vRealize Operations Manager User Guide

vRealize Operations Manager 6.4

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About This User Guide

The VMware® *vRealize Operations Manager User Guide* describes what to do when users experience performance problems in your managed environment.

As a system administrator, you might become aware of a problem with an object in your environment when vRealize Operations Manager generates an alert, or when a user contacts you. To help ensure optimal performance, this information describes how you use vRealize Operations Manager to monitor, troubleshoot, and take action to address problems. It also provides information on how to assess whether problems due to over demand or lack of capacity require a system change or upgrade.

Intended Audience

This information is intended for vRealize Operations Manager administrators, virtual infrastructure administrators, and operations engineers who track and maintain object performance in your managed environment.

VMware Technical Publications Glossary

VMware Technical Publications provides a glossary of terms that might be unfamiliar to you. For definitions of terms as they are used in VMware technical documentation, go to http://www.vmware.com/support/pubs.

Monitoring Objects in Your Managed Environment by Using vRealize Operations Manager

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You can use vRealize Operations Manager to resolve problems that your customers raise, respond to alerts that identify problems before your customers report problems, and generally monitor your environment for problems.

When your customers experience performance problems and call you to resolve the problem, the data that vRealize Operations Manager collects and analyzes is presented to you in graphical forms so that you can compare and contrast objects, understand the relationship between objects, and determine the root cause of problems.

To manage your environment as a proactive rather than reactive administrator, you monitor and respond to alerts. A generated alert notifies you when objects in your environment are experiencing problems. If you resolve the problem based on the alert before your customers notice, then you avoid service interruptions.

You can investigate the problems that generate alerts or that result in calls by using the **Analysis**, **Troubleshooting**, **Details**, and **Environment** tabs.

If you find the root cause of the problem, you might be able to resolve the problem by running an action. The actions make changes to objects in the target system, for example, the VMware vCenter Server® system, from vRealize Operations Manager.

This chapter includes the following topics:

- "What to Do When...," on page 7
- "Monitoring and Responding to Alerts," on page 32
- "Monitoring and Responding to Problems," on page 36
- "Running Actions from vRealize Operations Manager," on page 59
- "Viewing Your Inventory," on page 76

What to Do When...

As a virtual infrastructure administrator, network operations center engineer, or other IT professional, you use vRealize Operations Manager to monitor objects in your environment so that you can ensure service to your customers and resolve any problems that occur.

Your vRealize Operations Manager administrator has configured vRealize Operations Manager to manage two vCenter Server instances that manage multiple hosts and virtual machines. It is your first day using vRealize Operations Manager to manage your environment.

- User Scenario: A User Calls With a Problem on page 8

  The vice president of sales telephones the help desk reporting that her virtual machine, VPSALES4632, is running slow. She is working on sales reports for an upcoming meeting and is running behind schedule because of the slow performance of her virtual machine.

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  You return from lunch to find an alert notification in your inbox. You can use vRealize Operations Manager to investigate and resolve the alert.

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  As you investigate your objects in the context of this scenario, vRealize Operations Manager provides details to help you resolve the problems. You analyze the state of your environment, examine current problems, investigate solutions, and take action to resolve the problems.

User Scenario: A User Calls With a Problem

The vice president of sales telephones the help desk reporting that her virtual machine, VPSALES4632, is running slow. She is working on sales reports for an upcoming meeting and is running behind schedule because of the slow performance of her virtual machine.

As a network operations engineer, you were just reviewing the morning alerts and did not see any problems with her virtual machine, so you begin troubleshooting the problem.

Procedure

1   Search for a Specific Object on page 8

    As a network operations engineer, you must locate the customer's virtual machine in vRealize Operations Manager so that you can begin troubleshooting the reported problem.

2   Review Alerts Related to Reported Problems on page 9

    To determine if the virtual machine about which the vice president of sales reported problems has alerts that indicate the cause of the problem, you review the alerts in vRealize Operations Manager for the object.

3   Use the Troubleshooting Tab Options to Investigate a Reported Problem on page 10

    To troubleshoot problems with the VPSALES4632 virtual machine, you evaluate the symptoms, examine time line information, consider events, and create metric charts to find the root cause of the problem.

