

Monitoring a VMware ESX/ESXi Environment



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Introduction

HP offers software products that can be integrated into a solution that monitors the health, performance, and availability of system resources in a VMware ESX/ESXi environment. This document describes how the following HP products can help you manage your VMware ESX/ESXi environment.

- HP Operations Manager for Windows 8.00 or HP Operations Manager for UNIX/Linux 9.00
- HP Operations agent 8.60
- HP Performance Agent 5.00
- HP Smart Plug-in for Virtualization Infrastructure 1.50 or later.
- HP Performance Manager 8.20 - Optional

You can also use HP GlancePlus for real-time monitoring and HP SiteScope for agent less monitoring. This document, however, does not directly address those two products.

Target Audience

Administrators of HP Operations Manager and virtualization domains can benefit from the information in this document. An understanding of the HP Operations agent, HP Performance Agent, and the Virtualization Infrastructure SPI is recommended for implementing the solution.

Terms Used in the Document

The following abbreviations and acronyms are used in this document:

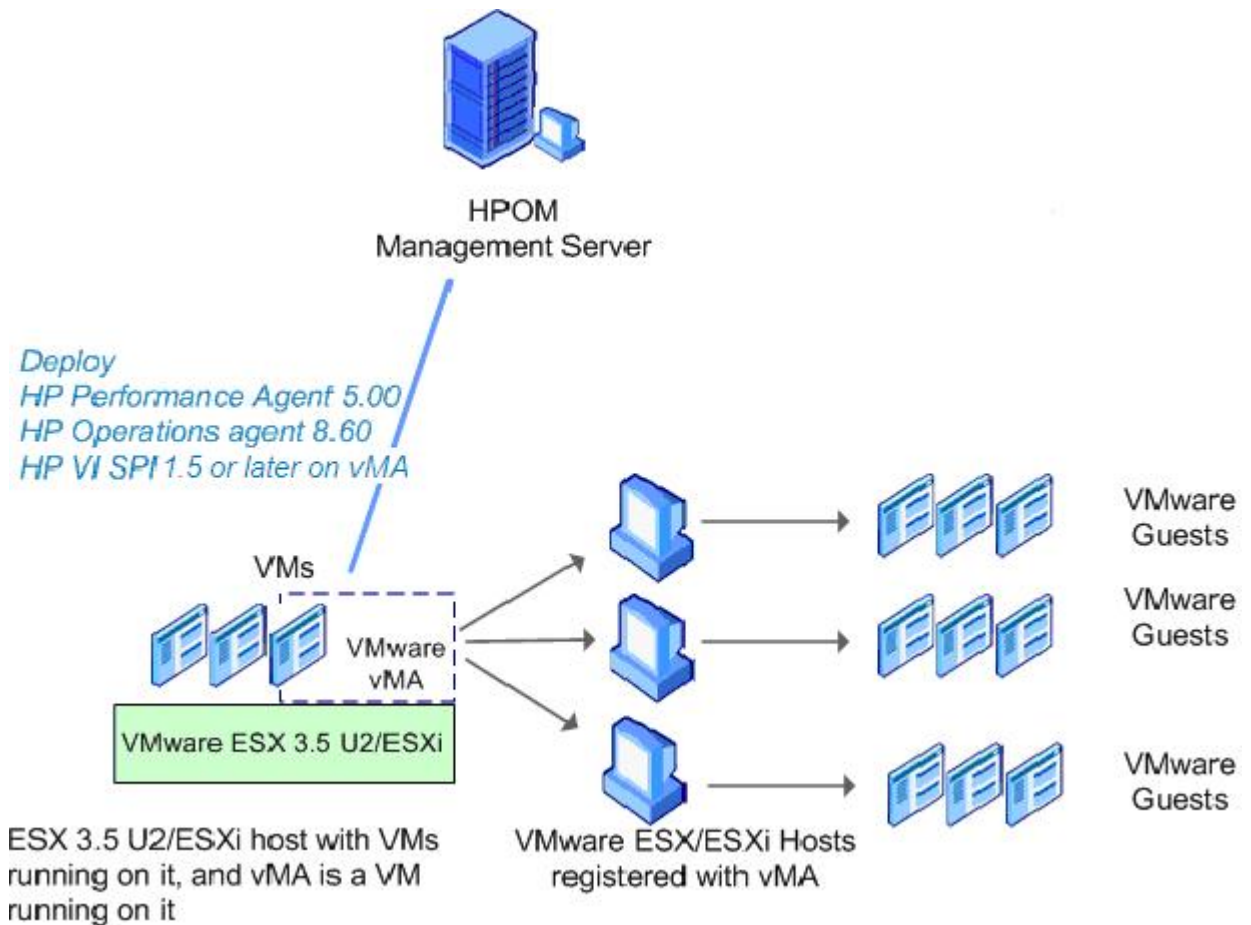
- HPOM HP Operations Manager
- VI SPI HP Smart Plug-in for Virtualization Infrastructure
- DRS Distributed Resource Scheduler
- vMA vSphere Management Assistant
- VM Virtual machine
- Host VMware ESX/ESXi server or host
- Guest Virtual machine hosted on VMware ESX/ESXi hosts
- Resource pool Logical group of hosts and guests

How the Monitoring Solution Works

The monitoring solution for a VMware ESX/ESXi environment that is deployed on a vMA enables you to:

- Gather the availability and capacity information of multiple VMware ESX/ESXi hosts, guests, and resource pools associated with the hosts.
- Monitor the performance of VMware ESX/ESXi hosts and guests.

