Industry leading management integration
Veeam nworks Management Pack
for Microsoft System Center Operations Manager for VMware

Best Practices:

VMware Monitoring
with Operations Manager 2007 and MOM 2005

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WHAT'S NEW IN NWORKS MP V5

The nworks Management Pack (MP) 5.0 updates Veeam's leading-edge solution for distributed VMware Infrastructure monitoring and management with Microsoft System Center Operations Manager 2007.

Responding to customer feedback and continuing to work closely with VMware, version 5.0 includes the following enhancements while maintaining VMware VI3 backward compatibility:

Support for VMware vSphere, vCenter v4.0 and ESX v4.0

nworks MP v5 has full native support for vSphere VI-API v4.0, with many new events, policies, monitors and topology objects. VMware Ready Optimized certification means you stay future-proofed and are able to monitor and use all vSphere features with full confidence from Operations Manager 2007.

vSphere Support

Full VMware vSphere support with preconfigured monitoring of –

- Distributed Power Management
- Host Profiles
- Virtual Applications
- VM Fault-Tolerance

NEW nworks Management Center

The new nworks Management Center is designed for large enterprise deployments with multiple nworks Collectors, and offers centralized deployment, configuration and management. It features a web-based administration GUI directly accessible from the Ops Mgr console, and provides centralized configuration of a group of nworks Collectors. The nworks Management Center gives administrator enterprise scalability with lower administration overhead, simplified deployment and configuration, and high-availability.

High-Availability

The nworks Management Center, leveraging its centralized license and configuration capabilities, provides high-availability through "Hot-Standby" nworks Collectors. An nworks Collector 'heartbeat' failure triggers redistribution of the failed nworks Collector's management jobs to the standby nworks Collector.

Load-Balancing

Deployment and configuration tasks are further automated through the load-balancing feature of the nworks Management Center. In multiple nworks Collectors implementations, monitoring Jobs are automatically assigned using the Balance feature, eliminating individual nworks Collector configuration.

License Server

Centralised management for licensing across multiple nworks Collector servers, greatly simplifying deployment tasks and ongoing management overhead for dynamically growing environments. The License Server manages a pool of licenses across all nworks Collectors, automatically distributing licenses as required.

INTRODUCTION

This document describes an end-to-end solution for monitoring and managing VMware vSphere or Virtual Infrastructure 3 using a full integration with Microsoft Systems Center Operations Manager (Ops Mgr) to produce a comprehensive image of system health with minimal impact on your operations staff.

Organizations invested in Microsoft System Center Ops Mgr 2007 or Microsoft Operations Manager (MOM) 2005 and already using (or planning to deploy) VMware vSphere require an integrated solution providing monitoring and data consistency in their Ops Mgr Enterprise Management System (EMS).

An important part of the production environment, vSphere requires the same level of monitoring as the Microsoft Windows infrastructure. At first glance various methods exist for monitoring servers in the virtual infrastructure – however it is crucial to choose the correct technology solution. Here are some common technical approaches and their pros and cons :

- **An Ops Mgr agent installed inside a Guest Operating System (OS)** running in a Virtual Machine (VM) does not provide correct VM resource monitoring data and does not monitor the additional aspects of vSphere virtualization.

- **Solutions based on installing a Linux-style agent in the ESX Host** Console Operating System (COS), **or on using SSH, SNMP or Syslog** present problems including:
    - An incomplete picture of system health
    - Impact on hypervisor stability
    - Lack of long-term supportability
    - No assurance of future compatibility with VMware innovations

- Most solutions for VMware vSphere monitoring provide limited out-of-the-box Ops Mgr integration, requiring **additional consoles, databases, and configuration utilities** in order to work. This contributes to "console sprawl" and results in "swivel chair management" using multiple management consoles.

The nworks Management Pack avoids the problems mentioned above as it uses native VMware APIs to gather performance, event and configuration data from VMware Infrastructure and vSphere.

