Virtualization management
with HP Server Automation and HP Insight Dynamics - VSE
in a HP BladeSystem environment

Introduction

If you're in a data center environment, you may already be using server virtualization to use resources more efficiently, lower costs and increase flexibility. You may also be finding that virtual environments bring their own set of management challenges. Some of you may be to the point where you have realized that the management of virtual environments requires the same management and control as the physical infrastructure -- from deployment to monitoring to securing, compliance and change management.

Figure 1 below lists the challenges customers are facing today related to virtualization in the data center and how HP Server Automation software and HP Insight Dynamics - VSE work together to meet those challenges.

Figure 1: HP Server Automation and HP Insight Dynamics - VSE meeting the challenges of virtualization management

Challenge
Application compliance with operating systems and application policies applied across both physical and virtual resources
Mature change and configuration controls applied to both physical and virtual resources
End-to-end mapping of both physical and virtual resources from the applications to the infrastructure
Control of virtual machine creation preventing extensive sprawl
Easy determination of virtualization candidates
Freedom and flexibility to manage physical resources as if they were virtual
Optimization of both physical and virtual resources in real-time from the same user interface
Affordable everyday high availability
Detailed knowledge of the infrastructure including resource utilization and energy usage

HP Server Automation

Optimized for software management

HP Insight Dynamics - VSE

Optimized for HP server management

Insight Dynamics - VSE continuously analyzes and optimizes the physical and virtual HP server infrastructure, while Server Automation monitors the software configuration and compliance, providing comprehensive management of business applications.

HP Server Automation

Server Automation software goes beyond managing servers independently. It provides server lifecycle management for enterprise servers and applications, from discovery to provisioning, patching to configuration management, script execution to compliance assurance. Server Automation also automates operations and processes across disparate IT teams and systems.

Server Automation is integrated with other HP Data Center Automation software such as process automation with HP Operations Orchestration for a single view of your enterprise application environment.

Key features

Server Automation can enable you to:

- o Respond to business requirements with speed and agility by automating server lifecycle management

- o Reduce operating costs and increase productivity by automating common, operational tasks

- o Proactively manage regulatory compliance

- o Control virtual machine sprawl

- o Accelerate application release management

- o Span operational silos through a single view of application dependencies, network details, server hardware and configuration information

Server Automation (Figure 2) supports a distributed architecture that enables global scalability. It can manage tens of thousands of servers in different subnets in data centers around the world, running Windows, Linux, and various UNIX operating systems, including HP-UX 11i, and hypervisors such as VMware across hardware from a multitude of vendors.

Figure 2: HP Server Automation
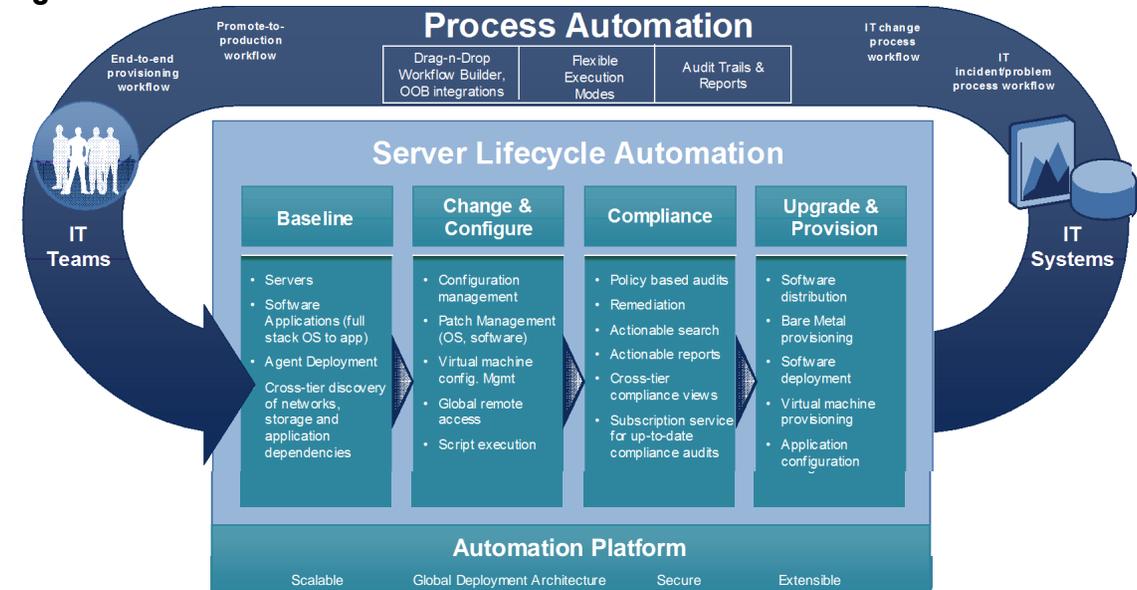
Visibility and control

Server Automation enables you to bring the entire server environment under management quickly and gain unprecedented visibility into servers and operations. After bringing servers under management through an automated process, Server Automation provides a high degree of flexibility for managing and reporting server and application operations. The server explorer facilitates easy browsing of operating systems, patches, and applications across a heterogeneous group of servers. The global shell and Windows PowerShell interfaces let you run automation scripts easily and with enhanced security features across multiple servers at once. All administrator actions are stored and digitally signed in a central data repository for performing compliance and IT reporting. With a record of all changes and server and business application views, Server Automation provides deep visibility and increased control for your application environment.

Change and configuration management

Without automation, IT activities such as application and patch installation can consume countless hours of administrator time. Server Automation supports operating system and application provisioning, as individual tasks or as one sequence. Policies created to manage best practices for operating system and software configurations can be defined by subject matter experts. These policies can be shared and utilized by administrators in any location, ensuring compliance with corporate standards across all servers in all data centers.

Server Automation offers powerful capabilities that aid in managing change and configurations. A secure communication channel enables you to access any server under management and view operating system, patch, running services, and audit trail information. Comparisons of current application states with previous points in time quickly identify changes and rollback as necessary.

Compliance management

Server Automation leverages user-defined best practices and provides out-of-the-box policies to proactively manage software configuration settings and to correct or prevent drift. You can audit your entire IT server infrastructure to validate compliance against audit policies and immediately remediate any areas that are out of compliance. You can write policies to cover software installation, application configuration, system configuration, virtualization, network, and storage. In addition, out-of-the-box reports show whether systems comply with regulatory standards. You can use the HP Live Network subscription service to acquire the most up-to-date security and regulatory compliance policies, which you can apply to systems as appropriate. The compliance policies from HP Live Network are drawn from standards such as Center for Internet Security (CIS), Sarbanes-Oxley (SOX), Payment Card Industry (PCI), Health Insurance Portability and Accountability Act (HIPAA), Federal Information Security Management Act (FISMA). New security vulnerability policies are generated daily from the National Vulnerability Database (NVD). Because these policies are configured as HP Server Automation policies, you can add them easily to systems for quick auditing and remediation.

Upgrade and provision

Server Automation provisions operating systems quickly, consistently, and with minimal manual intervention. You can enforce, easily update and patch, and refresh consistent and secure server baselines quickly to meet your corporate standards. For software provisioning, a simple user interface makes it easy for you to create new software policies that contain code, content, scripts, and configurations. All policies, for both software and operating system, are stored in folders with read/write access to foster sharing of policies while maintaining control over who can deploy, edit, and view policies.

For virtual server environments, Server Automation supports provisioning and control of VMware ESX server and Sun Solaris 10 containers. All operating system and software policies can be used across physical and virtual servers.

Process automation

Server Automation, a key component of Data Center Automation Center (Figure 3), provides capabilities to automate operations and processes across disparate IT teams and systems. Integrating with HP Operations Orchestration, Server Automation workflows automatically coordinate and sequence IT processes and its sub-tasks to manage end-to-end operations and to ensure that IT follows best practices. Also, by seamlessly integrating with other products in the Data Center Automation suite, Server Automation offers server administrators deep visibility into network, storage, and business application elements in the data center.

Figure 3: Data center automation center
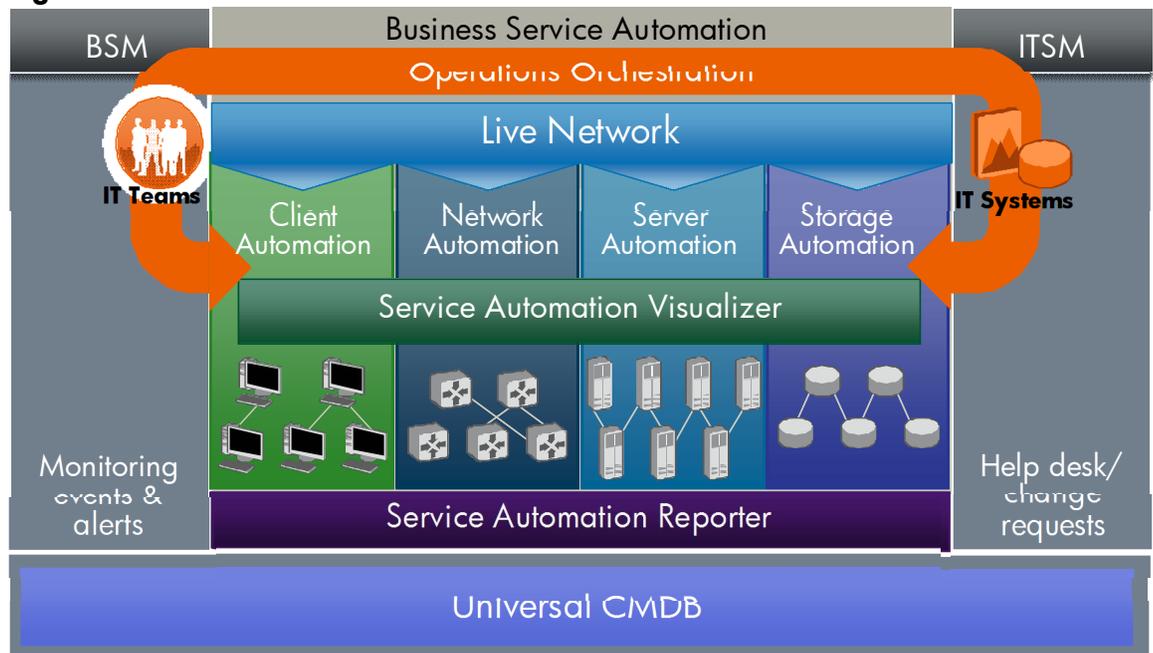
HP Insight Dynamics - VSE

HP Insight Dynamics - VSE is the world's first integrated solution that lets you analyze and optimize physical and virtual resources in the same way. It makes your infrastructure adaptive, with the freedom and flexibility of virtualization delivered across your physical infrastructure. With advanced planning and visualization, it makes change more predictable and easier to manage. HP Insight Dynamics - VSE is the ideal tool to help you continuously consolidate your infrastructure, build a more dynamic test and development infrastructure, provide fast and affordable high availability where it was not cost-effective before, and perform energy-aware capacity planning.

Whereas Server Automation is designed to monitor software configuration and compliance, providing comprehensive lifecycle management of business applications, Insight Dynamics - VSE is designed to visualize, plan, and change the physical and virtual HP server infrastructure.

