

WHITE PAPER

HP & VMware Operations Pack

VMware and HP Virtualization Management



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Executive Summary

Today's enterprises demand the flexibility to deploy IT services quickly and reliably. VMware Infrastructure allows customers to create a flexible pool of resources in the form of virtual machines that can be deployed across the enterprise with ease. VMware Infrastructure 3 allows for partitioning and isolation of virtual machines enabling IT administrators to maximize the utilization of their servers, while encapsulation makes it easy to quickly move virtual machines from one server to another. These three properties — partitioning, isolation, and encapsulation — help enterprises contain server sprawl, thus reducing deployment and operation costs.

As virtual machines are deployed and moved around the infrastructure at will, management of the virtual infrastructure becomes crucial factor in ensuring that the complexity of the infrastructure is minimized. The HP & VMware Operations Pack is a bundle of products from HP, VMware, and nWorks that helps customers integrate their virtual environment with their HP Software management environment to provide end-to-end management of all elements in the infrastructure - from the hardware components to virtual machines and enterprise applications. The features of the pack complement VMware VirtualCenter capabilities for effective management of server farms running VMware ESX Server.

The following sections, discuss features of the HP & VMware Operations Pack and its benefits to customers.

HP & VMware Operations Pack

The HP & VMware Operations Pack is a loose bundle of various HP and VMware products that together provide an integrated IT operations management solution. The following products are included in the pack:

- *HP Systems Insight Manager* — Hardware management tool that works with HP software to consolidate and simplify infrastructure management.
- *HP Operations Manager* — Monitors, controls, and reports on the availability and performance of the IT infrastructure
- *HP Performance Agent* — Helps to monitor and analyze resource utilization.
- *HP Performance Insight* — Provides capacity planning, performance, and availability of networks, systems, applications, and services.
- *VMware Infrastructure* — Industry-leading virtualization platform that helps customers optimize and consolidate large IT environments. VMware provides a suite of applications that deliver comprehensive virtualization, management, resource optimization, application availability, and operational automation capabilities.
- *nWorks Smart Plug-In for VMware* — Provides monitoring, alerting, data collection, and report generation capabilities for VMware ESX Server hosts from HP Operations Manager.

Figure 1 shows the components of the pack and their interactions with each other.

As shown in the figure, HP Systems Insight Manager (SIM) manages ESX Server hosts with the Insight Manager (IM) agent installed on ESX Server hosts. These agents are required on each system being managed. The agents use the SNMP protocol to provide statistical and trap information to the HP SIM console (generally referred to as the CMS — central management system). Similarly, each managed virtual machine also must

have an SNMP agent installed. The Windows Management Instrumentation package is preloaded on most recent Windows operating systems, and no further configuration is needed for Windows guest operating systems. Web Based Enterprise Management (Wbem) is required on Linux-based virtual machines. Packages such as Pegasus or OpenWEBM can be downloaded from the Internet and configured to allow Linux virtual machines to communicate with the CMS.

While SIM is used to manage the servers and virtual machines, HP Operations Manager provides a central console for monitoring and managing heterogeneous IT environments. It monitors, controls, and reports on the health and performance of the hardware components and applications.

HP Operations Manager can be extended by using smart plug-ins (SPI) that can extend its inherent capabilities. The nWorks SPI for VMware is one such plug-in that provides the link between VMware infrastructure and HP software. The nWorks SPI monitors the state of virtual machines (on, off, paused, unresponsive) and ESX Server hosts. It can gather configuration data, host and guest performance data, and event information used for monitoring and reporting. It gathers information about individual virtual machines and their use of physical resources including CPU, disk, I/O, and memory. It can also use ESX Server and the VirtualCenter SDK to report performance data.