> **Veeam nworks Management Pack for VMware allows you to leverage your investment into Microsoft System Center Operations Manager, and to avoid the large cost of buying, deploying, learning and managing another set of agents and another framework monitoring solution.**

VMware vSphere implements virtualization by introducing a new layer of software technology: the hypervisor. The hypervisor requires specific monitoring designed to understand how it works and how it fits into the IT infrastructure. Any hypervisor requires Ops Mgr administrators and operators to learn about virtualization to ensure successful monitoring and support for the new virtualized infrastructure. The real challenge is to reduce the learning curve required to manage the VMware vSphere Infrastructure using an off-the-shelf product. The Veeam nworks Management Pack (MP) for vSphere is the most compressive enterprise scalable and reliable solution providing thorough out-of-the-box Microsoft MP integration.

Intended Audience

This document is intended for datacenter managers and Ops Mgr experts in charge of Microsoft System Center Ops Mgr 2007 or MOM 2005 in organizations using VMware vSphere or considering implementing VMware vSphere in their production environment.

Author

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Founded in 1994, nworks grew into a leading provider of software bridging the gap between mission-critical business infrastructure applications and enterprise management systems from Hewlett-Packard and Microsoft. In June 2008, Veeam Software acquired nworks. Today, the combined Veeam Software/nworks organization offers award-winning tools for VMware infrastructure and management connectors between VMware products and enterprise management systems.

Certified "VMware Ready Optimized"

With the success of VMware, it is in vogue to say a software company supports the VMware Infrastructure. The number of companies participating in the VMware Infrastructure market has gone from tens to thousands in a few short years. The problem is, which vendor is actually qualified so make such an assertion? How does a customer know which vendors have played by the rules set forth by VMware? How does a customer know which vendors are executing a strategy in line with VMware's? VMware created the VMware Ready Optimized program to address these questions. It is the highest level of VMware certification for software products. Products bearing the VMware Ready logo assure customers a product with optimized levels of integration, functionality, and performance, that strictly adhere to VMware's architectural, supportability, and future-proofing requirements.

Veeam was one of the first independent software vendors VMware invited to go through the VMware Ready Optimized certification process. The nworks Management Pack (MP) for VMware for Microsoft System Center Ops Mgr proudly bears the VMware Ready Optimized logo, certifying it has passed VMware's most rigorous testing process.

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OVERVIEW

When it comes to deploying VMware vSphere, the main operational objective is to reduce costs through increased operational efficiency and capital utilization. When a company chooses Microsoft System Center Ops Mgr 2007 as their Enterprise Management System, they make substantial capital and operational investments in order to reduce downtime and keep their IT infrastructure running smoothly. When introducing VMware vSphere it is incumbent on the operations staff to integrate monitoring and management of the new virtual infrastructure into their current operating environment with minimal impact. An ideal solution provides physical and virtual system monitoring of Microsoft Windows and VMware vSphere from the comfort of the Ops Mgr interface. It provides an integrated view of the physical and virtual systems. Such a solution should not require a separate VMware monitoring team, a separate monitoring platform, or additional training investments.

For OS and application software and health monitoring, Ops Mgr uses the Ops Mgr agent. The assumption is that through OS monitoring, the Ops Mgr agent can determine the utilization of the underlying hardware. With virtualization, the one-to-one OS/hardware link is broken. This means an Ops Mgr agent running in the OS no longer is able to determine the underlying hardware system performance. Only the hypervisor is capable of providing a true picture of hardware utilization and the resources provided to the VMs and the guest OS. Deploying an Ops Mgr agent inside a guest OS installed in a VM provides a skewed picture, as the Ops Mgr agent treats the VM as a physical machine. In addition, vSphere-specific metrics from the hypervisor layer (for example, balloon memory and CPU wait time) are invisible to the Ops Mgr agent. And important components of vSphere (ESX hosts, clusters, vCenter) are invisible to Ops Mgr. Important vSphere features such as DRS, VMotion and HA are also invisible. Without the visibility of vSphere as a whole, it is impossible to monitor ESX host performance, physical hardware status, VM status and VM location (e.g., which ESX host they are running on, and where their storage is located) and other critical aspects of vSphere.