Search for a Specific Object

As a network operations engineer, you must locate the customer's virtual machine in vRealize Operations Manager so that you can begin troubleshooting the reported problem.

You use vRealize Operations Manager to monitor three vCenter Server instances with a total of 360 hosts and 18,000 virtual machines. The easiest way to locate a particular virtual machine is to search for it.

Procedure

1   In the **Search** text box, located on the vRealize Operations Manager title bar, type the name of the virtual machine.

    The **Search** text box displays all the objects that contain the string you type in the text box. If your customer knows that her virtual machine name contains SALES, you can type the string and the virtual machine is included in the list.

2   Select the object in the list.

The left pane displays the object name and the related objects, including the host system and vCenter Server instance. The main pane displays the **Summary** tab.

What to do next

Look for alerts related to the reported problem for the object. See "Review Alerts Related to Reported Problems," on page 9.

Review Alerts Related to Reported Problems

To determine if the virtual machine about which the vice president of sales reported problems has alerts that indicate the cause of the problem, you review the alerts in vRealize Operations Manager for the object.

Alerts on an object give you an insight into problems other than the one that the object user reports.

Prerequisites

Locate the customer's virtual machine so that you can review related alerts. See "Search for a Specific Object," on page 8.

Procedure

1   Click the **Summary** tab for the problematic object.

    The **Summary** tab displays active alerts for the object and for any descendant objects that are classified at the top alerts.

2   Review the top alerts for Health, Risk, and Efficiency.

    Top alerts are considered the primary contributors to the current state of the alert badges. Do any of them appear to contribute to the slow response problem? For example, any ballooning or swapping alerts, which indicates that you need to add memory to the virtual machine? Any alerts related to memory contention, which indicates that you need to add memory to the host.

3   If the **Summary** tab does not include any top issues that appear to explain the reported problem, click the **Alerts** tab.

    The **Alerts** tab displays all active alerts for the current object.

4   Review the alerts for problems that are similar to or contribute to the reported problem.

    a   To view the active and cancelled alerts, click **Status: Active** to clear the filter and display active and inactive alerts.

        The cancelled alerts might provide information about the problem.

    b   Click the **Created On** column to sort the alerts so that you can locate alerts generated on or before the time when your customer reported the problem.

    c   To view alerts for the ancestor objects in the same list with the alert for the virtual machine, click the up arrow and select **Host System** and **Cluster Compute Resources**, if they are configured in your environment.

        Add these object types to the list so that you can determine if alerts among the parent objects are contributing to the reported problem.

5   If you locate an alert that appears to explain the reported problem, click the alert name in the alerts list.

6   On the alert details **Summary** tab, review the triggered symptoms and recommendations to determine if the alert indicates the root cause of the reported problem.

What to do next

■   If the alert appears to indicate the source of the problem, follow the recommendations and verify the resolution with your customer. For an example, see "Run a Recommendation On a Datastore to Resolve an Alert," on page 18.

■   If you cannot locate the cause of the reported problem among the alerts, begin more in-depth troubleshooting. See "Use the Troubleshooting Tab Options to Investigate a Reported Problem," on page 10.

Use the Troubleshooting Tab Options to Investigate a Reported Problem

To troubleshoot problems with the VPSALES4632 virtual machine, you evaluate the symptoms, examine time line information, consider events, and create metric charts to find the root cause of the problem.

If a review of the alerts did not help you identify the cause of the problem reported for the virtual machine, use the **Troubleshooting** tabs, Symptoms, Timeline, Events, and All Metrics, to troubleshoot the history and current state of the virtual machine.

Prerequisites

- Locate the object for which the problem was reported. See "Search for a Specific Object," on page 8.

- Review the alerts for the virtual machine to determine if the problem is already identified and recommendations made. See "Review Alerts Related to Reported Problems," on page 9.

Procedure

1   If you are viewing the **Alert Details** tabs, click **Virtual Machine** in the left pane and select VPSALES4632 in the lower list.

    The main pane updates to the display the object **Summary** tab.

2   Click the **Troubleshooting** tab, click the **Symptoms** tab, and review the symptoms to determine if one of the symptoms is related to the reported problem.