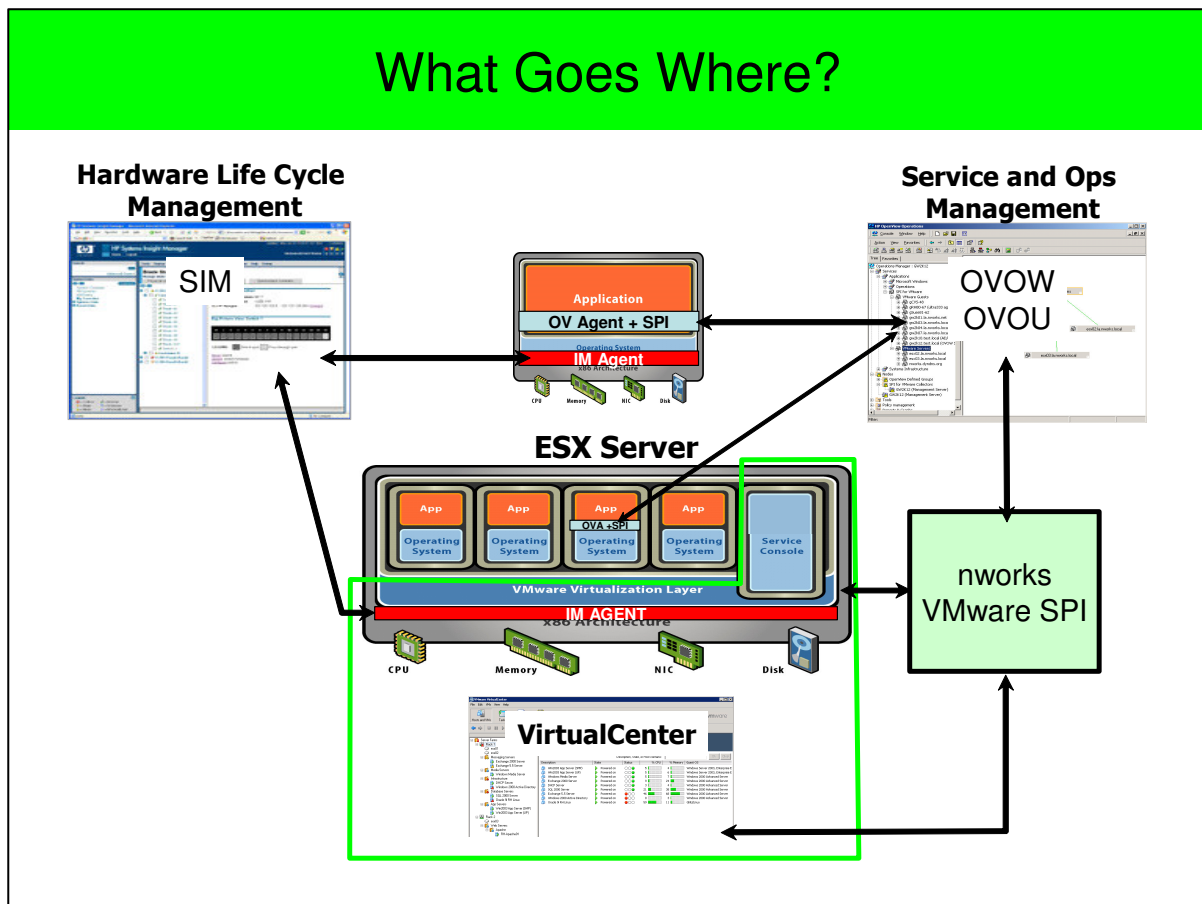


Figure 1: The architecture of HP & VMware Operations Pack. The figure also illustrates the relationships among various subcomponents.

VMware Infrastructure is the industry's first full infrastructure virtualization suite that allows enterprises and small businesses alike to transform, manage, and optimize their IT systems infrastructure through virtualization. VMware Infrastructure delivers comprehensive virtualization, management, resource optimization, application availability, and operational automation capabilities in an integrated offering. As shown in Figure 1, VMware Infrastructure consists of ESX Server and its components plus the management component of VirtualCenter. It is important to note that the nWorks plug-in works in conjunction with VirtualCenter, which is a required component in this solution.

Virtualization introduces certain unique needs for management. Because virtual machines can be moved from one physical server to another, their relationships with the physical machines need to be tracked so that IT administrators can be alerted if a virtual machine changes its location. Also, when virtual machines move to new hardware, it is often necessary to monitor the underlying resource utilization (server and network resources, for example) for capacity planning purposes.

HP Operations Manager includes a console that provides visibility into the virtual-to-physical server mapping and vice versa. HP Operations Manager enables customers to use the same tools for virtual infrastructure that they use for their physical infrastructure. This enables efficient deployment of virtual technology without the need for retraining of IT staff on new tools. Using the HP & VMware Operations pack, customers can understand the impact of events on both physical and virtual environments from the same management environment.

The HP Performance Agent included in the Operations Pack helps customers accurately monitor performance of ESX Server hosts, virtual machines on the ESX Server hosts, and even individual processes or applications executing inside the virtual machines.

How it all works together

While each of the components of the Operations Pack can function independently of each other, together they provide integrated management of a mixed physical and virtual environment. Some configuration is needed to enable the components to work together.

Virtualization brings the benefit of improved utilization and higher availability to IT infrastructure. When applications are deployed in a virtual environment, they are no longer tied to a particular hardware server. The virtual infrastructure can be configured to dynamically schedule the virtual machine on any hardware that ensures best performance. Moreover, once a virtual machine is allocated to run on a particular server, it can be moved later without any service interruption to another server through a policy configuration. When an administrator is managing a large virtual server farm where there can be many virtual machines moving between servers, it is important to have tools to effectively manage that dynamic infrastructure.