There are several third-party solutions integrating VMware vSphere monitoring into Ops Mgr. These solutions can be organized into three categories:

1. **Agent in the ESX COS:** One method used to integrate VMware vSphere into Ops Mgr is to deploy an agent inside an ESX host's Console Operating System (COS). The logic is the ESX COS is a Red Hat Linux derivative, so it makes sense to monitor the COS like any other OS. The first problem with this approach is that the COS is used to start the ESX hypervisor, but it is not the hypervisor. This leads to the second problem. The ESX COS is a window into the hypervisor, and as such, if a program (such as an agent running in the COS) hangs, the window is blocked: visibility into the hypervisor is lost. It is for this specific reason that VMware developed a series of secure remote management APIs to communicate directly with the hypervisor. An agent running in the ESX COS only gives partial visibility to many vSphere aspects such as DRS/HA Clustering, Distributed Power Management (DPM), vCenter licensing, etc. And finally, the agent-based method cannot be employed for ESXi hosts, which lack a COS in which to install an agent.

2. **Use of standard management protocols (SNMP, Syslog, etc.):** Other third-party solutions use methods such as SNMP trapping, or 'screen-scraping' of the ESX COS via SSH, or Syslog monitoring. These older technologies provide a limited picture of the status of the complex vSphere environment. As with running an agent in the ESX COS, these solutions provide only partial visibility of the vSphere environment.

3. **As stated above, VMware provides a secure remote management API.** VMware developed the Virtual Infrastructure SDK which exposes the VMware Infrastructure API (VI API) and built vCenter server itself using the VI API. Only the VI API presents a comprehensive picture of the health of all vSphere systems and their dependencies. Clearly, any valuable monitoring solution for VMware must employ the VI API.

When evaluating VI API-based solutions, it is also necessary to examine the level of integration into Ops Mgr. From the beginning, nworks has provided a deep integration into Ops Mgr. While other products provide only limited management integration using alert forwarding or other data injection methods, only nworks provides full integration into the Ops Mgr health model. This 100% integration of the Veeam nworks MP for VMware provides the best leverage to your existing investment in Ops Mgr, requiring minimal additional infrastructure, staff training or other operational costs.

In an enterprise environment, it is also recommended to review issues such as scalability, high availability and management overhead. By using the VI API, little additional overhead is placed on the ESX hosts, as vCenter is already gathering the same information. The nworks distributed, automated, and fault-tolerant architecture is the best model to maximize the benefits of your Ops Mgr infrastructure for vSphere monitoring. Now in its fifth version, the nworks MP for VMware vSphere provides a solution for monitoring VMware vSphere as a whole through Microsoft Ops Mgr. Through a comprehensive pre-packaged set of rules, the nworks MP provides a solid baseline for VMware vSphere monitoring right out of the box. Using this as a starting point, Ops Mgr administrators can focus on capturing their organization's unique business requirements into Ops Mgr. There is no need to spend countless hours tediously designing, developing, and debugging rules to get to the baseline provided by the nworks MP.

Integration with Microsoft Ops Mgr

At present, the nworks MP is the only solution providing full integration with Microsoft Ops Mgr. This allows the use of the Microsoft Ops Mgr console for monitoring the Microsoft infrastructure and VMware vSphere, for alerting and graphing, and for undertaking automated and manual remedial actions. By fully utilizing the native Ops Mgr interface, the nworks MP gains the upper hand over competitors offering proprietary vSphere monitoring interfaces with a limited Ops Mgr 'Connector' technology. Using the nworks MP, Ops Mgr administrators work in a familiar environment, requiring no additional training in a new third-party administration interface, and avoiding dividing their attention between different monitoring consoles.

This 100% integration with Ops Mgr provides the ability to include VM application and service data in the vSphere topology. If an Ops Mgr Agent is installed in a VM (which is optional and not a requirement for nworks), the nworks MP can use the data received from the agent to drill down to the application level inside the VM "guest OS" to see application and service data (SQL databases, Exchange Server and so on), providing complete coverage of the vSphere monitoring scope — from ESX cluster, to ESX host, to VM, to guest OS, and into applications and services running in the guest OS.

