# VMware vSphere 4
*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.

**Key Features and Benefits Summary**

VMware vSphere™ is the industry's first cloud operating system comprising 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, 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

★**New – Indicates feature is new with the latest version of VMware vSphere**

| Key Features and Benefits | VMware vSphere Standard | VMware vSphere Advanced | VMware vSphere Enterprise | VMware vSphere Enterprise Plus |
|---|---|---|---|---|
| **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. | X | X | X | X |
| • **Small footprint.** VMware ESXi is a compact, 70 MB 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. | X | X | X | X |
| • **Server integration.** VMware ESXi is available integrated into servers from leading OEM vendors for a simplified boot and deployment experience. | X | X | X | X |
| • **Efficient resource virtualization** | | | | |
| – **CPU virtualization.** Run many operating systems and applications encapsulated inside virtual machines on a single physical server for | X | X | X | X |

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[1] VMware vCenter Server is an essential requirement for management of VMware vSphere environments and is separately purchased.
[2] VMware ESX and ESXi are functionally equivalent with some minor exceptions.

| Key Features and Benefits | VMware vSphere Standard | VMware vSphere Advanced | VMware vSphere Enterprise | VMware vSphere Enterprise Plus |
|---|---|---|---|---|
| higher utilization, without risking critical processes being starved of compute or memory resources. VMware ESX/ESXi use intelligent process scheduling and load balancing across available processors to manage the execution of virtual machine processing | | | | |
| – **Advanced memory management** | X | X | X | X |
| • **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 |
| • **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 |
| • **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 |
| • **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. | X | X | X | X |
| • **Large Memory pages.** Allow guest operating systems and applications to access memory more efficiently through use of large memory pages. | X | X | X | X |
| • **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 kernel that include VMI support) that run at higher levels of performance because they are virtualization aware. | X | X | X | X |
| • **Networking offload.** Reduce the CPU overhead associated with processing network i/o with networking performance optimizations such as TCP Segment Offload and Jumbo Frames | X | X | X | X |
| • ★**New : 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 | X | X | X | X |
| • **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. | X | X | X | X |
| – **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. | X | X | X | X |
| • **Scalability** | X | X | X | X |
| – ★**New - 255GB RAM for virtual machines.** Run the most memory-intensive workloads in virtual machines with a memory limit increased from 64GB. | X | X | X | X |
| – ★**New – Support for powerful physical server systems**. Take advantage of very large server systems with up to 64 logical CPUs and upto 1TB RAM for large scale server consolidation and DR projects. | X | X | X | X |
| – ★**New - Support for up to 256 powered-on virtual machines.** Take advantage of very large server systems for server enterprise-class server consolidation and containment. The maximum number | X | X | X | X |

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| Key Features and Benefits | VMware vSphere Standard | VMware vSphere Advanced | VMware vSphere Enterprise | VMware vSphere Enterprise Plus |
|---|---|---|---|---|
| of powered-on virtual machines per VMware ESX/ESXi has been extended from 170 to 256. | | | | |
| • **Interoperability**<br>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. | X[3] | X | X | X |
| – **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. | X | X | X | X |
| o **Support for FibreChannel, 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. | X | X | X | X |
| 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 | X | X | X | X |
| – **Operating systems**. VMware vSphere 4 supports a wide range of unmodified operating systems including Windows, Linux, Solaris and Novell NetWare. | X | X | X | X |
| o ★**New-** 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. | 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.** VMware vSphere 4 can run virtual machines created in non-VMware formats. VMware 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 | X | X | X | X |
| • ★ **New-Host level power management** VMware vSphere 4 now 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. | X | X | X | X |
| **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. | | | X | X |
| • **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. | | | X | X |
| • **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. | | | X | X |
| • **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 | | | X | X |

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[3] VMware ESX and ESXi have different hardware compatibility matrices

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| Key Features and Benefits | VMware vSphere Standard | VMware vSphere Advanced | VMware vSphere Enterprise | VMware vSphere Enterprise Plus |
|---|---|---|---|---|
| management of virtual machine environments | | | | |
| • ★ **New - 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 IPMI, iLO and Wake on Lan to control servers in production environments. | | | X | X |