    Depending on how your alerts are configured, some symptoms might be triggered but not sufficient to generate an alert.

    a   Review symptom names to determine if one or more symptoms are related to the reported problem.

        The Information column provides the triggering condition, trend, and current value. What are the most common symptoms that affect response time? Do you see any symptoms related to CPU or memory usage?

    b   Sort by the **Created On** date so that you can focus on the time frame in which your customer reported that the problem.

    c   Click the **Status: Active** filter button to disable the filter so that you can review active and inactive symptoms.

    Based on symptoms, you think the problem is related to CPU or memory use. But you do not know if the problem is with the virtual machine or with the host.

3   Click the **Timeline** tab and review the alerts, symptoms, and change events over time that might help you identify common trends that are contributing to the reported problem.

    a   To determine if other virtual machines had symptoms triggered and alerts generated at the same time as your reported problem, click **Show Peer Events**.

        Other virtual machine alerts are added to the time line. If you see that multiple virtual machines triggered symptoms in the same time frame, then you can investigate ancestor objects.

    b   Click the **Show Ancestor Events** and select **Host System**.

        The alerts and symptoms that are associated with the host on which the virtual machine is deployed are added to the time line. Use the information to determine if a correlation exists between the reported problem and the alerts on the host.

4   Click the **Events** tab to view changes in the collected metrics for the problematic virtual machine that could direct you toward the cause of the reported problem.

    a   Use the **Date Controls** option view event for the approximate time when your customer reported the problem.

    b   Click through the **Workload**, **Capacity**, and **Stress** badges to determine if any events are associated with the problem.

    c   Click **Zoom the View** and zoom in on any events or event clusters that occurred at or before the problem was reported.

    d   Click **Show Data Values** and place the cursor over an event to view the details about the event.

       The events for the selected time also appear in the data grid below the event chart.

    e   In the left pane, click **Host System**, click the host name in the list on the lower left pane, and repeat the analysis of the host using **Workload**, **Capacity**, and **Stress**.

Comparing events on the virtual machine and the host, and evaluating those results, indicates that CPU or memory issues are the likely cause of the problem.

5   If you can identify that the problem is related to, for example, CPU or memory use, click the **All Metrics** tab to create your own metric charts so that you can determine whether it is one or the other, or a combination.

    a   If host is still the focus, then start by working with host metrics.

    b   In the metric list, double-click the **CPU Usage (%)** and the **Memory Usage (%)** metrics to add them to the workspace on the right.

    c   In the map, click the **VPSALES4632** object.

       The metric list now displays the virtual machine metrics.

    d   In the metric list, double-click the **CPU Usage (%)** and the **Memory Usage (%)** metrics to add them to the workspace on the right.

    e   Review the host and virtual machine charts to see if you can identify a pattern that indicates the cause of the reported problem.

In this scenario, comparing the four charts reveals that CPU use is normal on both the host and the virtual machine, and the memory use is normal on the virtual machine. However, the memory use on the host began going consistently high three days before the reported problem on the VPSALES4632 virtual machine.

The host memory is running consistently high, affecting the response time for the virtual machines. The number of virtual machines it is running is well within the supported amounts. The possible cause might be too many high process applications on the virtual machines. You can move some of the virtual machines to other hosts, distribute the workload, or power off idle virtual machines.

What to do next

■   In this example, you can use vRealize Operations Manager to power off virtual machines on the host so that you can improve the performance of the virtual machines that are in use. See "Run Actions From Toolbars in vRealize Operations Manager," on page 66.

■   If the combination of charts that you created on the **All Metrics** tab are something that you might want to use again, click **Generate Dashboard**.

■   If you did not resolve the problem, continue your investigation.

User Scenario: An Alert Arrives in Your Inbox

You return from lunch to find an alert notification in your inbox. You can use vRealize Operations Manager to investigate and resolve the alert.

As a network operations engineer, you are responsible for several hosts and their datastores and virtual machines, and you receive emails when an alert is generated for your monitored objects. In addition to alerting you to problems in your environment, alerts should provide viable recommendations to resolve those problems. As you investigate this alert, you are evaluating the data to determine if one or more of the recommendations can resolve the problem.