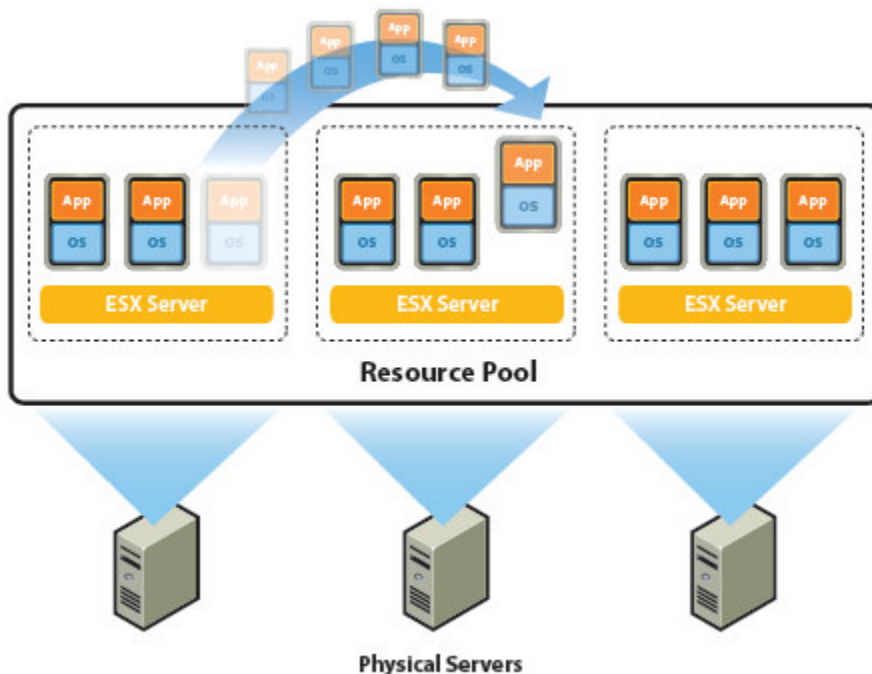


Figure 2: Dynamic Resource Scheduler (DRS) capability of VMware Infrastructure. Using DRS, virtual machines can be moved from one ESX Server host to another without interruption or downtime.

As ESX Servers hosts are added and virtual machines are deployed, enterprises soon may face virtual machine sprawl. In order to provide efficient service, IT administrators must be able to tell where particular virtual machines are running at any moment. Also, they must carefully monitor the performance of the virtual infrastructure to check resource utilization as well as to make adjustments if necessary. All this management can become overwhelming without proper tools.

Virtual machines are mobile and can be migrated dynamically from one server to another. This means that dynamic management and performance monitoring are needed to keep the business running optimally

Before HP SIM can start managing the hardware, the ESX Server hosts must be configured to work with SIM. The configuration includes enabling the ESX Server SNMP agent through the ESX Server Management Interface. Once this is accomplished and an IM agent is installed on the ESX Server host, that host can be managed through the HP software console.

Once the ESX Server host is configured, virtual machines running WMI (for Windows guests) or WBEM (for Linux guests) can start communicating with the CMS (central management system). At all times, these servers and virtual machines are also being monitored and managed by VirtualCenter.

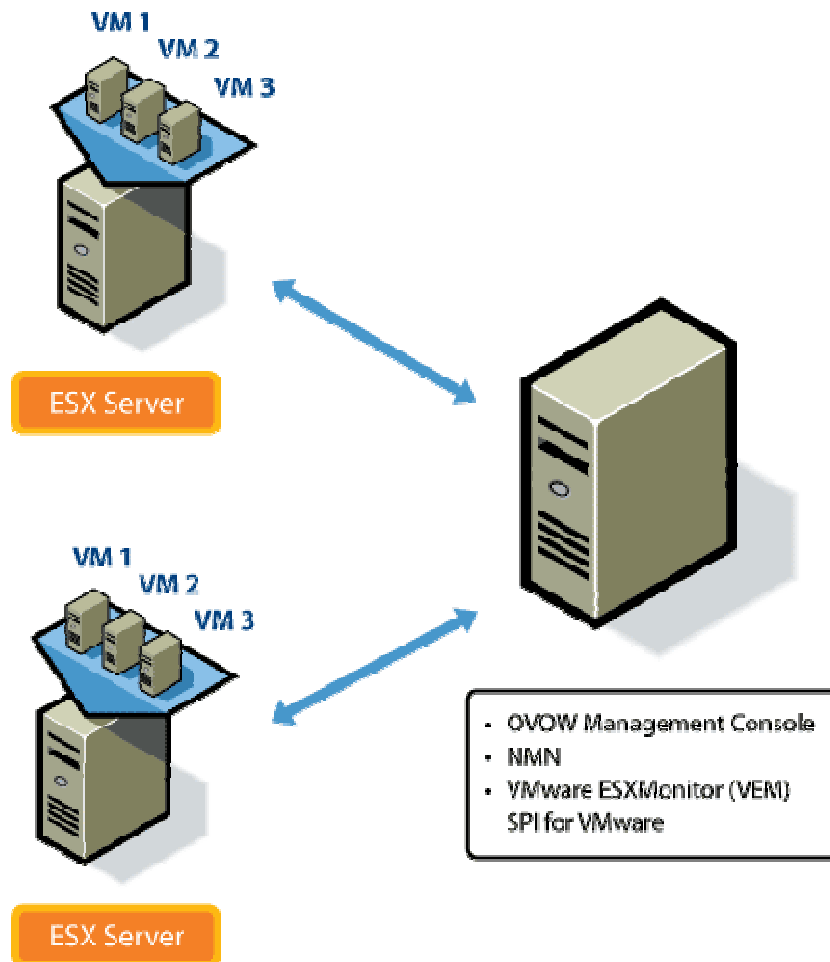


Figure 3: Communication between ESX Server hosts and OpenView Operations . Note that there are no special agents needed inside the virtual machine for this solution to work. The agent is installed only on the managed ESX Server hosts.