## <u>VMware vNetwork:</u> Infrastructure services that enable optimal administration and management of networking in virtual environments

| Key Features and Benefits | VMware vSphere Standard | VMware vSphere Advanced | VMware vSphere Enterprise | VMware vSphere Enterprise Plus |
|---|---|---|---|---|
| − **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. | X | X | X | X |
| o **Virtual NICs.** Configure each virtual machine with one or more (upto 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. | X | X | X | X |
| − **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 2040 ports, and every host can be configured with up to 248 switches | X | X | X | X |
| 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. | X | X | X | X |
| 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. | X | X | X | X |
| 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. | X | X | X | X |
| 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. | X | X | X | X |
| 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. | X | X | X | X |
| − **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. | X | X | X | X |
| − **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. | X | X | X | X |
| − ★ **New -IPv6 support.** Support IPv6 across both VMware ESX/ESXi hosts as well as guest operating systems | X | X | X | X |
| ★ **New** <u>**vNetwork Distributed Switch:  Aggregate virtual networking across many ESX hosts and even clusters**</u> | | | | |
| o ★ **New - Centralized virtual network management.** | | | | X |

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| Key Features and Benefits | VMware vSphere Standard | VMware vSphere Advanced | VMware vSphere Enterprise | VMware vSphere Enterprise Plus |
|---|---|---|---|---|
| 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. | | | | |
| o ★ **New - Support for Private VLANs.** Simplified setup and monitoring of Private VLANs, segmenting network traffic easily in shared environments | | | | X |
| o ★ **New - 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. | | | | X |
| o ★ **New -Bidirectional Network Traffic Shaper.** Enhance virtual machine traffic prioritization and management through bidirectional rate limiting | | | | X |
| • ★ **New -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.) | | | | X |

## VMware vStorage: 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.

| Key Features and Benefits | VMware vSphere Standard | VMware vSphere Advanced | VMware vSphere Enterprise | VMware vSphere Enterprise Plus |
|---|---|---|---|---|
| – **Storage virtualization.** Abstract the complexity of storage subsystems while centrally maintaining virtual machine file storage for greater flexibility and manageability | X | X | X | X |
| o **HBA consolidation.** Share expensive storage network components (upto 8 FC HBAs per host and 256 targets per HBA) across many virtual machines while maintaining hardware fault tolerance. | X | X | X | X |
| 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 |
| o **Support for SAN security features**. Enforce security policies with LUN zoning and LUN masking. | X | X | X | X |

## vStorage VMFS : High performance cluster file system

| Key Features and Benefits | VMware vSphere Standard | VMware vSphere Advanced | VMware vSphere Enterprise | VMware vSphere Enterprise Plus |
|---|---|---|---|---|
| • **Store** virtual disk files on high performance shared storage such as Fibre Channel or iSCSI SAN. | X | X | X | X |
| o **Online addition or removal of nodes.** Add or delete an VMware ESX/ESXi instance from a VMFS volume without pausing or halting the processing of other VMware ESX/ESXi instances. | 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 |
| • **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. | 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 VMFS volume resizing**. <br> - Aggregate multiple storage disks into a single VMFS volume. Add new heterogeneous LUNs to a VMFS volume on the fly. <br> - ★ **New** – **VMFS Volume Grow.** Grow existing LUNs (on arrays that support this feature) and resize VMFS volumes 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.** VMFS volumes continue to function even if some LUNs are lost. | X | X | X | X |
| • **Raw device mapping.** Optionally, map SAN LUNs directly to a virtual machine in order to enable application clustering[4] and array-based | X | X | X | X |

