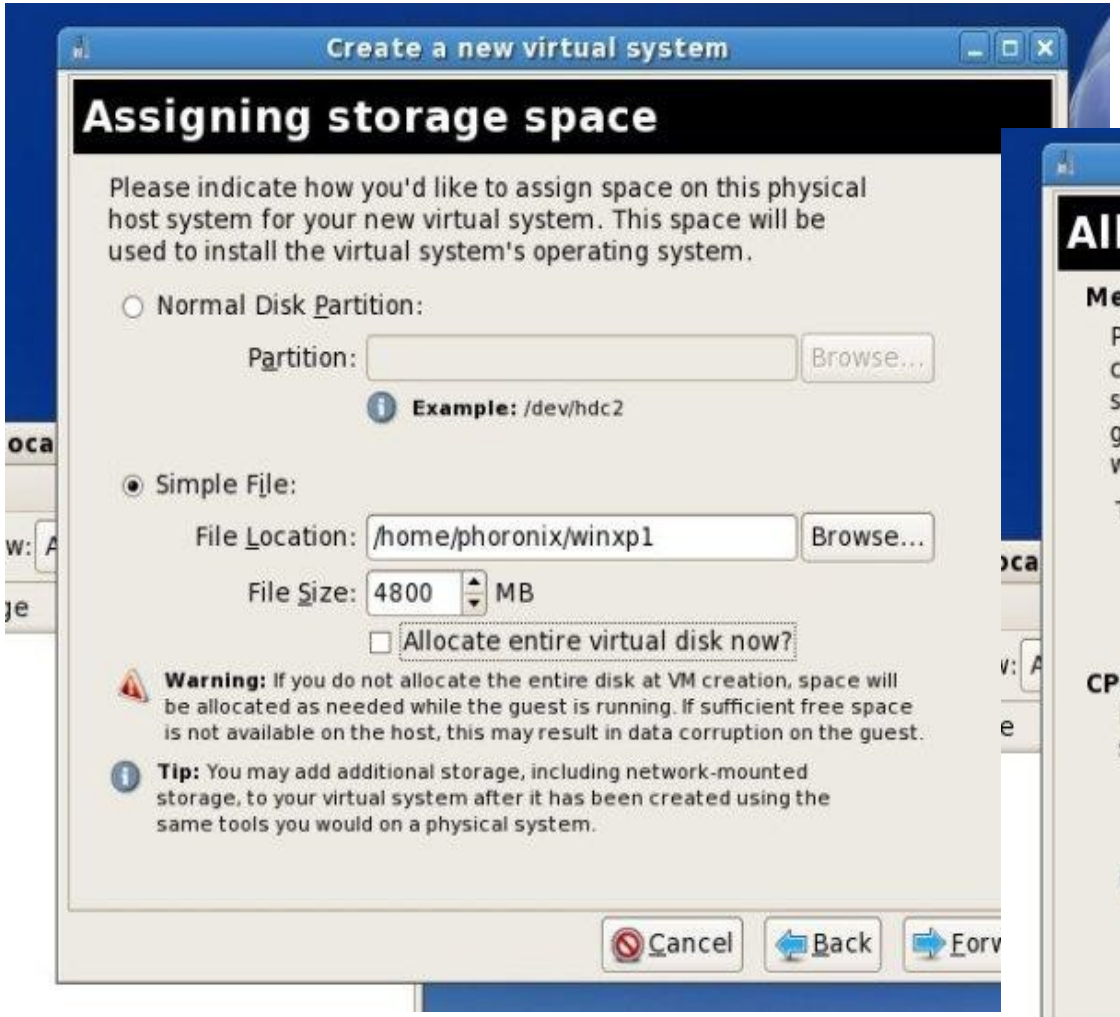


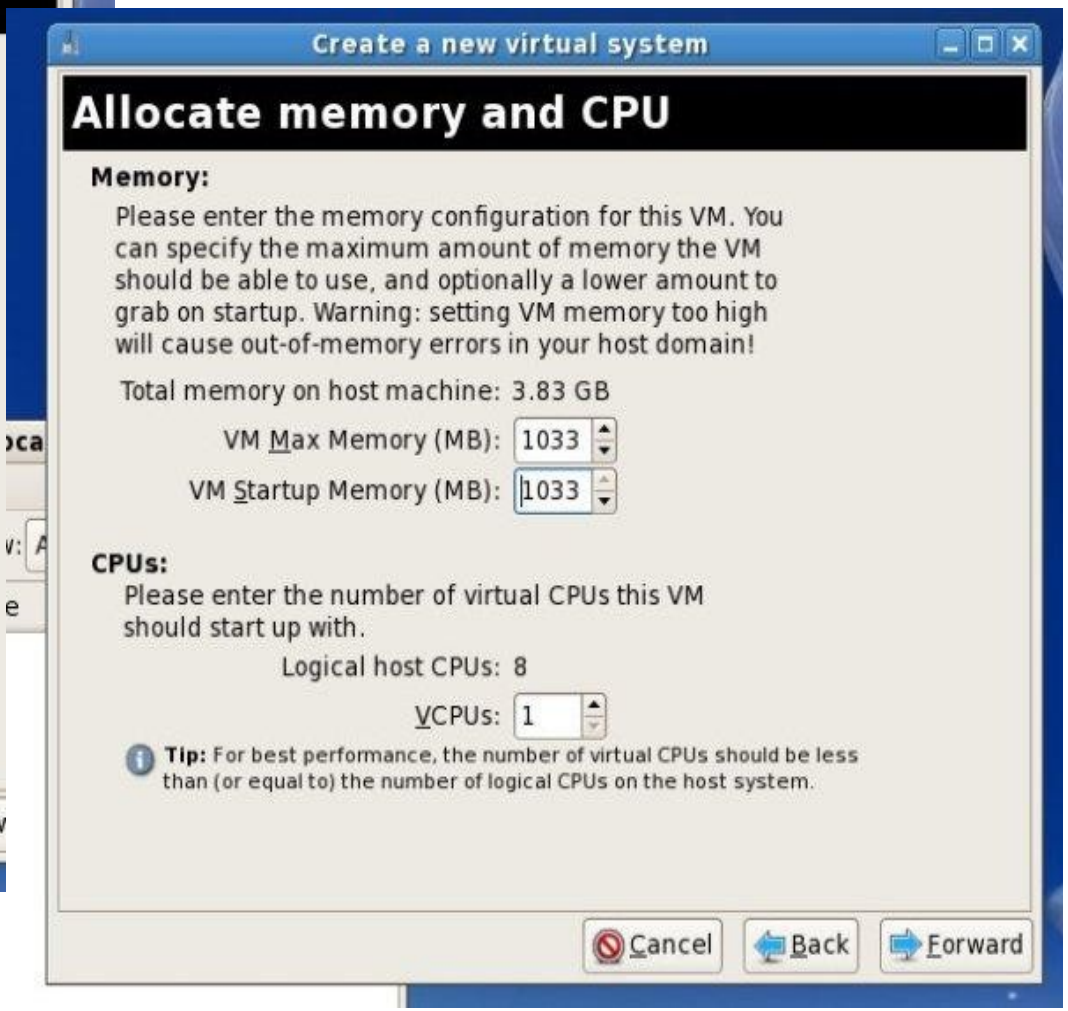
KVM virt-manager (Hardware Selection)