The following illustrates a typical VMware environment with the monitoring solution deployed on a vMA.



The illustration shows that the HP Performance Agent, HP Operations agent, and the VI SPI are deployed on a vMA, which is a virtual machine hosted on a VMware ESX/ESXi host. It is used to perform most of the tasks performed in the ESX/ESXi service console. vMA is a standard used to run scripts or agents that manage VMware ESX/ESXi hosts and guests.

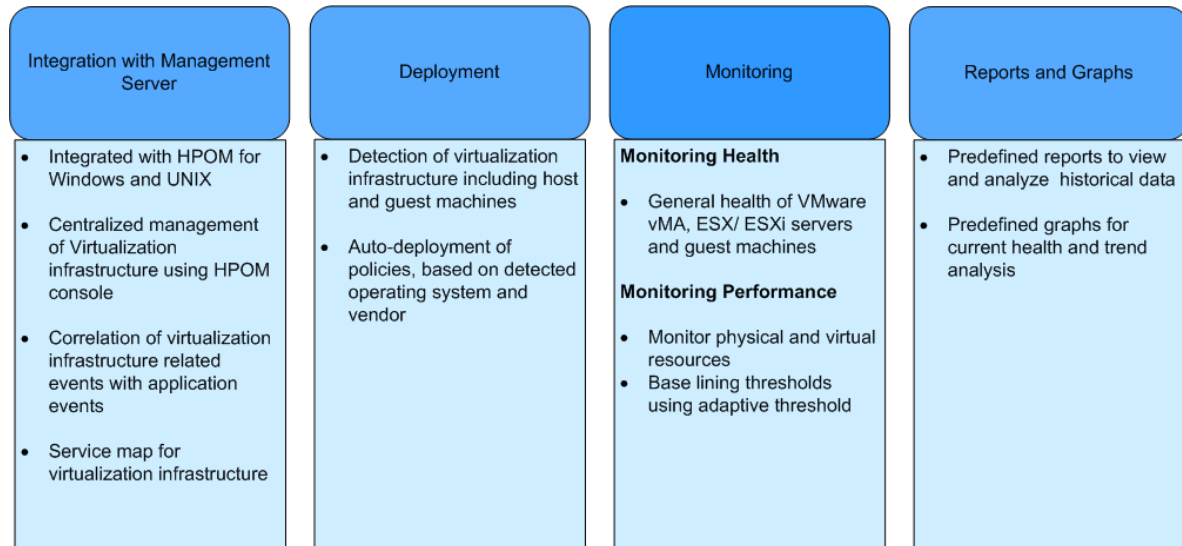
The monitoring solution is designed to work in a vMA environment. A single vMA installation is sufficient to manage events and performance data for multiple VMware ESX/ESXi hosts, guests, and associated resource pools.

The advantages of running the monitoring solution on a vMA are the following:

- You can monitor several VMware ESX/ESXi hosts, guests, and resource pools with a single instance of the HP Performance Agent, HP Operations agent, and the VI SPI.
- No overhead on the VMware ESX/ESXi hosts to monitor the virtual environment.

Features of the Monitoring Solution

The monitoring solution provides the following functionality:



HP Products Integrated with the Monitoring Solution

The following products constitute the monitoring solution:

- **HPOM** -- The HPOM console enables you to manage and view the events related to the performance, availability, and capacity of system resources. With HPOM, you can deploy policies, the alarm definition file, the HP Operations agent, and the VI SPI to the vMA, which acts as a managed node.
- **HP Operations agent** -- The HP Operations agent deployed on the vMA provides operational capabilities and ensures secure communication between HPOM management server and vMA.
- **HP Performance Agent** -- HP Performance Agent, when deployed on a vMA, provides a rich set of logical system (BYLS) metrics to collect the performance and resource utilization data from multiple VMware ESX/ESXi hosts, guests, and resource pools associated with hosts.

To see a complete list of the BYLS metrics on a Linux platform provided by the HP Performance Agent, click [HP Performance Manager 5.00 metric list](#).

The HP Performance Agent can be installed on the VMware guests for in-depth monitoring of the system resources allocated to the guests. It can provide guest metrics apart from the metrics provided for a standalone physical node.