Insight Dynamics - VSE is integrated by design, delivering capabilities greater than the sum of its parts. HP Insight Dynamics - VSE is based on proven technologies from HP, such as HP Virtual Server

Environment, HP Insight Control, and HP Virtual Connect. The new software seamlessly plugs into HP Systems Insight Manager (HP SIM), the world's most popular platform management tool.

Key features

Insight Dynamics - VSE includes three key capabilities; the logical server, capacity planning, and unified control of physical and virtual infrastructure.

The logical server

A logical server is a management abstraction that simplifies and optimizes the provisioning and re-provisioning of servers (Figure 4). Using logical servers, HP is bringing the management of server blades and virtual machines together under a single management paradigm. When managing resources as logical servers, you can instantiate and control disparate resources in the same manner and with the same tools.

HP Insight Dynamics - VSE software provides a comprehensive set of management capabilities for logical servers, in a solution which has been designed to fit the demands of the production IT environment. Insight Dynamics - VSE frees you from tedious administrative tasks like verifying configuration parameters by performing these checks automatically as prerequisites to management operations. You can save workload configuration information in the form of logical server definitions which can then be brought on-line quickly and dependably as the need arises. You can audit management operations because HP Insight Dynamics - VSE displays status and maintains logs for each operation, even when many operations are concurrent. HP includes in Insight Dynamics - VSE a unique and power graphical user interface which shows the current state of each IT resource — physical, virtual, or logical — in an extremely clean and intuitive format.

Because a logical server is abstracted from the underlying platform, it makes those underlying resources anonymous to the application/operating system stack. A logical server can be created from a discrete physical server, from within a pool of physical resources, or from a virtual machine. From left to right, Figure 4 illustrates logical servers created within a physical resource pool; created using a physical resource pool and a software-based virtual machine; and from a typical discrete server using software-based virtual machines.[1]

A logical server profile describes an abstracted system image[2] (including the system services and resources), whether these are virtual, physical, shared, or unshared. The system image includes everything that the operating system and application stack require to operate on a particular workload. For example, a logical server profile would include attributes describing entitlements such as power allocation, processor and memory requirements, PCI Express devices (local I/O), network connections (distributed I/O), and storage.

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[1] In addition to the discrete network fabrics shown in Figure 1, a unified fabric could also be implemented with RDMA, LAN, and iSCSI support integrated into the Ethernet NIC.
[2] System image is a term that represents the services and components that are exposed to the operating system, including the component-level connection, the node identifiers, and the BIO services and configuration.

Figure 4: Insight Dynamics - VSE logical server abstraction – decoupling the underlying hardware from the application/operating system workload
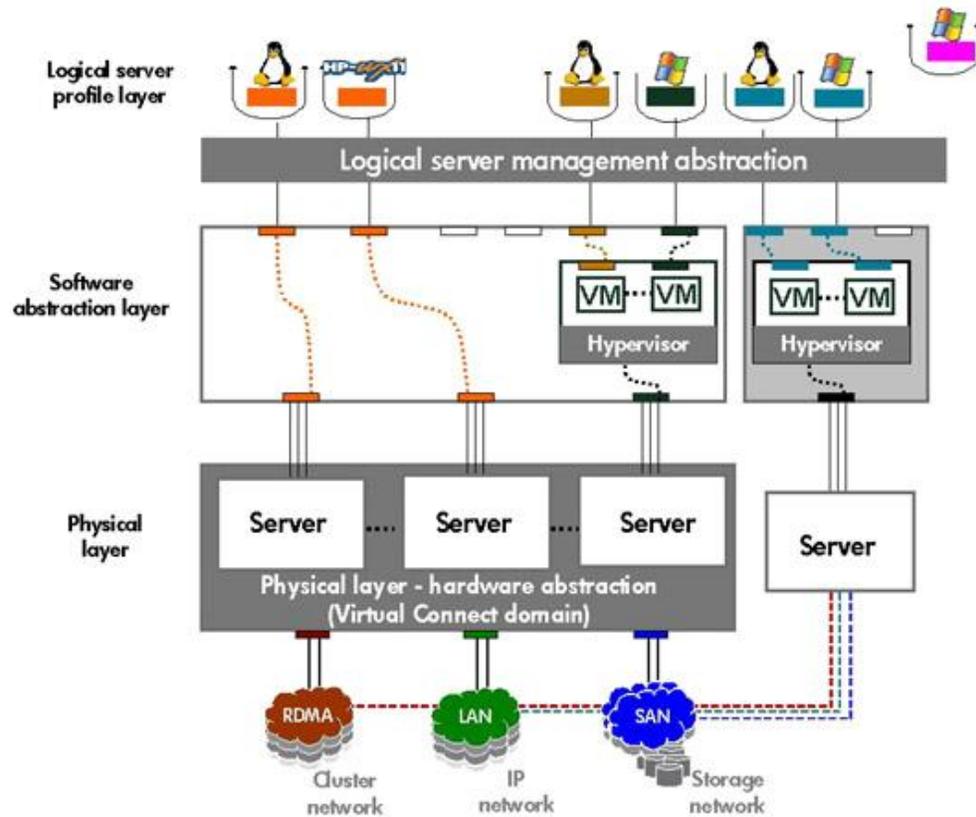
Capacity planning

HP Insight Dynamics - VSE software also includes capacity planning functionality for the evaluation of consolidation, rebalancing, and redesign what-if scenarios. It also includes technology which provides an interactive, five-star rating system during each logical server move operation to indicate which destination is the most appropriate match for a migrating logical server among available physical resources (Figure 5).

The rating system has also been integrated into the logical server management interface so you can see in real time if a logical server can be moved. If so, you can simply drag and drop the logical server to place it in the new location.

In addition, the software includes capabilities that allow you to model utilization limits in order to define service level objectives on system resources, including CPU, memory, disk, network bandwidth and power consumption. Limits can be configured on a global basis or defined for specific workloads, and are also taken into account when recommending targets for the logical server. This technology is especially useful for what-if analysis for the consolidation of multiple workloads onto fewer physical servers.

Figure 5: Insight Dynamics - VSE capacity planning

Unified control

Insight Dynamics - VSE enables you to control physical and virtual resources in exactly the same way (Figure 6). It extends the capabilities of HP SIM management platform to show all available resources on a single screen. Insight Dynamics - VSE is designed to manage leading virtualization technologies from VMware, with full support for Microsoft® HyperV and Citrix planned for a future release (capacity planning functionality supported today). You can drill down as far as you need to without logging into another tool.

Figure 6: Insight Dynamics - VSE unified control

- Visualize and manage logical servers whether they are built on physical or virtual machines

- Work across multiple OSs and virtual machine technologies

- Easily move from high-level environment views to specific management tasks
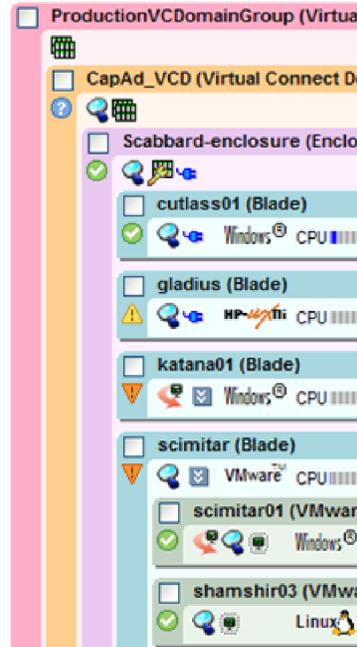
Network Groups and Domains

Blade Enclosures

Integrity and ProLiant Servers

Virtual Servers

Solution components

Insight Dynamics - VSE includes HP Insight Control Environment. Virtual Connect and Virtual Connect Enterprise Manager must be purchased separately. As part of the HP Insight software family they are designed to work together in a fully integrated fashion. See Appendix A for more detail.

Example use cases

The following examples illustrate how Server Automation and Insight Dynamics - VSE work together to maintain control of your data center while allowing for the agility and flexibility that virtualization technology offers.

These examples are not intended to be comprehensive, just illustrative.

Simplifying a technology refresh and consolidation

In this example, 200 older servers need to be refreshed. Most of these 200 servers are running small workloads that with today's technology do not require a dedicated server. In order to move forward with the project there are a number of questions to be answered:

Capacity planning

- ➢ How many new virtual machine host servers will be required to optimally place the 200 workloads into logical servers whether they are physical servers or virtual machines?
- ➢ How do you determine if any of these servers will require dedicated hardware?

- ➢ Do you have data on those various workloads over time to make sure there is sufficient headroom on the virtual machine host to handle peak loads across multiple workloads?
- ➢ How do you plan for the 10% growth expected to happen next year?

Operational deployment considerations

- ➢ How do you make sure, on a continual basis, the infrastructure remains optimized?
- ➢ As you consolidate these workloads, how do you optimize the new infrastructure for power consumption?
- ➢ How do you ensure application compliance to the operating system and applications policies across both physical and virtual infrastructure?
- ➢ How do you apply change and configuration controls across both the physical and virtual infrastructure?

You might be facing many weeks if not months of determining the answers to these questions and even then, many of the answers will be educated guesswork.

Insight Dynamics - VSE in combination with Server Automation can significantly reduce the time and effort required to consolidate applications running on 200 older servers to Virtual Machines and BladeSystem C-class servers. Insight Dynamics - VSE is used to define the logical servers and the optimal place for them based on the customer preference whether it be performance or power consumption. Server Automation will ensure the new virtual machine software stacks are compliant and consistent with established policies.

Consolidation planning

A key component of Insight Dynamics - VSE is capacity planning described earlier in this document. This includes the capability to perform a what-if analysis for the consolidation of multiple applications onto fewer physical servers. This feature is used to determine how many new virtual machine (VM) host servers will be required and how to optimally place the workloads into logical servers (physical or VMs) on those hosts.