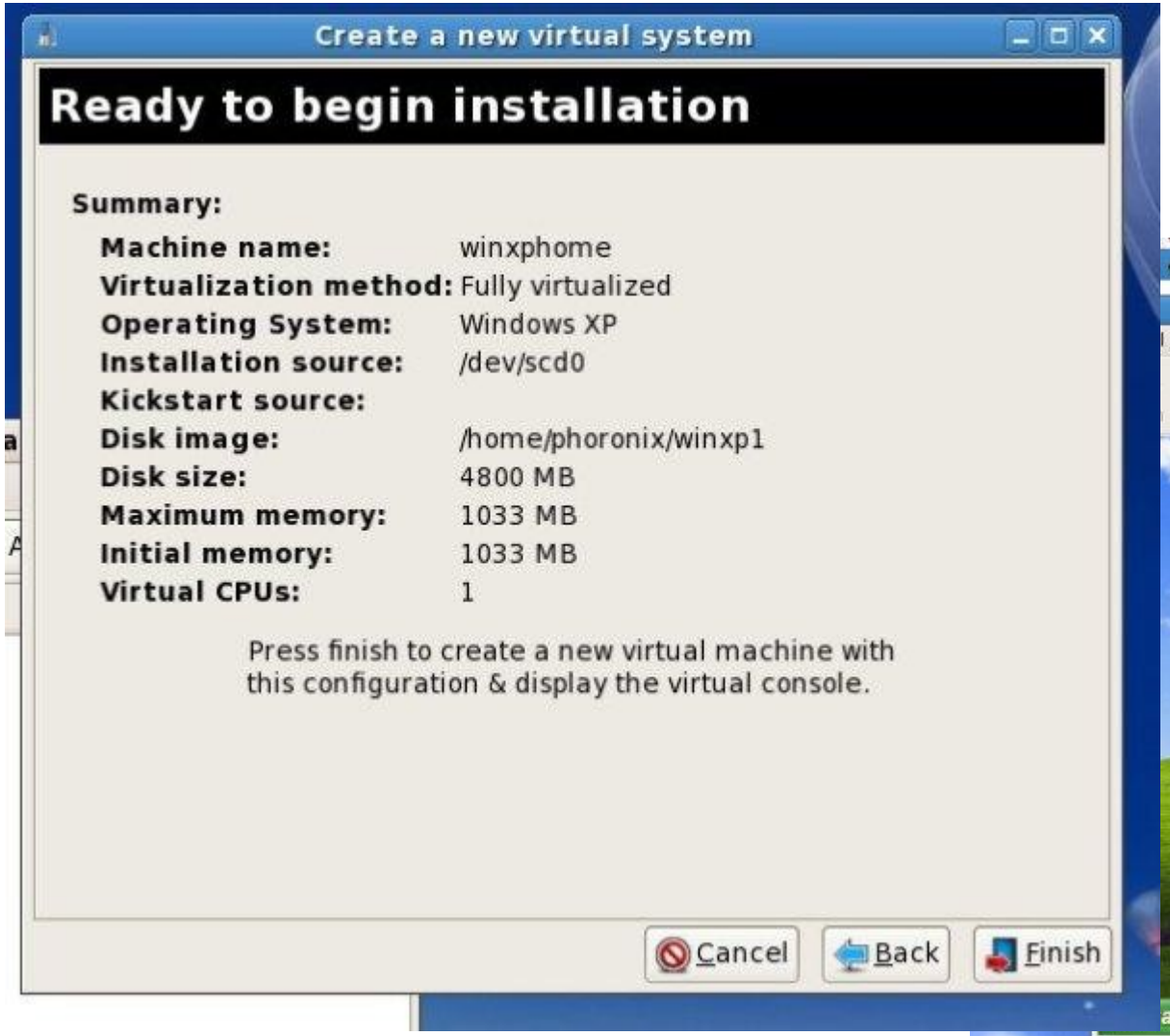


KVM virt-manager (Storage/Resource Selection)





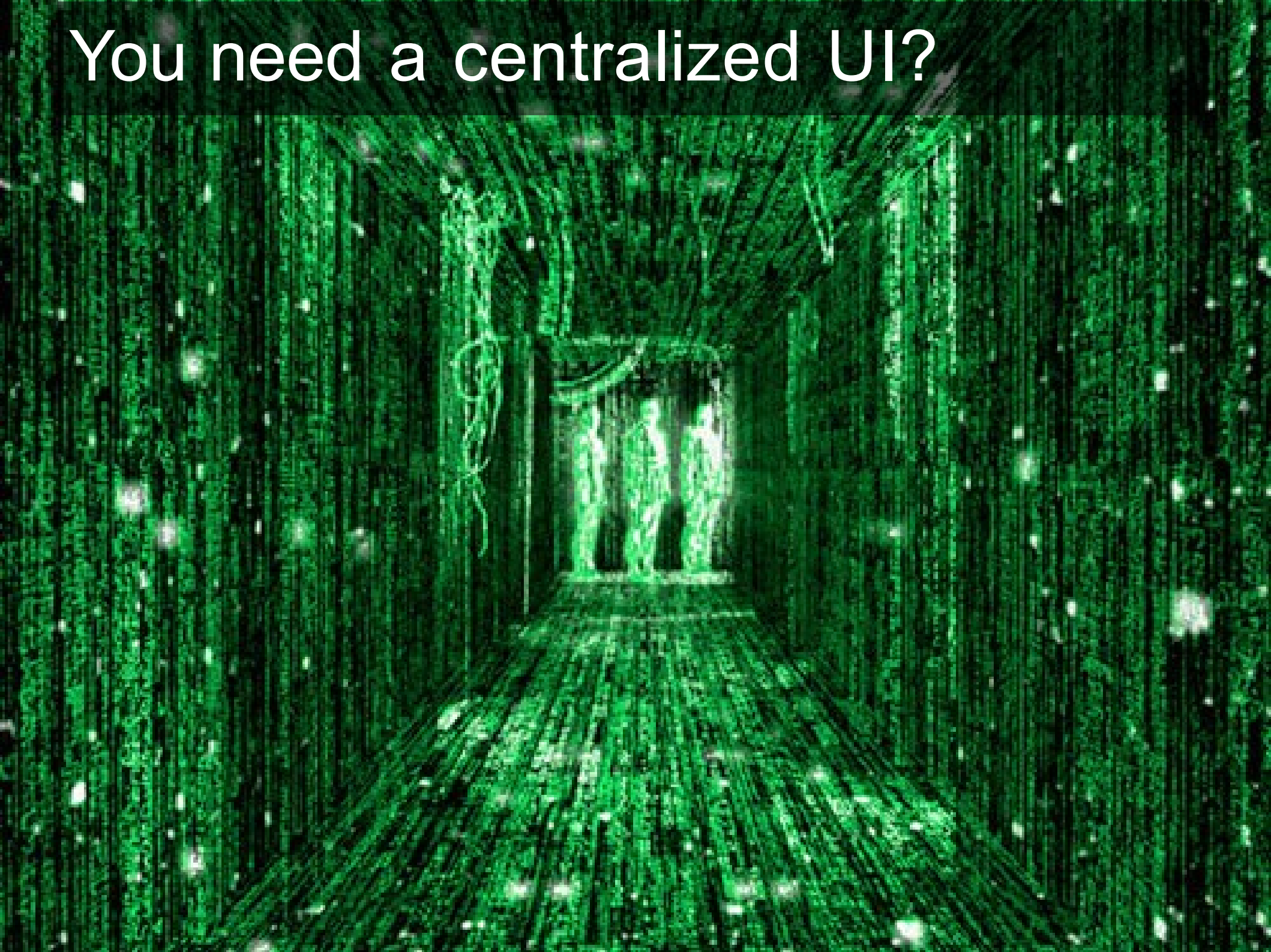
KVM virt-manager (Summary)