- **VI SPI** -- The VI SPI is installed on the HPOM server and deployed on the vMA. The VI SPI automatically discovers VMware ESX/ESXi hosts and guest in your virtual environment. It provides preconfigured policies and tools that monitor the operations, availability, and performance of the discovered VMware ESX/ESXi hosts, guests, and resource pools.

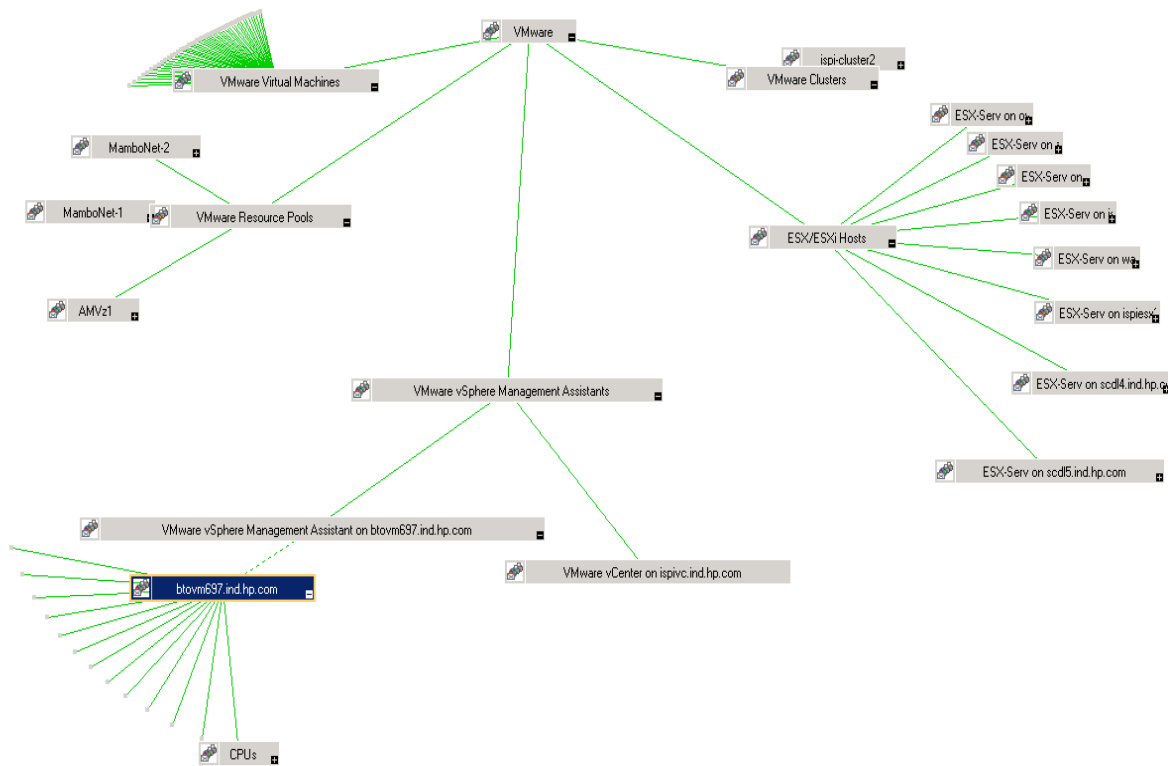
VI SPI policies with pre-defined thresholds keep constant vigilance over the VMware ESX/ESXi hosts and guests and improve monitoring schedules in the form of service map alerts and messages. Some of the policies provided by the VI SPI are the following:

- **Auto Discovery policy** -- Finds all the virtual machines on an ESX/ESXi host. From the discovery data, it creates a service model depicting the VMs and their hosting servers.

- **Availability policy** – Enables you to know the current state of the host machine and guest virtual machine. You can check if the host machine is working or not, and whether the virtual machine is not responding or has stopped working.
- **Capacity policy** – Monitors VMFS space, VM memory usage, and disk utilization.
- **Performance policy** – Monitors the performance of CPU, memory, and network interface.
- **Event Monitoring policy** – Monitors the VMware Event Type Policy, Distributed Resource Scheduler (DRS) Event Policy, VM Creation or Removal Event Policy, VM Suspended and Resumed Event Policy, and other policies.
- **DRS Event policy** – Checks for various DRS conditions, including DRS entered standby model, DRS entering standby mode, DRS VM powered on event, DRS exiting standby mode, DRS enabled, and DRS disabled.

The following graphic shows a service map discovered by the VI SPI in VMware ESX/ESXi environment.

View in display: Contains or Uses



The graphic shows the discovered ESX/ESXi hosts, virtual machines, and VMware resource pools.

HP Performance Manager (Optional)

HP Performance Manager deployed on HPOM enables you to create graphs based on the data collected by the Performance Agent. This aids in in-depth performance analysis of various VMware ESX/ESXi hosts, guests, or resource pools.

