VMware vSphere 4.1 Features and Benefits Compared to Microsoft Hyper-V R2, Citrix XenServer 5.6 and Red Hat Enterprise Virtualization 2.2

VMware vSphere – The best platform for building cloud infrastructures

VMware vSphere™, the industry's first cloud operating system, leverages the power of virtualization to transform datacenters into dramatically simplified cloud computing infrastructures and enables IT organizations to deliver the next generation of flexible and reliable IT services, using internal and external resources, securely and with low risk. VMware vSphere is comprised of the following groups of components:

Infrastructure services –The set of components that comprehensively virtualize server, storage and network resources, aggregate them and allocate them precisely on demand to applications based on business priority.

Application services – The set of components that provide built-in service level controls to all applications running on VMware vSphere, regardless of application type or operating system.

Administration of infrastructure and application services and automation of day-to-day operational tasks with deep visibility into every aspect of large and small VMware vSphere environments is provided by VMware vCenter™[1] Server.

Key Features and Benefits Comparison to Competing Virtualization Products

VMware vSphere features and benefits, including many new innovations, put it far ahead of competing products from Microsoft, Citrix and Red Hat.
NOTE: Microsoft capabilities are based on features of Hyper-V R2 as managed by System Center Virtual Machine Manager 2008 R2. Citrix capabilities are based on XenServer 5.6. Certain Citrix features require extra cost editions of XenServer. Red Hat capabilities are based on Red Hat Enterprise Virtualization 2.2.

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[1] VMware vCenter Server is an essential requirement for management of VMware vSphere environments and is separately purchased.

Key Features and Benefits	VMware vSphere 4.1 Enterprise Plus	Windows Server 2008 Microsoft Hyper-V R2	Citrix XenServer 5.6	Red Hat Enterprise Virtualization 2.2
Infrastructure Services: Virtualize and Aggregate Hardware Resources VMware vSphere™ infrastructure services transform discrete hardware resources into a shared mainframe-like computing platform that is incredibly resilient and capable of running the most demanding applications with near-native performance.				
VMware vCompute: Infrastructure services that efficiently virtualize server resources and aggregate them into logical pools that can precisely be allocated to applications.				
VMware ESX and ESXi[2] virtualize server resources comprehensively				
• **Bare-metal architecture** VMware ESX and ESXi insert a robust virtualization layer directly on the server hardware for near-native virtual machine performance, reliability and scalability.	✓	Yes, but Hyper-V requires Windows Server 2008. The stand-alone Hyper-V Server R2 requires a large portion of Windows Server 2008	Yes, but XenServer requires a Linux OS in the Domain 0 management partition	No, RHEV requires a Red Hat Enterprise Linux host OS
• **Small footprint.** VMware ESXi is a compact, ~100MB form factor of the production proven VMware ESX hypervisor. It is a fraction of the size of a general purpose operating system for unparalleled security and reliability.	✓	No Microsoft Hyper-V R2 with Server Core has a 3.6 GB footprint	No XenServer 5.5 including its Linux Dom 0 has a 1.8GB disk footprint	✓ RHEV Hypervisor excludes some Linux OS components
• **Server integration.** VMware ESXi is available integrated into servers from leading OEM vendors for a simplified boot and deployment experience.	✓	Partial, OEM vendors can preinstall Windows Server 2008, but additional configuration needed to enable Hyper-V role	Yes, XenServer preinstallation is available from some OEMs	No
• Efficient resource virtualization	✓	Yes, basic	Yes, basic	Yes, basic
– **CPU virtualization.** Run many operating systems and applications encapsulated inside virtual machines on a single physical server for higher utilization, without risking critical processes being starved of compute or memory resources. VMware ESX/ESXi uses intelligent process scheduling and load balancing across available processors to manage the execution of virtual machine processing	✓	Yes	Yes	Yes
– **New - User-configurable Number of Virtual CPUs per Virtual Socket.** Configure virtual machines to have multiple virtual CPUs reside in a single virtual socket, with each virtual CPU appearing to the guest operating system as a single core.	✓	Fixed ratios	No	Yes
– Advanced memory management	✓	No	No	No

[2] VMware ESX and ESXi are functionally equivalent with some minor exceptions.

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• **RAM over-commitment.** Increase memory utilization by configuring virtual machine memory that safely exceeds the physical server memory. For example, the sum of the memory of all virtual machines running on a server with 8GB physical memory can be 16GB.	✓	No	Yes, but dependence on only ballooning impacts guest performance	Partial, RHEV release notes warn against using overcommit, limits overcommit to 150% for servers
• **Transparent page sharing.** Utilize available memory more efficiently by storing memory pages identical across multiple virtual machines only once. For example, if several virtual machines are running Windows Server 2003, they will have many identical memory pages. Transparent page sharing consolidates those identical pages into a single memory location.	✓	No	No	Partial, Linux Kernel Samepage Merging allows limited overcommit if enabled
• **Memory ballooning.** Shift memory dynamically from idle virtual machines to active ones. Memory ballooning artificially induces memory pressure within idle virtual machines, forcing them to use their own paging areas and release memory for active virtual machines.	✓	No	Yes	No
• **New - Memory Compression.** ESX will selectively compress memory pages to delay the need to swap to disk when under memory pressure. Compression operates 1000x faster than swapping, so VM performance is maintained longer.	✓	No	No	No
• **Hypervisor paging.** When more memory is needed than can be provided by the above methods or an instant response is need, ESX will swap memory pages to disk.	✓	No	No	No
• **Guest memory resource shares.** Prioritize memory allocations to VMs by assignable shares. Ensures critical VMs get memory needed to meet service level agreements.	✓	No	No	No
– Performance accelerators	✓	Limited	Limited	Limited
• **2nd-Generation Processor hardware assist.** Optimize memory translation time between guest operating systems and physical memory with support for processor technologies such as AMD's Rapid Virtualization Indexing and Intel's Extended Page Tables for the lowest overhead while executing virtual machines.	✓	Yes	Yes	Yes
• **Large Memory pages.** Allow guest operating systems and applications to access memory more efficiently through use of large memory pages.	✓	Yes	No	Yes