Management Best Practices

- As of RHEL5.2 remote management via virt-manager/virsh
  - Can implement a “virtual appliance” style management instance
  - Can trigger live migration from remote , as well as all other virsh commands
- Can consolidate all management interfaces for virtualization and clustering onto a single management “appliance”/host
- If clustering is deployed use a bonded network interface for the cluster traffic and “virtualization” (live migration) traffic
  - Currently the clustering software assumes the network associated to the hostname is used for cluster and “virtualization” traffic
- Even if no clustering is used it is recommended to use a dedicated network for migration traffic (and use at least a GbE connection)

You need a centralized UI?



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Red Hat Enterprise Virtualization

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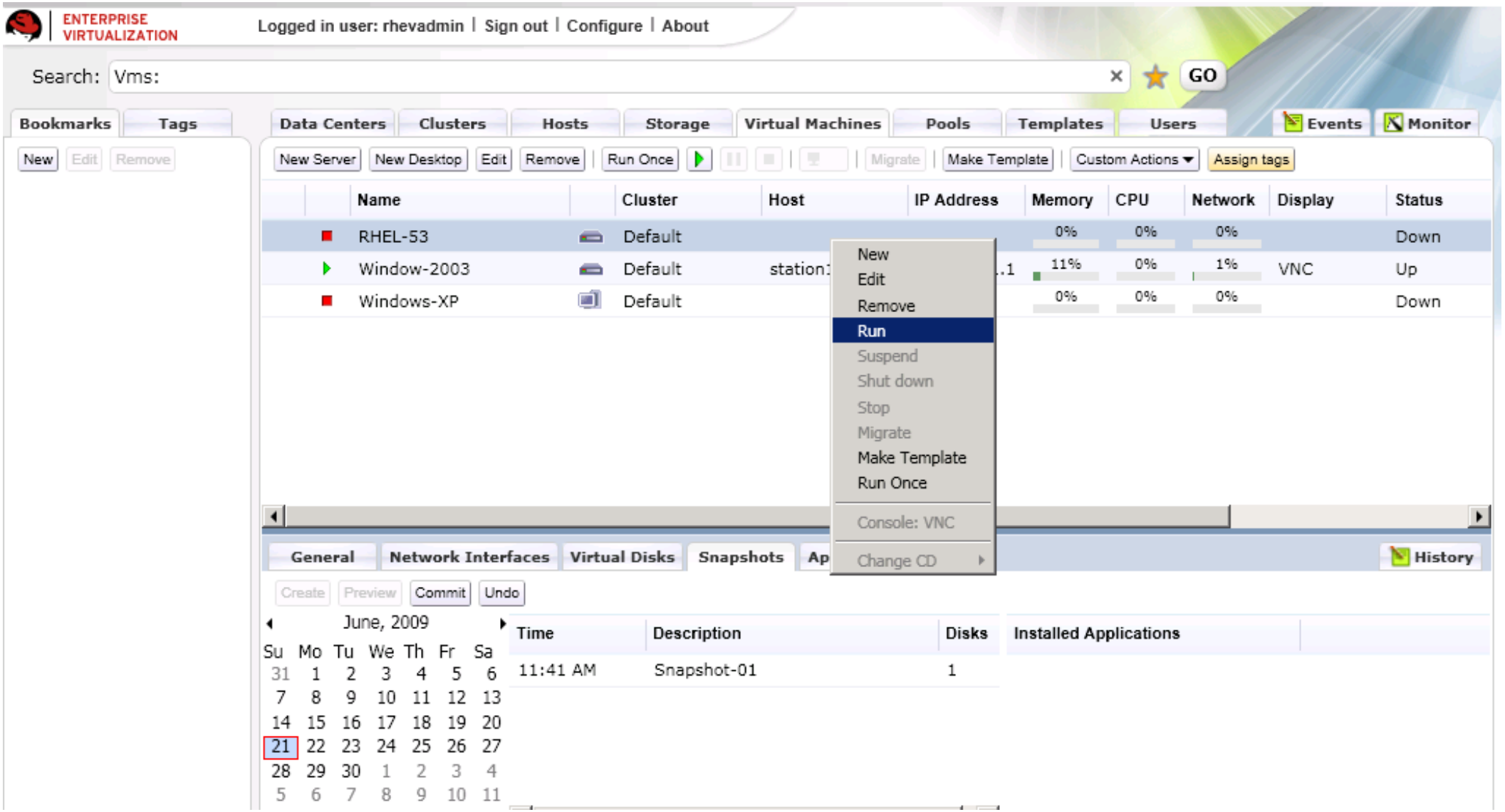
Red Hat Enterprise Virtualization Manager