Deploying the Monitoring Solution

Before you deploy the monitoring solution in your VMware ESX/ESXi environment, you must have a vMA installed and configured on a VMware ESX/ESXi host. For information on how to install and configure the vMA, go to the following links:

<http://www.vmware.com>

<http://www.vmware.com/go/vma/>

http://www.vmware.com/support/developer/vima/vima40/doc/vma_40_guide.pdf

You must apply the latest patches of the HP products, which you can access from the following link:

<http://h20230.www2.hp.com/selfsolve/patches>

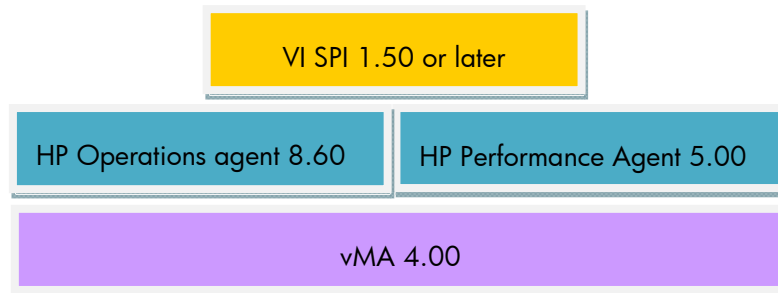
Deploying the monitoring solution in your VMware ESX/ESXi environment, consists of the following tasks:

Task 1: Make sure that the prerequisites for installing HP Operations agent and HP Performance Agent are met on the vMA. Click [here](#) to see the prerequisites.

Task 2: Install HP Operations agent, and then install HP Performance Agent on the vMA. Click [HP Operations agent](#) and [HP Performance Agent](#) to see the installation instructions.

Task 3: Make sure that the prerequisites for installing VI SPI are met on the vMA. Click [here](#) to see the prerequisites.

Task 4: Install VI SPI 1.5 or later on the vMA. Click [VI SPI](#) to see the installation instructions.



Prerequisites for Installing the HP Performance Agent and Operations Agent

You must have superuser or root privileges to use the vMA. To obtain superuser or root privileges, follow these steps:

1. Log on to the vMA as the vi-admin user, and enter the following command:

```
$ sudo bash
```

```
< type vi-admin's password>
```

```
# < This provides the root privileges >>
```

2. Make sure that the following prerequisites are met:

Prerequisite 1 - By default, vMA does not open the port 383 required for communication between vMA and HPOM. To open the ports on vMA to enable communication across firewall, enter the following command:

```
iptables -I RH-Firewall-1-INPUT 3 -p tcp -m tcp --dport 383 --tcp-flags SYN,RST,ACK SYN -j ACCEPT
```

To save this configuration setting so that it is available after restarting the system, run the following command:

```
iptables-save
```

Prerequisite 2 – Make sure that the portmap service is enabled.

- To check that portmap is enabled, run the following command:

```
chkconfig --list portmap
```

- To enable portmap for run levels 2, 3, 4 and 5, run the following command:

```
chkconfig --level 2345 portmap on
```

Prerequisite 3 – Register all the VMware ESX/ESXi hosts that need to be monitored with vMA:

- Enter the following commands:

```
vifp addserver <ESX/ESXi hostname>
```

```
vifp listservers
```

(This shows that the ESX/ESXi hosts are registered with vMA.)

- For more details, enter the following command:

```
vifp help
```

Prerequisite 4 – Disable the floppy drive on the vMA. If the floppy drive is not disabled, I/O errors will occur that will cause problems in the HP Performance Agent connectivity to ESX/ESXi hosts for data collection.

To disable the floppy drive, follow these steps:

1. Connect to the ESX/ESXi Server hosting vMA 4.0 using the VI infrastructure client.
2. Click **vMA 4.0**.
3. Stop vMA.
4. Click the **Summary** tab, and then click **Edit Settings** → **Options** tab → **Boot Options**.
5. Enable the Force BIOS Setup page.
6. Restart the vMA. It stops at BIOS setup.
7. Disable the floppy drive.

Prerequisite 5 – By default, the vMA has a host name as an alias for 127.0.0.1 in the `/etc/hosts` directory. Remove this entry from the file. If you do not remove this entry, the local host requests the agent certificate instead of the required host, which will cause communication problems between the HP Operations agent and the HPOM management server.

Prerequisite 6 – Increase the RAM size for the vMA to 1GB. The default RAM size is 512 MB.

Installing the HP Operations agent

Make sure that the prerequisites are met and then follow these steps:

1. Move the HP Operations agent package from the following directory on the management server to a temporary directory on the vMA:
 - On HPOM for Windows:

```
%ovdatadir%\shared\Packages\HTTPS\linux\linux\2.6\x64\Operations-agent\
```

- On HPOM for UNIX:

```
/var/opt/OV/share/databases/OpC/mgd_node/vendor/linux/x64/linux26<HPOM_version>/RPC_BBC/
```

2. To install the product with the vi-admin user:

- a. Log on to the vMA as the vi-admin user.
- b. Enter the following command:

```
sudo bash
```

The command line prompts you for the password of the vi-admin user.

