

VMware Infrastructure 3

Data center management and optimization suite

VMware® Infrastructure is the most widely deployed software suite for optimizing and managing IT environments through virtualization – from the desktop to the data center. The only production-ready virtualization software suite, VMware Infrastructure is proven to deliver results to more than 20,000 customers of all sizes and is used in a wide variety of environments and applications. VMware Infrastructure is fully optimized, rigorously tested and certified for the widest range of hardware, operating systems and software applications. It provides built-in management, resource optimization, application availability and operational automation capabilities that deliver transformative cost savings as well as increased operational efficiency, flexibility and IT service levels.

Key Features and Benefits Summary

VMware Infrastructure 3 is a suite of products comprising:

- The virtualization platform or hypervisor, which partitions a single server into multiple self-contained virtual machines
- Virtual infrastructure services that aggregate entire farms of virtualized servers, storage and the network into unified, standardized logical resources
- Virtual Infrastructure management solutions to automate end-to-end IT processes

Key Features and Benefits	ESX Server 3i ¹	VMware Infrastructure Foundation	VMware Infrastructure Standard	VMware Infrastructure Enterprise
Virtualization Platform <i>Partition a single physical machine into multiple self-contained virtual machines</i>				
VMware® ESX Server				
• Bare-metal architecture inserts a robust virtualization layer directly on the server hardware for near-native virtual machine performance, reliability and scalability.	X	X	X	X
• New – Small footprint. ESX Server 3i is a compact, 32MB form factor of the production proven ESX Server hypervisor. It is a fraction of the size of a general purpose operating system for unparalleled security and reliability.	X	X	X	X
• New – Server integration. ESX Server 3i can be integrated into servers from leading OEM vendors for a simplified boot and deployment experience.	X	X	X	X
• Comprehensive resource virtualization				
– CPU virtualization. Increase server utilization without the risk of critical services being starved for CPU resources. ESX Server uses intelligent process scheduling and load balancing across available processors to manage the execution of virtual machine processing.	X	X	X	X
– Network virtualization. Network together virtual machines as you would physical machines. Build complex networks within a single ESX Server or across multiple installations of ESX Server for production deployments or development and testing purposes.	X	X	X	X
o Virtual NICs. Configure each virtual machine with one or more 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.	X	X	X	X
o Virtual switches. Create a simulated network within an ESX Server with virtual switches that connect virtual machines.	X	X	X	X
o Expanded port configuration policies. Simplify port configuration by utilizing a single configuration object across large groups of ports. The configuration object specifies all information needed to enable a port: NIC teaming policy (now per port instead of per virtual switch), VLAN tagging, Layer 2 security and traffic shaping.	X	X	X	X
o VLAN Overlay a logical LAN on top of physical LANs to isolate network traffic for security and load segregation purposes. ESX Server VLANs are compatible with standard VLAN implementations from other vendors. 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.	X	X	X	X
o VLAN tagging. Enhance network security by tagging and filtering network traffic on VLANs. Limit the scope of broadcast domains.	X	X	X	X
o Layer 2 network security policies. Enforce security for virtual	X	X	X	X

¹ KB article 1003345 describes the differences in supported networking features between ESX Server and ESX Server 3i