Red Hat Enterprise Virtualization Hypervisor

Scalability

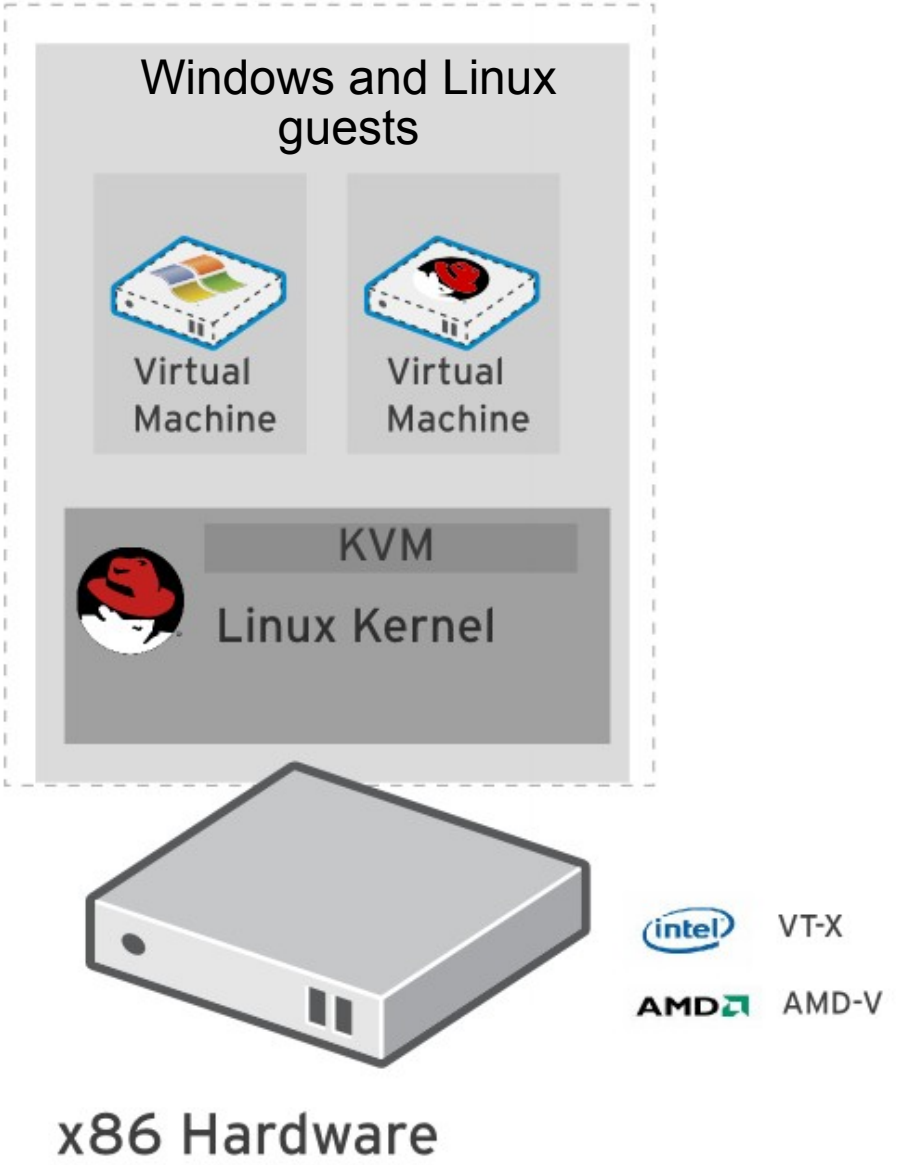
- Host: 96 cores, 1 TB RAM
- Guest: 16vCPU, 64 GB RAM