Figure 7: Insight Dynamics – VSE Smart Solver technology
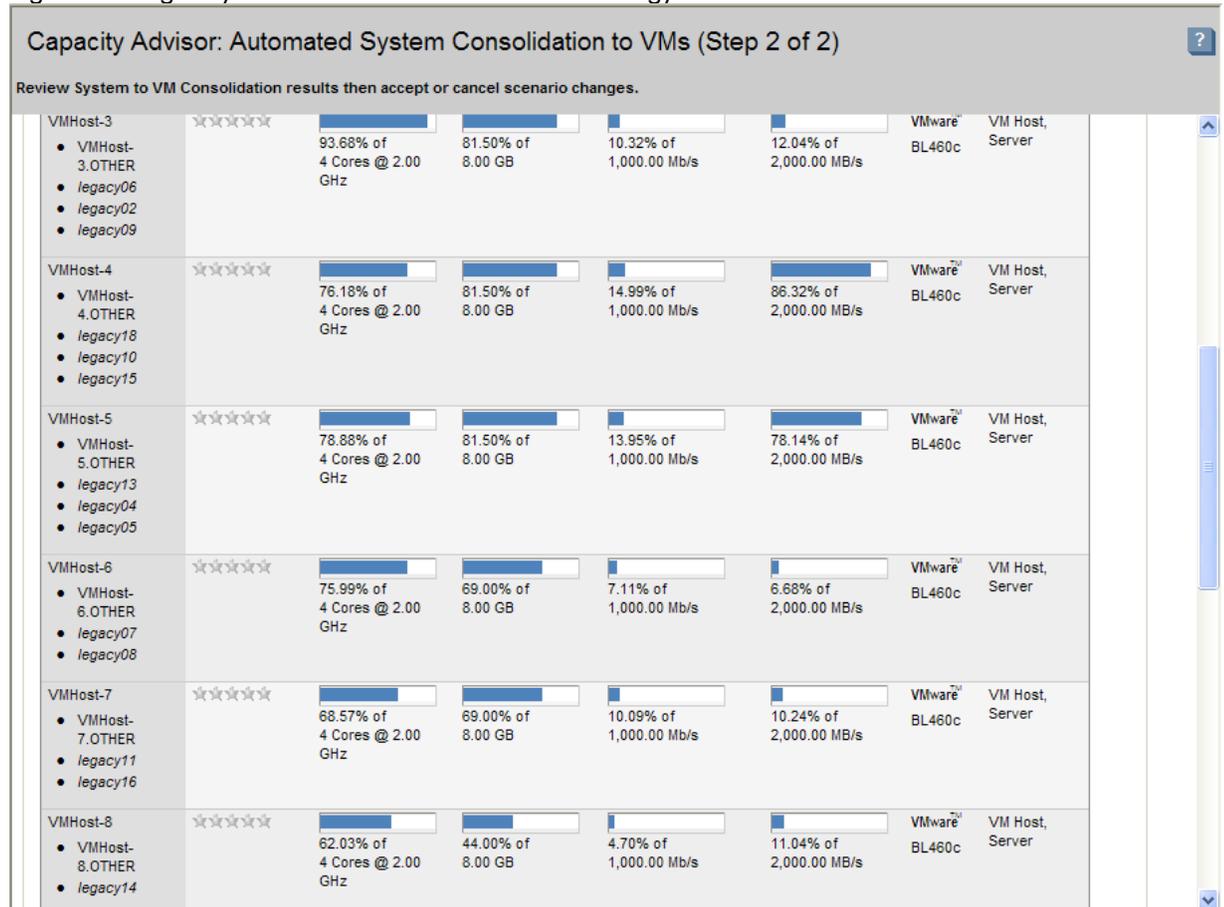
In this example, the Smart Solver determines that 27 of our 200 applications are large enough to require an entire physical server, so those will be deployed using blade logical servers rather than VMs to minimize the overhead. The view shown in Figure 7 shows several servers with multiple workloads. Note that VMHost-8 has only one workload running on it.

Setting up the target environment

The Insight Dynamics - VSE logical server technology will be used to create the profiles for the physical server blades, VM hosts and the VMs themselves. First you create the logical server profiles for the physical servers and the VM hosts. These profiles can then be activated and assigned to actual physical server blades in the infrastructure. Next you create the logical servers for the virtual machines as well (Figure 8).

Figure 8: Insight Dynamics – VSE logical server creation
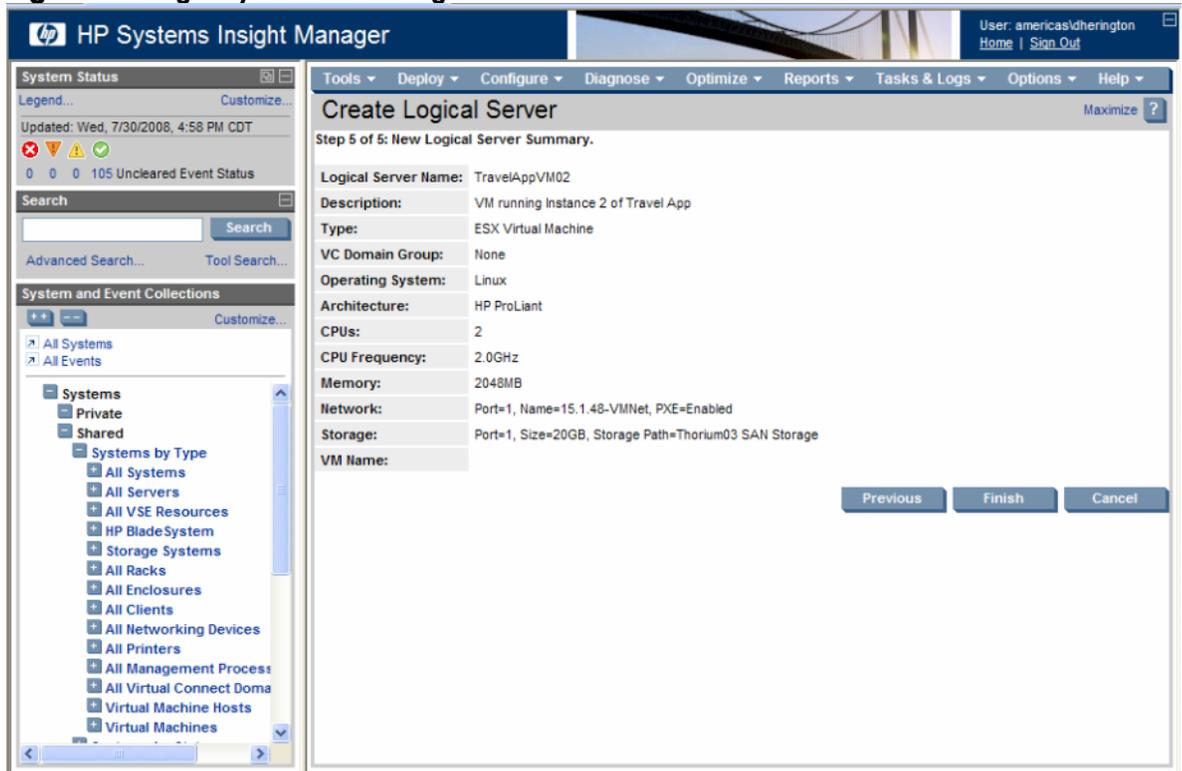
As these new servers boot for the first time, HP Rapid Deployment Pack, which ships as a component of Insight Dynamics - VSE, is used to provision and configure the pre-boot environment (configure RAID, upgrade BIOS and firmware, etc…) and install the operating system or VMware ESX server. Since you want to take advantage of the industry leading automation and compliance management capabilities of Server Automation, you have included the Server Automation agent in the provisioning sequence. After the base operating system is installed, Server Automation can be used to provision the application stack for each of the servers, both physical and virtual, based on the policies defined (Figure 9).

Figure 9: Server Automation software policy assignment
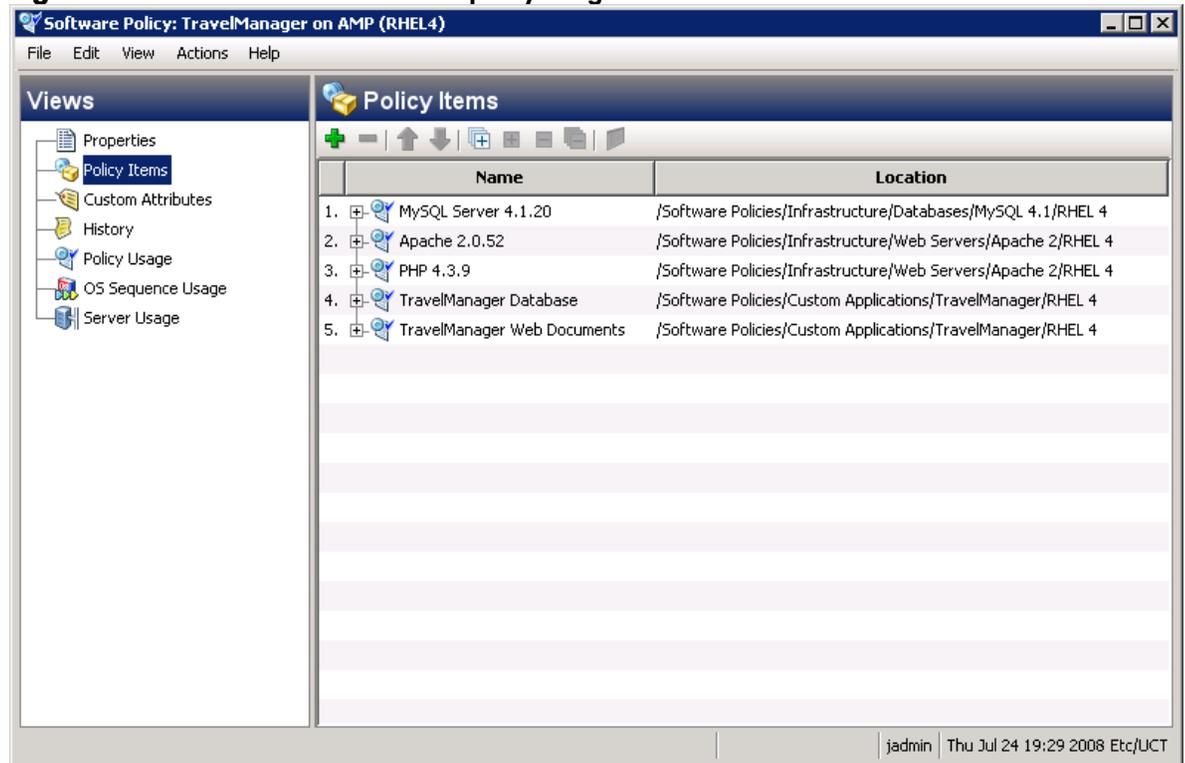
Ongoing management

Now that you have completed the migration to the new virtualized environment, there are a number of normal ongoing tasks that are required to keep this environment running smoothly. These tasks include standard software management required regardless of whether the servers are physical or virtual. In addition, there are some new challenges in the virtual environment. Given that virtualization provides the ability to share resources on the host, it is necessary to ensure that as workloads grow and change over time, the VM hosts continue to be able to support the multiple loads on them.

Server Automation provides the automation required to audit and maintain this large number of servers. Out-of-the-box reports show whether systems comply with regulatory standards. The HP Live Network subscription service can be used to acquire the most up-to-date security and regulatory compliance policies, dramatically simplifying the process of keeping these servers compliant and ensuring that unauthorized configuration changes are easily detectable and can quickly be remediated (Figure 10).