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• **Paravirtualization.** Maximize throughput and lower latency through the use of paravirtualized network (VMXNET3) and storage (PVSCSI) drivers for more efficient network and storage access by virtual machines. VMware vSphere also supports paravirtualized Linux guest operating systems (Linux kernels that include VMI support) that run at higher levels of performance because they are virtualization aware.	✓	Yes, paravirtualized network and storage drivers	Yes, supports paravirtualized Linux guests	Yes, paravirtualized drivers for Windows guests
• **Networking offload.** Reduce the CPU overhead associated with processing network I/O with networking performance optimizations such as iSCSI hardware offload (new), TCP Segment Offload and Jumbo Frames	✓	Yes, TCP Segment Offload and Jumbo Frames	TCP Segment Offload only	Jumbo frames supported, Large Receive Offload disabled with patch to fix performance problem
• **VMDirectPath I/O.** Allow virtual machines to directly access physical network and storage I/O devices enhancing CPU efficiency in handling workloads that require constant and frequent access to I/O devices	✓	No	No	No
• **Resource management for virtual machines.** Define advanced resource allocation policies for virtual machines on a single server to improve service levels to software applications. Establish minimum, maximum, and proportional resource shares for CPU, memory, disk and network bandwidth. Modify allocations while virtual machines are running. Enable applications to dynamically acquire more resources to accommodate peak performance.	✓	Limited, Hyper-V R2 doesn't have traffic shaping or disk I/O throttling	Limited	Limited
– **CPU capacity prioritization**. CPU capacity on a host is assigned to virtual machines on a "fair share" basis and CPU resource controls also allow an absolute minimum level of CPU capacity to be provided to critical virtual machines.	✓	Yes	Basic CPU resource controls	No, cannot set guest CPU shares or minimums
– **New - Storage I/O Control** provides QoS capabilities for storage I/O in the form of I/O shares and limits that are enforced across all virtual machines accessing a datastore, regardless of which host they are running on. Use Storage I/O Control to ensure that the most important virtual machines get adequate I/O resources even in times of congestion.	✓	No	No	No
• **Scalability**	✓	Limited	Limited	Limited
– **Large virtual machine RAM capacity – 255GB.** Run the most memory-intensive workloads in virtual machines.	✓	No, only 64GB per VM	No, only 32GB per VM	256GB
– **New – Support for powerful physical server systems**. Take advantage of very large server systems with up to 128 logical CPUs and up to 1TB RAM for large scale server consolidation and DR projects.	✓	64 logical CPUs and 1TB of RAM	64 logical CPUs and 256GB RAM	1TB RAM

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– **New – Support for up to 320 powered-on virtual machines.** Take advantage of very large server systems for server enterprise-class server consolidation and containment. The maximum number of powered-on virtual machines per VMware ESX/ESXi has been extended from 256 to 320.	✓	Yes, Hyper-V R2 will support 384 powered-on VMs	Undocumented	Undocumented
Interoperability VMware vSphere is optimized, rigorously tested and certified across the complete IT stack of servers, storage, operating systems and software applications allowing for enterprise-wide hardware and operating system independent standardization.				
– **Hardware.** VMware vSphere 4 is rigorously tested and certified with industry-leading rack, tower and blade servers from Dell, Fujitsu Siemens, HP, IBM, NEC, Sun Microsystems, Cisco, Unisys as well as Intel whiteboxes.	✓ Over 1600 servers supported	Supports servers qualified for Windows Server 2008 R2	257 server models certified (as of 4/12/10)	615 server models certified for RHEL (as of 4/12/2010)
– **Storage.** VMware vSphere 4 is rigorously tested and certified with a wide range of storage systems from Dell, EMC, Fujitsu, Fujitsu Siemens, HP, Hitachi Data Systems, IBM, NEC, Network Appliance, StorageTek, Sun Microsystems, 3PAR, Pillar, Xiotech and others.	✓ Over 600 storage arrays supported	Supports arrays qualified for Windows Server 2008 R2	Limited, 117 arrays certified, only 29 certified with StorageLink (as of 4/12/2010)	Not documented
o **Support for Fibre Channel, iSCSI, NAS shared storage types and local SCSI/SAS/SATA storage.** VMware vSphere 4 supports a range of storage types to allow a variety of cost/performance options to be available for applications.	✓	Limited, Hyper-V R2 doesn't support NAS	Limited, no NAS support with StorageLink, non-shared H/W iSCSI only	Limited, RHEV data centers limited to a single storage type, only NFS allowed for ISO images
o **Support for leading edge storage and networking technologies** Use leading edge fabric such as 10 GigE, Infiniband as well as FCoE in vSphere environments, allowing for a variety of cost/performance options for consolidated environments	✓	Limited, supports 10Gb and FCoE but not Infiniband	Limited, no FCoE or Infiniband	Limited, storage support must be configured in RHEL host OS
– **Operating systems**. VMware vSphere 4.1 supports a wide range of unmodified operating systems including Windows, Linux, Solaris and Novell NetWare.	✓ 65 supported guest operating systems	Limited, only 25 guest OSs supported	Limited, only 17 guest OSs supported	Limited, only 5 guest OSs supported (desktop guests not supported with RHEV for Servers)
o VMware vSphere 4 adds support for several new operating systems such as Asianux, CentOS, Debian , FreeBSD, OS/2, new versions of Solaris, SCO OpenServer, SCO Unixware in addition to its already supported OS list comprising of several versions of Windows Server, RHEL, SLES, MS-DOS, NetWare etc.	✓	Limited, Hyper-V R2 only supports only 2 single CPU Linux guests (SMP Linux support in beta)	Limited, no support for Asianux, FreeBSD, OS/2, Solaris, SCO, MS-DOS, NetWare	Limited, no support for Asianux, FreeBSD, OS/2, Solaris, SCO, MS-DOS, NetWare. SLES
– **Software applications.** Run software applications from hundreds of software vendors in VMware virtual machines.	✓ Over 1400 apps available from the VMware Virtual Appliance Marketplace	Only 18 Microsoft products and 7 partner products available in "VHD Test Drive"	No virtual appliance download center	No virtual appliance download center