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

| Key Features and Benefits | VMware vSphere Standard | VMware vSphere Advanced | VMware vSphere Enterprise | VMware vSphere Enterprise Plus |
|---|---|---|---|---|
| snapshot technology while profiting from the manageability benefits of VMFS. | | | | |
| • **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 |
| • **Boot from SAN.** Run multiple instances of VMware ESX/ESXi 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 |
| • **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 |
| • **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 |
| • **Increased number of VMware ESX/ESXi hosts per VMFS volume**. Connect up to 32 VMware ESX/ESXi installations to a single VMFS volume. | X | X | X | X |
| • **Extended block size and file limits.** Run even the most data intensive production applications such as databases, ERP and CRM in virtual machines<br>• Maximum volume size: 64 TB<br>• Maximum virtual disk size: 2 TB<br>• Maximum file size: 2 TB<br>• Block size: 128KB to 8 MB | X | X | X | X |
| • **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 |
| • ★ **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 | X | X | X | X |
| • **Distributed journaling.** Recover virtual machines faster and more reliably in the event of server failure**.** | X | X | X | X |
| • **Storage Management** | | X | X | X |
| – **LUN discovery and management**. Discover LUNs in the shared storage and map those LUNs to a VMFS volume. | X | X | X | X |
| – **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 |
| – **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 |
| – **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 |
| – ★ **New - Customizable reports and topology maps.** Increase visibility into vSphere 4.0 storage space utilization with per virtual machine, per datastore and other reports. Resolve configuration related issues with storage specific topology maps | X | X | X | X |
| – ★ **New - Centralized Datastore Management.** Create, configure, organize and secure datastores centrally for more granular control over storage in vSphere environments. | X | X | X | X |
| – **SMI-S-compliant management interfaces.** Monitor virtual storage using any standard SMI-S-aware storage management tool. | X | X | X | X |
| – **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 |
| **vStorage Thin Provisioning : Use storage only as needed; defer and avoid excess storage costs** | | | | |
| • ★ **New - Thin Provision virtual machines** Create virtual machines without provisioning all the storage required upfront | X | X | X | X |
| • ★ **New - 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 | X | X | X | X |
| **vStorage APIs : Integrations with leading storage hardware and software products for data protection, high** | | | | |

| Key Features and Benefits | VMware vSphere Standard | VMware vSphere Advanced | VMware vSphere Enterprise | VMware vSphere Enterprise Plus |
|---|---|---|---|---|
| **availability and disaster recovery** | | | | |
| • ★ **New - 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. | X | X | X | X |
| – One-step restore of virtual machine consolidated backup images with VMware Converter or vCenter Server (formerly VirtualCenter) | X | X | X | X |
| **Fibre Channel ,iSCSI, NAS  and local storage support**. Use vStorage APIs with a variety of storage options. | X | X | X | X |
| – **Backup proxy server**. Remove load from VMware ESX/ESXi installations by consolidating backup load and management onto a backup proxy server. ★ **New –** The backup proxy server for VCB no longer needs to be a separate install once backup products have integrated with vStorage APIs in vSphere 4.0 | X | X | X | X |
| – ★ **New - File level full and incremental backup (**for virtual machines running supported Microsoft® Windows as well as Linux operating systems)**.** Recover individual files and directories | X | X | X | X |
| – **VSS Support.** Ensure data consistency by using Microsoft Volume Shadow Copy Services (VSS) for virtual machines running supported Microsoft Windows operating systems | X | X | X | X |
| – ★ **New - Incremental, differential backup** in addition to full -image level backup (for virtual machines running any operating system). | X | X | X | X |
| – **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 |
| • ★**New - vStorage APIs for Multi-pathing.** Support for 3$^{rd}$ 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. | | | | X |

**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. | | X | X | X |
| – **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. | | X | X | X |
| • **Storage VMotion:** Live migrate running virtual machines from one storage location to another with no disruption or downtime. | | | X | X |
| - ★**New**: 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. | | | X | X |
| – ★**New**: New administrator interface makes it a simple point and click interaction to move storage | | | X | X |
| • **Cold migrate** virtual machines from one server to another or virtual machine disks from one storage array to another. | X | X | X | X |
| **VMware High Availability and Fault Tolerance: Protect applications from unplanned downtime, cost effectively and easily** | | | | |
| • **VMware HA:** Low cost high availability for all applications | X | X | X | X |
| – **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. | X | X | X | X |
| – **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. | X | X | X | X |

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| Key Features and Benefits | VMware vSphere Standard | VMware vSphere Advanced | VMware vSphere Enterprise | VMware vSphere Enterprise Plus |
|---|:---:|:---:|:---:|:---:|
| – ★**New -** Protect against operating system failures with virtual machine failure monitoring in VMware HA | X | X | X | X |
| – **Intelligent choice of servers** (when used with VMware DRS). Automate the optimal placement of virtual machines restarted after server failure. | X | X | X | X |
| – ★**New - HA Maintenance Mode** Suspend failover actions during maintenance operations on servers | X | X | X | X |
| • ★**New -VMware Fault Tolerance** Provide zero downtime, zero data loss continuous availability against physical server failures with VMware Fault Tolerance | | X | X | X |
| – **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 | | X | X | X |
| – **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 | | X | X | X |
| – **Compatibility with all types of shared storage.** VMware Fault Tolerance works with all types of shared storage Fibre Channel, NAS or iSCSI | | X | X | X |
| – **Compatibility with all operating systems.** VMware Fault Tolerance works with all operating systems[5] supported with VMware ESX | | X | X | X |
| – **Compatibility with existing DRS and HA clusters.** VMware Fault Tolerance works with existing DRS and HA clusters** [6] and only an additional dedicated gigabit Ethernet network | | X | X | X |
| – **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. | | X | X | X |
| ★**New -VMware Data Recovery and Snapshots: 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 | | X | X | X |
| • **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 | X |
| • **Support for Microsoft® Clustering Services.** Cluster virtual machines running Microsoft® Windows operating system across physical hosts. | X | X | X | X |