Figure 10: Server Automation compliance remediation
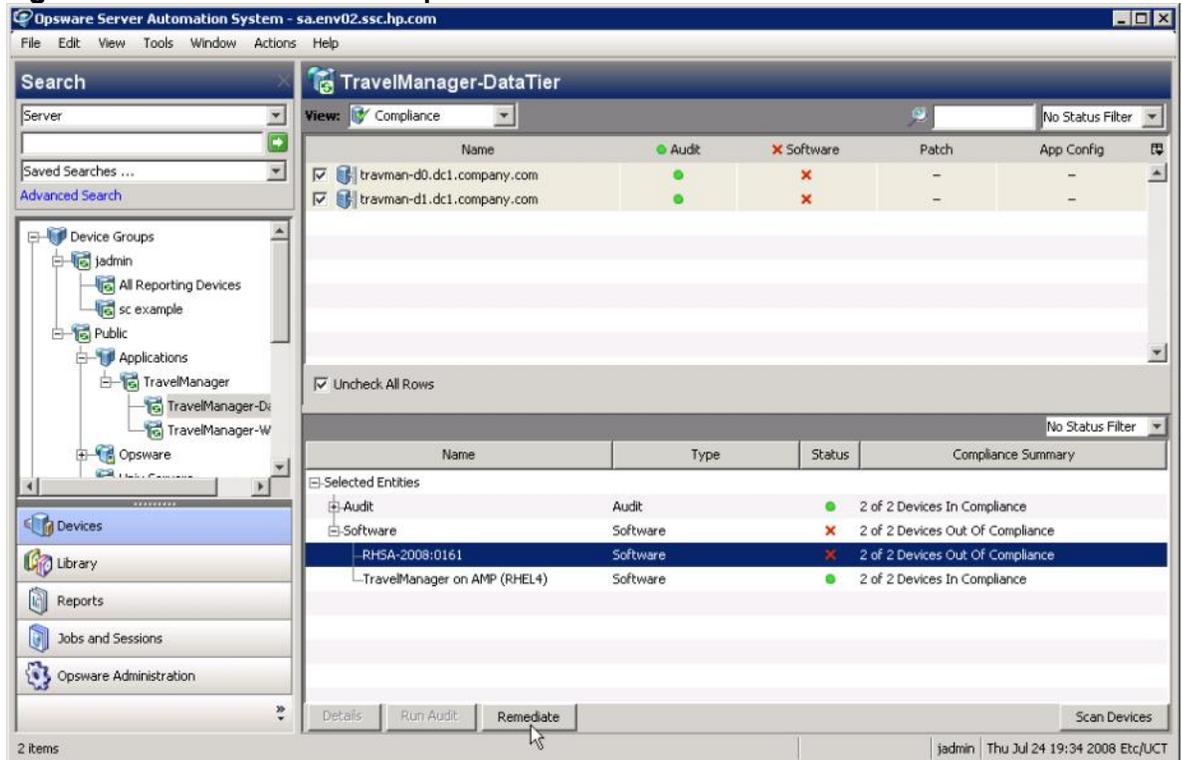
In order to maintain a smooth running virtual infrastructure across the many VM hosts, Insight Dynamics - VSE can keep the workloads balanced on the existing infrastructure as well as to help you plan for when new capacity will be required as workloads grow over time. When you determine a rebalance is necessary, it is a simple drag-and-drop to move the VMs to their new target hosts (Figure 11).

Figure 11: Insight Dynamics – VSE logical server migration
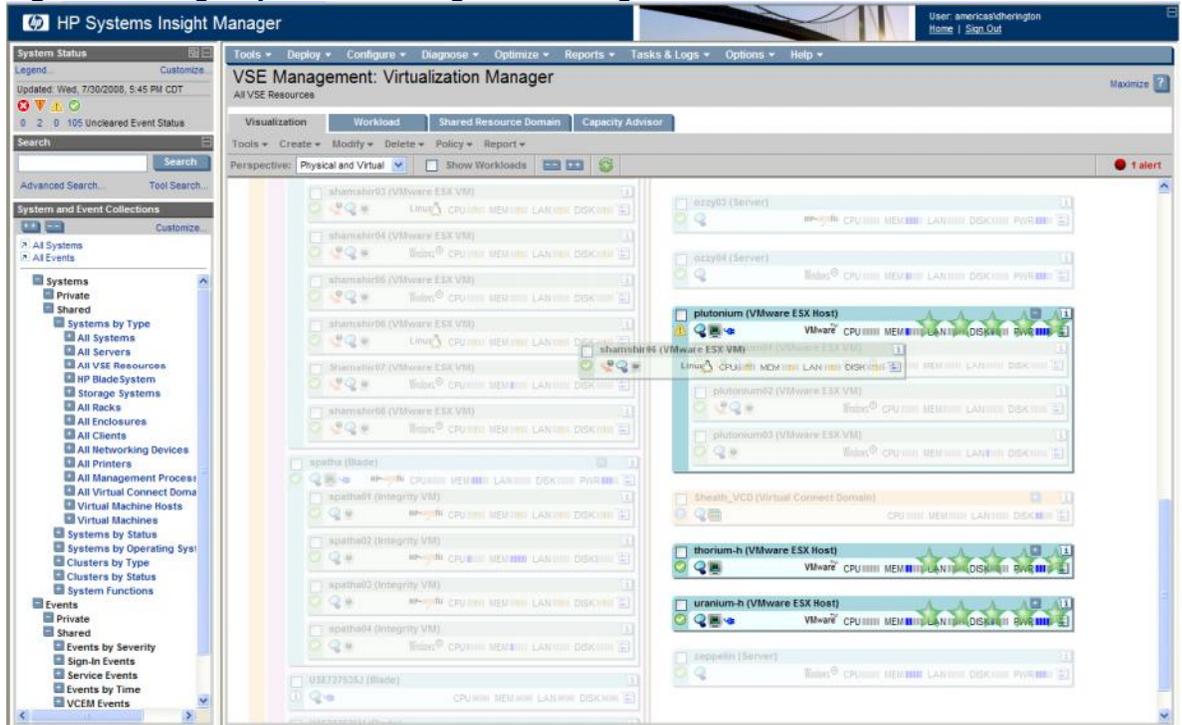
Improving the efficiency of your Test and Development environment

Most IT organizations maintain several sets of servers for each enterprise application, including development systems, test systems, training systems, pre-production and production. Often the test, pre-production and training systems sit idle for weeks or even months at a time while updates are being made to the enterprise application in the development environment. Once an update is finished, the new version needs to be tested and subsequently moved to the pre-production environment. However, the amount of time these servers get used is typically measured in weeks, separated by development cycles that often last months.

Efforts at reducing the overall number of test systems required by sharing servers with multiple projects are hampered by the need for server operating system and software stack combinations to be application and project specific, leading to test environments with large numbers of servers that sit idle for significant periods of time.

Consider an IT organization that is maintaining 10 enterprise applications, each using four application servers in production with a standardized deployment environment. Pre-production is used to test the roll-out of new versions from development/test into production, so the configuration is kept as close as possible to a mirror image of the production environment. The test environment needs the same number of servers as the production environment because each of these applications has a slightly different application stack and the developers need to be able to test the load balancer and application behavior when each of the four servers activate and deactivate. As a result, there are 40 servers in production, 40 in pre-production and as many as 40 in test, for a total of 120 physical servers supporting the ten applications.

Typical development times for the release of a new version of the application range from 3-6 months. During this time, developers will occasionally use the test systems for validation, but this is typically only for a few hours at a time. Once the release is complete, the team then spends 3-4 weeks in full scale quality assurance, in which all the systems in the test environment are used full time to support functional, performance and stress testing.

The pre-production environment is used for two purposes. It is used to test the rollout process of new versions of the application from test into production and some of the pre-production servers could be used during production server downtime to maintain performance and availability. For both of these uses, the pre-production environment needs to be identical to the configuration of the production environment.

Using Server Automation and Insight Dynamics - VSE to allow pooling of physical servers while maintaining software configurations and compliance, the development teams share a set of physical servers on which they run both test and pre-production logical servers. During the development phase of the project, the developers reserve physical servers from the pool. During system test, they borrow physical servers from pre-production, without disturbing the images required for pre-production. When it is time to test the migration of the application into the production environment, they activate the pre-production logical servers and configure software policies in Server Automation to support the new application in production. These policies are assigned to the pre-production servers to cause the new version of the application to be pushed to the pre-production environment. After testing the rollout procedures and the new version in pre-production, the policies are applied to the production environment at the next maintenance window to reliably migrate the application changes into production.

Using Insight Dynamics - VSE logical server technology

The logical server technology in Insight Dynamics - VSE, is used to store the test and pre-production images required for all the projects while allowing pooling and sharing the physical servers.

Now, the developers can reserve a set of physical servers when they need to run tests. Using logical servers, the amount of time it takes to get their pre-existing test servers running, with the configured operating system and application stack, is roughly the time it takes to reboot the server.

Logical servers can be imported from existing physical or virtual servers, or they can be created from scratch. In this example, the application scale-out environment which requires multiple physical servers for scalability is implemented using HP BladeSystem physical blades with Virtual Connect. Figure 12 shows the storage configuration portion of the logical server creation wizard.

Figure 12: Insight Dynamics - VSE: Logical server creation wizard
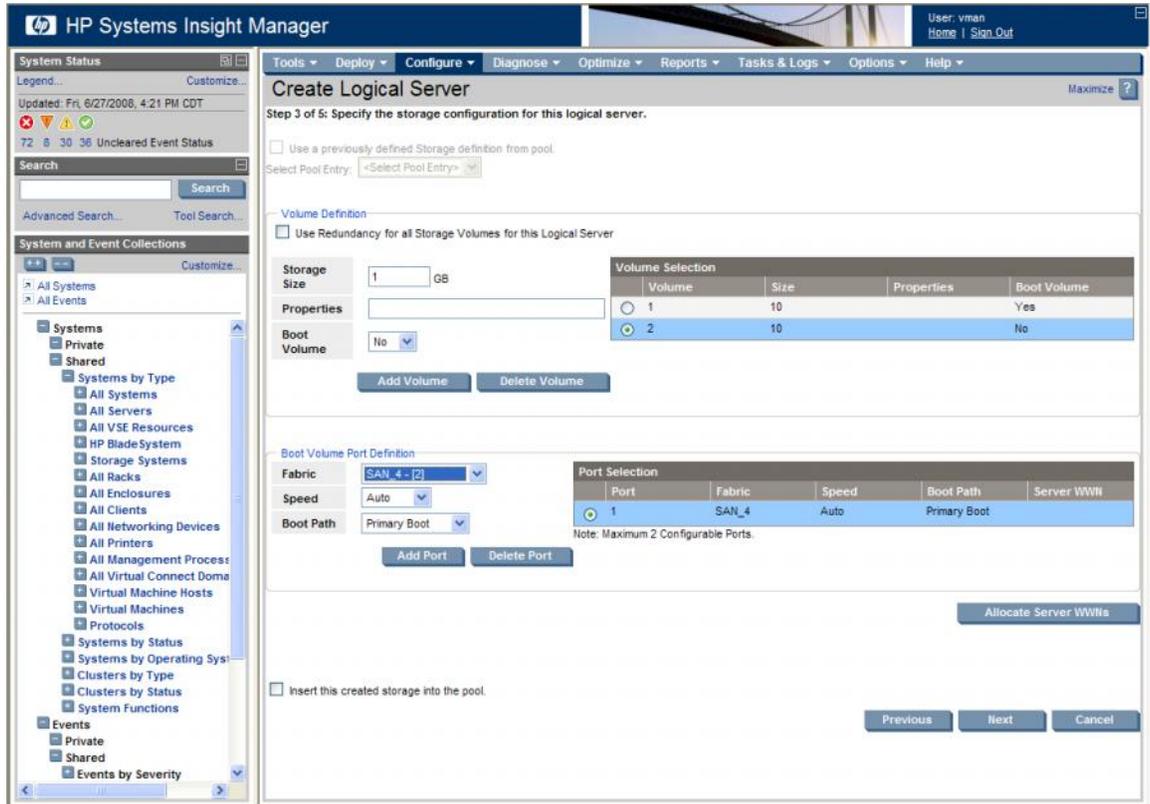
Once logical servers have been defined or imported, Insight Dynamics - VSE provides the ability to activate and deactivate these logical servers on any available server blade in the pool, whenever it is needed. When the developer needs to run a test against this particular logical server you activate it on a physical blade using the Activate Logical Server screen in Figure 13. This screen provides a listing of the available blade servers as well as a 5-star rating indicating how well each server will meet the resource requirements defined in the logical server configuration.