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– **Support for other virtual machine formats.** VMware vSphere 4.1 can run virtual machines created in non-VMware formats. vCenter Converter (available for free download or integrated into vCenter Server) converts virtual machines from other virtual machine formats to virtual machines that run on VMware vSphere 4.1	✓	No, Hyper-V R2 requires SCVMM to convert virtual disk formats	Limited, no live V2V	No V2V utilities
• **Host level power management** VMware vSphere 4.1 supports Intel Speed Step/AMD Power Now technologies allowing power savings through dynamic voltage and frequency scaling when hosts are not being utilized at full capacity. VMware vSphere 4 also supports Turbo Mode for saving power in Intel Xeon 5500 series of processors. **New** -- ESX 4.1 takes advantage of processor deep sleep states to further reduce power consumption during idle periods.	✓	Limited, Hyper-V R2 will support Core Parking but not server power down	No	No
Distributed Resource Scheduler: Align resource allocation with business priorities, across a group of servers with VMware DRS (including DPM)				
• **Aggregate resources across many servers into shared resource pools**. Manage resources independently of the physical servers that contribute the resources.	✓	No, Hyper-V R2 doesn't have resource pools. Will require SCVMM	Limited, cannot subdivide resources of pooled hosts	Limited, cannot subdivide resources of pooled hosts
• **Flexible hierarchical organization**. Organize resource pools hierarchically to match available IT resources to the business organization. DRS ensures that resource utilization is maximized while business units retain control and autonomy of their infrastructure. Resource pools can be flexibly added, removed, or reorganized as business needs or organization change.	✓	No, Hyper-V R2 doesn't have resource pools or DRS. Will require SCVMM and SCOM for PRO Tips	Lacks hierarchical resource pools	Lacks hierarchical resource pools
• **Isolation between resource pools**. Make allocation changes within a resource pool without impacting other unrelated resource pools. For example, any allocation changes in the resource pool dedicated to a given business unit do not impact other resource pools.	✓	No, Hyper-V R2 doesn't have resource pools. Will require SCVMM	No, no hierarchical resource pools	No, no hierarchical resource pools
• **Align computing resources with business goals** while ensuring flexibility and efficient utilization of hardware resources. VMware DRS continuously monitors utilization across resource pools and intelligently allocates available resources among virtual machines based on pre-defined rules and policies. VMware DRS dynamically responds to changing virtual machine requirements using VMware VMotion to move virtual machines non disruptively between servers, automating operational management of virtual machine environments	✓	No, Hyper-V R2 doesn't have resource pools or DRS. Will require SCVMM and SCOM for PRO Tips	Workload Balancing requires additional servers and Enterprise or Platinum Editions	Dynamic Resource Balancing
• **New - DRS Virtual Machine Host Affinity Rules** provide the ability to set constraints that restrict placement of a virtual machine to a subset of hosts in a cluster and to keep virtual machines paired or separated. This feature is useful for enforcing host-based ISV licensing models, as well as keeping sets of virtual machines on different racks or blade systems for availability reasons.	✓	No	VM host affinity checked only on initial startup	No

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• **Distributed Power Management** Reduce energy consumption in the datacenter by optimizing workload placement for low power consumption with VMware Distributed Power Management (DPM). DPM consolidates workloads when DRS clusters need fewer resources and powers off host servers to conserve energy. When resource requirements increase, DPM brings hosts back online to ensure service levels are met. DPM uses WOL and IPMI and iLO to control servers in production environments.	✓	Limited, Windows Server 2008 with Hyper-V R2 supports Core Parking but not server power down	Advanced Power Management feature lacks IPMI support	No, Power Saver feature does not power off hosts
<u>VMware vNetwork:</u> Infrastructure services that enable optimal administration and management of networking in virtual environments				
– **Network virtualization.** Network virtual machines like physical machines. Build complex networks within a single VMware ESX/ESXi or across multiple installations of VMware ESX/ESXi for production deployments or development and testing purposes.	✓	Yes	Yes	Yes
o **Virtual NICs.** Configure each virtual machine with one or more (up to 10) virtual NICs. Each of those network interfaces can have its own IP address and even its own MAC address. As a result, virtual machines are indistinguishable from physical machines from a networking standpoint.	✓	Yes, supports up to 12 virtual NICs per VM – 8 synthetic, 4 emulated	Limited, 7 virtual NICs per VM	8 virtual NICs per VM
– **Flexible virtual switches.** Create a virtual network within a VMware ESX/ESXi host with virtual switches that connect virtual machines within the same host as well as the outside physical network. Virtual switches can be created with up to 4096 ports, and every host can be configured with up to 248 switches	✓	Yes	Yes	Yes
o **Expanded port configuration policies.** Simplify port configuration by utilizing Port Groups across multiple virtual ports. The Port Group specifies all information needed to enable a port: NIC teaming policy, VLAN tagging, Layer 2 security, and traffic shaping.	✓	No port groups	No port groups	No port groups
o **VLANs** Overlay a logical LAN on top of physical LANs to isolate network traffic for security and load segregation purposes. VMware ESX/ESXi VLANs are compatible with standard IEEE 802.1Q VLAN implementations. Modify network configurations without having to change actual cabling and switch setups. VLANs keep broadcast traffic limited to the VLAN, reducing the network load of broadcast packets on other switches and network segments.	✓	Yes	Yes	Yes
o **VLAN tagging.** Enhance traffic isolation and network security using IEEE 802.1Q VLAN tagging on uplinks or all the way into guest VMs. Limit the scope of Layer 2 broadcast domains.	✓	Yes	Yes	Yes

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o **Layer 2 network security policies.** Enforce security for virtual machines at the Ethernet layer. Disallow promiscuous mode sniffing of network traffic, MAC address changes, and forged source MAC transmits.	✓	No	No	No
o **Enhanced NIC teaming.** Give each networked virtual machine built-in NIC failover and load balancing enabling greater hardware availability and fault tolerance. NIC teaming policies allow users to configure multiple active and standby adapters. Teaming configuration may vary per port groups on the same virtual switch and uplinks.	✓	Limited, Hyper-V R2 will support third-party NIC teaming	Yes	Yes
o **New - Load-Based Teaming** allows dynamic adjustment of the teaming algorithm so that the load is always balanced across a team of physical adapters on a vNetwork Distributed Switch.	✓	No	No	No
– **New - Network I/O Control.** Traffic-management controls allow flexible partitioning of physical NIC bandwidth between different traffic types, including virtual machine, vMotion, FT, and IP storage traffic (vNetwork Distributed Switch only).	✓	No	No	No
– **Outbound Network Traffic Shaper**. Ensure that critical virtual machines receive priority access to network bandwidth. Network traffic from virtual machines can be prioritized on a "fair share" basis. Network Traffic Shaper manages virtual machine network traffic to meet peak bandwidth, average bandwidth and burst size constraints.	✓	No, Hyper-V R2 does not have traffic shaping	No, only basic network rate limiting through CLI	No
– **Cisco Discovery Protocol (CDP) support** Discover and advertise physical and virtual network configurations for better debugging and monitoring of Cisco-based environments from within vCenter Server.	✓	No	No	No
– **IPv6 support.** Support IPv6 across both VMware ESX/ESXi hosts and guest operating systems	✓	Yes	No	No, IPv6 support disabled in RHEV
vNetwork Distributed Switch: Aggregate virtual networking across many ESX hosts and even clusters				
– **Centralized virtual network management.** Simplify provisioning and administration of virtual networking through a centralized interface. Create and manage a single distributed switch with distributed virtual port groups than span a Datacenter wide array of ESX/ESXi hosts.	✓	No	No	No
– **Support for Private VLANs.** Simplified setup and monitoring of Private VLANs, segmenting network traffic easily in shared environments	✓	Yes	No	No
– **Network VMotion.** Retain network runtime state centrally as virtual machines live migrate from server to server in shared DRS clusters; simplifying network troubleshooting and monitoring.	✓	No	No	No