**Security:** Security services within VMware vSphere allow IT to provide applications with appropriate level of enforcement of security policies in an operationally efficient way.

| Key Features and Benefits | VMware vSphere Standard | VMware vSphere Advanced | VMware vSphere Enterprise | VMware vSphere Enterprise Plus |
|---|:---:|:---:|:---:|:---:|
| ★**New - VMware vShield Zones and VMSafe: Secure applications effectively in dynamic, shared environments** | | | | |
| • ★**New - VMware vShield Zones** : Integrated dynamic firewalling for all applications | | X | X | X |
| – **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. | | X | X | X |
| – **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. | | X | X | X |
| – **Logging and reporting** of allowed and disallowed network activity by application and protocol. | | X | X | X |
| – **Easily configure trust zones** using existing VI container objects. | | X | X | X |
| – **Assured and auditable policies** throughout VMotion and VM lifecycle events. | | X | X | X |
| • ★**New - VMware VMsafe:** Provide higher levels of security than physical servers to all applications with VMsafe integrated security appliances from VMware partners | X | X | X | X |
| – **Secure collaboration of security appliances** with the hypervisor | X | X | X | X |

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

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| Key Features and Benefits | VMware vSphere Standard | VMware vSphere Advanced | VMware vSphere Enterprise | VMware vSphere Enterprise Plus |
|---|---|---|---|---|
| for higher levels of protection to virtual machines | | | | |
| – **Enable multiple security functions from a single solution** reducing performance overhead due to agents, inline devices etc | X | X | X | X |

## Scalability: Scalability services allow IT to deliver the right amount of resource to every application, based on its need, non disruptively.

| | | | | |
|---|---|---|---|---|
| **VMware DRS, Hot Add and Virtual SMP: Shrink and grow applications according to requirements and business priorities** | | | | |
| – **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 | | | X | X |
| ★**New -Hot Add: Grow virtual machines dynamically without  disruption** | | | | |
| ★**New - Hot Add CPU & Memory** Provision additional CPU and memory to virtual machines on an as needed basis, without disruption to users | | X | X | X |
| ★**New - 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 | | X | X | X |
| ★**New 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. | | | | X |

VMware vCenter Server 4.0, 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.

| Integrated Management Services provided by VMware vCenter™ Server | | | | |
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| • **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. | X | X | X | X |
| – **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 | X |
| – **Server and virtual machine management** | X | X | X | X |
| o **vSphere Client.** Use a single console to access vCenter Server and manage multiple installations of VMware ESX/ESXi, virtual machines, resource pools etc. | X | X | X | X |
| o **vSphere Web Access.**  Manage virtual machines and access virtual machine graphical consoles without installing a client. | X | X | X | X |
| o **Virtual machine shortcuts.**   Enable self-help for end users with direct access to virtual machines through a Web browser. | X | X | X | X |
| – **System monitoring.** Continuously monitor physical servers and virtual machine availability and utilization from a single interface. | X | X | X | X |
| 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. | X | X | X | X |
| o ★**New – Event based alarms** Proactively manage and monitor of infrastructure resources by setting alarms to trigger on events and for notification of critical error conditions.  Alarms are time based to prevent false alarms. | | | | |
| o ★**New - Performance graphs.** Monitor and analyze virtual machines, resource pools and server utilization and availability with detailed performance graphs. Performance | X | X | X | X |