Figure 13: Insight Dynamics - VSE activate logical server screen
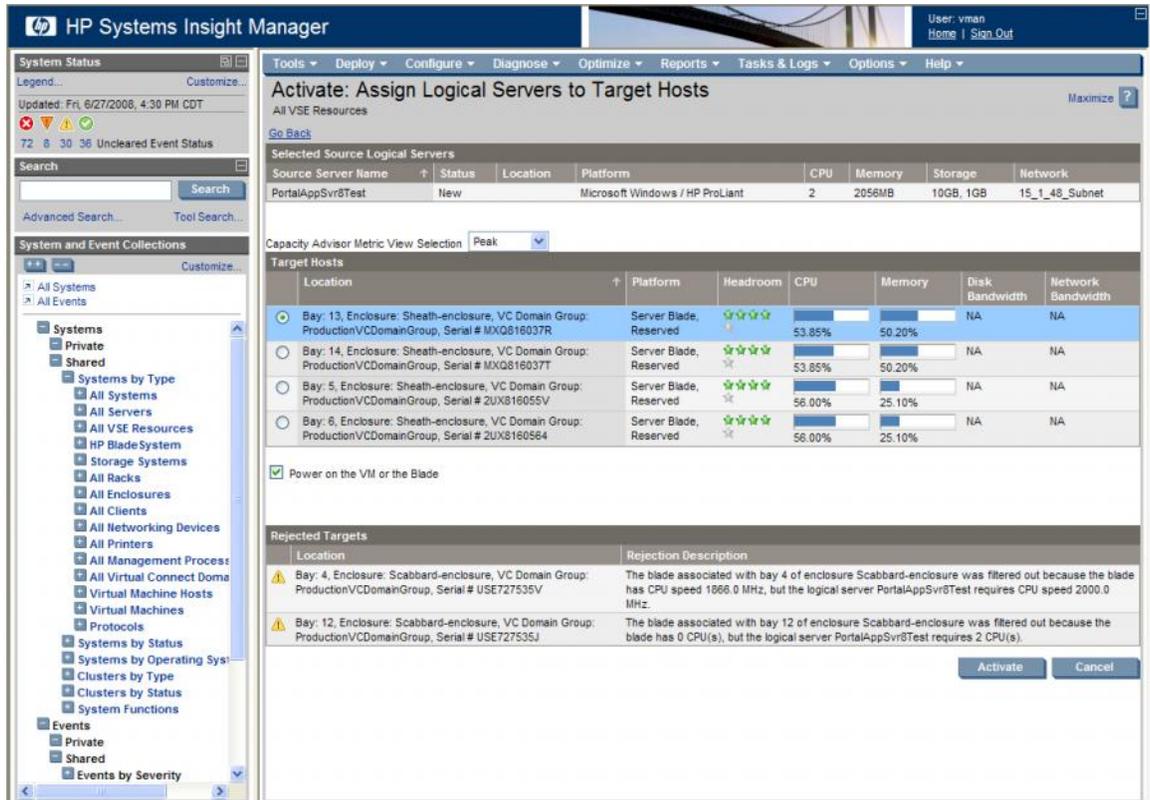
Monitoring compliance using Server Automation

Server Automation can maintain both the production and pre-production environments ensuring that the configurations remain consistent with one another.

Server Automation provides tools for deploying updates to the operating system or application, which can be rolled out to some or all of the servers with a single operation. In addition, it has the ability to monitor the compliance of these images to detect and remediate configuration drift that might occur as a side-effect of day-to-day operation of these servers (Figure 14).

Figure 14: Server Automation monitoring compliance
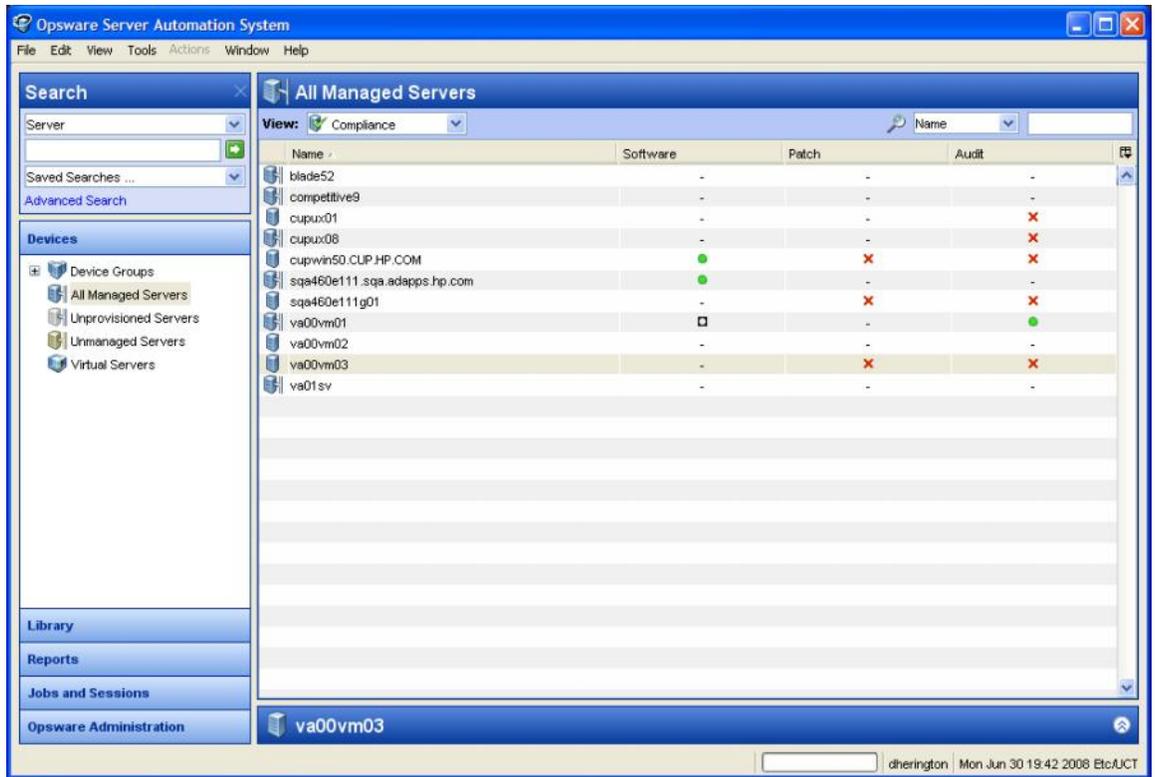
Attaching a software policy using Server Automation

When you need to test the roll-out of a new application, or any other patch or configuration change, simply define Server Automation policies for the new configuration, apply those policies to the appropriate servers and remediate them when ready to apply the change (Figure 15). The pre-production environment can be used to test this roll-out functionality prior to applying the policies to the production servers. Because Server Automation is used to ensure the pre-production and production environments stay consistent, there is a high degree of confidence that the production roll-out will work smoothly.

Figure 15: Server Automation attaching a software policy to the production servers
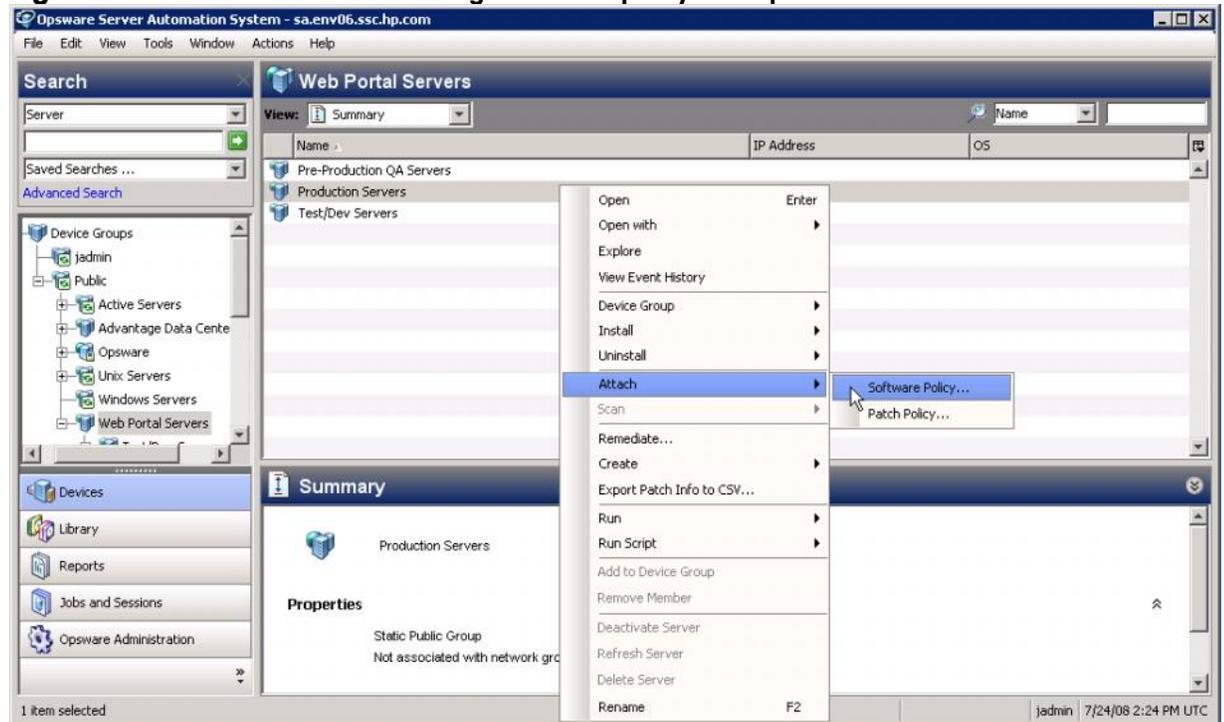
As a result of the combination of Server Automation and Insight Dynamics - VSE, you can dramatically reduce the number of physical servers required to support the test and pre-production environments. The number of servers is reduced in two ways:

- **Test servers are now logical servers** – The developers have imported the server configurations for all of their test servers into Insight Dynamics - VSE as logical servers. They can be activated and deactivated on demand and can be placed on any of the physical blade servers in the server pool only when they are needed. The developers now reserve a set of physical servers when they need to test, activate the servers, run the tests and deactivate the servers when done. *This reduced the number of physical servers in the test environment from 40 to 20 with no impact on the developers' productivity*.