- c. Specify the password of the vi-admin user.
- d. You can either deploy the HP Operations agent from the management server or you can install the HP Operations Agent on the vMA virtual machine.

HPOM for Windows 8.xx: See the “Configuring Agents” topic in HPOM for Windows online help.

HPOM on UNIX/Linux 9.00 management servers: See the instructions in the “Installing HPOM Agents on the Managed Nodes” chapter in the *HP Operations Manager for UNIX Administrator’s Reference Guide*. Also see the instructions in the “Working with HTTPS Managed Nodes” topic in the *HTTPS Agent Concepts and Configuration Guide* available at the following link:

http://h20230.www2.hp.com/selfsolve/document/KM746040/binary/OMU9_HTTPSAgent_ConceptConfig.pdf?searchIdentifier=18890701%3a12677232405%3a-18a1&resultType=document

Installing the HP Performance Agent

Make sure the prerequisites are met and then follow these steps:

1. Log on to the vMA virtual machine as the vi-admin user.
2. Enter the following command:

```
sudo bash
```

The command line prompts you for the password of the vi-admin user.

3. Specify the password of the vi-admin user.

You can either deploy the Performance Agent from the management server or you can install the Performance Agent on the vMA.

To install HP Performance Agent deployables on the HPOM management server, see the instructions in the *HP Performance Agent Deployables Installation Guide* available at the following link:

http://h20230.www2.hp.com/selfsolve/document/KM817311/binary/OMU8_9_PA_Deploy_Installation.pdf?searchIdentifier=5b22d9a5%3a126f600a568%3a-69e&resultType=document

To install the HP Performance Agent on the node, see the instructions in the “Installing Performance Agent” section in the *HP Performance Agent (Linux) Installation and Configuration Guide* available at the following link:

http://h20230.www2.hp.com/selfsolve/document/KM817305/binary/PA5_Linux_InstallConfiguration.pdf?searchIdentifier=18890701%3a12677232405%3a-15c8&resultType=document

Prerequisites for Installing the VI SPI

Make sure that the following prerequisites are met:

Prerequisite 1 – The HP Operations agent and HP Performance Agent must be installed first.

Prerequisite 2 – Make sure that the Performance Agent collects logical class (BYLS) metrics by updating the parm file, which is available in the following directory:

```
/var/opt/perf
```

In the parm file, append the logicalsystem key word for the Performance Agent to collect the BYLS metrics as follows:

```
log global application process device=disk,cpu,lan,filesystem transaction  
logicalsystem
```

Prerequisite 3 – Make sure that BYLS data is collected. To make Scopeux log BYLS data, go to the /opt/perf/bin/ directory and enter the following command:

```
ovpa restart scope
```

This allows the Performance Agent to collect BYLS data for some intervals. After collecting BYLS data for some intervals, go to the /opt/perf/bin/ directory, and enter the following command to verify that the BYLS data is collected:

```
extract -xp -i
```

This command generates the xfrdLOGICAL.asc file. Check this file to verify that BYLS data is present.

Prerequisite 4 – Make sure that the Performance Agent collects data related to VMware ESX/ESXi hosts/guests/resource pools through BYLS class.

Go to the /opt/OV/bin directory and enter the following command to check that BYLS data is collected by the Performance Agent:

```
ovcodauti1 -dumpds SCOPE | grep BYLS
```

Installing VI SPI

Before installing VI SPI, make sure the [prerequisites](#) are met. VI SPI 1.5 is a part of the Infrastructure Smart Plug-in 1.00 (iSPI 1.00) media. VI SPI 1.6 is a part of the Infrastructure Smart Plug-in 1.60 (iSPI 1.60) media.

You can deploy the Infrastructure Smart Plug-in (iSPI) from the HPOM console. Click on the link below to access the instructions in the *HP Operations Smart Plug-ins for Infrastructure Installation Guide*.

http://h20230.www2.hp.com/selfsolve/document/KM777976/binary/SPI_Virtual_Infrast1.0_InstallGd.pdf?searchIdentifier=-4e240451:12618bb9bab:2d8f&resultType=document