This scenario assumes that you configured the outbound alerts to send standard email using SMTP and that you configured notifications to send you alert notifications using the standard email plug-in. When outbound alerts and notifications are configured, vRealize Operations Manager sends you messages when an alert is generated so that you can begin responding to problems as quickly as possible.

Prerequisites

■ Verify that outbound alerts are configured for standard email alerts. See *vRealize Operations Manager Customization and Administration Guide*.

Procedure

1 Respond to an Alert in Your Email on page 13

As a network operations engineer, you receive an email message from vRealize Operations Manager with information about one of the data stores for which you are responsible. The email notification informs you about the problem even when you are not presently working in vRealize Operations Manager.

2 Evaluate Other Triggered Symptoms for the Affected Data Store on page 14

You determined that you need more information about the data store before you decide the best response. As a network operations engineer, you examine the **Impacted Object Symptoms** tab to see the other triggered symptoms for the data store.

3 Compare Alerts and Events Over Time in Response to a Datastore Alert on page 15

To evaluate an alert over time, compare the current alert and symptoms for the datastore to other alerts and symptoms, other events, other objects, and over time.

4 View the Affected Datastore in Relation to Other Objects on page 16

To view the object for which the alert was generated as it relates to other objects, use the topological map on the **Relationships** tab in vRealize Operations Manager to visualize the environment.

5 Construct Metric Charts to Investigate the Cause of the Data Store Alert on page 17

To analyze the capacity metrics related to the generated alert, you create charts in vRealize Operations Manager that compare different metrics. These comparisons help identify when something changed in your environment and what effect it had on the datastore.

6 Run a Recommendation On a Datastore to Resolve an Alert on page 18

As a network operations engineer, you investigated the alert regarding datastore disk space and determined that the provided recommendations will resolve the problem, particularly the recommendation to delete unused snapshots. You use vRealize Operations Manager to delete the snapshots.

Respond to an Alert in Your Email

As a network operations engineer, you receive an email message from vRealize Operations Manager with information about one of the data stores for which you are responsible. The email notification informs you about the problem even when you are not presently working in vRealize Operations Manager.

In your email client, you receive an alert similar to the following message.

```
Alert was updated at Tue Jul 01 16:34:04 MDT :
Info:datastore1 Datastore is acting abnormally since Mon Jun 30 10:21:07 MDT  and was last
updated at Tue Jul 01 16:34:04 MDT

Alert Definition Name: Datastore is running out of disk space
Alert Definition Description: Datastore is running out of disk space
Object Name : datastore1
Object Type : Datastore
Alert Impact: risk
Alert State : critical
Alert Type : Storage
Alert Sub-Type : Capacity
Object Health State: info
Object Risk State: critical
Object Efficiency State: info
Symptoms:
SYMPTOM SET — self
Symptom Name    | Object Name    | Object ID     | Metric     | Message Info
Datastore space usage reaching critical limit     datastore1     | b0885859-
e0c5-4126-8eba-6a21c895fe1b     |  Capacity|Used Space    |  HT above 99.20800922575977 > 95

Recommendations:
- Storage VMotion some Virtual Machines to a different Datastore
- Delete unused snapshots of Virtual Machines
- Add more capacity to the Datastore
Notification Rule Name: All alerts -- datastores
Notification Rule Description:
Alert ID : a9d6cf35-a332-4028-90f0-d1876459032b
Operations Manager Server - 192.0.2.0
Alert details
```

Prerequisites

■ Verify that outbound alerts are configured for standard email alerts. See *vRealize Operations Manager Customization and Administration Guide*.

■ Verify that the notifications are configured to send messages to your users for the alert definition. For an example of how to create an alert notification, see *vRealize Operations Manager Customization and Administration Guide*.

Procedure

1 In your email client, review the message so that you understand the state of the affected objects and determine if you must begin investigating immediately.

Look for the alert name, the alert state to determine the current level of criticality, and the affected objects.

2   In the email message, click **Alert Details**.

vRealize Operations Manager opens on the **Summary** tab in the alert details for the generated alert and affected object.

