What Is New in VMware vCenter™ Server 4
# VMware white paper

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What Is New in VMware vCenter™ Server 4

VMware vSphere™ 4 is the industry’s first cloud operating system – transforming datacenters into dramatically simplified environments to enable the next generation of flexible, reliable IT services. VMware vCenter™ Server 4 (previously known as VMware VirtualCenter™ Server) is a critical component of a complete VMware vSphere deployment and provides centralized management, provisioning, updating, and orchestration of VMware vSphere hosts.

vCenter Server 4 greatly simplifies virtualization management, providing the ability to:

• Analyze and remediate issues quickly with deep visibility into vSphere and its underlying infrastructure.
• Improve IT responsiveness by proactively managing your vSphere environment with rapid provisioning, automated load balancing of virtual machine workloads, and out-of-box workflows for automation.
• Scale to meet the needs of the most demanding enterprise environments with support for up to 10,000 virtual machines.

This paper provides a technical overview of new virtualization management capabilities in the vCenter Server 4 release, including VMware vCenter Server Linked Mode, VMware vCenter Orchestrator, and VMware Host Profiles.

Centralized Control and Visibility

VMware vCenter Server 4 gives administrators deep insight into the status and configuration of clusters, hosts, VMs, storage, the guest OS, and other critical components of a virtual infrastructure – all from one place.

Simplified Navigation and Inventory Search

VMware vCenter Server 4 introduces a new vCenter home page that provides easy, one-click access to vCenter inventory, vCenter solution plug-ins, and key administration and management tasks. Upon logging out of the vSphere Client, the client application remembers the view that was displayed when it was closed, and will return you to that view when you next log in. In addition to the home page, there is a globally accessible navigation bar that makes it easy to switch between different parts of the vSphere Client.

The new search field simplifies day-to-day operations by enabling you to easily identify virtual machines, hosts, datastores, networks, and folders that meet whichever criteria you specify. You can perform basic searches by entering keywords in the search field in the top right of the vSphere Client. You can also perform advanced searches by specifying multiple search criteria – for example, virtual machines that need an update to VM Tools, or datastores which have more than 100GB of free space remaining.

Figure 1. Advanced search-based navigation in vCenter Server 4
Centralized License Management
With the release of VMware vSphere 4, VMware has introduced a fully redesigned licensing experience. License administration is built directly into VMware vCenter Server 4. There is no separate license server which must be installed and monitored. Using the vCenter Server interface, you can centrally assign VMware vSphere licenses, report on license usage, and monitor for license state and compliance.

vCenter Server 4 is the recommended interface for license assignment to vSphere hosts. When vCenter Server 4 assigns a license key to a host, the license key is copied to the host and saved in a persistent format. In the event that the host becomes disconnected from vCenter Server 4, the license key remains active on the host indefinitely, even after a host reboot. Only a deliberate licensing operation by the user can remove or replace a host license key. Although the recommended licensing option is to assign all VMware vSphere licenses centrally from vCenter Server 4, you can also assign license keys directly to individual hosts.

For more information on VMware vSphere licensing, go to http://www.vmware.com/support/licensing.html.

Health Monitoring for vCenter Server 4
vCenter Server 4 includes a new vCenter Service Status plug-in that displays the health of the vCenter components and its associated extensions – allowing administrators to quickly identify and correct failures in the vCenter management infrastructure. You can access vCenter Service Status from the vSphere Client home page.

The vCenter Service Status screen enables you to view the following information:

- A list of all vCenter Server systems and their services, and vCenter Server plug-ins
- The status of all listed items
- The date and time when the last change in status occurred
- Any messages associated with the change in status

The vCenter Server Status screen will display a warning message under various conditions, including:

- If any of the vCenter database stats rollup jobs are not causing stats data to be correctly rolled up in the database
- If the CIM data feed is unable to receive inventory data required for providing hardware monitoring functionality for VMware ESX hosts
- If there is an error connecting to LDAP
**Real-Time Performance Monitoring**

The vCenter Server 4 introduces a number of performance monitoring enhancements, that enable you to quickly troubleshoot performance issues, monitor usage trends, do capacity planning, and determine which resources to increase or decrease on your hosts and virtual machines.

Performance charts have been enhanced to provide a single view of all performance metrics such as CPU, memory, disk, and network without having to navigate through multiple charts. In addition, the performance charts include the following improvements:

- Aggregated charts show high-level summaries of resource distribution, which helps you identify top consumers
- Thumbnail views of virtual machines, hosts, resource pools, clusters, and datastores with easy navigation to the individual charts
- Drill-down capability across multiple levels in the inventory help you to isolate the root-cause of performance problems quickly
- Detailed storage views show usage by file type, and point out unused capacity

Chart customization can be done from the Advanced Performance Charts page, which displays charts as they were displayed in previous vCenter Server versions. You can customize a performance chart by specifying the objects to monitor, the counters to include, the time range, and chart type.