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machines at the Ethernet layer. Disallow promiscuous mode sniffing of network traffic, MAC address changes and forged source MAC transmits.				
<ul style="list-style-type: none"> o Enhanced NIC teaming. Give each networked virtual machine built-in NIC failover and load balancing to enable greater hardware availability and fault tolerance. NIC teaming policies allow users to configure multiple active and standby adapters. Teaming configuration may be different for different port groups on the same virtual switch, and different groups can even select different teaming algorithms for the same team. 	X	X	X	X
<ul style="list-style-type: none"> - Storage virtualization. Leverage shared storage to centralize virtual machine file storage for greater manageability, flexibility and availability. 	X	X	X	X
<ul style="list-style-type: none"> o Fibre Channel HBA consolidation. Share expensive storage network components across many virtual machines while maintaining hardware fault tolerance. 	X	X	X	X
<ul style="list-style-type: none"> 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. 	X	X	X	X
<ul style="list-style-type: none"> o Compatibility with SAN security practices. Enforce security policies with LUN zoning and LUN masking. 			X	X
<ul style="list-style-type: none"> - Advanced memory management 	X	X	X	X
<ul style="list-style-type: none"> • 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. 	X	X	X	X
<ul style="list-style-type: none"> • 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. 	X	X	X	X
<ul style="list-style-type: none"> • 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. 	X	X	X	X
<ul style="list-style-type: none"> • New – Enhanced virtual machine performance. <ul style="list-style-type: none"> - Networking performance optimizations such as TCP Segment Offload and Jumbo Frames that reduce the CPU overhead associated with processing network i/o². - Support for large memory pages, which makes memory access for the guest operating systems and the hypervisor more efficient. - Support for paravirtualized Linux guest operating systems (Linux kernel 2.6.21 onwards) that run at higher levels of performance because they are virtualization-aware. 	X	X	X	X
<ul style="list-style-type: none"> • Wake-on LAN. Enable higher consolidation ratios by allowing virtual machines to go on stand-by mode when not used. 	X	X	X	X
<ul style="list-style-type: none"> • Resource management for virtual machines. Define advanced resource allocation policies for virtual machines 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. 	X	X	X	X
<ul style="list-style-type: none"> - CPU capacity prioritization. CPU capacity 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. 	X	X	X	X
<ul style="list-style-type: none"> - Storage I/O traffic prioritization. Ensure that critical virtual machines receive priority access to storage devices. I/O traffic from virtual machines to disk can be prioritized on a "fair share" basis. 	X	X	X	X
<ul style="list-style-type: none"> - 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. 	X	X	X	X
<ul style="list-style-type: none"> • Scalability 	X	X	X	X

² Jumbo frames require specialized NIC hardware.

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- New - 64GB RAM for virtual machines. Run the most memory-intensive workloads in virtual machines with a memory limit extended to 64GB.	X	X	X	X
- New - Support for powerful physical server systems. Take advantage of very large server systems with up to 32 logical CPUs and 256GB RAM for large scale server consolidation and DR projects.	X	X	X	X
- Support for up to 128 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 ESX Server has been extended from 80 to 128.	X	X	X	X
- Flexible virtual switches. Scale up to handle more virtual machines. Virtual switches can be created with any number of ports from 8 to 1016, and the maximum number of virtual switches has been raised from 128 to 248.	X	X	X	X
<ul style="list-style-type: none"> • Interoperability ESX Server 3 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 Infrastructure 3 is rigorously tested and certified with industry-leading rack, tower and blade servers from Dell, Fujitsu Siemens, HP, IBM, NEC, Sun Microsystems and Unisys.	X ³	X	X	X
- Storage. VMware Infrastructure 3 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 and 3PAR.	X	X	X	X
o NAS and iSCSI SAN support. By supporting lower-cost, more easily managed shared storage, ESX Server 3 further reduces total cost of ownership of IT environments. Advanced VMware Infrastructure capabilities like VMotion™, VMware® DRS and VMware® High Availability (HA) are fully supported with NAS and iSCSI environments.	X	X	X	X
o New - Local SATA storage support.	X	X	X	X
o New - Use high-speed networking such as 10 GigE and Infiniband for the most network-intensive workloads.	X	X	X	X
- Operating systems. VMware Infrastructure 3 supports a wide range of unmodified operating systems including Windows®, Linux®, Solaris® and Novel® NetWare™.	X	X	X	X
o New - Ubuntu support	X	X	X	X
o New - Windows® Vista® support	X	X	X	X
- Software applications. Run software applications from hundreds of software vendors in VMware virtual machines.	X	X	X	X
- Support for other virtual machine formats. ESX Server 3 can run virtual machines created in non-VMware formats. VMware® Converter (available for free download or integrated into VirtualCenter) converts virtual machines from other virtual machine formats to virtual machines that run on ESX Server.	X	X	X	X
• Improved power management ESX Server enters a low power "halt" state when a CPU is not scheduled.	X	X	X	X
VMFS cluster file system				
• Shared data file system. Enable multiple installations of ESX Server 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.	X	X	X	X
- Store virtual disk files on high-performance shared storage such as Fibre Channel or iSCSI SAN.	X	X	X	X
o Online insertion or deletion of nodes. Add or delete an ESX Server from a VMFS volume without pausing or halting the processing of other ESX Server installations.	X	X	X	X
o On-disk disk file locking. Ensure that the same virtual machine is not powered on by multiple servers at the same time	X	X	X	X
• Logical volume manager. Manage the interaction between the physical storage arrays and VMFS with flexibility and reliability.	X	X	X	X
- Dynamic volume resizing. Aggregate multiple storage disks into a single VMFS volume. Resize LUNs and add new heterogeneous LUNs to a VMFS volume on the fly.	X	X	X	X
- Automatic volume re-signaturing. Simplify the use of array-based snapshot technology. Re-signaturing automatically recognizes snapshot VMFS volumes.	X	X	X	X
- Partial online operation. Volume continues to function even if some LUNs	X	X	X	X