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– **Bidirectional Network Traffic Shaper.** Enhance virtual machine traffic prioritization and management through bidirectional rate limiting	✓	No	No	No
• **Third Party Distributed Virtual Switches.** Enable monitoring and control of your virtual networking environments through the familiar interfaces of third party networking tools, with the capability to plug in third party software virtual switches such as the Cisco Nexus 1000V.(note: third party virtual switches are purchased separately.)	✓	No	No	No
<u>VMware vStorage:</u> Infrastructure services that abstract storage resource from the complexity of underlying hardware systems to enable the most efficient utilization of storage capacity in virtualized environments.				
– **Storage virtualization.** Abstract the complexity of storage subsystems while centrally maintaining virtual machine file storage for greater flexibility and manageability	✓	Limited	Limited	Limited
o **HBA consolidation.** Share expensive storage network components (up to 8 FC HBAs per host and 256 targets per HBA) across many virtual machines while maintaining hardware fault tolerance.	✓	No, Hyper-V R2 doesn't have HBA consolidation	Multipathing requires RDAC MPP support in array, limited HCL	Multipathing configured in RHEL OS
o **Virtual disk files** Simplify virtual machine storage management. Virtual machines see their own private virtual disk files. However, outside the virtual machine, the virtual disks are simply large files that can be copied, moved, archived and backed up as easily as any other file.	✓	Yes, VHD virtual disk files	Yes, XenServer supports VHD virtual disk files	No, uses only LVM volumes on FC and iSCSI
o **Support for SAN security features**. Enforce security policies with LUN zoning and LUN masking.	✓	No, requires SAN tools to zone and mask LUNs	No	No
<u>vStorage VMFS: High performance cluster file system</u>				
• **Broad storage hardware and protocol support.** VMFS is certified on all major arrays and vSphere storage features are supported on Fibre Channel, iSCSI, NFS and local storage.	✓ Over 600 arrays certified	Storage support relies on Windows 2008 OS	Limited, 117 array certified (only 29 for StorageLink)	Storage support relies on RHEL OS
• **Store** virtual disk files on high performance shared storage such as Fibre Channel or iSCSI SAN, mixed protocols permitted.	✓	Yes, Hyper-V supports FC and iSCSI shared storage	Yes, XenServer supports FC and iSCSI shared storage	Limited, only FC and iSCSI, only one protocol allowed per cluster
o **Online addition or removal of nodes.** Add or delete a VMware ESX/ESXi instance from a VMFS volume without pausing or halting the processing of other VMware ESX/ESXi instances.	✓	No, Hyper-V R2 doesn't allow online additions or removal of nodes	Only if XenServer node is not the cluster master node	No
o **On-disk file locking.** Ensure that the same virtual machine is not powered on by multiple servers at the same time	✓	Yes, only with CSV enabled	Yes	Requires GFS on RHEL OS

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• **Shared data file system.** Enable multiple instances of VMware ESX/ESXi to read and write from the same storage location concurrently. Since virtual machines are hardware independent and portable across servers, VMFS ensures that individual servers are not single points of failure and enables resource balancing across multiple servers.	✓	No true cluster file system, CSV is a hybrid, coordinator node controls access	XenServer does not provide a cluster file system but does allow multiple hosts to access virtual disks on a common storage volume	Requires GFS on RHEL OS
• **Logical volume manager**. Manage the interaction between the physical storage arrays and VMFS with flexibility and reliability.	✓	Limited, Windows Server 2008 utilizes the Storage Manager MMC tool to manage volumes	Limited, StorageLink partially exposes array features, limited choice of supported arrays	No
• **Dynamic VMFS volume resizing**. - Aggregate multiple storage disks into a single VMFS volume. Add new heterogeneous LUNs to a VMFS volume on the fly. - **VMFS Volume Grow.** Grow existing LUNs (on arrays that support this feature) and resize VMFS volumes on the fly.	✓	No, requires third party SAN tools to grow and shrink LUNs	No	No
• **Automatic volume re-signaturing.** Simplify the use of array-based snapshot technology. Re-signaturing automatically recognizes snapshot VMFS volumes.	✓	No	No	No
• **Partial online operation.** VMFS volumes continue to function even if some LUNs are lost.	✓	Undocumented	Undocumented	Undocumented
• **Raw device mapping.** Optionally, map SAN LUNs directly to a virtual machine in order to enable application clustering[3] and array-based snapshot technology while profiting from the manageability benefits of VMFS.	✓	Yes, Hyper-V supports passthrough disks	Yes	Yes
• **Write-through I/O.** Ensure precise recovery of virtual machines in the event of server failure. Write-through I/O enables virtual machines to have the same recovery characteristics as a physical system running the same operating system.	✓	No	No	No
• **Boot from SAN.** Run multiple instances of VMware ESX/ESXi on diskless configurations of blade and rack mount servers by booting from FC, FCoE or iSCSI SANs. Simplify backups and disaster recovery by eliminating the need to separately backup local attached server disks.	✓	Yes	Limited, XenServer can boot from FC SAN only, not iSCSI	No, only boots from local storage
• **High Performance.** Optimized for virtual machine I/O. Store and access the entire virtual machine state efficiently from a centralized location with virtual disk performance close to native SCSI.	✓	No, uses generic Windows storage drivers	No, uses generic Linux storage drivers	No, uses generic Linux storage drivers
• **Adaptive block sizing.** Uses large block sizes favored by virtual disk I/O. Use sub-block allocator for small files and directories.	✓	No	No	No

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[3] Microsoft Clustering Services requires direct access to a SAN LUN.

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• **Increased number of VMware ESX/ESXi hosts per VMFS volume**. Connect up to 64 VMware ESX/ESXi installations to a single VMFS volume.	✓	Not documented	Not documented	Not documented

• **Extended block size and file limits.** Run even the most data intensive production applications such as databases, ERP and CRM in virtual machines
    • Maximum volume size: 64 TB
    • Maximum virtual disk size: 2 TB
    • Maximum file size: 2 TB
    • Block size: 128KB to 8 MB
	✓	Yes, Hyper-V has NTFS limits. 2 TB VHD limit	Not documented	Not documented

• **Caching**. VMFS uses volume, device, object and buffer caching to improve performance	✓	No	Not documented	Not documented
• **Built-in storage access multipathing.** Ensure shared storage availability with SAN multipathing for Fibre Channel or iSCSI SAN, and NIC teaming for NAS.	✓	Limited support, requires third party tools	Multipathing requires RDAC MPP support in array, limited HCL	Multipathing configured in RHEL OS
• **New - Hot add and hot extend virtual disks.** Add virtual disks or extend virtual disks non-disruptively to a running virtual machine to increase available resources	✓	No hot extend. Hot add of SCSI disks only	Hot add only, no hot extend	No
• **New - Configuring USB Device Passthrough from an ESX/ESXi Host to a Virtual Machine.** Virtual machines can use USB devices connected to an ESX/ESXi host where the virtual machine is running. The connection is maintained even if the virtual machine migrates using vMotion.	✓	No	No	No
• **Distributed journaling.** Recover virtual machines faster and more reliably in the event of server failure.	✓	No	No	No, each GFS node has its own journal
• **Storage Management**	✓	No	Partial	No
– **LUN discovery and management**. Discover LUNs in the shared storage and map those LUNs to a VMFS volume.	✓	Only from Windows management OS	Yes	No
– **File directories.** Enable easy virtual machine administration with file directories. All files for a virtual machine are stored in a separate directory.	✓	Yes, Hyper-V VM files can be stored anywhere	Partial, only for VHD on NFS	Partial, only for virtual disks on NFS
– **Direct pass through of virtual machine data.** Ensure correct application behavior and data integrity for applications running in virtual machines. VMFS preserves the internal file system semantics of the operating system running inside the virtual machine.	✓	No, Cluster Shared Volumes adds NTFS filter driver layer	No	No
– **Unified hierarchical namespace**. Manage all available physical disks, logical volumes and VMFS volumes with a consistent namespace that eliminates potential conflicts.	✓	No	Yes	No