The VMware ESX Monitor from nWorks (VEM) smart plug-in monitors the state of the virtual machines and ESX Server hosts. It gathers configuration, event, and performance data on guest operating systems as well as ESX Server hosts. VEM runs on a Windows 2000 or Windows Server 2003 server and must be able to communicate with the ESX Server hosts in order to monitor them. ESX Server APIs and the VirtualCenter SDK are used by the SPI to gather information. No special installation or configuration is necessary. The SPI modules are configured to work with HP Operations Manager by installing management server components on the OpenView console. The SPI uses the APIs and SDK to collect performance data from ESX Server hosts and virtual machines. It also uses the performance component for the OpenView Operations agent to collect and manage performance information for performance monitoring and reporting functions.

Performance Management: HP Performance Manager is a graphical analysis and planning tool. It is designed to analyze and project future resource utilization and performance trends.

Using historical data, HP Performance Manager allows IT administrators to examine resource utilization and performance trends in depth. With this information, the

administrators can then uncover bottlenecks that, if left unchecked, result in poor service levels.

By comparing activity levels, administrators can balance workloads, allocate resources, and deliver a quality of service that parallels business needs. Performance Manager can export performance data in various formats for use in capacity planning, statistical analysis, and spreadsheet applications.

The HP Performance Agent logs and collects data, then sends alarms about that data when necessary. The agent is installed on each system that needs to be monitored.

VirtualCenter is used for managing the ESX Server hosts and virtual machines. Some advanced features of VMware Infrastructure such as VMware Distributed Resource Scheduler (VMware DRS) and VMware High Availability (VMware HA) can be enabled only through VirtualCenter. Also, tasks such as creating resource pools and setting VMware HA parameters etc can be achieved easily in the VirtualCenter interface.

When all the components are working together as described above, the following management functionality for virtualization is enabled in the HP software environment:

Service maps — Service maps keep track of the ESX Server hosts and virtual machines (see Figure 4). Using the service map, you can determine the virtual machines running on an ESX Server host and the ESX server host on which a virtual machine is running. If a virtual machine moves from one host to another, SPI for VMware updates the map to reflect this change automatically. The service map maintains the state of the virtual machines. The service map also translates different severities of messages into different colors to represent the current state of each virtual machine.