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| metrics can be defined with several levels of granularity and can be viewed in real time, or across a specified time interval.<br>o ★**New -** Aggregated charts show high-level summaries of resource distribution that is useful to identify the top consumers.<br>o ★**New -**Thumbnail views of hosts, resource pools, clusters, and datastores allow for easy navigation to the individual charts.<br>o ★**New -** Drill down capability across multiple levels in the inventory helps in isolating the root-cause of performance problems quickly.<br>o ★**New -** Detailed datastore level views show utilization by file type and unused capacity. | | | | |
| o **Reports**. Export vCenter Server data to HTML and Excel formats for integration with other reporting tools and offline analysis. | X | X | X | X |
| – **VMware ESX/ESXi configuration**. Centralize management and configuration of all VMware ESX/ESXi installations in vCenter Server. | X | X | X | X |
| – **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. | X | X | X | X |
| – **Virtual machine cloning.** Copy existing virtual machines when a new instance of a server is needed. | X | X | X | X |
| – **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, 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. | X | X | X | X |
| – **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 | X |
| – **Fine-grained access control**. Secure the environment with configurable, tiered group definitions and fine-grained permissions. | X | X | X | X |
| – **Integration with Microsoft® Active Directory**. Base access controls on existing Microsoft® Active Directory authentication mechanisms. | X | X | X | X |
| – **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.<br>– ★**New –** Set permissions at the datastore and network level. | X | 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 |
| – **Centralized licensing**.  Administer and manage all license keys centrally within vCenter Server. | X | X | X | X |
| – **PXE (Pre-boot Execution Environment) support**.  Use your server provisioning tools to deploy existing system images to empty virtual machines. | X | 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 | X |
| – **Session management.** Discover and, if necessary, terminate vCenter Server user sessions. | X | X | X | X |
| • **Proactive management and automation of vSphere environments** | | | | |
| – **Deployment wizard**. Create new virtual machines with a user friendly wizard.  Customize network identities and operating system | X | X | X | X |

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| parameters to make new instances unique. | | | | |
| − ★**New - 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. | | | | X |
| − ★**New - 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 now includes support for creating and running vApps as well as importing and exporting them in compliance with Open Virtualization Format (OVF) 1.0 standard. | X | X | X | X |
| − **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 , VMware Consolidated backup images to running virtual machines. | X | X | X | X |
| − **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 | X |
| − ★**New - 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. This process helps enable consistency, standardization, and reduces the possibility of errors | X | X | X | X |
| • **Scalability and extensibility** | | | | |
| − **Large-scale management** with vCenter Server 4.0.<br>• ★**New** - Manage upto 300 hosts and 3000 virtual machines with vCenter Server 4.0<br>• ★**New** - Link many vCenter Servers in your environment with **vCenter Server Linked Mode** to manage upto 10,000 virtual machines from a single console | X | X | X | X |
| − **Programmatic interfaces** through the VMware vSphere SDK. vSphere SDKs, and Toolkits provide robust easy to use programmatic interfaces to manage and automate large and small scale deployments. Toolkits are based on the powerful vSphere API which allows you automate the same tasks as the vSphere Client. Resources for software developers, administrators available http://developer.vmware.com Downloads, Documentation, Forums, Sample Code, Webinars. management products and to extend of the core functionality | X | X | X | X |
| • **vSphere PowerCLI –** An easy to use Windows PowerShell interface for managing VMware vSphere. Includes over 100 ready to use commandlets ,sample code, documentation and libraries enabling powerful scripting and simple automation of day to day tasks. | X | X | X | X |
| • **vSphere Command-Line Interface –** Provides administration of day to day tasks and includes documentation, sample code and 26 tested ready to use commands. | X | X | X | X |
| • **vSphere Management Assistant –** Linux Virtual Machine for deploying scripts and third party agents. | X | X | X | X |
| • **vSphere Web Services SDK –** Robust software development kit supporting SOAP, web services, HTTPS and more industry standards. Allows for creation of customized provisioning applications, integrating with management applications. Kit includes documentation, libraries, and sample code. | X | X | X | X |
| • **vSphere SDK for Perl –** Perl interface for managing the vSphere platform. SDK ships with documentation, sample code and libraries. | X | X | X | X |
| • **VMware CIM SDK –** Software development kit for building Hardware Management applications. Includes documentation, sample code and libraries. Supporting industry standards such as SMASH, SMI-S | X | X | X | X |
| • **VMware Guest SDK -** Monitor virtual machine statistics from within the virtual machine guest. Includes updates, sample code, libraries. | X | X | X | X |

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