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– **Customizable reports and topology maps.** Increase visibility into vSphere 4.1 storage space utilization with per virtual machine, per datastore and other reports. Resolve configuration related issues with storage specific topology maps	✓	No	Limited reports, no topology maps	No
– **Centralized Datastore Management.** Create, configure, organize and secure datastores centrally for more granular control over storage in vSphere environments.	✓	No	Yes, requires StorageLink	No
– **SMI-S-compliant management interfaces.** Monitor virtual storage using any standard SMI-S-aware storage management tool.	✓	No	Yes, requires StorageLink	No
– **N-port ID virtualization.** Assign individual worldwide port names to each virtual machine to enable QoS analysis on a per virtual machine basis using third party SAN tools.	✓	Yes	No	???
vStorage Thin Provisioning: Use storage only as needed; defer and avoid excess storage costs				
• **Thin Provision virtual machines** Create virtual machines without provisioning all the storage required upfront	✓	Microsoft recommends against production use of thin disks	Limited, requires StorageLink and supported SAN, no NAS support	Documentation recommends against thin disks for server VMs
• **Consumption based monitoring and alerting** Set alerts to notify administrators when they need to procure more storage or rebalance virtual machines across the available storage with Storage VMotion	✓	No monitoring tools for thin disks	No monitoring tools for thin disks	No monitoring tools for thin disks
vStorage APIs: Integrations with leading storage hardware and software products for data protection, high availability and disaster recovery				
• **New – Hardware Acceleration with vStorage APIs for Array Integration (VAAI).** ESX can offload specific storage operations to compliant storage hardware. With storage hardware assistance, ESX performs these operations faster and consumes less CPU, memory, and storage fabric bandwidth.	✓	No	StorageLink partially exposes array features, limited choice of supported arrays	No
• **vStorage APIs for Data Protection (formerly VMware Consolidated Backup)** Use your backup and recovery solution in VMware environments efficiently for off-host, LAN-free backup of virtual machines and their restore.	✓	No, Hyper-V R2 has no APIs for data protection	No	No
– **One-step restore** of virtual machine consolidated backup images with VMware Converter or vCenter Server (formerly VirtualCenter)	✓	No	No	No
– **Fibre Channel, iSCSI, NAS and local storage support.** Use VMware Consolidated Backup with a variety of storage options.	✓	Requires SCDPM	No consolidated backup feature	No consolidated backup feature
– **Backup proxy server**. Remove load from VMware ESX/ESXi installations by consolidating backup load and management onto a backup proxy server.	✓	No	No consolidated backup feature	No consolidated backup feature
– **File level full and incremental backup (**for virtual machines running supported Microsoft® Windows as well as Linux operating systems**).** Recover individual files and directories	✓	Requires SCDPM	No consolidated backup feature	No consolidated backup feature

Key Features and Benefits	VMware vSphere 4.1 Enterprise Plus	Windows Server 2008 Microsoft Hyper-V R2	Citrix XenServer 5.6	Red Hat Enterprise Virtualization 2.2
– **New - VSS Support.** Ensure data consistency by using Microsoft Volume Shadow Copy Services (VSS) for virtual machines running supported Microsoft Windows operating systems, including Windows 2008 and 2008 R2.	✓	Limited, Hyper-V R2 supports VSS backups, but not when using CSV	VSS supported in Windows guests	No
– **Incremental, differential backup** in addition to full -image level backup (for virtual machines running any operating system).	✓	Requires SCDPM	No	No
– **Built in integrations** with most major backup providers. Leverage existing investment in backup agents to move virtual machine data from the Consolidated Backup proxy server to tape devices	✓	No	No	No
• **vStorage APIs for Multi-pathing.** Support for 3rd party multi-pathing plug-in extension modules from vendors such as EMC, Dell/Equallogic and others to enhance high availability and load balancing for critical applications.	✓	Limited, PowerPath for Windows	Limited to arrays supporting RDAC MPP	No
Application Services: Built-In Service Level Controls for Applications VMware vSphere™ application services provide built-in controls over application service levels such as availability, security and scalability, and can be enabled simply and uniformly for any application running inside VMware virtual machines				
Availability: Availability services allow IT to provide applications with varying levels of high availability depending on their priority and need, without the need for complex redundant hardware or clustering software.				
VMotion and Storage VMotion : Avoid application disruptions due to planned hardware maintenance				
• **VMotion:** Live migrate running virtual machines from one server to another with no disruption or downtime.	✓	Yes, Hyper-V R2 will have live migration	XenMotion will suspend migrating VMs under memory-heavy load	Yes
– **Enhanced VMotion Compatibility** — Enhanced VMotion Compatibility (EVC) automatically configures servers whose CPUs feature Intel FlexMigration and AMD-V Extended Migration technologies to be VMotion-compatible with servers that use older CPUs.	✓	Limited, Hyper-V R2 CPU Compatibility Mode degrades all VMs to Pentium 4	Requires Enterprise Edition and Intel FlexMigration or AMD Extended Migration support	Limited, virtual CPUs masked to Pentium II features
– **New - vMotion Enhancements.** Up to 8x performance improvement in vSphere 4.1 for individual vMotion migrations and support for four to eight simultaneous vMotion migrations per host, depending on the vMotion network adapter (1GbE or 10GbE respectively).	✓	Hosts support only one live migration at a time	Hosts support only one live migration at a time	Hosts support only one live migration at a time
• **Storage VMotion:** Live migrate running virtual machines from one storage location to another with no disruption or downtime.	✓	No, Hyper-V R2 Quick Storage Migration is not live	No	No
– Storage VMotion can be used across different types of storage (FC, iSCSI, NFS and even local storage) allowing customers to allocate the right tier of storage to applications based on their lifecycle.	✓	No	No	No
– New administrator interface makes it a simple point and click interaction to move storage	✓	No	No	No