Monitoring vSphere as a whole, the nworks MP is aware of VM migration and deployment, ESX Host status and DRS or HA errors, licensing and security issues, Resource Pool performance, storage and network I/O bottlenecks, Datastore configuration and all critical aspects of the vSphere 'Datacenter OS'.

Agentless Architecture

In contrast to Ops Mgr's native method of relying on an Ops Mgr agent inside a guest OS to get monitoring data, the nworks MP uses an agentless approach. Using the VI API to provide access to more than 300 VMware-specific health and performance metrics and events, the nworks solution gives visibility to the overall VMware vSphere health including VMs, ESX hosts, Clusters, and vCenter.

This agentless architecture is of special importance as an Ops Mgr integration agent deployed inside the ESX COS has been known to impact the stability and performance of the ESX hypervisor itself. Even COS agents approved by VMware to run in the service console (such as the hardware vendors' agents) require re-certification for every VMware patch, upgrade, and add additional management overhead. Using the VI API eliminates the additional operational costs and risks associated with COS based agentry.

Agent-based monitoring is impossible for ESXi, which lacks a COS in which to deploy an agent. The VI API allows the nworks MP to safely, efficiently and accurately monitor ESXi hosts in the same manner as ESX hosts.

VMware needed to provide a method for monitoring hardware when ESXi eliminated the COS. vSphere implements the CIM-SMASH hardware model (see www.dmtf.org) to publish hardware configuration, status, and event data such as fan speed, power supply status, CPU temperature, and the like. The nworks MP accesses CIM/SMASH data through the VI API, enabled in any version of ESXi, and ESX 3.5 Update 2 onwards.

Picture 1. Monitoring ESX Host Hardware Sensor Data

Intelligent Health Model

The nworks MP includes pre-configured vSphere rules and performance monitors. Pre-configured rules help avoid overflowing the Ops Mgr Console with unimportant or informational events, and improve Ops Mgr administrator productivity, making the nworks MP an out-of-the-box solution not requiring extensive end-user development or customization. Ops Mgr administrators can modify the pre-configured rules to their specific organizational requirements. This optional customization takes place in the Ops Mgr Console Authoring section, using the same standard methods as other Management Packs.

The intelligent health model of the nworks MP not only alerts on inconsistencies within vSphere; it dynamically handles and presents vSphere performance data and events. This helps Ops Mgr administrators detect problems and provides automated monitoring. Open alerts are auto-resolved

and the object state is reset to healthy when the underlying issue is resolved (for example, when VM CPU usage returns to normal). With the automated response options available in Ops Mgr, it is possible to automatically take a recovery action when a specific problem is detected.

Each alert has a detailed description in the Product Knowledge Base, providing technical information such as the meaning of the underlying metric, the importance of an alert, troubleshooting data and possible resolution steps, as well as links to potentially helpful external resources. This is a great resource to elevate first-line monitoring staff, to improve response times and ensure correct escalation routes are taken. Fast problem resolution yields lower operational costs, and solving potential problems through intelligent threshold and event monitoring yields even greater benefits.

Monitoring VMware vSphere with Microsoft System Center Ops Mgr

This section illustrates the basic views and features used for monitoring vSphere health with Ops Mgr.

Using vSphere performance data and events received from vCenter, the nworks MP enables centralized monitoring of vSphere resources: ESX Host, Cluster and VM physical resources (CPU, memory, disk, network) and more. It operates with native Ops Mgr features, views and tools, such as the Health Explorer, to provide information on vSphere status: vSphere topology, alerts, real-time performance graphing and so on. These are available for any vSphere object in the vSphere hierarchy.