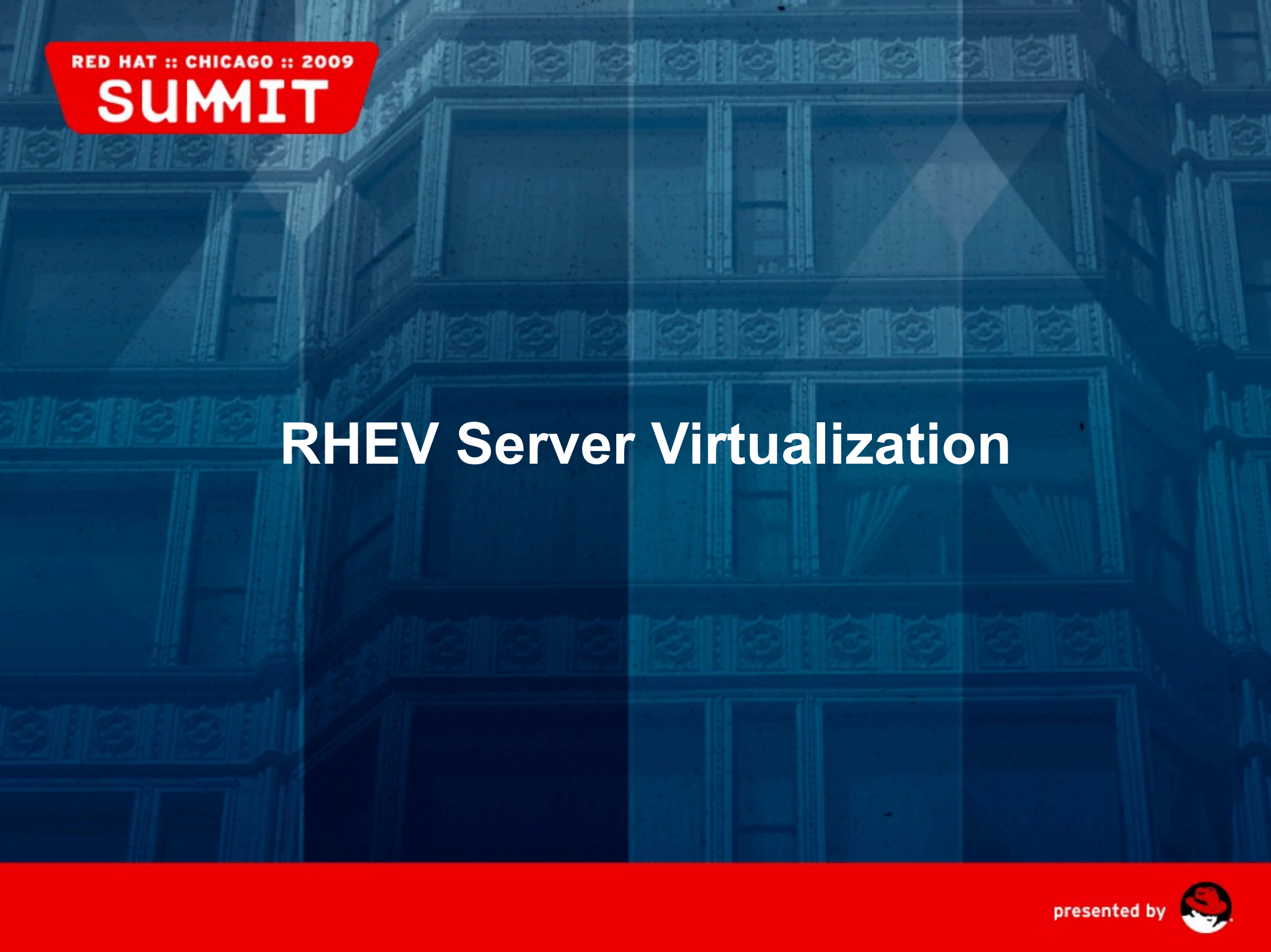
Industry Standards

- Trusted RHEL kernel + KVM
- High performance VirtIO drivers
- Libvirt management interface

Advanced Features