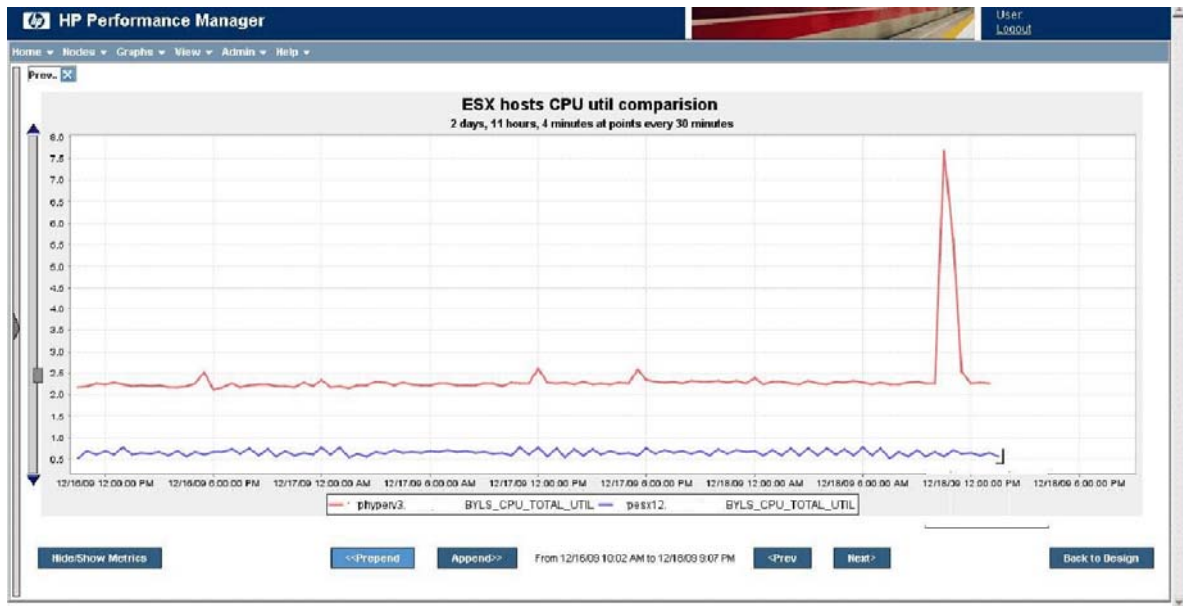
Deployment Examples

The following examples illustrate the types of deployment scenarios that can be monitored using this monitoring solution.

Integration of HP Performance Agent and HP Performance Manager

Example 1

The following graph generated by HP Performance Manager compares the CPU utilization of two different VMware ESX hosts. The graph is generated based on the data collected by the Performance Agent installed on the vMA. In this example, both VMware ESX hosts are registered to the vMA.



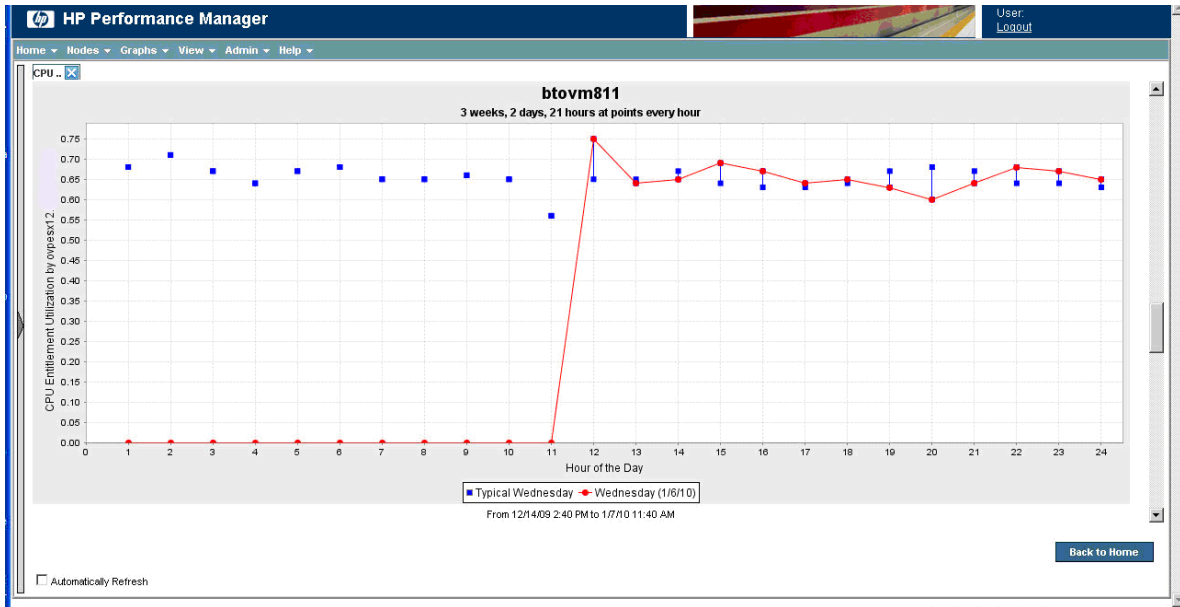
Example 2

The following graph generated by HP Performance Manager shows the memory utilization of two guests running on a VMware ESX host. The graph is generated based on the data collected by the Performance Agent installed on the vMA.



Integration of HP Performance Manager and VI SPI

The following graph generated by HP Performance Manager compares current performance with baseline performance based on the data collected by the VI SPI. The graph compares the CPU entitlement utilization of a VM on a Wednesday with the CPU entitlement utilization on a typical Wednesday, which is the baseline. (Baseline is derived based on the historical data.) An alert is generated when the current CPU entitlement utilization is below or above the baseline.