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Key Features and Benefits	VMware vSphere 4.1 Enterprise Plus	Windows Server 2008 Microsoft Hyper-V R2	Citrix XenServer 5.6	Red Hat Enterprise Virtualization 2.2
• **Cold migrate** virtual machines from one server to another or virtual machine disks from one storage array to another.	✓	Yes	No	Yes
VMware High Availability and Fault Tolerance: Protect applications from unplanned downtime, cost effectively and easily				
• **VMware HA:** Low cost high availability for all applications	✓	Yes, Hyper-V uses MSCS for HA	Requires XenServer Advanced Edition	Yes
– **Protect against physical machine failures** through low cost, easy to setup VMware HA. VMware HA automatically detects physical machine failure and restarts virtual machines on other physical machines in a shared storage environment.	✓	Yes, requires MSCS	Yes	Yes
– **No single point of failure.** VMware HA ensures virtual machine restart even if vCenter Server is unavailable.	✓	Yes, with MSCS	Yes	No, VMs won't restart if RHEV Manager is down
– **Resource checks**. Ensure that capacity is always available in order to restart all virtual machines affected by server failure. HA continuously monitors capacity utilization and "reserves" spare capacity to be able to restart virtual machines.	✓	No	No	No
– **VM restart priority** settings ensure the most critical virtual machines are restarted first	✓	No	Yes	Yes
– **Protect against guest operating system failures** with virtual machine failure monitoring in VMware HA	✓	Yes, Hyper-V R2 will monitor VM heartbeat	No	Yes
– **Intelligent choice of servers** (when used with VMware DRS). Automate the optimal placement of virtual machines restarted after server failure.	✓	No, controlled by MSCS	Yes	Yes
– **HA Maintenance Mode** Suspend failover actions during maintenance operations on servers	✓	Requires SCVMM R2	No, must disable HA manually	No
– **New - Windows Failover Clustering with VMware HA.** Clustered virtual machines that utilize Windows Failover Clustering/Microsoft Cluster Service are fully supported by VMware HA.	✓	Yes, requires MSCS	No	No
– **New - VMware HA Scalability Improvements.** VMware HA has the same limits for virtual machines per host (320), hosts per cluster (32), and virtual machines per cluster (3000) as vSphere.	✓	No, MSCS limited to 16 hosts/cluster	Undocumented	Undocumented
– **New - VMware HA Healthcheck and Cluster Operational Status** dashboard in the vSphere Client displays the current VMware HA operational status, including the specific status and errors for each host in the VMware HA cluster.	✓	No	No	No

Key Features and Benefits	VMware vSphere 4.1 Enterprise Plus	Windows Server 2008 Microsoft Hyper-V R2	Citrix XenServer 5.6	Red Hat Enterprise Virtualization 2.2
• **VMware Fault Tolerance** Provide zero downtime, zero data loss continuous availability against physical server failures with VMware Fault Tolerance	✓	No	No (everRun VM from Marathon Technologies provides limited FT features at extra cost)	No
– **Seamless stateful failover.** Automatically trigger seamless stateful failover when the protected virtual machines fail to respond; resulting in zero downtime, zero data loss continuous availability	✓	No	No	No
– **Automatic creation of secondary virtual machines.** Automatically trigger the creation of a new secondary virtual machine after failover, to ensure continuous protection to the application	✓	No	No	No
– **Compatibility with all types of shared storage.** VMware Fault Tolerance works with all types of shared storage Fibre Channel, NAS or iSCSI	✓	No	No	No
– **Compatibility with all operating systems.** VMware Fault Tolerance works with all operating systems[4] supported with VMware ESX	✓	No	No	No
– **Compatibility with existing DRS and HA clusters.** VMware Fault Tolerance works with existing DRS and HA clusters [5] and only an additional dedicated gigabit Ethernet network	✓	No	No	No
– **Easy point and click administration.** VMware Fault Tolerance can be turned on or off through an easy point and click action in vSphere Client, allowing administrators to use the capability as needed.	✓	No	No	No
– **New – FT-specific versioning control** mechanism allows Primary and Secondary VMs to run on ESX hosts at different patch levels.	✓	No	No	No
– **New – FT interoperability with DRS** lets FT-enabled virtual machines can take advantage of DRS functionality for load balancing and initial placement.	✓	No	No	No
<u>VMware Data Recovery and Snapshots</u>: Recover from outages quickly and cost effectively				
• **VMware Data Recovery** Backup virtual machines quickly, easily and cost effectively with VMware Data Recovery, an integrated backup and recovery solution for virtual environments. VMware Data Recovery is appropriate for small office or remote office environments of 100 VMs or less	✓	No	No	No
• **New - Concurrent VMware Data Recovery Sessions.** vSphere 4.1 provides the ability to concurrently manage multiple VMware Data Recovery appliances.	✓	No	No	No

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[4] VMware Fault Tolerance is initially supported for virtual machines with a single virtual processor
[5] VMware Fault Tolerance requires Intel 31xx, 33xx, 52xx, 54xx, 55xx, 74xx, 75xx or AMD 13xx, 23xx, 83xx, 84xx series of processors or above.

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Key Features and Benefits	VMware vSphere 4.1 Enterprise Plus	Windows Server 2008 Microsoft Hyper-V R2	Citrix XenServer 5.6	Red Hat Enterprise Virtualization 2.2
• **Virtual machine snapshots**. Increase application availability while reducing backup windows using virtual machine snapshots. Create a point-in-time copy of virtual machine data that can be used for testing, backup, and recovery operations,	✓	Limited, can't commit snapshot if VM powered on, not recommended for production	Yes	Only snapshots of powered off VMs
• **Support for Microsoft® Clustering Services.** Cluster virtual machines running Microsoft® Windows operating system across physical hosts.	✓	Yes, Hyper-V supports MSCS	Only with iSCSI	No
Security: Security services within VMware vSphere allow IT to provide applications with appropriate level of enforcement of security policies in an operationally efficient way.				
VMware vShield Zones and VMsafe: Secure applications effectively in dynamic, shared environments				
• **VMware vShield Zones**: Integrated dynamic firewalling for all applications	✓	No	No	No
– **Control network access to sensitive areas of the virtual datacenter** such as the DMZ or servers with sensitive data subject to PCI or SOX compliance regulations, efficiently within shared vSphere environments.	✓	No	No	No
– **Securely bridge, firewall or isolate traffic** across logical trust or organizational boundaries within existing vSphere deployments, while still leveraging the flexibility and availability of sharing resource computing pools.	✓	No	No	No
• **VMware VMsafe:** Provide higher levels of security than physical servers to all applications with VMsafe integrated security appliances from VMware partners	✓	No	No	No
– **Secure collaboration of security appliances** with the hypervisor for higher levels of protection to virtual machines	✓	No	No	No
– **Enable multiple security functions from a single solution** reducing performance overhead due to agents, inline devices etc	✓	No	No	No
Scalability: Scalability services allow IT to deliver the right amount of resource to every application, based on its need, non-disruptively.				
• **New – Storage and Network I/O Control** Set quality of service priorities to guarantee fair access to critical resources	✓	No	No	No
– **New – Storage I/O Control.** Set storage I/O shares and limits for all VMs accessing a datastore, regardless of which host they are running on. Ensure that important virtual machines get adequate I/O resources even in times of congestion.	✓	No	No	No
– **New - Network I/O Control. P**artition physical NIC bandwidth between different traffic types, including virtual machine, vMotion, FT, and IP storage traffic (vNetwork Distributed Switch only).	✓	No	No	No
VMware DRS, Hot Add and Virtual SMP: Shrink and grow applications according to requirements and business priorities				