**Customizable Alarm Triggers**

The vCenter Server 4 provides better monitoring of infrastructure resources through expanded support for vCenter Server alarms on managed entities, such as datastores and clusters. Low level hardware and host events are now displayed in the vSphere Client to quickly identify and isolate faults.

Alarms can now be set to trigger on events and notify when critical error conditions occur. Some example event triggers include: Status changes (such as Host Exited Maintenance Mode), Access Control operations (such as Role Created), and license events (such as License Expired).

In addition, alarms are triggered only when they satisfy certain time conditions to minimize the number of false triggers. Condition and State triggers can be more finely defined by specifying details such as: Amount of time a condition should exist to trigger the alarm (to avoid false alarms due to sporadic fluctuations), and tolerance range for a metric (to allow a different upper and lower threshold for an alarm value)

The addition of new alarm actions enables you to trigger automated alarm workflows to remedy and pre-empt problems. Some new actions that can be configured for alarms include:

- VMware VMotion™ to reboot, or shutdown a VM
- Enter or exit maintenance mode or standby mode on a host
- Reboot or shutdown a host

Also, vCenter comes with a wide variety of pre-defined alarms for various situations. For example, you can configure alarms to occur when a virtual machine is powered off, a datastore exceeds a set capacity, or when a host’s networking redundancy is compromised due to a NIC failure.

**Virtual Machine Performance Counters Integration into Perfmon**

Because VMware ESX™ and VMware ESXi™ provide a virtual interface to the hardware, traditional performance instrumentation that is based on measuring hardware resources may not be accurate. The problems seen as a result of usage of traditional in-guest performance measurements come from three areas:

1. They are unaware of work being performed by the virtualization software, so they will not have complete information on the resources being used by the virtualization software. This includes memory management, scheduling, and other support processes like the service console in VMware ESX.
2. The way in which guest operating systems account time is different and ineffective in a virtual machine.
3. Their visibility into available CPU resources is based on the fraction of the CPU that they have been provided by the virtualization software.
To address these issues, vCenter Server 4 introduces the integration of virtual machine performance counters such as CPU and Memory into Perfmon for Microsoft Windows guest operating systems when VMware Tools is installed. These new in-guest counters provide an accurate view of how much CPU and memory is actually allocated to the virtual machine by the VMware ESX host.

**Storage Monitoring**

vCenter has been enhanced with several new storage specific capabilities to help the virtual administrator manage their environments with a higher degree of control. These enhancements provide administrators with proactive alerts and alarms to address issues before they interrupt the availability of applications running on those resources. vCenter allows setting permissions and quota limits on datastores, as well as per VM.

To help manage storage space in vSphere, each VM and ESX in the inventory now has its own storage tab that shows information about storage resources for those objects. New storage performance charts also give users the ability to set alerts and alarms for a VM, ESX, or datastore level. vSphere also provides a detailed view of all the components in the storage layout. These topology maps provide key information to administrators about which paths are available, as well as the grouping of objects sharing storage resources.

More details regarding the new vCenter storage capabilities are provided in the What is New in VMware vSphere 4: Storage paper.

**Hardware Monitoring with CIM**

The new vCenter Server 4 Hardware Status plug-in provides the ability to monitor the hardware health of your VMware ESX hosts, including key components such as fans, system board, and power supply. The health information displayed by the vCenter Hardware Status plug-in are defined and provided by the server hardware vendor through the industry-standard Common Information Model (CIM) interface. The implementation is based on the System Management Architecture for Server Hardware (SMASH) profiles defined by Distributed Management Task Force (DMTF).

![vCenter Hardware Status plug-in](image)

With this plug-in, vCenter Server 4 provides an integrated, centralized view of both the physical and virtual assets in the vSphere environment. The plug-in is also integrated with the vCenter alarm interface, so you can be alerted when hardware failures occur. You can set vCenter alarms to trigger automated alarm workflows to pre-empt and remedy hardware problems. For example, if vCenter detects that the host temperature is getting too hot, it could trigger an alarm action that automatically puts the VMware ESX host into maintenance mode (migrating the VMs off the host using VMware DRS in the process) to allow the server to cool down.
Proactive Management and Automation
vCenter Server 4 introduces a number of new capabilities for proactive management, making it easier for administrators to meet business requirements and improve service levels.