VI SPI Policies

The following examples illustrate how the VI SPI policies can help identify common issues that occur while monitoring the VMware ESX/ESXi environment. The examples include only some of the VI SPI policies.

Example 1: VI-VMwareVMPoweredOnOffEvent Policy

The following graphic shows an event generated on the HPOM console. This event indicates that the VM is powered off. The event was generated because the VI-VMwareVMPoweredOnOffEvent policy was running on the vMA. Events are generated when VM is powered on. These events provide the host/guest availability information in the ESX/ESXi environment.

Severity	Dup.	SUIAONE	Time Received	Node	Application	MsgGrp	Object
Warning	--X--X-		16:34:11 01/12/10	phyerv3	VMware	Virtualization	VMFS Low disk space has been detected on storage device 'Storage1' with device No 'mpx.vmhba0:C0:T0:L0 connected to host : phyerv3
Warning	--X----		14:47:28 12/14/09	phyerv3	VMware	Virtualization	Virtual machine b7sb1-apps was powered off - VM Name : b7sb1-apps Ser
Warning	--X----		14:47:28 12/14/09	phyerv3	VMware	Virtualization	Virtual machine b7sb1-bac was powered off - VM Name : b7sb1-bac Ser
Warning	--X----		14:24:27 12/14/09	phyerv3	VMware	Virtualization	Virtual machine b7sb1-apps was powered off - VM Name : b7sb1-apps Ser
Warning	--X----		14:24:27 12/14/09	phyerv3	VMware	Virtualization	Virtual machine b7sb1-bac was powered off - VM Name : b7sb1-bac Ser

The VI-StateMonitor policy also provides host/guest availability and VM state information.

Example 2: VI-VMwareVMFSUtilizationMonitor Policy

The following graphic shows an event generated on the HPOM console. This event alerts you about the low disk space in one of the disks attached to the ESX/ESXi host. This event was generated because the VI-VMwareVMFSUtilizationMonitor policy was deployed on the vMA virtual machine.

Severity	Dup.	SUIAONE	Time received	Node	App	MsgGrp	Object
Warning	--X--X-		16:34:11 01/12/10	phyerv3	Virtualization	VMFS	Low disk space has been detected on storage device 'Storage1' with device No 'mpx.vmhba0:C0:T0:L0 connected to host : phyerv3
Warning	--X----		14:47:28 12/14/09	phyerv3	Virtualization	b7sb1-apps	Virtual machine b7sb1-apps was powered off - VM Name : b7sb1-apps Ser
Warning	--X----		14:47:28 12/14/09	phyerv3	Virtualization	b7sb1-bac	Virtual machine b7sb1-bac was powered off - VM Name : b7sb1-bac Ser
Warning	--X----		14:24:27 12/14/09	phyerv3	Virtualization	b7sb1-apps	Virtual machine b7sb1-apps was powered off - VM Name : b7sb1-apps Ser
Warning	--X----		14:24:27 12/14/09	phyerv3	Virtualization	b7sb1-bac	Virtual machine b7sb1-bac was powered off - VM Name : b7sb1-bac Ser

Low disk space has been detected on storage device 'Storage1' with device No 'mpx.vmhba0:C0:T0:L0 connected to host : phyerv3. This may affect the performance of VMs hosted on this system unless the symptom is treated effectively.
 Disk utilization (%) = 81.96 (threshold=80)
 Filesystem = VMFS
 Location = /vmfs/volumes/4a301db9-8da4bb99-e93f-0022642dd506

Example 3: VI-VMwareVMMemoryPerformanceMonitor Policy

The following graphic shows an event generated on the HPOM console. The event indicates that the memory is above the threshold limit in one of the virtual machines. This event was generated because the VI-VMwareVMMemoryPerformanceMonitor policy was deployed on the vMA virtual machine. Performance-related events about CPU, memory, and network interface are reported as a result of the performance policies that are packaged with the VI SPL.

Severity	Dup.	SITUATION	Time Received	Node	Application	MsgGrp	Object	Message Text
Minor		--X--X--	20:48:19 01/12/10	esx6win1	VMware	Virtualization	esx6win1	The swap utilization level on the virtual machine esx6win1 is
Minor		--X--XX-	20:34:36 01/12/10	esx6win1	VMware	Virtualization	esx6win1	The swap utilization level on the virtual machine esx6win1 is
Minor		--X--X--	11:38:51 01/11/10	esx6win1	VMware	Virtualization	esx6win1	The swap utilization level of the virtual machine esx6win1 is

The swap utilization level on the virtual machine esx6win1 is 78.22%. It has reached or exceeded a minor threshold of 55%. This indicates the virtual machine esx6win1 is starving for memory.

Example 4: VI-VMwareVMMemoryUsage-AT Policy

The following graphic shows an event generated on the HPOM console. The event indicates that the memory usage of the VM is above or below the normal usage. It also provides a standard deviation of the memory usage along with minimum or maximum memory usage information. This event was generated because the VI-VMwareVMMemoryUsage-AT policy was deployed on the vMA virtual machine.