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Key Features and Benefits	VMware vSphere 4.1 Enterprise Plus	Windows Server 2008 Microsoft Hyper-V R2	Citrix XenServer 5.6	Red Hat Enterprise Virtualization 2.2
– **Shares and reservations** Allocate proportionally higher shares of resources to applications with higher priority within logical resource pools; or reserve fixed quantities of memory or CPU bandwidth for applications based on their priorities. DRS automatically load balances virtual machines across servers when some applications require more resources to meet their user requirements	✓	Requires SCVMM and SCOM. No logical resource pools – shares apply across entire cluster	Per VM memory min/max but no shares. No per VM CPU shares or reservations. No logical resource pools – shares apply across entire cluster	No CPU or memory shares or reservations. No logical resource pools – shares apply across entire cluster
Hot Add: Grow virtual machines dynamically without disruption				
Hot Add CPU & Memory Provision additional CPU and memory to virtual machines on an as needed basis, without disruption to users	✓	No	No	No
Hot Plug virtual devices Add or remove virtual storage, networking and other virtual devices to or from virtual machines on an as needed basis, without disruption to users	✓	Limited, only supports hot add and remove virtual SCSI drives	No	No
8-way Virtual SMP™. Enable a single virtual machine to simultaneously use up to 8 logical processors on your server (increased from 4 for VMware ESX/ESXi 3). With 8-way Virtual SMP even the most processor intensive software applications like databases and messaging servers can be virtualized.	✓	No, Hyper-V R2 is limited to 4vCPUs. Only Win2k8 VMs will support 4vCPUs	Yes	Yes

VMware vCenter Server 4.1 is the scalable and extensible management server required to administer vSphere components that provides deep visibility and control into vSphere environments as well as the proactive management and automation for vSphere environments.

Key Features and Benefits	VMware vSphere Enterprise Plus	Windows Server 2008 Microsoft Hyper-V R2	Citrix XenServer 5.5	Red Hat Enterprise Virtualization 2.2
Integrated Management Services provided by VMware vCenter™ Server				
Centralized control and visibility				
– **Comprehensive inventory model**. Manage the complete inventory of virtual machines, applications, resource pools and physical servers with greater visibility into object relationships. The new inventory model provides the flexibility to organize objects into folders and create two separate hierarchical views.	✓	No	No	No
– **Interactive topology maps**. Visualize the relationships between physical servers, virtual machines, networks and storage. Topology maps allow to easily verify correct configuration for distributed services such as VMotion, DRS and HA.	✓	Limited, requires SCOM	No	No
– **Server and virtual machine management**	✓	Yes (requires SCVMM)	Yes	Limited
o **vSphere Client.** Use a single console to access vCenter Server and manage multiple installations of VMware ESX/ESXi, virtual machines, resource pools etc.	✓	No, multiple clients required to access Hyper-V, SCVMM, SCOM, etc.	XenCenter Windows-based client	RHEV Manager Windows-based client
o **vSphere Web Access.** Manage virtual machines and access virtual machine graphical consoles without installing a client.	✓	No	No	No
o **Virtual machine shortcuts.** Enable self-help for end users with direct access to virtual machines through a Web browser.	✓	No	No	No
o **New - vSphere Management Assistant (vMA)** virtual appliance that allows administrators to run scripts and agents to manage vSphere now supports Active Directory for authentication.	✓	No	No	No
o **New - Access Virtual Machine Serial Ports Over the Network.** Redirect virtual machine serial ports over a standard network link in vSphere 4.1. This enables solutions such as third-party virtual serial port concentrators for virtual machine serial console management or monitoring.	✓	No	No	No
– **System monitoring.** Continuously monitor physical servers and virtual machine availability and utilization from a single interface.	✓	No, multiple Hyper-V and System Center UIs needed	Yes	Yes

Key Features and Benefits	VMware vSphere Enterprise Plus	Windows Server 2008 Microsoft Hyper-V R2	Citrix XenServer 5.5	Red Hat Enterprise Virtualization 2.2
o **Alerts and notifications.** Set green, yellow and red level alarms for CPU, memory and heartbeat states to manage and pre-empt problems. Alarm triggers generate automated notifications and alerts. Schedule automatic execution of system management tasks such as sending SNMP traps, sending emails, running management scripts, suspending, powering off, and resetting virtual machines. o **Event based alarms.** Proactively manage and monitor infrastructure resources by setting alarms to trigger on events and for notification of critical error conditions. Alarms are time based to prevent false alarms.	✓	Limited to standard Windows Event Logs	Basic CPU and memory alarms only	Very limited CPU, memory, networking and status alerts
o **Performance graphs.** Monitor and analyze virtual machines, resource pools and server utilization and availability with detailed performance graphs. Performance metrics can be defined with several levels of granularity and can be viewed in real time, or across a specified time interval. o Aggregated charts show high-level summaries of resource distribution that is useful to identify the top consumers. o Thumbnail views of hosts, resource pools, clusters, and datastores allow for easy navigation to the individual charts. o Drill down capability across multiple levels in the inventory helps in isolating the root-cause of performance problems quickly. o Detailed datastore level views show utilization by file type and unused capacity. o **New - Storage Performance Statistics.** NFS statistics are now available in vCenter Server performance charts, as well as esxtop. New VMDK and datastore statistics are included. All statistics are available through the vSphere SDK.	✓	Limited to Windows Server 2008 Perfmon, required SCOM for basic charts	Basic charts, no customization	RHEV Manager shows only basic statistics from last 24 hours. Must create SQL queries for more detailed history.
o **Reports**. Export vCenter Server data to HTML and Excel formats for integration with other reporting tools and offline analysis.	✓	No	No	No exports from RHEV Manager, must create own SQL queries
– **VMware ESX/ESXi configuration**. Centralize management and configuration of all VMware ESX/ESXi installations in vCenter Server.	✓	Requires SCVMM, SCOM, and SCCM for equivalent capabilities	Yes, XenCenter manages XenServer hosts	RHEV Manager
– **Virtual Machine Configuration** Establish and ensure compliance with corporate configuration standards through virtual machine templates. Save virtual machines as templates that can be instantiated in minutes. Minimize errors and downtime by establishing configuration standards for virtual machines. Re-designed templates support easy virtual machine patching and updating. Templates can be stored on shared storage for greater reliability.	✓	Requires SCVMM, SCOM, and SCCM for equivalent capabilities	Yes, supports templates	VMs from templates are linked clones – unsuitable for server VMs