Simplified Host Configuration and Monitoring with VMware Host Profiles
VMware Host Profiles, introduced in vCenter Server 4, greatly simplifies host configuration management, and enables centralized compliance monitoring and reporting against a desired host configuration. With Host Profiles, you can quickly and easily make host configuration changes across a large population of hosts, such as updating DNS and NTP settings or configuring hosts to use a new vNetwork Distributed Switch. This is accomplished using Host Profile policies, which capture the blue-print of a known, validated golden configuration and use this to configure networking, storage, security settings, etc. on multiple hosts.

Figure 4. Host Profiles automates host configuration and ensures compliance in four steps

When you select a cluster from the vCenter inventory panel, the Profile Compliance tab displays host profile compliance information about the hosts within the selected cluster.

Figure 5. Cluster Profile Compliance Tab
A base set of host compliance checks are generated from the description for how hosts are configured, such as networking, DNS, and NTP settings. In addition, the following built-in cluster compliance checks occur with or without a host profile attached to the cluster.

**Figure 6. Built-in Cluster Compliance Checks**

<table>
<thead>
<tr>
<th>Cluster Requirement</th>
<th>Cluster Compliance Check</th>
</tr>
</thead>
</table>
| VMware DRS          | • Validate that VMotion NIC speed is at least 1000 Mbps.  
                      | • Validate that VMotion is enabled.  
                      | • Validate that at least one shared datastore exists |
| VMware DPM          | • Validate that power management is supported on the host |
| VMware HA / VMware FT | • Validate that FT logging is enabled.  
                          | • Validate that FT logging NIC speed is at least 1000 Mbps.  
                          | • Validate that all the hosts in the cluster have the same build for Fault Tolerance  
                          | • Validate that the host hardware supports Fault Tolerance. |

With Host Profiles, IT can eliminate per-host, manual, or UI-based host configuration, while maintaining configuration consistency and correctness across the datacenter.

**Workflow Automation with VMware vCenter Server 4 Orchestrator**

vCenter Server 4 includes vCenter Orchestrator, a powerful orchestration engine that simplifies management by enabling administrators to automate over 800 tasks using out-of-the-box workflows, or by assembling workflows using an easy drag-and-drop interface.

Orchestrator relies on workflows to create and execute automated processes. Workflows are reusable building blocks that combine actions, decisions, and results that, when performed in a particular order, complete a specific task or process in a virtual environment.

Orchestrator provides a library of workflows that encapsulate best practices for common virtual environment management tasks such as provisioning virtual machines, backing up, and performing regular maintenance. Orchestrator also provides libraries of the individual actions that the workflows execute.

**Figure 7. VMware vCenter Orchestrator**

Orchestrator exposes every operation in the vCenter Server 4 API, allowing you to integrate all these operations into your automated processes. The workflow engine can also take objects from external libraries that you plug into Orchestrator, allowing you to create your own tailor-made processes, or implement functions provided by third-party applications.

**Automated Patch Management with VMware vCenter™ Update Manager 4.0**

The vCenter Update Manager automates scanning and patching of vSphere hosts and virtual machines. In vCenter Server 4, Update Manager introduces two significant enhancements to baselines: You can now use Update Manager to upgrade ESX/ESXi hosts, virtual machine hardware, VMware Tools, and virtual appliances; and baseline groups allow you to specify an upgrade baseline and a set of
patches in one group. Update Manager also includes a new dashboard to review how machines comply with baselines and baseline groups.

Update Manager includes a stage wizard so that you can download patches from a remote server to a local server without applying the patches immediately. Staging patches speed up the remediation process because the files are available locally when the staged patches and upgrades are applied to a set of hosts.

**Guided Consolidation**

Guided Consolidation walks you step-by-step through the consolidation process, including automatic discovery of physical servers, performance analysis, conversion, and intelligent placement on the right host.

In vCenter Server 4, the Guided Consolidation service is now a modular plug-in to vCenter Server. This service can be installed on a different system than vCenter Server 4, allowing it to perform optimally with lower overheads around consolidation operations.

To find and analyze physical systems, you can add systems manually by entering a computer name, a singular or range of IP addresses, or file name. Alternatively, Guided Consolidation can automatically scan active domains and cache information about the systems in them. This information is updated daily. In vCenter Server 4, Guided Consolidation is also able to discover and analyze systems that run non-English versions of Windows. Guided Consolidation can concurrently analyze and make consolidation recommendations for up to 100 physical machines at a given time.

**Scalable and Extensible Management Platform**

As you extend virtualization across the datacenter, you need a management platform that can both scale to fit your organization and plug into your existing architecture. VMware vCenter Server 4 meets both of those needs. It is the simplest, most efficient way to manage VMware vSphere – whether you have ten virtual machines or tens of thousands of virtual machines.

