Stop the Finger-Pointing: Managing Tier 1 Applications with VMware vCenter™ Operations Management Suite™

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WHITE PAPER
There is a tradition of finger-pointing in too many IT departments. When problems occur, server administrators blame the storage, storage administrators blame the network, and network administrators blame the applications. This finger-pointing wastes tremendous IT resources and, more important, causes downtime or poor performance that impacts end users and the business.

The reason for this finger-pointing is inadequate information on the real source of the performance or infrastructure problems. The experts in IT, tasked to solve these types of problems, are only as good as their tools and processes. In other words, if your tools can't tell you the source of a problem, you are left trying to solve the problem through a rigorous trial-and-error process (while everyone suffers).

Fortunately, virtualization hypervisors and new virtualization management tools have made finding and solving problems faster and more efficient than ever before.

Making the Case for a New Approach to Operations Management

Let’s look at a typical enterprise and what it needs from an infrastructure management tool. The size of the virtual infrastructure isn’t relevant, because all virtual infrastructures have commonalities—servers, storage, network, hypervisor, virtual machines, applications and management tools.

Ideally, an enterprise needs to be able to solve impending problems in the virtual infrastructure before they affect users and business-critical applications. However, not all trouble can be predicted. If an unexpected problem occurs, your management tool should alert you as soon as it happens and direct you to the possible cause. To identify all possible causes, the tool needs insight into all aspects of the virtual infrastructure, including applications in the context of their supporting infrastructure. When you use your tool to identify the root cause of the problem, you should be able to quickly see all the resources of your infrastructure, in a “single pane of glass” (see Figure 1).

Your tool, then, must provide these capabilities:

- Insight into all aspects of the virtual infrastructure, including servers, storage, network, hypervisor and applications
- Prediction of infrastructure problems before they occur
- Monitoring and alerting
- Root-cause analysis
- Single pane of glass and efficient dashboard that helps you to quickly identify problems

![Image of New vCenter Operations Manager Dashboard]
VMware vCenter™ Operations Management Suite™ is one of the best solutions I’ve seen to address these needs. The latest version of the Enterprise Edition (5.6) provides a comprehensive tool set, including patented analytics, that enables organizations to take an integrated approach to performance, capacity and configuration management across virtual and cloud infrastructure.

VMware vCenter Operations Enterprise™ is able to meet the management needs of IT in our business case by offering:

- Unique badges representing critical infrastructure characteristics
- Health, risk and efficiency scores that quickly show you where your infrastructure is performing well or where there could be a problem
- Similar scores for all resources in the virtual infrastructure
- The ability to predict infrastructure problems before they occur as vCenter Operations Management Suite learns what is normal and abnormal for your infrastructure
- A single pane of glass into virtual infrastructure performance, root-cause analysis and application dependencies

As you drill down into the various objects that make up the virtual infrastructure, you can find out the amount of time remaining before your resources are exhausted, the capacity remaining, how much waste can be reclaimed from the infrastructure, and what your consolidation ratios are over time (see Figure 2).

With one of the main goals of virtualization being maximizing server resources by increasing utilization, it becomes critical to constantly monitor capacity and resource optimization. As more servers are virtualized, sizing of those virtual machines can be challenging. At VMworld® 2012, I met a VMware customer who works for a large pharmaceutical company where they recently virtualized their SAP ERP application. As they wanted to ensure good performance, they were liberal with the initial resource allocation to satisfy both the app team and

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### Figure 2. Capacity Remaining and Reclaimable Waste

<table>
<thead>
<tr>
<th>Time Remaining</th>
<th>Reclaimable Waste</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indicates the number of days before resources are exhausted</td>
<td>Shows the percentage of total capacity that can be reclaimed</td>
</tr>
<tr>
<td>Now, 1 Year From Now</td>
<td>8 Days</td>
</tr>
<tr>
<td>0%</td>
<td>130</td>
</tr>
<tr>
<td>100%</td>
<td>4.2TB</td>
</tr>
<tr>
<td>DISK SPACE 8</td>
<td>vCPUs</td>
</tr>
<tr>
<td>MEM &gt; 1y</td>
<td>Disk</td>
</tr>
<tr>
<td>DISK I/O &gt; 1y</td>
<td>341.4g</td>
</tr>
<tr>
<td>NET &gt; 1y</td>
<td>vMem</td>
</tr>
<tr>
<td>CPU &gt; 1y</td>
<td>29% Idle VMs</td>
</tr>
<tr>
<td></td>
<td>25% Powered Off VMs</td>
</tr>
<tr>
<td></td>
<td>47% Oversized VMs</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Capacity Remaining</th>
<th>Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measures the remaining available VMs as a percent of the total VM capacity</td>
<td>Compares the ideal consolidation ratio to the actual consolidation ratio</td>
</tr>
<tr>
<td>98%</td>
<td>VM : Host Ratio</td>
</tr>
<tr>
<td>2%</td>
<td>DEPLOYED 153 VMs</td>
</tr>
<tr>
<td></td>
<td>POWERED ON 93 VMs</td>
</tr>
<tr>
<td></td>
<td>3 More VMs</td>
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management. Thanks to VMware vCenter Operations Manager™ they were able to demonstrate to the application team how oversized their SAP virtual infrastructure was, as well as prove to management both the initial and potential cost savings. vCenter Operations Manager guided them to cut the resource allocation of their SAP virtual machines up to 50 percent. This demonstrated a potential savings of 68.7 hosts’ worth of vCPU and 25 hosts’ worth of RAM (with a common configuration of 4x10 cores and 512GB RAM), but moreover demonstrated a new baseline for the applications team for increased efficiency without sacrificing performance.