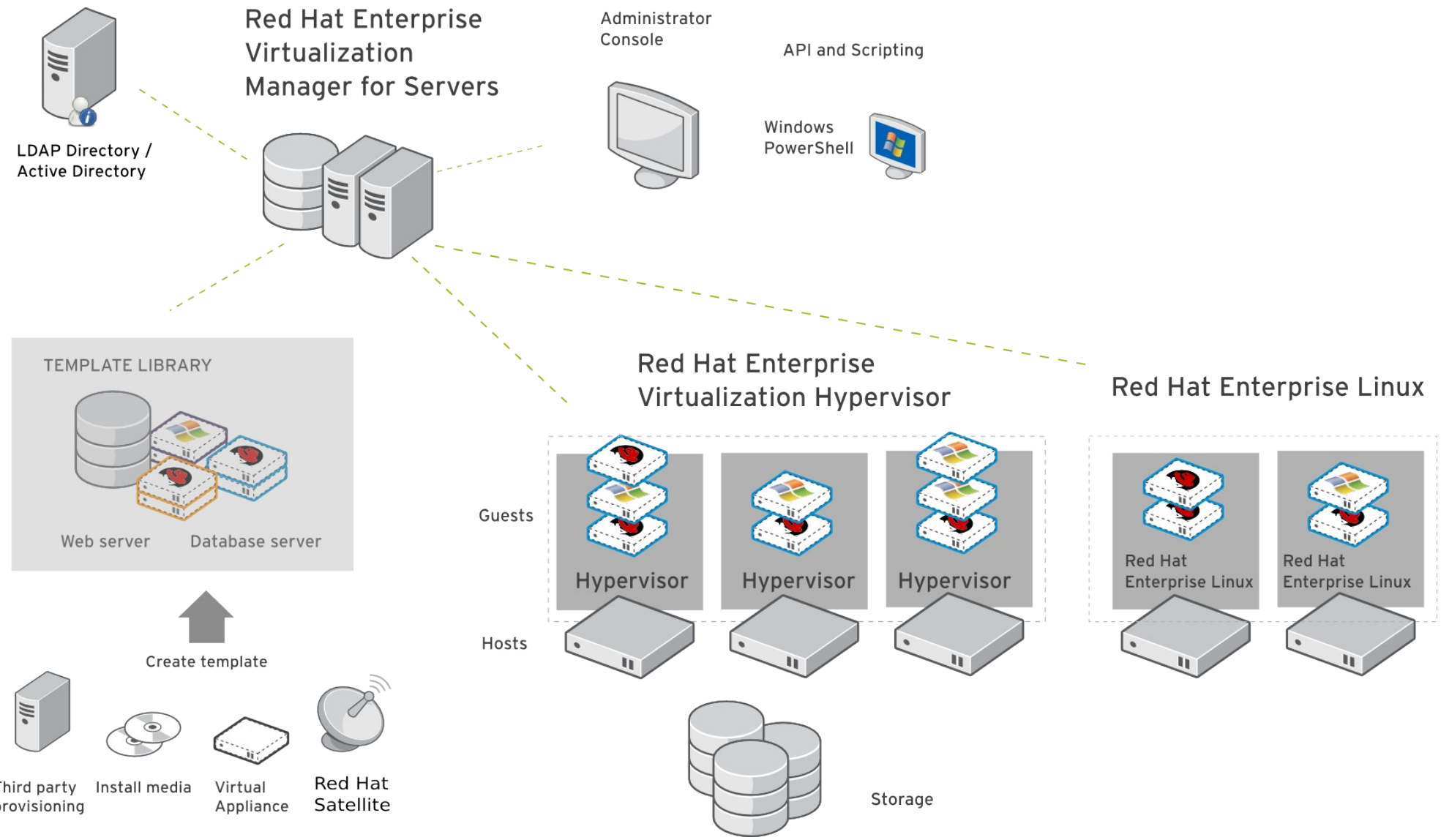
- Memory Page sharing
- SELinux for high security and isolation
- Live migration
- Snapshots
- Thin provisioning