- **The pre-production servers have also been created as logical servers** – All of the pre-production servers that are required for testing are maintained, but only activated when required. The pre-production environment needs to be as close as possible to the configuration of the production environment. Server Automation maintains both the production and pre-production environments and automatically ensures that the configuration of these images stays consistent. When servers are activated, you can run a compliance check on the image to identify if any changes have been made to the policies since the last time that image was running and if so, remediate them quickly. *With the increased flexibility of pooling logical servers and since pre-production servers are rarely used, the pre-production environment was reduced from 40 to 20 servers at the same time ensuring sufficient capacity in the event of a disaster in the production environment.*

In summary, the combination of Server Automation, Insight Dynamics – VSE and HP BladeSystem with Virtual Connect allowed for the reduction of the test and pre-production server count from 80 servers down to 40 servers, with a commensurate reduction in maintenance, software, floor space and power and cooling costs with no impact on developer productivity or production system availability.

Solving a CPU performance problem

Many situations can cause a performance problem, and on many occasions identifying the root cause is not intuitive. In order to quickly identify the root cause, monitoring both the application stack and the underlying infrastructure is required to get a full picture of the health of a business application. This is particularly true in complex environments running distributed composite multi-tier applications (application functions, glued together using middleware).

In today's increasingly complex environments, management tools are required that provide complete visibility of a business application. Insight Dynamics - VSE visualizes, plans, and changes the physical and virtual server infrastructure, while Server Automation monitors the software configuration and compliance.

Visualization using Insight Dynamics - VSE

The system administrator routinely monitors the physical and virtual server infrastructure using Systems Insight Manager (SIM) and Insight Dynamics - VSE. SIM polls each managed server periodically to retrieve a consolidated health status value that reflects the status of the server, which is presented in the Insight Dynamics - VSE visualization view. This view can also be used to access more detailed information about the health of the system, as well as access management tools appropriate to the server, regardless of whether it is a physical or virtual server. SNMP and WBEM events can be directed to the SIM central management server, where actions such as e-mail notifications, paging, script execution, and event assignment can be automated, and event details can be viewed. In this example, the system administrator configured SIM to send a pager alert when certain production servers exceed a CPU threshold. After SIM sends the pager alert, the administrator consults SIM and the Insight Dynamics - VSE visualization view and Server Automation to diagnose the problem.

Figure 16 shows an Insight Dynamics - VSE Visualization view of a collection of physical BladeSystem servers, as well as some virtual machines running on one of the blades. Included in this view is a high level status icon below the check box for each physical or virtual server as well as resource consumption meters for each major resource.

Figure 16: Insight Dynamics - VSE visualization view
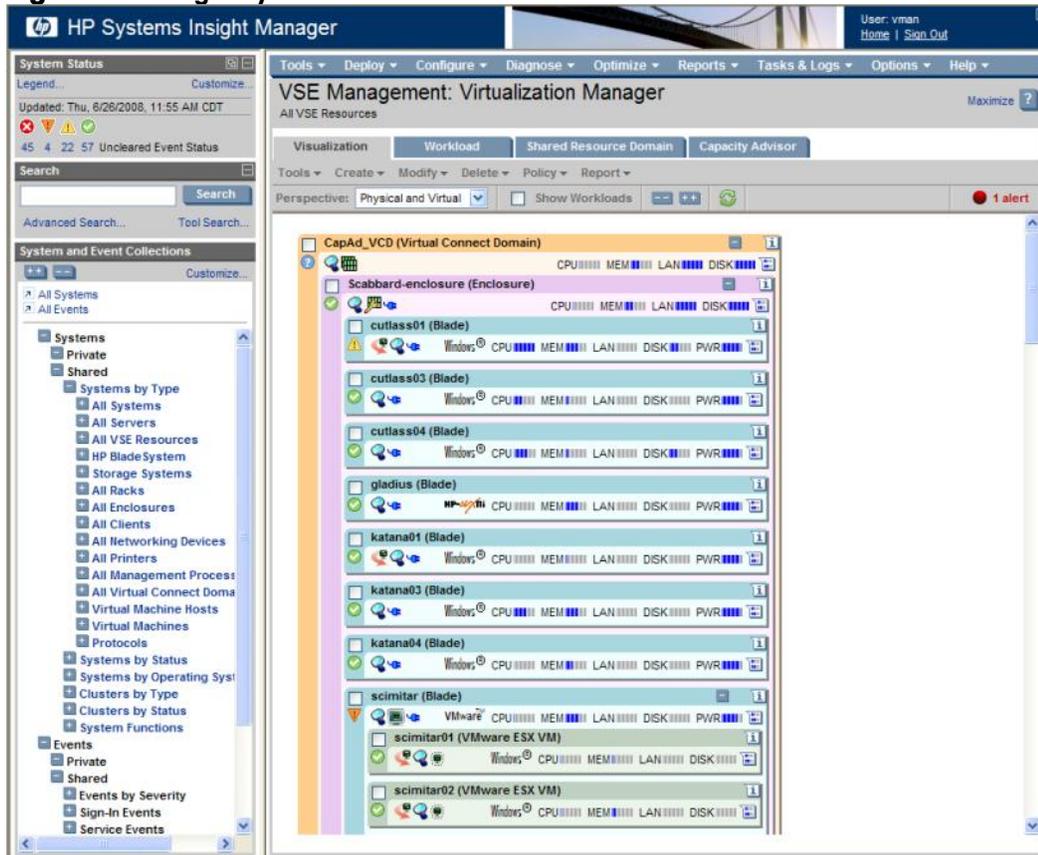
You can quickly see that one of the servers has a warning state and the CPU meter is very high. Clicking on the CPU meter brings up the historical graph of CPU utilization for this server. Clicking the "Collect Capacity Advisor Data" link updates the displayed data and provides a projection (shaded in blue) for the rest of today. This is shown in Figure 17.

Figure 17: Insight Dynamics – VSE : Capacity Advisor profile viewer
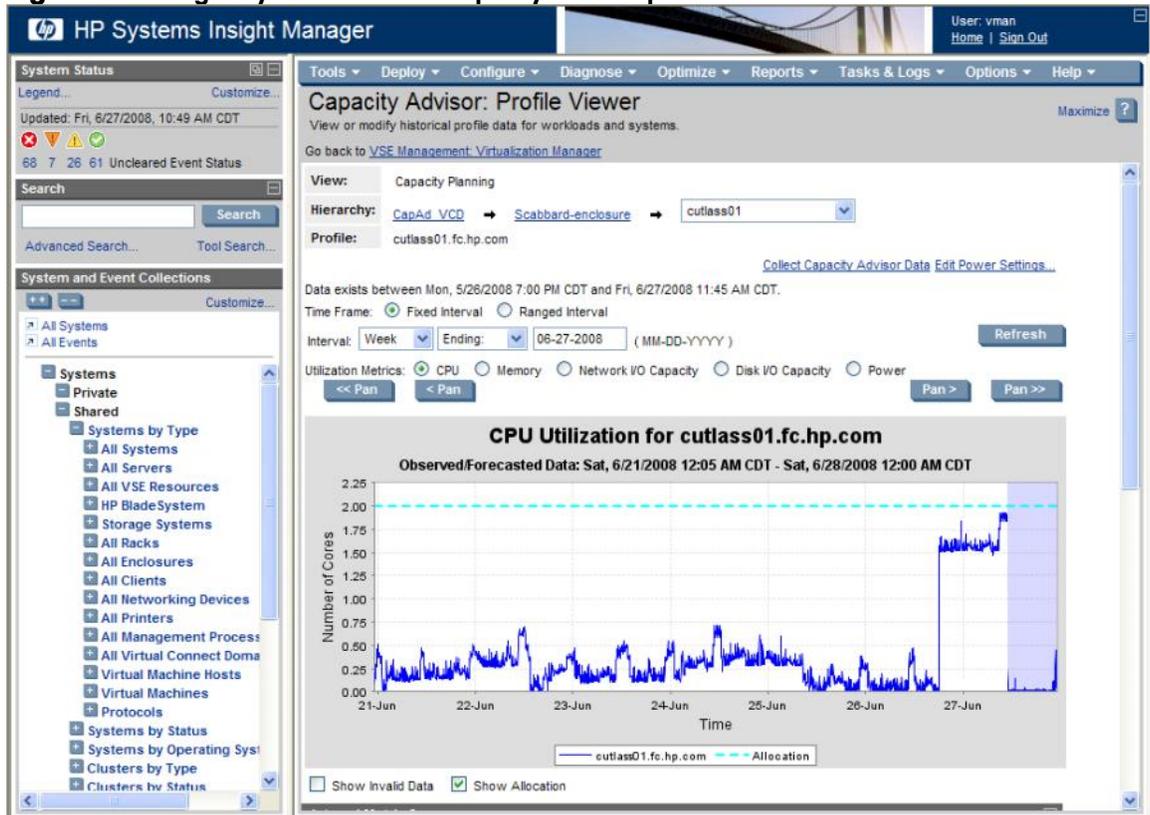
From this view it is apparent that there is a change in the consumption pattern that started last night.

Confirm configuration and compliance standards are met using Server Automation

The next step is to check the Server Automation compliance dashboard to see if the configuration has changed. Server Automation has a powerful automation engine that supports the creation of policies to define the software installation and configuration standards for a data center, a compliance dashboard that shows at a glance if the servers are in compliance with configured policies, and remediation to restore the correct configuration. The compliance dashboard view shown in Figure 18 shows that the Oracle application configuration for this server is out of compliance.

Figure 18: Server Automation compliance dashboard
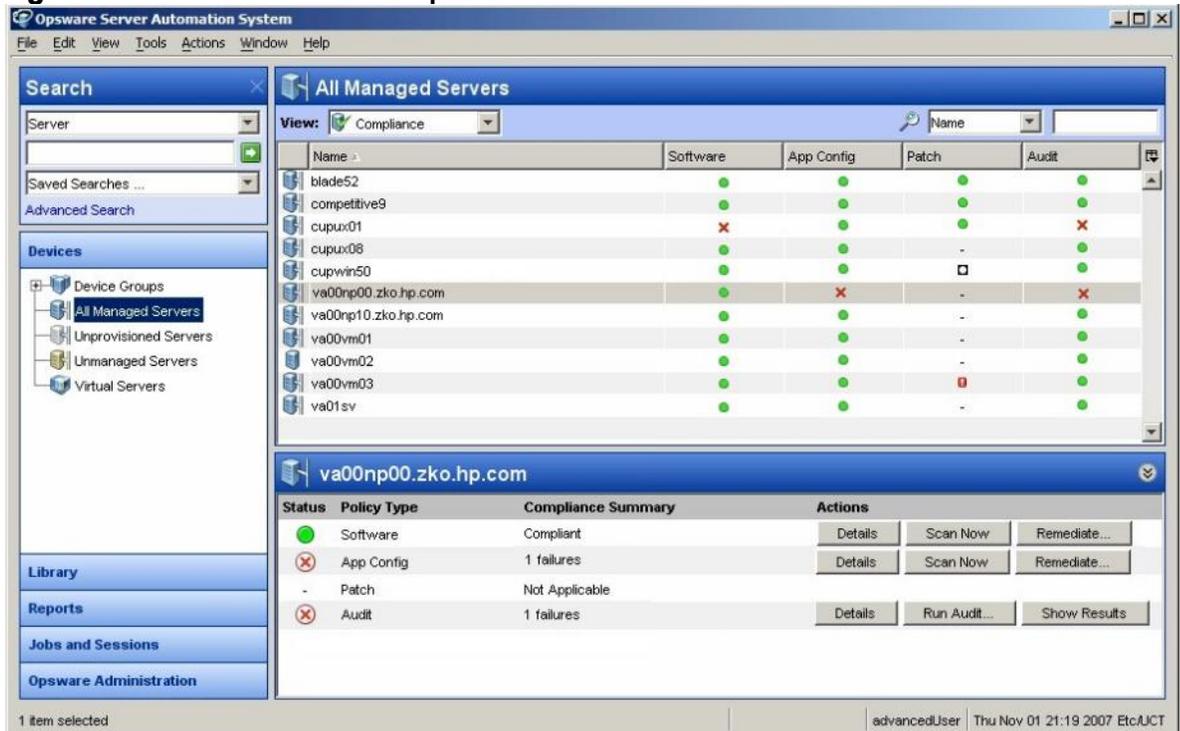
In this view, icons represent the following categories of policies:

- **Application configuration:** These policies manage configuration files associated with applications, in this case an Oracle database.
- **Patching:** Create policies from patch databases downloaded from an operating system vendor such as Microsoft.
- **Audit:** Policies that specify the ideal state of a server in areas such as file system permissions or registry values. Audits can be run on an ad-hoc basis if desired. If audits are scheduled, their results are shown in the dashboard.
- **Software:** Policies that model the desired state of an application installation, which might include patch and application configuration policies, in addition to software package specification.