**Application and OS Monitoring — Gain New Insight with vFabric Hyperic**

Although many monitoring tools offer the ability to monitor virtual infrastructure resources, they usually stop when they get to the virtual machine layer. Similarly, traditional OS and application level monitoring tools (like Microsoft’s System Center Operations Manager) are not providing visibility into the virtual infrastructure below the guest OS. What is needed is comprehensive visibility into and automated correlation of metrics from the hypervisor, OS and application layer to truly understand what is really driving application performance. But it’s critical to understand, from the perspective of the guest OS and the applications, how the applications and OS are really performing.

New in vCenter Operations Enterprise is an OS and application monitoring component called VMware vFabric™ Hyperic®. Although you may not immediately recognize the Hyperic name, you will appreciate the breadth of monitoring coverage it brings to the vCenter Operations Management Suite. These adapters enable you to connect vCenter Operations Management Suite with your applications, completing your view of the virtual infrastructure.

For example, suppose you have a Microsoft Exchange server running as a virtual machine and experiencing performance issues. Before end users can complain, vCenter Operations Management Suite determines, through the vFabric Hyperic adapters on the virtual machines, that the Exchange services are experiencing high transactional latency (even though your virtual infrastructure has plenty of resources available).

vCenter Operations Manager can even group similar virtual machines together, based on the types of applications they run. In Figure 3, we see a grouping of SharePoint, Exchange, database services and IIS Web servers.
With the addition of vFabric Hyperic adapters, vCenter Operations Management Suite can now recognize and monitor operating systems (Windows, Linux, Mac OS, AIX), major applications from Microsoft and other vendors, and other data sources such as SCOM. For example, Figure 4 shows vCenter Operations Management Suite using a vFabric Hyperic adapter to display statistics from an Oracle 9i database.

By adding application awareness to your virtual infrastructure monitoring solution, you will finally have the complete virtual infrastructure view you need for performance and capacity monitoring, as well as troubleshooting of your virtual infrastructure.

Figure 4. Monitoring Applications with vFabric Hyperic Adapters
Discover Application Dependencies with Infrastructure Navigator

As virtual infrastructures grow with more and more virtual machines, more multitiered applications are added. As we see in Figure 5, applications are becoming increasingly interrelated. Backup, maintenance windows, and disaster recovery all become more complex because you can’t tell if a critical virtual machine is dependent on less critical virtual machines.

As a result, servers without DNS, file servers, database servers and Web servers for certain tier 1 applications may fail to work, and end users will experience downtime. In a complex virtual infrastructure with hundreds or thousands of virtual machines, determining which virtual machines are dependent on other virtual machines is time-consuming and can be unreliable.

Included with vCenter Operations Management Suite Enterprise is VMware vCenter Infrastructure Navigator™. It offers the ability to continuously discover applications running on the virtual infrastructure and map application dependencies.

Let’s consider some of the things that you can do with this knowledge:

- View application dependencies and create vCenter Operations groups based on them.
- Monitor performance and capacity for applications (and their dependencies), not just hosts or virtual machines.
- Automatically update, add or remove new application servers in the appropriate groups through real-time integration.
- Map dependencies to external IP addresses, such as adjoining physical servers, up to one hop away.
- Create user-defined custom applications to be discovered.
- Prevent downtime and better prepare for disaster by having a complete application dependency view.

Performance tools that show you only per-host and per-virtual machine statistics don’t go far enough. Your infrastructure tool needs to know what is dependent on what to give you the full picture of performance and capacity so you can prevent downtime and troubleshoot problems.