³ Initially, ESX Server 3i has a separate hardware compatibility list from ESX Server 3.5

Key Features and Benefits	ESX Server 3i ¹	VMware Infrastructure Foundation	VMware Infrastructure Standard	VMware Infrastructure Enterprise
are lost.				
<ul style="list-style-type: none"> – Raw device mapping. Optionally, map SAN LUNs directly to a virtual machine to enable application clustering⁴ and array-based snapshot technology, while profiting from the manageability benefits of VMFS. 	X	X	X	X
<ul style="list-style-type: none"> • 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. 	X	X	X	X
<ul style="list-style-type: none"> • Boot from SAN. Run multiple installations of ESX Server on diskless configurations of blade and rack mount servers by booting from SAN. Simplify backups and disaster recovery by eliminating the need to separately backup local attached server disks. 	X	X	X	X
<ul style="list-style-type: none"> • 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. 	X	X	X	X
<ul style="list-style-type: none"> • Adaptive block sizing. Uses large block sizes favored by virtual disk I/O. Use sub-block allocator for small files and directories. 	X	X	X	X
<ul style="list-style-type: none"> • Dynamic increase of VMFS volume size. Create new virtual machines without relying on a storage administrator. Adaptive block sizing and addressing for growing files allows you to increase a VMFS volume on the fly. 	X	X	X	X
<ul style="list-style-type: none"> • Increased number of ESX Server per VMFS volume. Connect up to 32 ESX Server installations to a single VMFS volume. 	X	X	X	X
<ul style="list-style-type: none"> • Extended block size and file limits. Run even the most data-intensive production applications such as databases, ERP and CRM in virtual machines. <ul style="list-style-type: none"> • Maximum volume size: 64 TB • Maximum virtual disk size: 2 TB • Maximum file size: 2 TB max • Block size: 1 MB to 8 MB 	X	X	X	X
<ul style="list-style-type: none"> • Caching. VMFS uses volume, device, object and buffer caching to improve performance. 	X	X	X	X
<ul style="list-style-type: none"> • Built-in storage access multipathing. Ensure shared storage availability with SAN multipathing for Fibre Channel or iSCSI SAN, and NIC teaming for NAS. 	X	X	X	X
<ul style="list-style-type: none"> • Hot add virtual disk. Add virtual disk to a running virtual machine to increase available resources or for backup. 	X	X	X	X
<ul style="list-style-type: none"> • Distributed journaling. Recover virtual machines faster and more reliably in the event of server failure. 	X	X	X	X
<ul style="list-style-type: none"> • Storage Management 		X	X	X
<ul style="list-style-type: none"> – LUN discovery and management. Discover LUNs in the shared storage and map those LUNs to a VMFS volume. 	X	X	X	X
<ul style="list-style-type: none"> – File directories. Enable easy virtual machine administration with file directories. All files for a virtual machine are stored in a separate directory. 	X	X	X	X
<ul style="list-style-type: none"> – 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. 	X	X	X	X
<ul style="list-style-type: none"> – Unified hierarchical namespace. Manage all available physical disks, logical volumes and VMFS volumes with a consistent namespace that eliminates potential conflicts. 	X	X	X	X
<ul style="list-style-type: none"> – SMI-S-compliant management interfaces. Monitor virtual storage using any standard SMI-S-aware storage management tool. 	X	X	X	X
<ul style="list-style-type: none"> – New- 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. 	X	X	X	X
<ul style="list-style-type: none"> • 4-way Virtual SMP™. Enable a single virtual machine to use up to four physical processors simultaneously. ESX Server 3 extends this unique feature from two to four processors. With 4-way Virtual SMP, even the most processor-intensive software applications like databases and messaging servers can be virtualized. 	X	X	X	X
Virtual Infrastructure Services⁵ Aggregate entire farms of systems, storage and network into unified logical resources				
Mobility: Move virtual machines independent of the underlying hardware.				
<ul style="list-style-type: none"> • VMotion: Migrate running virtual machines from one server to another with no disruption or downtime. 				X
<ul style="list-style-type: none"> • Storage VMotion: Migrate running virtual machines from one storage array to another with no disruption or downtime. 				X
<ul style="list-style-type: none"> • Cold migrate virtual machines from one server to another or virtual machine disks from one storage array to another. 		X	X	X
Availability: Lower unplanned downtime by protecting against hardware failures.				