In addition to the policy compliance icons, the compliance dashboard also shows a change in the icon to the right of the server name to indicate if the Server Automation core server is unable to communicate with its agent, the managed server.

Server Automation compliance dashboard shows that the system is not compliant with one of its application configuration policies. Viewing details shows that the database configuration is out of compliance with the policy settings. After verifying the policies are correct and discussing them with the database administrator, the system administrator learns that, to help troubleshoot another problem last night, a higher level of database logging was manually turned on overnight and accidentally left on.   The increased logging activity is a likely cause of the performance alert. The system administrator clicks **Remediate** to change the settings back to those established in the Software Policy for the production application. As a final step, the system administrator returns to the Insight Dynamics - VSE Visualization view to verify that the CPU is returning to expected levels.

In summary, the combination of Server Automation, Insight Dynamics - VSE and HP BladeSystem provided visibility into the problem across both the infrastructure and application stack. Without this increased insight the systems administrator may have pursued another solution such as adding CPU capacity, which would have been expensive and masked the true nature of the problem.

Solving a cooling problem to ensure high availability

High system availability is now an imperative for an increasing number of applications. In the past high availability was achieved by protecting the few mission critical applications that each ran on one server. Nowadays there are fewer business processes that rely on a single mission critical application. Applications are now so interdependent that one business critical application may utilize data or resources from multiple applications with lower levels of resiliency. In the event of a disruption, the highly resilient application is at the mercy of several less resilient applications.

Virtualization can provide the ability to protect more applications, without breaking the bank. Insight Dynamics - VSE can respond to impending events and maintenance activities by moving physical servers or virtual machines to an alternate location. This is made possible by the use of logical servers (physical and virtual) that can be easily created, stored and freely moved across the infrastructure. This can be very interesting for scale-out applications where multiple servers are used to support a single application, because some of the application instances can be turned off when they are not needed and quickly and easily brought back online when the need arises. Before putting a new server into production, Server Automation can be used to verify that the configuration of the inactive instance is still in compliance with current operating system, application, and security policies.

Activate a standby server using Insight Dynamics - VSE

In this example, a systems administrator receives a page generated by SIM and discovers that several server blades in a particular enclosure have exceeded a predefined temperature threshold. One server blade is running an instance of a performance sensitive, mission-critical Oracle RAC database. In order to ensure performance and resilience of the RAC database, the system administrator uses Insight Dynamics - VSE's logical server feature to rapidly activate a predefined logical server, containing a standby instance of the database on an available server blade in another enclosure.

At this point, the Server Automation product is used to ensure the standby database instance is still compliant and can be added to the cluster. Now that sufficient capacity is assured, the administrator investigates the cooling problem, eventually finding out that a technician working on an adjacent rack placed some boxes over the cooling vent leading to these servers, leading to the temperature alert.

Figure 19 shows the Insight Dynamics - VSE visualization view in HP SIM. The administrator uses this view to investigate the blade chassis when HP SIM sends a pager alert indicating a problem with one of the blades.

Figure 19: Insight Dynamics - VSE visualization view
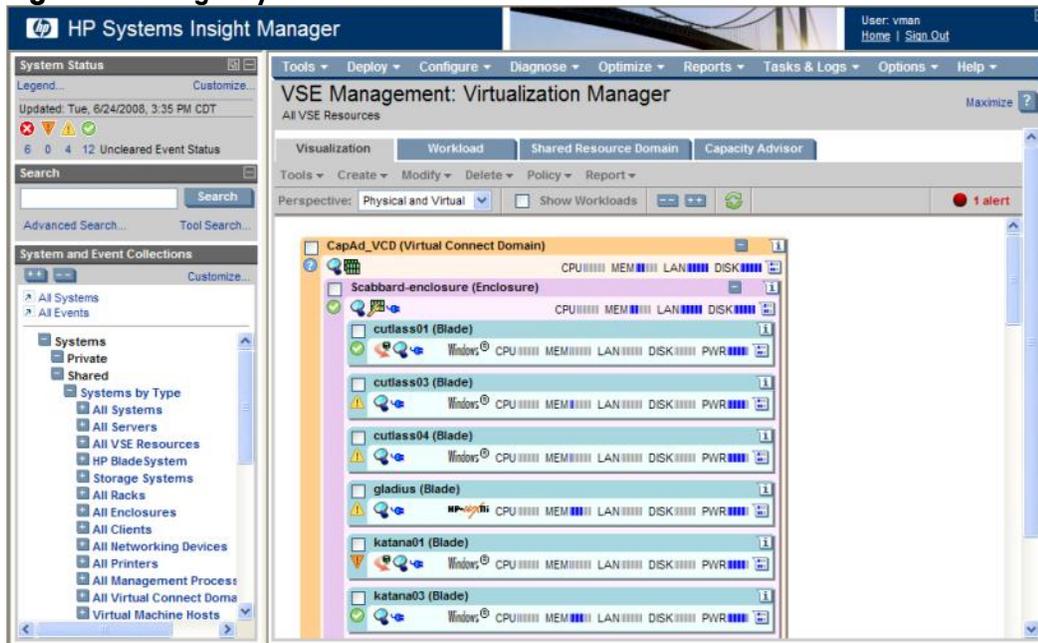
The administrator notices that there are several blades in the warning and major state in this chassis, so he clicks on the icon for the chassis view which takes him, in context, to the BladeSystem Integrated Manager view (Figure 20) that gives additional information about server blades within the enclosure. Not only is there a photo-realistic view of the front and back of the enclosure, showing each component overlaid by health status icons, but additional information on the same page about power and cooling is provided At this point, the administrator discovers an ambient temperature threshold is being exceeded.

Figure 20: HP BladeSystem Integrated Manager enclosure view
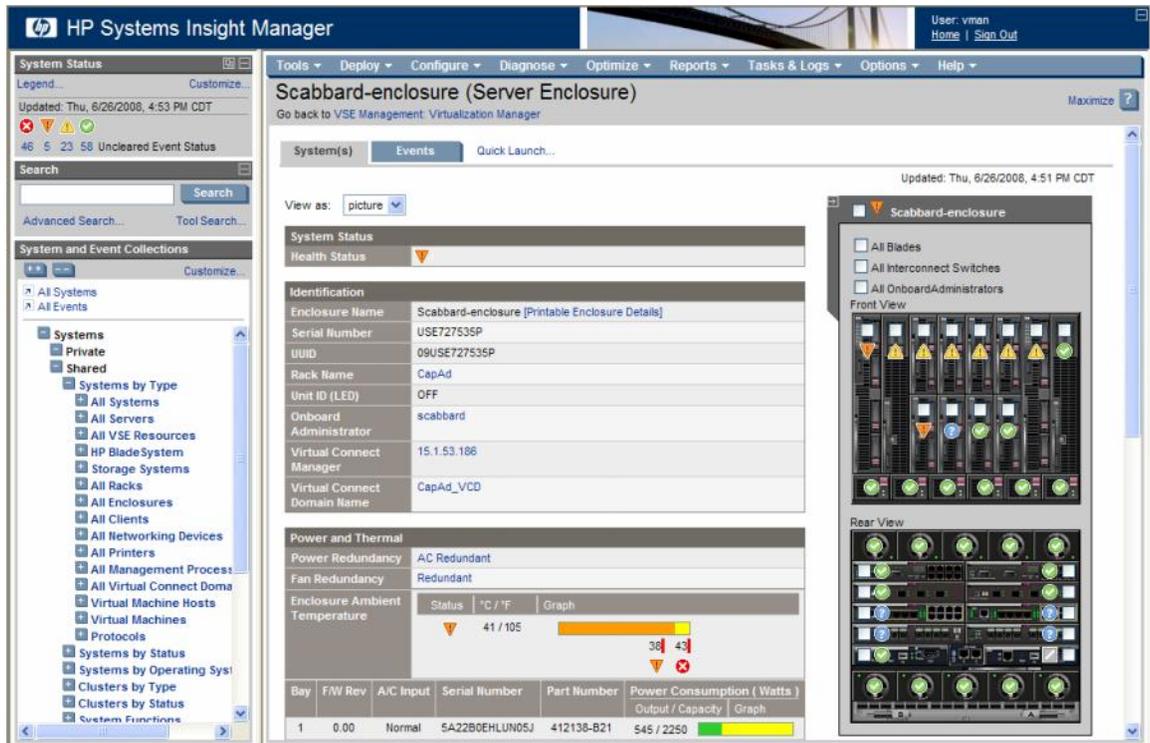
One server blade in the enclosure is part of a performance sensitive, mission-critical Application Server cluster. Not finding an obvious cause for the excessive temperature, the administrator decides to use an available server blade in another enclosure to add a server to the application cluster to ensure adequate performance and redundancy while investigating the problem.

This application cluster is part of a horizontally scalable application and was configured with additional application server instances, which are turned off during normal operations. The additional application server instances were created, configured, and tested in advance on servers configured using Insight Dynamics - VSE logical server technology, specifying LAN and SAN connectivity for each logical server.

One of the features of the logical server technology is the ability to activate and deactivate logical servers and move them between physical servers, regardless of whether they are virtual machines or physical blade servers. In this case, the application server instances are part of a scale-out performance sensitive application, so these are implemented using physical server blades.

The systems administrator locates and activates the standby application server instance to ensure that performance and redundancy is maintained for the cluster while diagnosing the cooling problem on the server running one of its instances. In this example, inactive logical servers have been configured, set up, and tested as part of the application cluster. During normal operations, inactive logical servers are disassociated from the server hardware, freeing the server for other uses, but the profiles remain available for immediate use. In the following figure, the administrator activates the spare application server logical server by associating it with an available server blade in another enclosure and booting the server. This assignment process provides additional information to help the administrator assess whether or not the target server offers sufficient performance for the logical server, including an at-a-glance 5-star rating. The star rating is based on historical trace data for the workload running in the logical server (Figure 21).