The topology map visualizes the entire vSphere scoped at the level of the selected vSphere object. It allows Ops Mgr administrators to get a high-level view of vSphere and to see an assembled image of the overall vSphere health model, as well as drill down through the vSphere infrastructure to the object causing the problem.
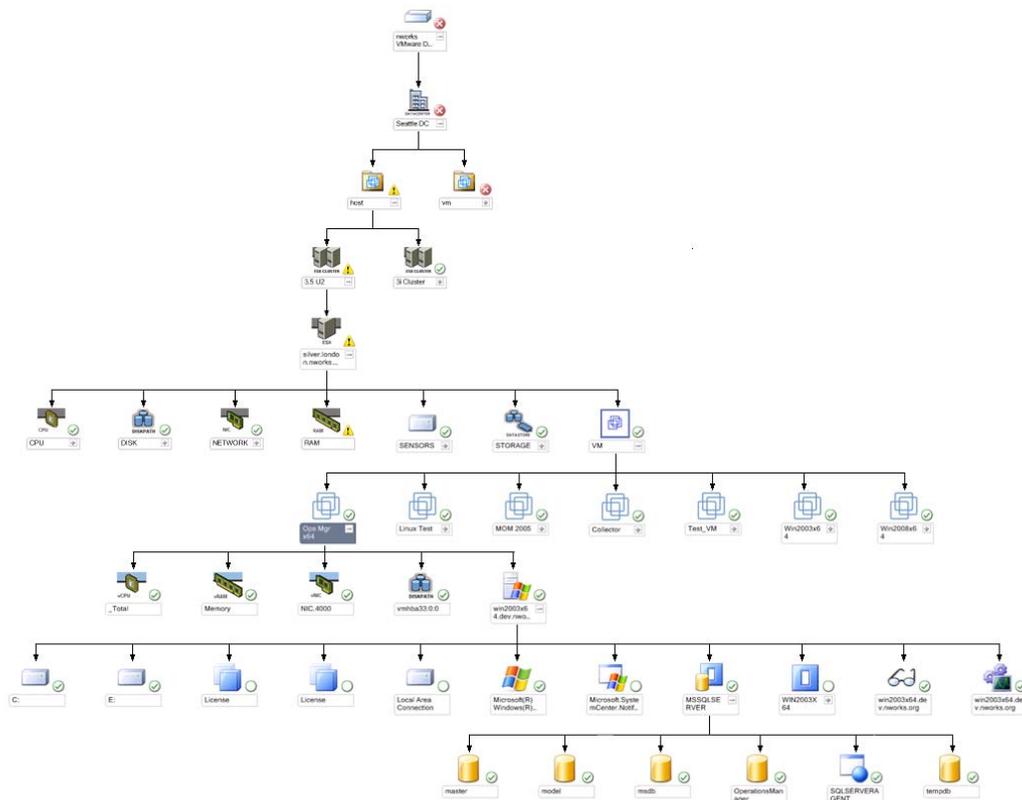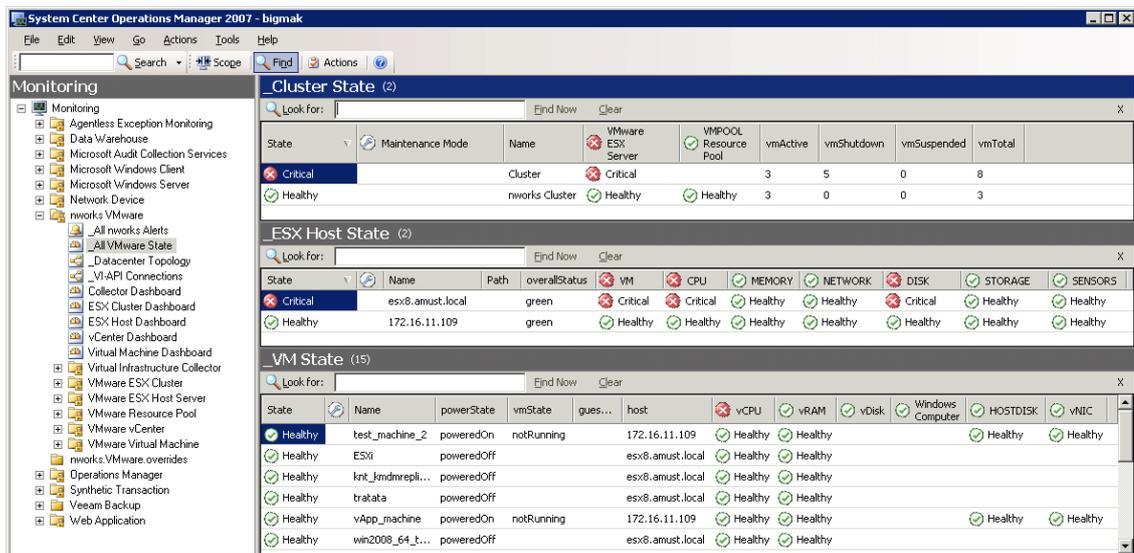