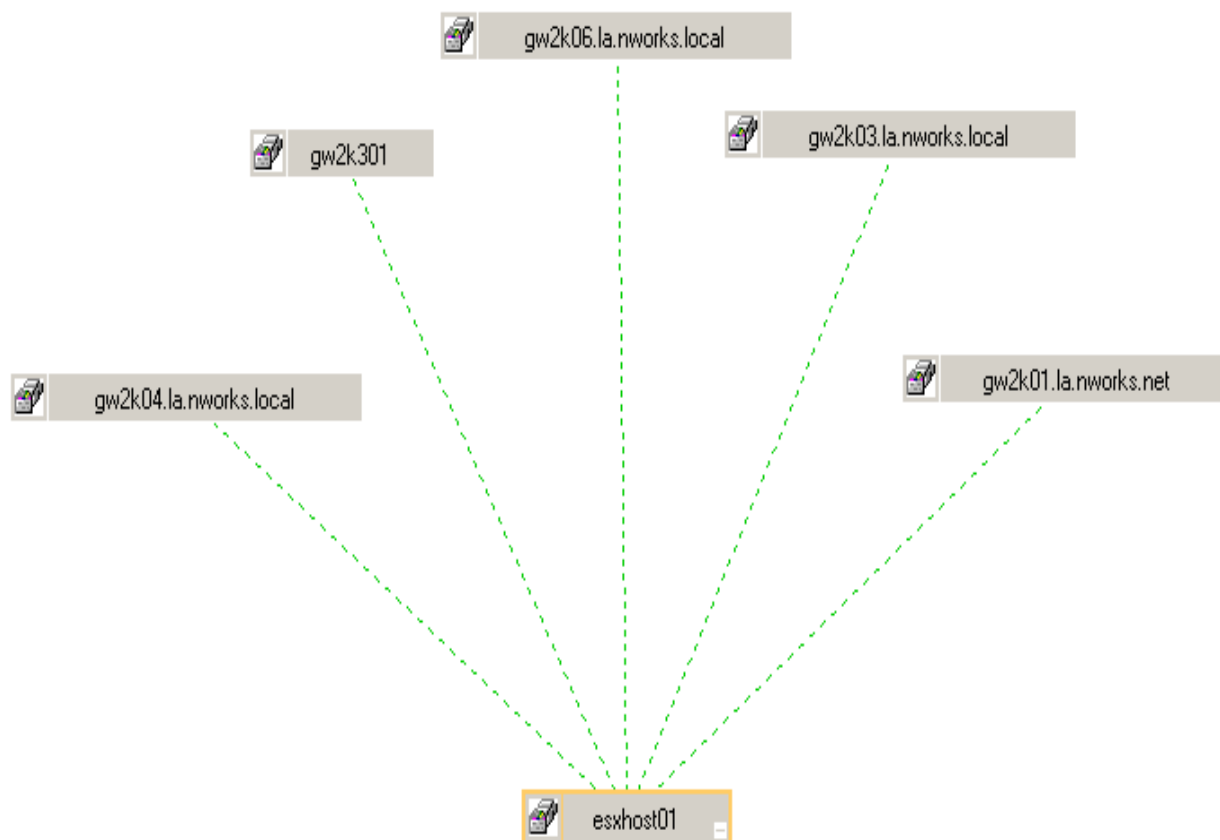


Figure 4: An example service map. This kind of map makes it easy to monitor utilization and availability in real time.

Use the map to launch graphs in the context of an ESX Server host. Since the collector component of the SPI is responsible for multiple ESX Server hosts, IT system operators use the service tree to select an ESX Server host for which they want the graph. Operators can launch tools in context from the service map itself. Operators then select the ESX Server host on which they want to run a particular tool.

Reporting – IT management can use the nightly reports of virtual machine activity to track long-term resource utilization of the ESX Servers hosts and the virtual machines.

Graphing – Near real-time graphs are also available. In addition, administrators can launch in-context graphs from the service map.

Policies – A large collection of predefined policies for monitoring performance, event, and state information is provided.

Programmatic control – Using the VMware SDK and APIs, the operations pack SPI can control resources, monitor status, and collect performance data.

VMware Infrastructure

The dynamic nature of today's business means that IT needs are constantly changing. In this fast-paced environment, it is essential for the IT administrator to be able to respond quickly to these changing needs. The IT infrastructure must be flexible and cost-effective.

Virtualization makes IT infrastructure flexible. By creating clusters of the servers and by deploying applications in the virtual infrastructure, IT administrators can make the most of their physical servers. Multiple applications can be deployed on a single server, thus increasing the utilization of the physical server. More application running on a single physical server means hardware costs can be substantially lowered. Figure 5 shows a hypothetical virtual infrastructure implementation. The virtual machines do not sit directly on the hardware, rather they run on top of a thin virtualization layer. This property gives virtual infrastructure its flexibility.

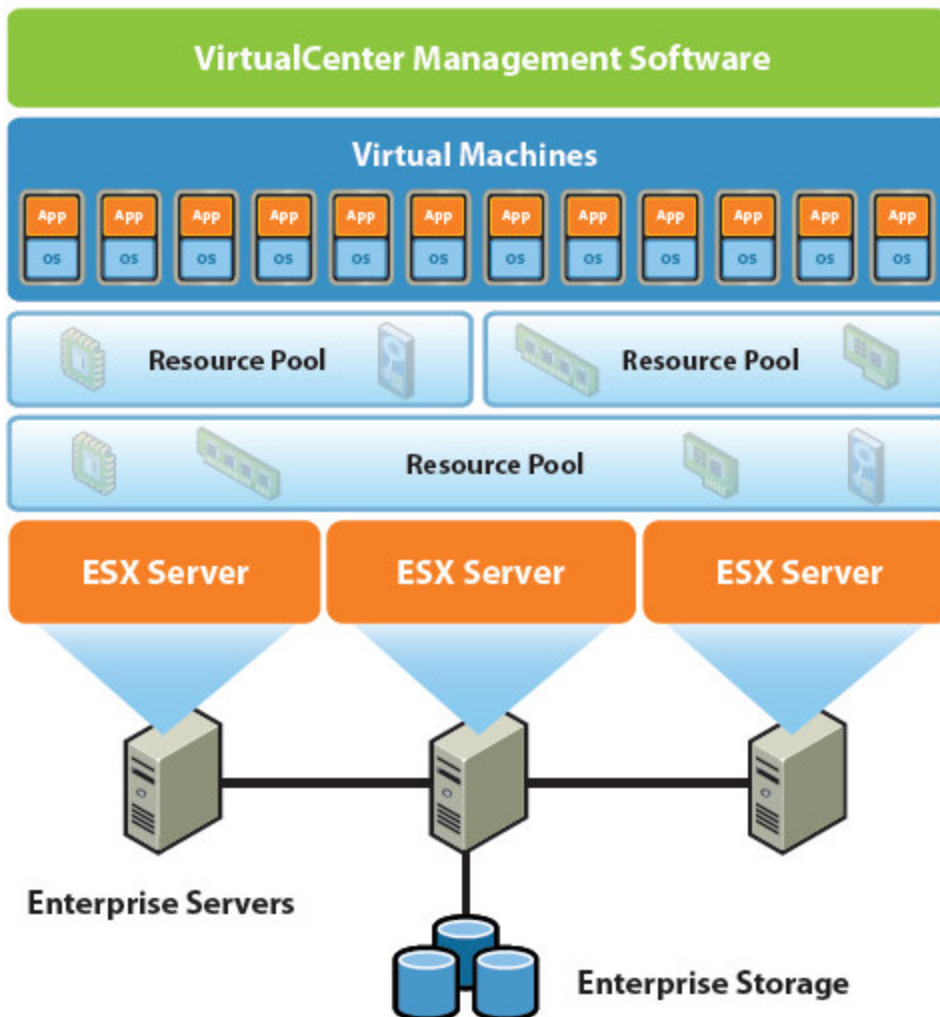


Figure 5: A hypothetical virtual infrastructure. Virtual machines can be deployed and moved dynamically from one physical server to another for better utilization and flexibility