⁴ Microsoft Clustering Services requires direct access to a SAN LUN.

⁵ Most Virtual Infrastructure Services require a VirtualCenter Server (previously known as VirtualCenter Management Server) in the environment

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<ul style="list-style-type: none"> • VMware HA: Low-cost high availability for all applications. <ul style="list-style-type: none"> - 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. - Resource checks. Ensure that capacity is always available to restart all virtual machines affected by server failure. VMware HA continuously monitors capacity utilization and “reserves” spare capacity for restarting virtual machines. - New- Protect against operating system failures with virtual machine failure monitoring (experimental) in VMware HA. - Intelligent choice of servers (when used with VMware DRS). Automate the optimal placement of virtual machines restarted after server failure. 			X	X
<ul style="list-style-type: none"> • Support for Microsoft® Clustering Services⁶. Cluster virtual machines running Microsoft® Windows® operating system across physical hosts. 				
<ul style="list-style-type: none"> • 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. 		X	X	X
<ul style="list-style-type: none"> • VMware Consolidated Backup. Centralize your backups by using your backup solution with VMware Consolidated Backup. <ul style="list-style-type: none"> - NEW: One-step restore of virtual machine consolidated backup images with VMware Converter or VMware® VirtualCenter. - New - Fibre Channel ,iSCSI, NAS and local storage support. Use VMware Consolidated Backup with a variety of storage options. - Backup proxy server. Remove load from ESX Server installations by consolidating backup load and management onto a backup proxy server. - File-level full and incremental backup for virtual machines running Microsoft Windows operating system. Recover individual files and directories. - Image-level backup for virtual machines running any operating system. Recover the entire virtual machine image. - 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. 	X	X	X	X
Resource Management: Align resource allocation with business priorities.				
<ul style="list-style-type: none"> • VMware Distributed Resource Scheduler. Dynamically optimize resource allocation to virtual machines across resource pools with VMware DRS. 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. <ul style="list-style-type: none"> - Abstraction of resources from hardware. Manage resources independently of the physical servers that contribute the resources. - Flexible hierarchical organization. Organize resource pools hierarchically to match available IT resources to the business organization. DRS maximizes resource utilization while business units retain control and autonomy of their infrastructure. Resource pools can be added flexibly, removed or reorganized as business needs change or the organization changes. - Isolation between resource pools. Make allocation changes within a resource pool without affecting other unrelated resource pools. For example, any allocation changes in the resource pool dedicated to a given business unit do not have an impact on other resource pools. - Management of sets of virtual machines running a distributed application. Optimize the service level of distributed applications by controlling the aggregate allocation of resources for the entire set of virtual machines running the distributed application. - Manual and Automatic Migration Mode. Execute recommendations for virtual machine resource optimization either manually or automatically with VMware VMotion. - Affinity Rules. Create rules that govern the allocation of virtual machines to physical servers. For example, certain virtual machines can always be kept on the same server for performance reasons. Alternatively, certain virtual machines can always be kept on different servers for high availability. - Maintenance mode for servers with VMware DRS. Perform maintenance on physical servers without disruption to virtual machines and end users. When a physical server is placed in maintenance mode, DRS automatically moves virtual machines to alternative servers in the resource pool. 				X
				X
				X
				X
				X
				X
				X
				X
				X
				X

⁶ Although previous versions of ESX Server support MSCS, ESX Server 3.5 currently does not support any version of MSCS.