The threshold is derived from the historical data, and the value is not static. The AT keyword in the policy name indicates Adaptive Threshold. The Adaptive Threshold concept is used to determine threshold values using the historical records for performance characteristics and usage patterns of infrastructure resources. This is used instead of the fixed threshold values specified in the policies.

Warning		--X--X-	22:23:37 01/12/10	btovm811	OS	System	Memory Utili...	Memory usage level reaching ne
Warning		--X--XX-	22:08:48 01/12/10	btovm811	OS	System	Memory Utili...	A memory bottleneck symptom h
Warning		--X--XX-	21:47:10 01/12/10	btovm811	VMware	Virtualization	GUEST esx...	The memory usage level for GUE
Normal								
Minor								
Warning								
Minor								
Major								
Minor								
Minor								
Warning								

The memory usage level for GUEST esx6win1 is much lower than normal

Current Average: 1537.5000

Historical Average: 1585.0800

Standard Deviation: 13.1527

WarningMax: 1617.96175

WarningMin: 1552.19825

MinorMax: 1624.5381

MinorMin: 1545.6219

Troubleshooting

Installation

Problem: Unable to get superuser/root privileges

Solution: To get the root privileges (during installation or post installation) on vMA, type the following command after logging in with the vi-admin user login:

```
$ sudo bash
```

The command line prompts you for the password of the root user. Enter the password.

Problem: Issuing certificates on a vMA

Solution: On the vMA virtual machine, check if an entry exists with the IP address 127.0.0.1 in the hosts file available in the /etc directory. If this entry contains the vMA virtual machine's hostname, remove the entry so that only localhost and localhost.localdomain remain.

Problem: VI SPI discovery (incomplete service map), or the HP Performance Agent is unable to collect BYLS data

Solution: Check that logicalsystems entry is present in the parm file available in the /var/opt/perf directory, and check that the HP Performance Agent is collecting BYLS data.

Check that the ESX/ESXi hosts are registered with vMA. If they are not registered, add ESX/ESXi hosts using the following command:

```
vifp addserver <ESX/ESXi hostname>
```

To check if the VServer process is running, enter the following command:

```
/opt/perf/bin/perfstat
```

If the VServer process is not running, make sure that at least one of the processes - scopeux, perfd, glance, or xglance - is running.

Check for errors in the status.VServer file available in the /var/opt/perf directory.

Make sure that the .viserver.lock file does not exist in the /var/opt/perf directory before you restart the VServer.

Operational Problems

To check the status of the HP Operations agent/HP Performance Agent:

1. Go to the /opt/OV/bin directory, and run the ovc -status command.
2. To see the status of the HP Performance Agent, go to the /opt/perf/bin directory, and run the ovpa -status command.
3. To check if the HP Performance Agent is collecting BYLS data, go to the /opt/OV/bin directory and run the following command to check if Performance Agent is collecting the BYLS data:

```
ovcodutil -dumpds SCOPE | grep BYLS
```

This shows the values for some of the BYLS metrics.

Example:

```
.....  
01/28/10 07:55:00 PM|BYLS_CPU_PHYS_USER_MODE_UTIL |1.48|  
01/28/10 07:55:00 PM|BYLS_CPU_PHYS_SYS_MODE_UTIL |0.00|  
.....
```

4. To check if the policies are deployed on the vMA virtual machine, go to the opt/OV/bin/ directory and run the following command:

```
ovpolicy -list
```

Policy names that are prefixed with VI-VMware refer to the VI SPI policies for VMware. VI-Discovery is a VI Discovery policy. In addition to these policies, SI-SystemDiscovery policy must also be present.

Running Discovery Manually

1. On the vMA virtual machine, go to /opt/OV/bin directory and run the following commands:

```
ovagtrep -run SI-SystemDiscovery  
ovagtrep -run VI-Discovery  
ovagtrep -publish
```

2. On the HPOM management server, run the following command:

```
opcservice -assign opc_admin AutoDiscovery (applicable on HPOM on UNIX/Linux 9.00)
```

VI SPI Discover Fails

The VI-Discovery policy cannot discover guests if you do not set the following entity:

```
AutoAdd_Guests=true in the InfraSPI-ServerSettings Node Information policy.
```

Communication Across Firewall is Disabled

Open port 383 and enable communication across firewall. Check [Prerequisite -1](#) for more information.

VI-StateMonitor Policy Fails

VI-StateMonitor policy functions only if you set the AlertOnPlannedOutage parameter value to True.

References

To see the documentation available on HP Products, check the following link

<http://h20230.www2.hp.com/selfsolve/manuals>

To see a technical document on using HP Performance Agent 5.00 for performance monitoring of ESXi environment, click [HP Performance Agent 5.00 Performance and Scalability Guide on vMA](#)

To see more information on VMware virtual environment, check the following link

<http://www.vmware.com>