Servers configured in a cluster monitor each other for failure. If a failure is detected, virtual machines can be restarted on the remaining healthy server. This way the application is always available. Nonproductive downtime can be kept to a minimum. VMotion technology from VMware also allows user to balance the load among clustered ESX Server hosts.

VMotion technology makes it possible to move a virtual machine from one server to another without interruption or downtime. The virtual machine keeps running the applications it is running and users remain connected to the application while the move is going on. This VMware DRS feature allows IT administrators the flexibility needed to move high priority applications to faster systems while moving lower priority applications to slower servers.

IT administrators also need to know the capacity of their infrastructure. The HP & VMware Operations Pack provides reporting and real-time monitoring that allow administrators to keep on top of that information. In addition to the availability information, information about performance of each individual component and its mapping to various resources is also reported. Figure 6 shows the screen that reports this information.

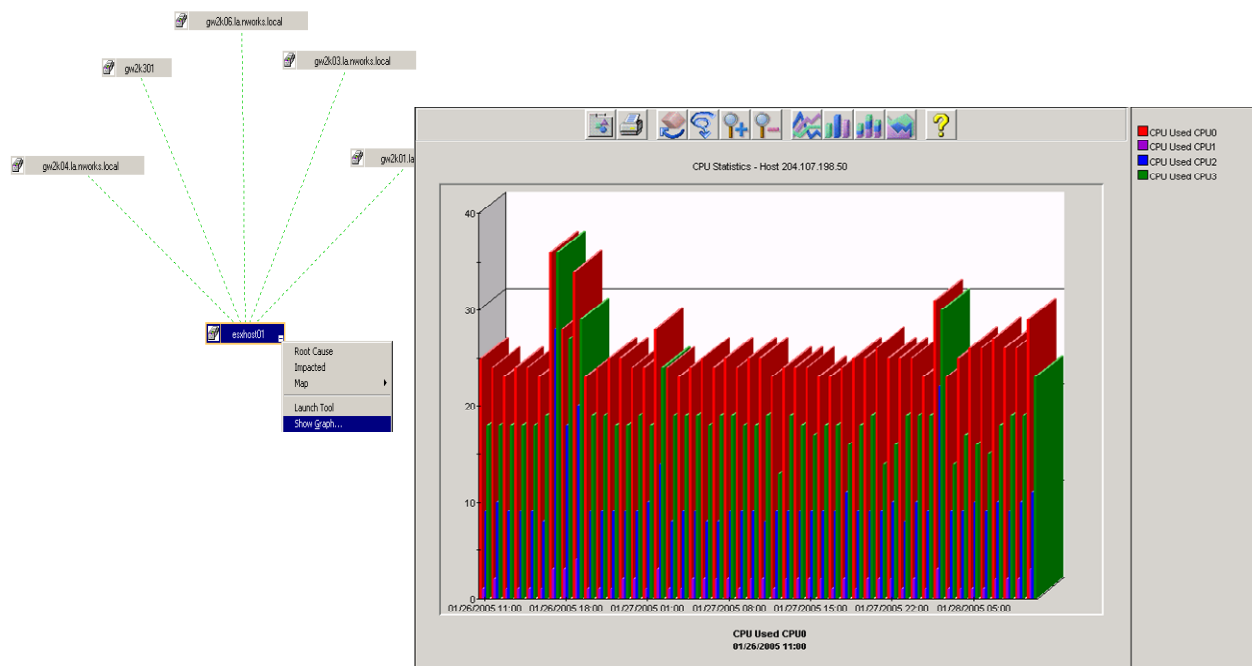


Figure 6: The screen displaying performance data for an ESX Server host. The data is dynamic and is shown in real time..

The HP & VMware Operations pack allows IT administrators to respond quickly to changes in business needs by deploying new applications in a virtual environment and taking down unneeded applications without any reconfiguration or reinstallation.

IT Service Management

The HP & VMware Operations pack transforms IT administration into a business-responsive function. The Operations pack is unique because it allows customers to project future service levels by modeling existing resource utilization and performance

trends that contribute to a business service. It enables integration and correlation across multiple silos of traditional IT information blocks, providing a central console and point of control. Moreover, it enables efficient use of IT staff by filtering out “noise” from false alarms, allowing IT to focus on resolving the events that affect the highest-impact business services. Using the HP & VMware Operations pack, IT administrators can view and diagnose business service problems from the application down to the level of the virtual machine that is running the service. Moreover, with virtual-to-physical mapping, administrators can diagnose problems efficiently down to the physical server level. Virtual machines can be redeployed speedily to solve the problem. After a virtual machine is redeployed, all the maps are dynamically updated and events logged for future reporting.