Key Features and Benefits	ESX Server 3i ¹	VMware Infrastructure Foundation	VMware Infrastructure Standard	VMware Infrastructure Enterprise
<ul style="list-style-type: none"> Distributed Power Management (experimental). 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. 				X
Security: Secure virtual infrastructure from vulnerabilities				
<ul style="list-style-type: none"> New- Patch Management. Enforce compliance to patch standards through automated scanning and patching of online ESX Server hosts and select Microsoft and Linux virtual machines. 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. 		X	X	X
Virtual Infrastructure Management <i>Automate end to end IT processes</i>				
VMware VirtualCenter				
Provisioning Management				
<ul style="list-style-type: none"> - Deployment wizard. Create new virtual machines with a user-friendly wizard. Customize network identities and operating system parameters to make new instances unique. 	X	X	X	X
<ul style="list-style-type: none"> - 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 are stored on shared storage for greater reliability. 		X	X	X
<ul style="list-style-type: none"> - Virtual machine cloning. Copy existing virtual machines when a new instance of a server is needed. 		X	X	X
<ul style="list-style-type: none"> - PXE (Pre-boot Execution Environment) support. Use your server provisioning tools to deploy existing system images to empty virtual machines. 	X	X	X	X
<ul style="list-style-type: none"> - Remote devices. Install software in a virtual machine running on a server from the CD-ROM of a desktop without leaving your desk. 		X	X	X
Configuration Management				
<ul style="list-style-type: none"> - Establish and ensure compliance with corporate configuration standards through virtual machine templates. 		X	X	X
<ul style="list-style-type: none"> - Centralized storage of virtual machine configuration files. Increase deployment flexibility with centralized storage of virtual machine configuration files. 		X	X	X
<ul style="list-style-type: none"> - ESX Server configuration. Centralize management and configuration of all ESX Server installations in VirtualCenter. 		X	X	X
<ul style="list-style-type: none"> - Centralized licensing. Manage all VMware software licenses with an embedded FlexNet licensing server and a single license file. 		X	X	X
<ul style="list-style-type: none"> - Configure and control all the virtual infrastructure services. 				X
<ul style="list-style-type: none"> - Programmatic interfaces through the VMware Infrastructure SDK. Provide Web Services APIs to access the functionality and data provided through the graphical user interfaces to integrate with third-party systems management products and to extend the core functionality. 	X	X	X	X
Infrastructure Management				
<ul style="list-style-type: none"> - New - Manage up to 200 hosts and 2,000 virtual machines with VirtualCenter 2.5. 	-	X	X	X
<ul style="list-style-type: none"> - Enhanced inventory model. Manage the complete inventory of virtual machines, 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. 		X	X	X
<ul style="list-style-type: none"> - Enhanced object model. Manage virtualized IT environment with a consistent object model covering all entities such as virtual machines, physical servers and resource pools. 		X	X	X
<ul style="list-style-type: none"> - 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. 		X	X	X
<ul style="list-style-type: none"> - New- Cisco® Discovery Protocol support. Discover physical and virtual network configurations for better debugging and monitoring of Cisco-based environments from within VirtualCenter. 		X	X	X
<ul style="list-style-type: none"> - Server and virtual machine management <ul style="list-style-type: none"> o Virtual Infrastructure Client. Manage multiple installations of ESX Server, virtual machines and VirtualCenter with a common user interface. 	X	X	X	X
<ul style="list-style-type: none"> o Virtual Infrastructure Web access. Manage virtual machines and access virtual machine graphical consoles without installing a client. 	X	X	X	X

Key Features and Benefits	ESX Server	VMware Infrastructure Foundation	VMware Infrastructure Standard	VMware Infrastructure Enterprise
	3i ¹			
o Virtual machine shortcuts. Enable self-help for end users with direct access to virtual machines through a Web browser.		X	X	X
- Fine-grained access control. Secure the environment with configurable, tiered group definitions and fine-grained permissions.		X	X	X
- Integration with Microsoft® Active Directory. Base access controls on existing Microsoft® Active Directory authentication mechanisms.		X	X	X
- Custom roles and permissions. Enhance security and flexibility with user-defined roles. VirtualCenter 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.		X	X	X
- 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.	-	X	X	X
- Audit trails. Maintain a record of significant configuration changes and the administrator who initiated them. Export reports for event tracking.		X	X	X
- Session management. Discover and, if necessary, terminate VirtualCenter user sessions.		X	X	X
? Capacity Management				
- System monitoring. Continuously monitor physical servers and virtual machine availability and utilization from a single interface.		X	X	X
o Alerts and notifications. Set green, yellow and red 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.	X	X	X	X
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.	X	X	X	X
o Reports. Export VirtualCenter data to HTML and Excel formats for integration with other reporting tools and offline analysis.	X	X	X	X
? Consolidation Management				
- New- Integrated physical to virtual machine conversion. Manage multiple simultaneous conversions to virtual machines. Convert physical machines, virtual machine formats such as Microsoft VirtualServer or VirtualPC, backup images of physical machines such as Symantec Backup Exec LiveStateRecovery, Ghost 9 or VMware Consolidated backup images to running virtual machines.		X	X	X
- New- 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.		X	X	X

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