**vCenter Server 4 Platform Support**

vCenter Server 4 adds support for the following databases in this release:

- Microsoft SQL Server 2008
- Oracle 11g

vCenter Server 4 is supported on the following additional operating systems:

- Microsoft Windows 2003 (x64) in 32-bit compatibility mode
- Microsoft Windows 2008 (x64) in 32-bit compatibility mode
- Microsoft Windows 2008 (x32)

Additional details on the exact editions and architectures are available in the vsphere Compatibility Matrixes.

vCenter Server 4 can be installed in a physical or virtual machine. Deploying the vCenter Server 4 system in virtual machines has the following advantages:

- Rather than dedicating a separate server to the vCenter Server 4 system, you can place it in a virtual machine running on the same ESX host where your other virtual machines run.
- You can provide high availability for the vCenter Server system by using VMware HA.
- You can migrate the virtual machine containing the vCenter Server 4 system from one host to another, enabling maintenance and other activities.
- You can create snapshots of the vCenter Server 4 virtual machine and use them for backups, archiving, and so on.

**Enhanced vCenter Server 4 Scalability**

vCenter Server 4 is designed from the ground up to handle the largest IT environments. A single instance of vCenter Server 4 supports management of up to 300 hosts and 3,000 virtual machines. Integration between multiple vCenter Servers with Linked Mode enables organizations to manage up to 1,000 hosts and 10,000 virtual machines across 10 vCenter instances – all from a single management console.

Depending on the number of ESX hosts and virtual machines in your environment, the following system requirements should be
used as guidelines for optimal performance. When you have up to 200 hosts, you can use a 32-bit Windows operating system, but a 64-bit Windows operating system is preferred. When you have 200-300 hosts, a 64-bit Windows operating system is required. For additional recommendations for optimizing vCenter Server performance, see the ESX and vCenter Server Installation Guide.

**Large-Scale Management with vCenter Server 4 Linked Mode**

vCenter Server 4 introduces a feature called Linked Mode – where from a single vSphere Client, a user can access inventory and configuration information across multiple vCenter Servers. Each user sees only the vCenter Server instances for which they have valid permissions.

The Linked Mode feature provides a way to greatly improve the efficiency of managing multiple vCenter instances. There are several reasons why you may want to link vCenter Servers. For example, you may want to simplify management of inventories associated with remote offices or multiple datacenters. Likewise, you could use Linked Mode to configure a recovery site for disaster recovery purposes.

When vCenter Servers are connected in Linked Mode, you can:

- Log in simultaneously to all vCenter Servers for which you have valid credentials.
- Search the inventories of all the vCenter Servers in the group.
- View the inventories of all the vCenter Servers in the group in a single inventory view.

![Figure 8: View of two linked vCenters in vSphere Client](image)

The left-hand side inventory tree shows each vCenter instance at the top level, and for each one a lower levels it shows the datastores, folders, clusters, hosts, etc. From this single inventory tree, an administrator can see the inventory of all vCenter instances at once. Using the +/- indicator, the inventory for any vCenter instance can be collapsed, making it easier to focus on a smaller set of items. Although you are able to view multiple vCenter inventories in one client, any operations are confined within a single vCenter inventory. For example, you cannot drag and drop a host between vCenter instances, nor a virtual machine between hosts on two different vCenter instances.

Linked Mode uses Microsoft Active Directory Application Mode (ADAM), an implementation of Lightweight Directory Access Protocol (LDAP), to store and synchronize data across multiple vCenter Server instances. ADAM is installed automatically as part of the vCenter Server 4 installation. Using peer-to-peer networking, the ADAM instances in a group replicate shared global data to the LDAP directory. The global data includes the following information for each vCenter instance:

- Connection information (IP and ports)
- Certificates and thumbprints
- Licensing information
- User roles
A vCenter instance can be joined to a Linked Mode group at the time of installation, or afterwards by modifying an existing deployment. Both of these methods are described in the ESX and vCenter Server Installation Guide.

Open Architecture
vCenter Server 4 provides a foundation you can easily extend for end-to-end integration with your physical environment, and from which you can build an internal cloud infrastructure. vCenter Server 4’s open plug-in architecture supports a broad range of additional capabilities from VMware and its partners. More than 200 VMware partners directly integrate with vCenter Server 4, allowing you to easily extend the platform for more advanced management capability in areas such as capacity management, compliance management, business continuity, and storage monitoring. vCenter Server 4 exposes additional vCenter APIs and offers .NET extension support, which enables the creation of customized plug-ins that maintain the integrated look-and-feel of the vSphere Client. The .NET plug-ins can leverage vCenter roles to provide granular access control, inject events and tasks, and create custom actions for vCenter alarms.

Summary
VMware vCenter Server 4 provides a scalable and extensible platform that forms the foundation for virtualization management – delivering centralized control and visibility into every level of the virtual infrastructure. VMware innovations continue to make VMware vSphere 4 the industry standard for computing in data centers of all sizes and across all industries.