The figure 7 shows one view in the HP & VMware Operations Pack management window, where various applications and services are visible. By following links in the diagram, an administrator can find information such as the operating system, virtual machines, memory, and physical server that are being used for a particular application.

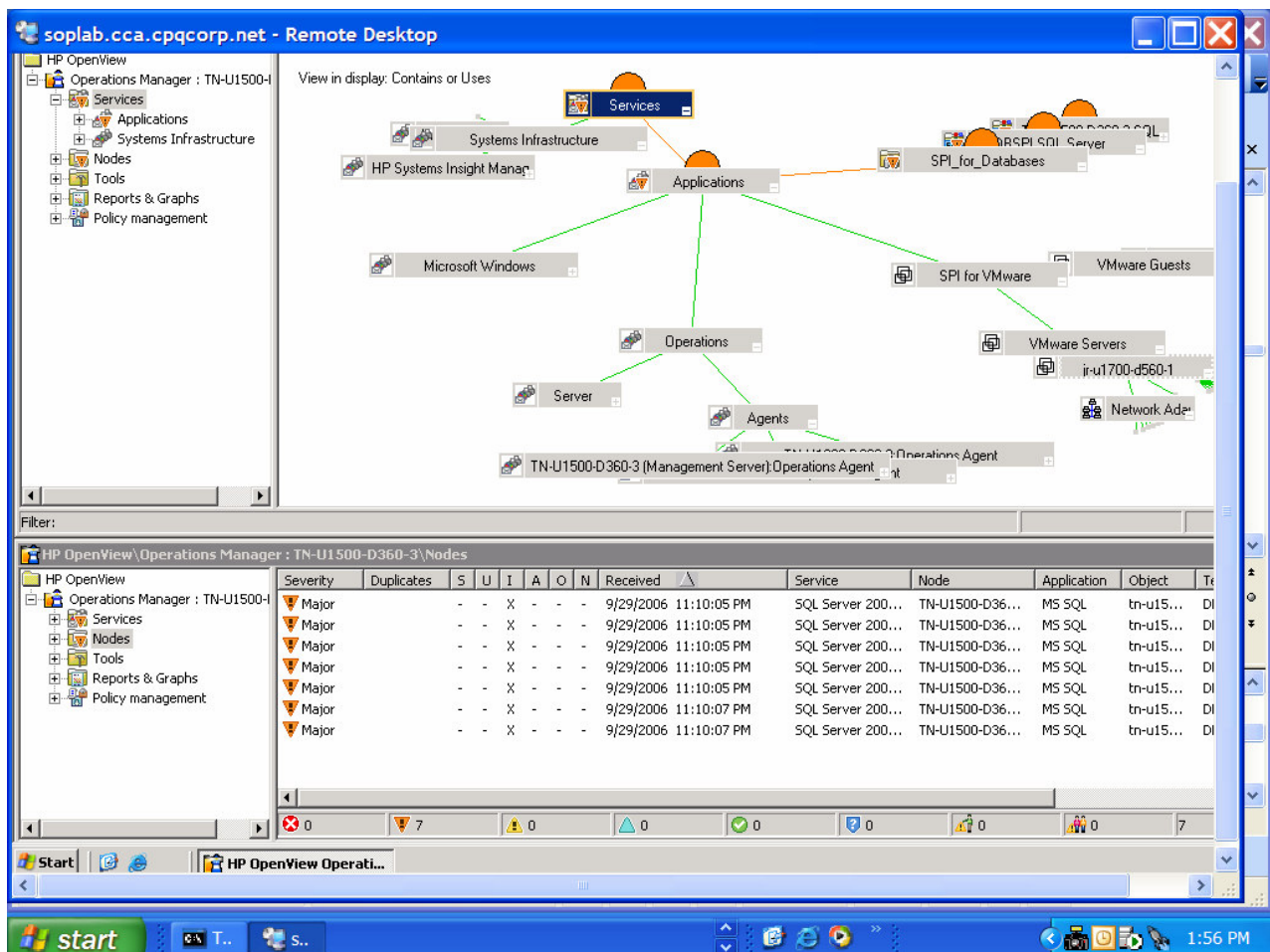


Figure 7: A view in the management window. Administrators can start with such a view of applications deployed in their environments and find the underlying virtual and physical infrastructure that maps to a service or application.