Picture 2. vSphere Topology Map

To track system health, the nworks MP enables full performance monitoring and alerting, and displays vSphere health data in various views such as Performance and State Dashboards.
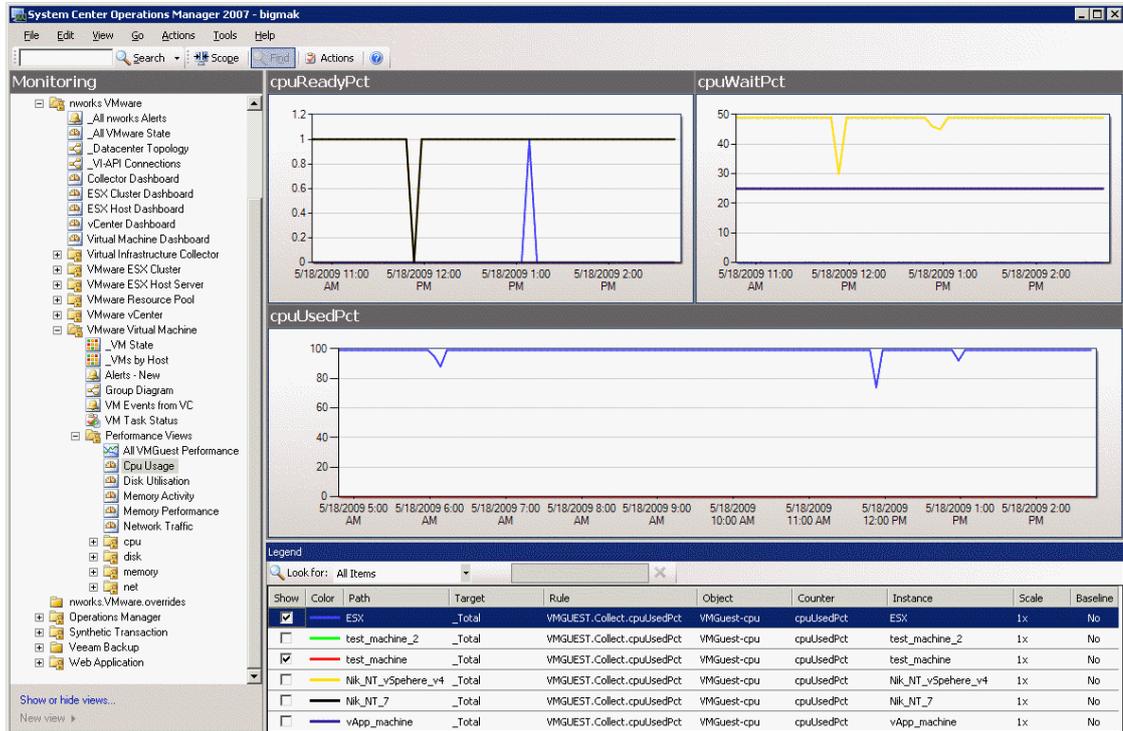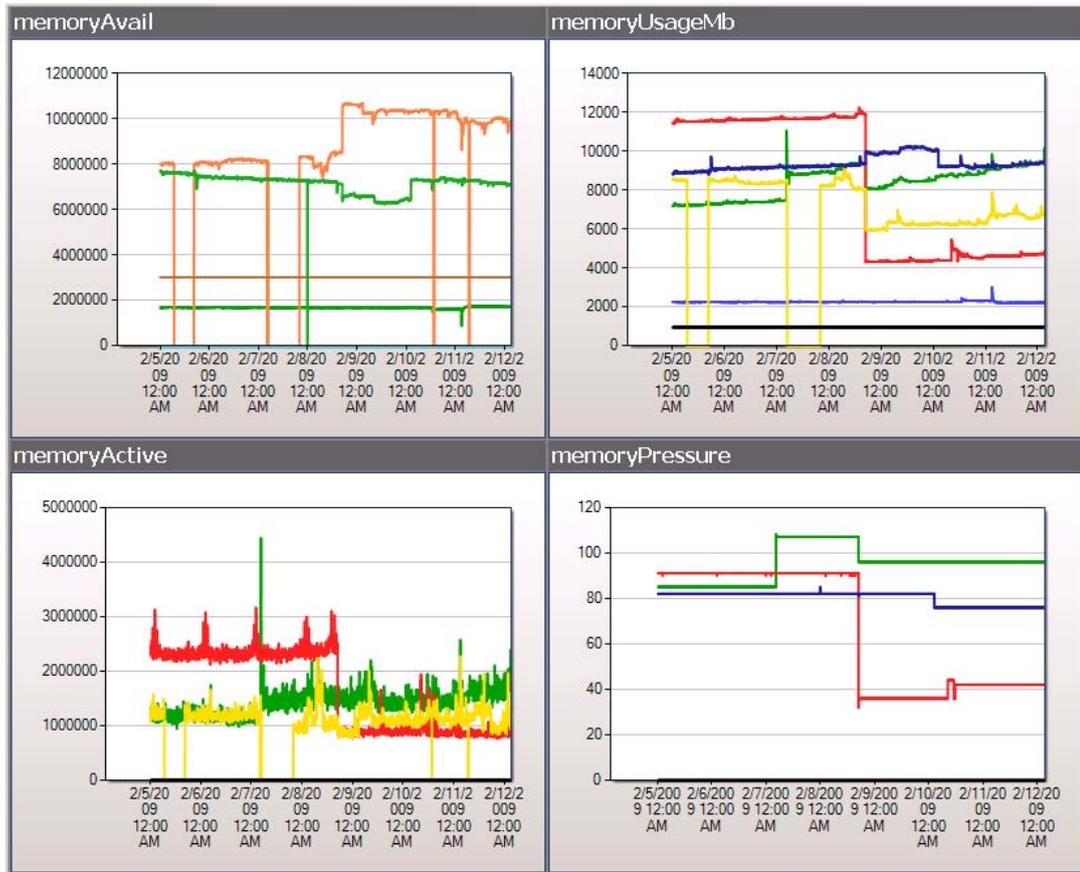