In Figure 6, notice how you are able to create a dynamic new application group based on applications recognized through vCenter Infrastructure Navigator. This group can be used both in vCenter Operations Management Suite and VMware vCenter Site Recovery Manager™ as a disaster-recovery protection group. You can even modify forecasting, trends, alerts, thresholds, capacity, time and other policies based on the dynamic group, as shown in Figure 7.
Define membership
Members get added to the group based on the search criteria

Search criteria
An object must match all rules in this rule set to be considered a match with the rule set.

Application equals
Add a new criteria

Add a new rule set
Preview

Objects to always include
RabbitMQ

Figure 6. Creating vCenter Operations Groups Based on vCenter Infrastructure Navigator

New Policy
1 Policy Details
1a General
1b Associations
2 Configure badges
2a Infrastructure badge thresholds
2b VM badge thresholds
2c Groups badge thresholds
3 Configure capacity and time
3a Capacity and time remaining
3b Usable capacity
3c Usage calculation
4 Configure state-related thresholds
4a Powered off and idle VMs
4b Oversized and undersized VMs
4c Underused and stressed
5 Configure alerts
6 Configure forecast and trends

Infrastructure badge thresholds
Adjust the threshold values for badges.

Health Level:
Workload Level:
Anomalies Level:
Faults Level:
Critical Standards Level:
Risk Level:

Time Level:
Capacity Level:
Stress Level:
Important Standards Level:
Efficiency Level:
Waste Level:

Figure 7. Modifying vCenter Operations Group Thresholds
Change and Configuration Management — Maintain Security and Compliance

One of the biggest impacts on virtual infrastructure performance is configuration changes. Not only can these changes slow applications down, they can also cause virtual machines to be out of compliance, or worse, to suffer downtime. Too many application outages or security breaches are caused by configuration changes.

Because of this problem, your solution for virtual infrastructure performance and capacity monitoring needs to work with a configuration management tool such as VMware vCenter Configuration Manager™. As an integrated component of the vCenter Operations Management Suite, vCenter Configuration Manager knows what configuration changes are made to VMware vSphere® hosts, virtual machines, guest operating systems and even the applications that run on them.

Let’s say that a critical Web server is malfunctioning. As we see in Figure 8, checking compliance with vCenter Configuration Manager is easy.

You’ll quickly know that the Web server is out of compliance because of recent changes. Figure 9 shows how the new integration between vCenter Operations Management Suite and vCenter Configuration Manager makes it easy to roll back those changes, resolve the problem and bring the Web server back into compliance with a few clicks.

Compliance verification doesn’t have to be accomplished one server at a time. vCenter Configuration Manager also provides infrastructure-wide compliance reporting (see Figure 10) so that you can immediately know which servers are in or out of internal configuration compliance, security compliance or payment card industry (PCI) compliance.
Figure 9. Rolling Back Changes with vCenter Configuration Manager

Figure 10. Infrastructure Compliance Reporting
Public, Private and Hybrid Cloud Monitoring — vCenter Operations Management Offers the Complete Picture

As more companies make the move from their own virtual infrastructure to a private cloud and then to the public cloud, they need infrastructure performance monitoring, capacity planning, and monitoring for every piece of their private and public cloud infrastructure. As we see in Figure 11, vCenter Operations Management offers a customizable user interface that enables you to see the complete performance and capacity picture of your entire private and public cloud infrastructure. With vCenter Operations Management, you get a solution that supports you all the way as you grow your environment and augment resources in your own datacenter with those from a service provider.

![vCenter Operations Manager Hybrid Cloud Dashboard](image-url)

*Figure 11. vCenter Operations Manager Hybrid Cloud Dashboard*
Figure 12 shows how you can drill down from the high-level dashboard to monitor performance in each of your cloud infrastructures.

Summary

Through the years I have reviewed numerous virtual infrastructure performance and capacity analysis tools, but none—until now—were able to drill down deeply enough to show what applications are running in the virtual infrastructure and what the application dependencies are. The integrated vCenter Operations Management Suite Enterprise Edition—including vCenter Infrastructure Navigator and vCenter Configuration Manager—delivers a unique set of capabilities for a comprehensive view of your infrastructure and applications. By bringing these tools together, you'll be more able to prevent downtime, ensure compliance and solve problems before they impact users. Best of all, you'll be able to stop the finger-pointing and work together with groups across your organization to avoid and solve IT problems.

About the Author

David Davis is the author of the best-selling VMware vSphere video training library from TrainSignal. He has written hundreds of virtualization articles on the Web, is a VMware vExpert, VCP, VCAP-DCA and CCIE #9369 with more than 18 years of enterprise IT experience. His personal Web site is VMwareVideos.com.