Scalable and Integrated Management

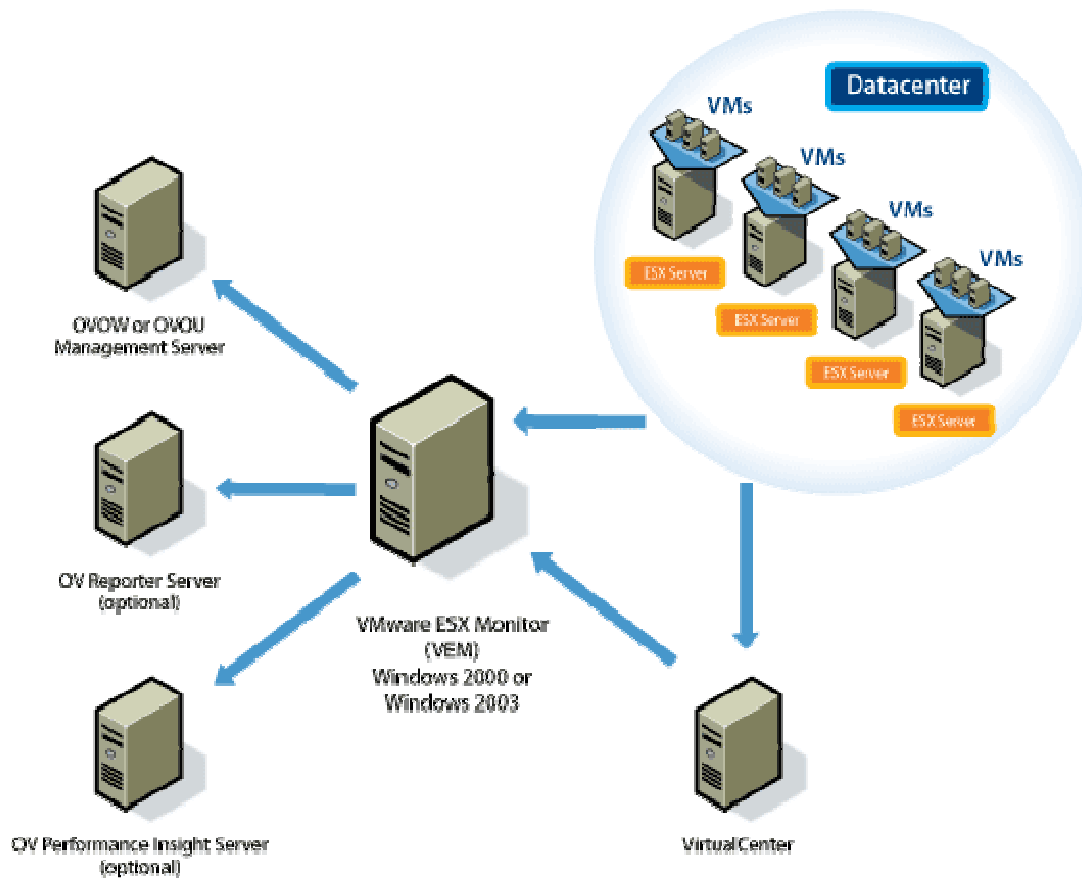


Figure 8: The integrated and interconnected solution. More than 1000 ESX Server hosts can be supported simultaneously using the operations pack, making it one of the most scalable management solutions for virtual infrastructures.

HP & VMware Operations Pack is designed to support large, heterogeneous installations. The pack can be used to manage a large number of hosts and virtual machines running a mix of ESX Server, UNIX, and Windows, along with databases and various other applications, Web servers, Active Directory, .NET, J2EE, etc.

Manageability from the pack is extremely scalable with the ability to support more than 1000 servers from a single console! What's more, the advanced manager-of-managers architecture makes it possible to implement divisional solutions, affording flexibility of implementation to IT administrators and architects. The Operations Pack makes it possible to have only one console to monitor and manage the physical and virtual infrastructure.

When IT infrastructure is divided among departments or divisions, sometimes administrators prefer to have local management. Management still must have the ability to view the entire IT infrastructure centrally. The HP & VMware Operations pack can be implemented in such an environment to provide the scale, ease of management and reporting. The operations pack agents communicate with a local management console, which then relays the information to a central server. Because management agents work locally, their performance is not affected by the addition of a higher-level management console.

In any environment that is expected to scale, intelligent management tools are essential. Because of the intelligence built into the agents and consoles, when events are triggered (for example, when an application crashes or power to a group of servers goes out) management agents relay that information to the local management console. At that point, the console software can relay that information to the central management console or can act on the event by itself. This entire event-response process can be automated. This helps in reducing the burden on the IT staff to monitor the events at all times and makes it easier to scale the IT infrastructure with less staff.

Summary

The value provided by the HP & VMware Operations pack includes:

- Improved infrastructure utilization and IT staff efficiency — VMware Infrastructure 3 provides infrastructure utilization and consolidation benefits while HP software helps maximize IT staff efficiency.
- End-to-end management — The Operations pack provides comprehensive event management, proactive performance monitoring, and automated alerting, reporting, and graphing of middleware and applications on physical and virtual machines.
- Single point of management — The HP & VMware Operations Pack management window provides a “single pane of glass” view of IT operations by linking the virtual infrastructure with HP Operations Manager.

The pack can be purchased as independent component products from HP, VMware and networks. It can also be purchased from channel partners of HP and VMware. Implementation services for the pack are available from leading system integrators such as BearingPoint and HP C&I.

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