RHEV Server Virtualization

Red Hat Enterprise Virtualization - Servers



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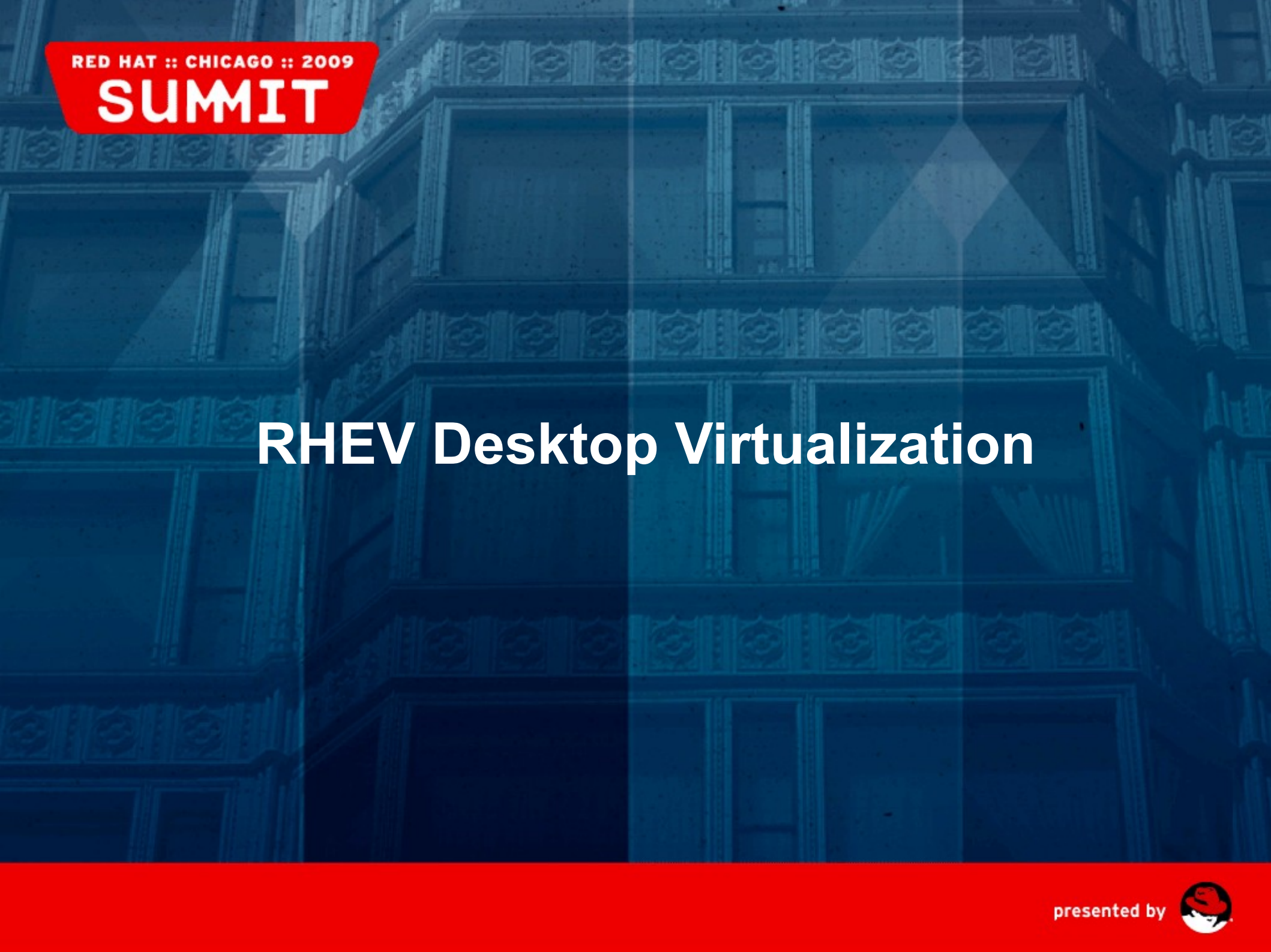
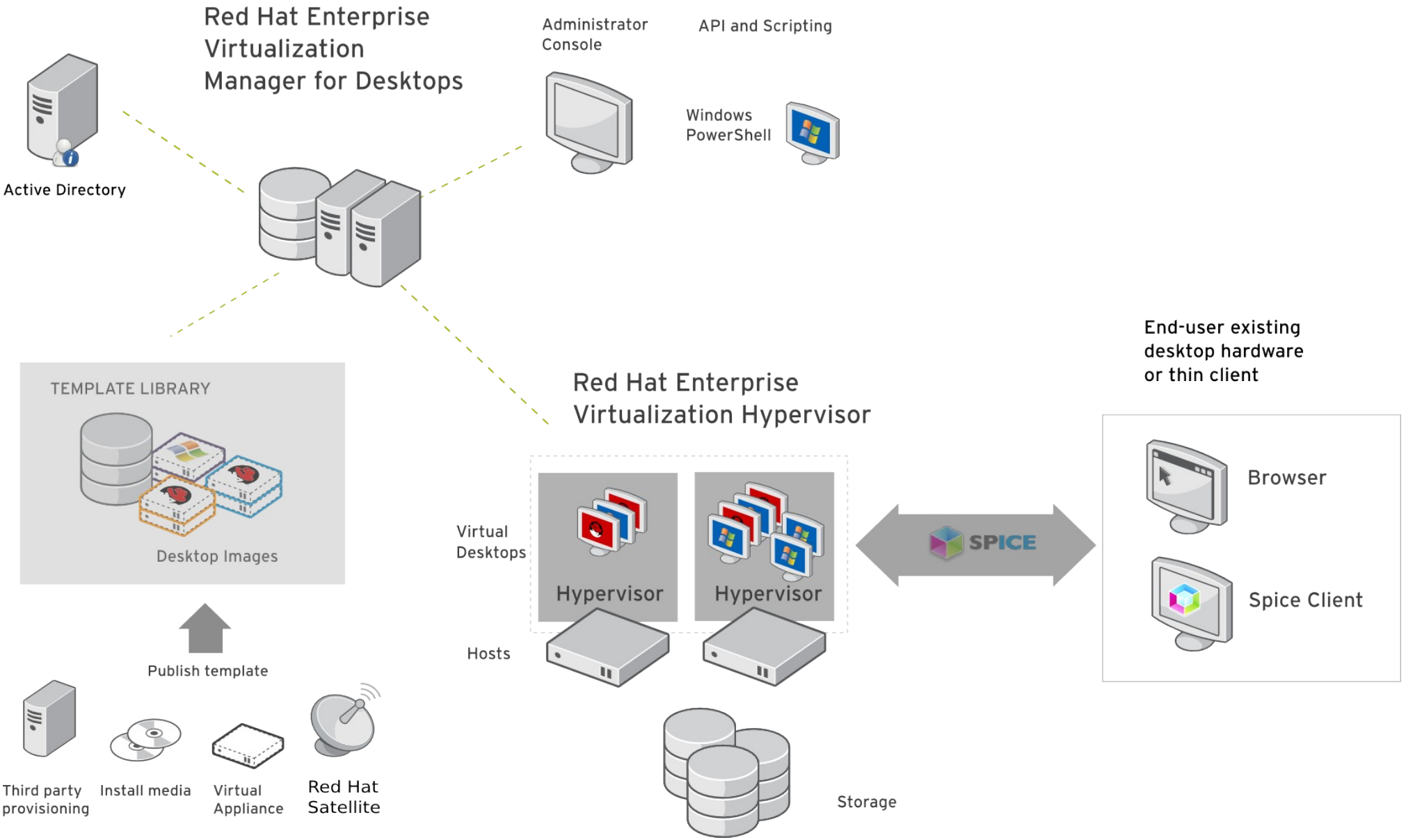


RHEV Desktop Virtualization

Red Hat Enterprise Virtualization - Desktops



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QUESTIONS?

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