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Key Features and Benefits	VMware vSphere Enterprise Plus	Windows Server 2008 Microsoft Hyper-V R2	Citrix XenServer 5.5	Red Hat Enterprise Virtualization 2.2
– **Virtual machine cloning.** Copy existing virtual machines when a new instance of a server is needed.	✓	Requires SCVMM	Only with supported arrays, limited HCL	Only supports linked clones – unsuitable for server VMs
– **Patch Management.** Get a datacenter wide actionable patch compliance dashboard that enables compliance to patch standards through automated policy driven scanning and patching of online ESX Server hosts, 3rd party ESX modules (like EMC PowerPath), VM Tools and VM hardware, Virtual Appliances and select Microsoft and Linux virtual machines with vCenter Update Manager. Reduce security exposure in the environment through secure patching of offline virtual machines and reduce downtime through automatic snapshots prior to patching and rollback. Integration with VMware DRS enables zero downtime ESX Server host patching. **New** – recalled patch handling notifies of recalls and prevents installation of recalled patches.	✓	Requires SCVMM and SCCM	No	No
– **Remote devices.** Install software in a virtual machine running on a server from the CD-ROM of a desktop without leaving your desk.	✓	No	Yes	No, VMs can only mount ISOs in an NFS directory
– **Fine-grained access control**. Secure the environment with configurable, tiered group definitions and fine-grained permissions.	✓	Yes, requires Authorization Manager	Only 6 predefined roles, permissions apply to all cluster hosts and can't be restricted to specific hosts or VMs, requires Enterprise Edition	Cannot limit permissions to a subset of hosts or VMs
– **Integration with Microsoft® Active Directory**. Base access controls on existing Microsoft® Active Directory authentication mechanisms. **New** – authenticate direct connections to ESX/ESXi hosts using AD.	✓	Yes	Yes, XenCenter users authenticated in AD	Yes, RHEV Manager users authenticated in AD
– **Custom roles and permissions.** Enhance security and flexibility with user-defined roles. vCenter Server users with appropriate privileges can create custom roles such as night shift operator or backup administrator. Restrict access to the entire inventory of virtual machines, resource pools and servers by assigning users to these custom roles. Can set permissions at the datastore and network level.	✓	Yes, requires Authorization Manager	No customization	Roles can be customized but can't restrict access based on managed objects
– **Resource pool access control and delegation.** Secure resource allocation at different levels in the company. For example, when a top-level administrator makes a resource pool available to a department-level use, all virtual machine creation and management can be performed by the department administrator within the boundaries assigned to the resource pool.	✓	No, can't subdivide resource pools	No, can't subdivide resource pools	No, can't subdivide resource pools
– **Centralized licensing**. Administer and manage all license keys centrally within vCenter Server. **New** – License Reporting Manager generates reports on license keys and usage.	✓	No	No	No

Key Features and Benefits	VMware vSphere Enterprise Plus	Windows Server 2008 Microsoft Hyper-V R2	Citrix XenServer 5.5	Red Hat Enterprise Virtualization 2.2
– **PXE (Pre-boot Execution Environment) support**. Use your server provisioning tools to deploy existing system images to empty virtual machines.	✓	Yes	Yes	Yes
– **New - Scripted Install for ESXi** to local and remote disks allows rapid deployment of ESXi to many machines. Start the scripted installation with a CD-ROM drive or over the network by using PXE booting.	✓	Requires SCCM and scripting	No	No
– **Audit trails.** Maintain a record of significant configuration changes and the administrator who initiated them. Export reports for event tracking.	✓	Yes	Requires Enterprise Edition	Yes
– **Session management.** Discover and, if necessary, terminate vCenter Server user sessions.	✓	No	No	No
Proactive management and automation of vSphere environments				
– **Deployment wizard**. Create new virtual machines with a user friendly wizard. Customize network identities and operating system parameters to make new instances unique.	✓	No guest customization	No guest customization	Sysprepped VMs only available using linked-clone template feature – not suitable for server VMs
– **Host Profiles** Establish standard configurations for VMware ESX/ESXi hosts and automate compliance to these configurations, simplifying operational management of large scale environments and reducing errors due to misconfigurations.	✓	No	No	No
– **Simplified Application deployment with vApps** vApps simplify the deployment and ongoing management of an n-tier application in multiple virtual machines by encapsulating it into a single virtual service entity. vApps encapsulate not only virtual machines but also their interdependencies and resource allocations allowing for single-step power operations, cloning, deployment, and monitoring of the entire application. vCenter includes support for creating and running vApps as well as importing and exporting them in compliance with Open Virtualization Format (OVF) 1.0 standard.	✓	No	No	Supports OVF
– **Integrated Physical to Virtual Machine conversion.** Manage multiple simultaneous conversions to virtual machines. Convert running physical machines to VMs. Import virtual machine formats such as Microsoft Hyper-V (new), VirtualServer or VirtualPC to VMs. Import backup images of physical machines such as Symantec Backup Exec LiveStateRecovery, Ghost 9, and VMware Consolidated backup images to running virtual machines.	✓	Yes, requires SCVMM	Limited, no hot Linux conversions, only VHD image support	No P2V tool, Linux V2V only

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Key Features and Benefits	VMware vSphere Enterprise Plus	Windows Server 2008 Microsoft Hyper-V R2	Citrix XenServer 5.5	Red Hat Enterprise Virtualization 2.2
– **Guided consolidation.** Guide first time virtualization users, in simpler Windows environments through the consolidation process workflow. Through a wizard based, tutorial like interface, Guided consolidation automatically discovers physical servers, helps analyze their performance and triggers the conversion of physical to virtual machines placed intelligently on the right host.	✓	No	No	No
– **Automation and Orchestration with vCenter Orchestrator** Automate routine day to day repetitive tasks for vSphere environments with vCenter Orchestrator. VMware vCenter Orchestrator allows for best practices to be captured and turned into workflows toenable consistency, standardization, and reduce the possibility of errors. **New** – 64-bit support for greater performance.	✓	No	Requires Citrix Workflow Studio	No
Scalability and extensibility				
– **New** - **Large-scale management** with vCenter Server 4.1. - Manage up to 1,000 hosts and 10,000 powered on virtual machines - Link up to 10 vCenter Servers in your environment with **vCenter Server Linked Mode** to manage up to 50,000 virtual machines from a single console	✓	Requires SCVMM	Scalability undocumented, no linked mode	RHEV Manager supports multiple datacenters/clusters, scalability limits not documented
– **Programmatic interfaces** through the VMware APIs and SDKs. Provide Web Services APIs to access the functionality and data provided through the graphical user interfaces in order to integrate with third party systems management products and to extend of the core functionality. Support for PowerShell, Perl, Java, C#, and CIM SMI-S and SMASH.	✓	Yes, PowerShell	Yes	Yes, PowerShell