Figure 21: Insight Dynamics – VSE activating a Logical server
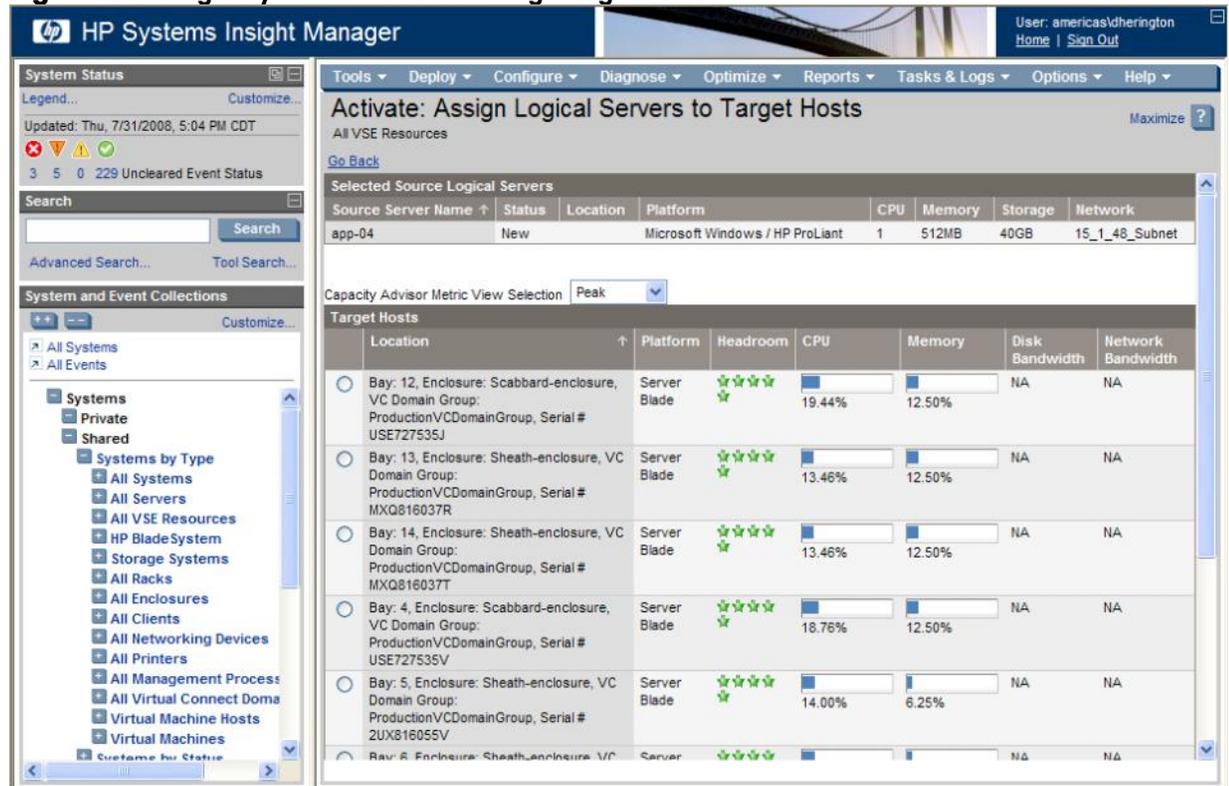
Verify compliance using Server Automation

The logical server is configured to boot from a pre-existing SAN-based boot partition that contains an image of the desired operating system and application, so the additional server blade can be added to the cluster quickly. Because this instance has been inactive, the configuration must be verified to ensure compliance with current operating system, application, and security policies and verify that no changes to the application have occurred while the logical server was inactive. The systems administrator consults the Server Automation server compliance view shown in Figure 22.

If there have been changes to the production application configuration policies since the last time this image was used, the system administrator can click **Remediate** to immediately bring the instance into compliance. In this case, the server is still in compliance, so this server can now be safely added into the production application cluster.

Figure 22: Server Automation server compliance view
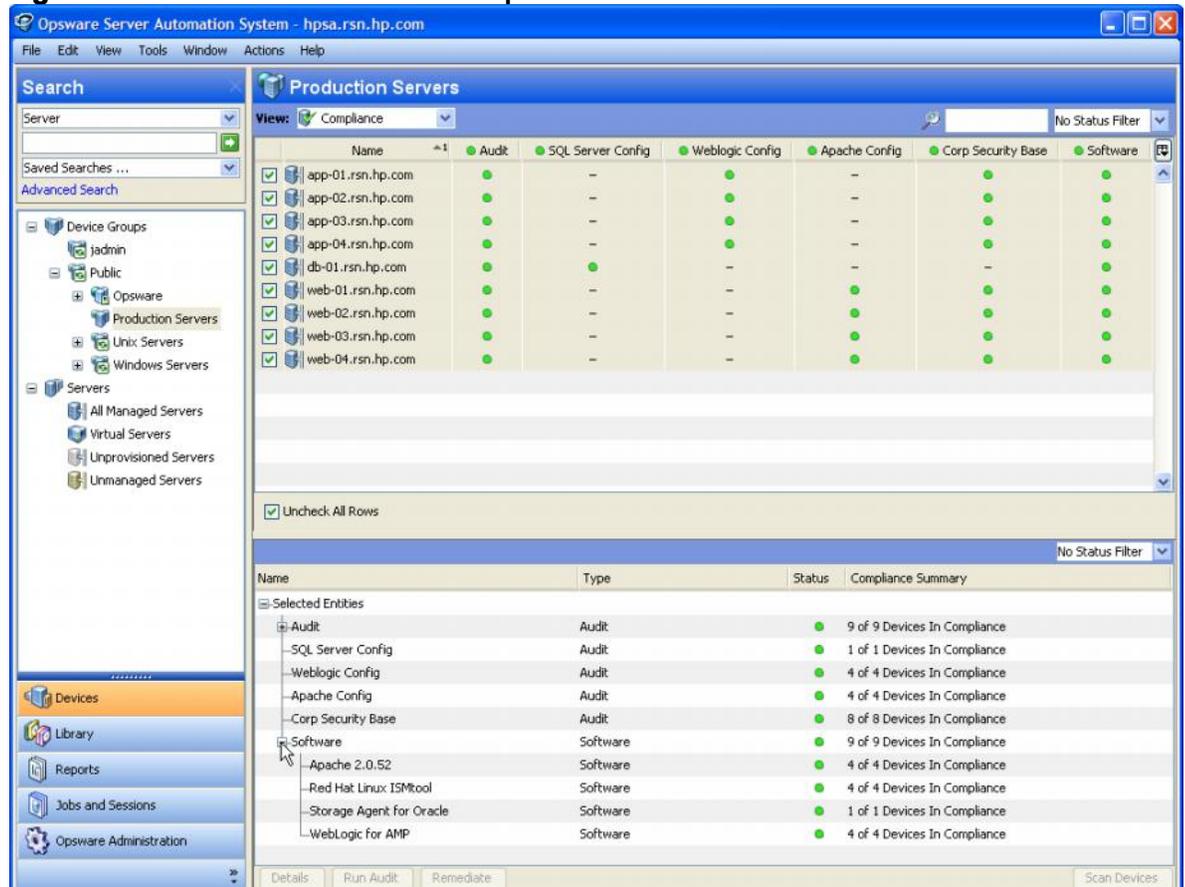
Now that the performance and availability of the application cluster is assured, the systems administrator can further investigate the underlying problem. After verifying various server hardware logs and verifying the temperature in the data center, the systems administrator goes into the data center to investigate the issue and finds that a technician that is installing servers in an adjacent rack has placed several boxes over the cooling vents that supply cool air to the server blades. Moving the boxes returns the server blades back to a normal operating temperature.

Conclusion

Server Automation and Insight Dynamics - VSE are complementary tools for managing your virtualized infrastructure. Server Automation enables you to easily manage the configuration of large numbers of heterogeneous servers and applications through its policy-based configuration and auditing capabilities. Insight Dynamics - VSE enables you the get the most from your HP servers by enabling analysis and optimization in real-time.

The management of virtual environments requires the same management and control as managing physical infrastructures -- from deployment to monitoring to securing, compliance and change management, HP Server Automation and HP Insight Dynamics – VSE work together to maintain control of your data center.

For more information

For more information, including white papers and downloads, see the following websites:

HP BladeSystem: http://www.hp.com/go/bladesystem

HP Insight Dynamics - VSE : http://www.hp.com/go/insightdynamics

HP Server Automation: http://www.hp.com/go/hpsa

Appendix A: HP Insight Software

Insight Dynamics - VSE includes HP Insight Control Environment. Virtual Connect and Virtual Connect Enterprise Manager must be purchased separately. They are designed to work together in a fully integrated fashion.

HP Insight Control Environment

Insight Control Environment is a set of capabilities to deploy, monitor and control your server infrastructure from almost anywhere.

Based on Systems Insight Manager, Insight Control delivers comprehensive system health, remote control, vulnerability scanning and patch management, as well as flexible deployment features, virtual machine management and power management. These capabilities come together in one easy-to-install package.

The Insight Control management suite includes HP Rapid Deployment Pack and HP Virtual Machine Manager, two products that complement the capabilities of Insight Dynamics - VSE.

Rapid Deployment Pack (RDP) is a component of the Insight Control Environment that facilitates the installation, configuration and deployment of high volumes of servers through either a GUI-based or a web-based console, using either scripting or imaging technology.

RDP only supports deployment of HP BladeSystem and other ProLiant servers for bare-metal operating system provisioning and pre-boot environment configuration. For full lifecycle management of the applications stack you can use RDP to provision HP servers and configure the pre-boot environment (configure RAID, upgrade BIOS and firmware, etc...) and include the Server Automation agent in the provisioning sequence to bring the server under management by Server Automation.

Virtual Machine Manager (VMM), a component of Insight Control Environment , provides capabilities to manage virtual machines. VMM provides central management and control of VMware, Microsoft and Citrix virtual machines with physical host to virtual machine association.

HP Virtual Connect and Virtual Connect Enterprise Manager

Virtual Connect is a virtual input-output (I/O) technology for HP BladeSystem. It simplifies the setup and administration of server connections to local area networks (LANs) and storage area networks (SANs). Through its ability to virtualize BladeSystem servers connections to external networks, Virtual Connect gives you the ability to add, move and change servers inside the BladeSystem domain without impacting LAN and SAN availability.

HP Virtual Connect Enterprise Manager (VCEM) builds upon and extends the Virtual Connect architecture to multiple BladeSystem enclosures that use Virtual Connect to control LAN and SAN connectivity. This advanced software application allows you to manage multiple BladeSystem enclosures from a single console.

HP Systems Insight Manager

Insight Dynamics - VSE integrates with HP SIM, the central point of administration for management of your HP infrastructure. This software, which ships with every HP server, provides **core management services** for discovery, monitoring and control of HP servers and storage.