3   Review the **Summary** tab information.

Option	Evaluation Process
Alert name and description	Review the name and description and verify that you are evaluating the alert for which you received an email message.
Recommendations	Review the top recommendation, and if available, other recommendations, to understand the steps that you must take to resolve the issue. If implemented, will the prioritized recommendations resolve the problem?
What is Causing the Issue?	Which symptoms were triggered? Which were not triggered? What affect does this evaluation have on your investigation? In this example, the alert that the datastore is running out of space is configured so that the criticality is symptom based. If you received a critical alert, then it is likely that the symptoms are already at a critical level, having moved up from Warning and Immediate. Look at the sparkline or metric graph chart for each symptom to determine when the problem escalated on the datastore object.

What to do next

- If you determine that the recommendations will resolve the problem, implement them. See “Run a Recommendation On a Datastore to Resolve an Alert,” on page 18.

- If you need more information about the affected objects, continue your investigation. Begin by looking at other triggered symptoms for the data store. See “Evaluate Other Triggered Symptoms for the Affected Data Store,” on page 14.

Evaluate Other Triggered Symptoms for the Affected Data Store

You determined that you need more information about the data store before you decide the best response. As a network operations engineer, you examine the **Impacted Object Symptoms** tab to see the other triggered symptoms for the data store.

If other symptoms are triggered for the object, not just the symptom included in the alert, you can evaluate them to determine what affect these symptoms could have on the alert to which you are responding, and whether the recommendations might resolve the problem.

Prerequisites

Verify that you are addressing the alert for which you received an alert message in your email. See “Respond to an Alert in Your Email,” on page 13.

Procedure

1   In the left pane of vRealize Operations Manager, click the **Alerts** icon.

2   In any of the alert lists, click the alert name.

The center pane view changes to display the alert detail tabs.

3   Click the **Impacted Object Symptoms** tab and review the active symptoms.

Option	Evaluation Process
Criticality	Are other symptoms of similar criticality present that are affecting the object?
Symptom	Are any of the triggered symptoms related to the symptoms that triggered the current alert? Symptoms related to time remaining, capacity, or stress that could indicate storage problems?

Option	Evaluation Process
Created On	Do the date and time stamps for the symptoms indicate that they were triggered before the alert you are investigating, indicating that it might be a related symptom? Were the symptoms triggered after the alert was generated, indicating that the alert symptoms contributed to these other symptoms?
Information	Can you identify a correlation between the alert symptoms and the other symptoms based on the triggering metric values?

What to do next

■   If your review of the symptoms and the provided information clearly indicates that the recommendations will solve the problem, implement one or more of the recommendations. For an example, of implementing one of the recommendations, see "Run a Recommendation On a Datastore to Resolve an Alert," on page 18.

■   If your review of the symptoms did not convince you that the recommendations will resolve the problem or provide you with enough information to identify the root cause, continue your investigation using the **Timeline** tab. See "Compare Alerts and Events Over Time in Response to a Datastore Alert," on page 15.

Compare Alerts and Events Over Time in Response to a Datastore Alert

To evaluate an alert over time, compare the current alert and symptoms for the datastore to other alerts and symptoms, other events, other objects, and over time.

As a network operations engineer, you use the **Timeline** tab to compare this alert to other alerts and events in your environment so that you can determine if you can resolve the problem of the datastore running out of disk space by applying one or more alert recommendations.

Prerequisites

Verify that you are addressing the alert for which you received an alert message in your email. See "Respond to an Alert in Your Email," on page 13.

Procedure

1   In the left pane of vRealize Operations Manager, click the **Alerts** icon.

2   Click the alert name link.

The center pane view changes to display the alert detail tabs.

3   Click the **Timeline** tab.

The **Timeline** tab displays the generated alert and the triggered symptoms for the affected object in a scrollable timeline format, starting when the alert was generated.

4   To determine if other alerts are generated for the object, click the other alert buttons.

In this example, the datastore alert generated a Risk alert, so the other alerts to add to the timeline are Health and Efficiency. Scroll through the timeline using the week timeline at the bottom.

5   To view events that might contribute to the alert, click **Select Event Type** and click the check box for each event type.

Events related to the object are added to the timeline. You add the events to your evaluation of the current state of the object and whether the recommendations can resolve the problem.