Picture 3. CPU Usage Performance View

Picture 4. All vSphere State View

In addition to general vSphere environment performance data, the nworks MP calculates vSphere-specific metrics, for example, the *Memory pressure* level. Memory pressure reflects the ratio of allocated VM memory to the available physical memory, and shows the level of memory over-commitment for both ESX hosts and Clusters. This metric is unique to the nworks MP.

Picture 5. Memory Usage Performance View

The nworks MP gathers many categories of performance data and events from vSphere, including security, status/state-change, object creation or deletion, and other management and admin actions. All alerts for nworks managed objects are displayed on the *Alerts* view.

Picture 6. All vSphere Alerts View

The lower pane of the Alerts view displays detailed information on the selected alert, as well as Knowledge Base data (general information, possible resolution and helpful links).

To view the status of rules and monitors operating for a specific vSphere object, and to get historical state changes and additional knowledge for alerts they trigger, right-click any vSphere object to browse to the Health Explorer.
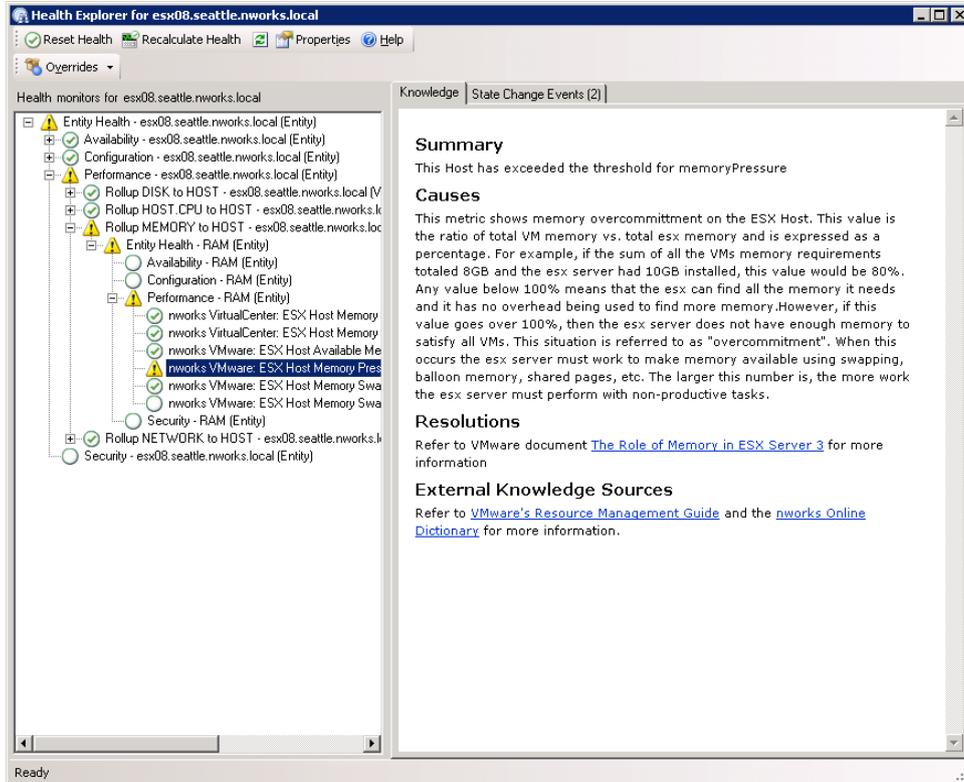
Picture 7. Health Explorer

CONCLUSION

The ideal solution for monitoring and management of VMware should allow you to:

- **Leverage your investments in Microsoft System Center Operations Manager.** Integrating with Ops Mrg, the nworks MP provides full visibility of vSphere through a 'single pane of glass' and enables all standard EMS functions — performance, events and state monitoring, reporting and auditing, receiving notifications and so on.

- **Provide enterprise scalability and performance.** Efficiency of the nworks MP is proven at more than 500 customers, including Siemens, Intel, BBC, Daimler, Electrolux and others.

- **Achieve visibility and monitoring.** The nworks MP offers provides more than 300 VMware metrics and alerts, hardware alerts, out-of-the-box 'smarts', graphs and reports to build detailed health model.

- **Use a single solution for physical and virtual infrastructures.** With the nworks MP, you can monitor your mission-critical applications – and the vSphere where they run.

- **Minimize additional costs.** The nworks MP enables you to lower your deployment and support costs and elevate staff skills without further training.

- **Stay future-proof.** VMware Ready Optimized certification means you can monitor and manage all vSphere features with full confidence from Ops Mgr 2007.

ABOUT VEEAM

Veeam Software, a premier-level VMware Technology Alliance Partner and member of the VMware Ready Management program, provides innovative software for managing VMware Infrastructure. Veeam offers an award-winning suite of tools to assist the VMware administrator, including #1 for VMware backup: Veeam Backup & Replication; Veeam Reporter Enterprise, for VMware performance, storage, capacity reporting and chargeback; Veeam Configurator, offering Host Profiles today; and Veeam Monitor, for VMware performance monitoring and alertingacross multiple vCenters. With its acquisition of nworks, Veeam's products include the nworks Smart Plug-in and the nworks Management Pack that incorporate VMware data into enterprise management consoles from HP and Microsoft. Learn more about Veeam Software by visiting www.veeam.com.