6   Click **Show Ancestor Events** and select **Host**.

Because the alert is related to disk space, adding the host to the timeline allows you to see what alerts and symptoms are generated for the host. As you scroll through the timeline, when did some of the related alerts begin? When are they no longer on the timeline? What was the effect on the state of the datastore object?

7   Click **Show Peer Events**.

If other datastores have alerts related to the alert you are currently investigating, seeing when the alerts for the other datastores were generated can help you determine what resource problems you are experiencing in your environment.

8   To remove canceled alerts from your timeline, click **Select Status** and deselect the **Canceled** check box.

Removing the canceled alerts and symptoms from the timeline clears the view and allows you to focus on current alerts.

What to do next

■   If your evaluation of alert in the timeline provided enough information to indicate that one or more of the recommendations to resolve the alert are valid, implement the recommendations. See "Run a Recommendation On a Datastore to Resolve an Alert," on page 18.

■   If you need more information about the affected object, continue your investigation. See "View the Affected Datastore in Relation to Other Objects," on page 16.

View the Affected Datastore in Relation to Other Objects

To view the object for which the alert was generated as it relates to other objects, use the topological map on the **Relationships** tab in vRealize Operations Manager to visualize the environment.

As a network operations engineer, you view a datastore and the related objects in a map to further your understanding of the problem, and to determine if implementing the alert recommendations will resolve the problem that the alert identifies.

Prerequisites

Evaluate the alert over time and in comparison to related objects. See "Compare Alerts and Events Over Time in Response to a Datastore Alert," on page 15.

Procedure

1   In the left pane of vRealize Operations Manager, click the **Alerts** icon.

2   Click the alert name link.

The center pane view changes to display the alert detail tabs.

3   Click the **Relationships** tab.

The **Relationships** tab displays the datastore in a map with the related objects. By default, the badge that this alert affects is selected only on the toolbar, and objects in the tree show a colored square to indicate the current state of the badge.

4   To view the alert status of the objects for the other badges, click the **Health** button and then the **Efficiency** button.

As you click each badge button, the squares on each object indicate whether an alert is generated and the criticality of the alert.

5   To view alerts for an object, select the object and click **Show alerts**.

The alert list dialog box appears, allowing you to search and sort for alerts for the object.

6   To view a list of the child objects for an object in the map, click the object.

A list of the number of children by object type appears at the bottom of the center pane.

7   Use the options to evaluate the datastore.

For example, what does the map tell you about the number of virtual machines that are associated with the datastore? If many virtual machines are associated with a datastore, moving them might free datastore disk space.

What to do next

■   If your review of the map provided enough information to indicate that one or more of the recommendations to resolve the alert are valid, implement the recommendations. See "Run a Recommendation On a Datastore to Resolve an Alert," on page 18.

■   If you need more information about the affected object, continue your investigation. See "Construct Metric Charts to Investigate the Cause of the Data Store Alert," on page 17.

Construct Metric Charts to Investigate the Cause of the Data Store Alert

To analyze the capacity metrics related to the generated alert, you create charts in vRealize Operations Manager that compare different metrics. These comparisons help identify when something changed in your environment and what effect it had on the datastore.

As a network operations engineer, you create custom charts so that you can further investigate the problem, and to determine if implementing the alert recommendations will resolve the problem that the alert identifies.

Prerequisites

View the topological map for the data store to determine if related objects are contributing to the alert or if triggering symptoms indicate that the data store is contributing to other problems in your environment. See "View the Affected Datastore in Relation to Other Objects," on page 16.

Procedure

1   In the left pane of vRealize Operations Manager, click the **Alerts** icon.

2   Click the alert name link.

The center pane view changes to display the alert detail tabs.

3   Click the **Metric Charts** tab.

The **Metric Charts** tab does not include charts. You must add the charts to compare.

4   To analyze the first recommendation, Add more capacity to the Datastore Storage, add related charts to the workspace.

   a   Enter `capacity` in the metric list search text box.

   The list displays metrics that contain the search term.

   b   Double-click the following metrics to add the following charts to the workspace:

   ■   Capacity | Used Space (GB)

   ■   Disk Space | Capacity (GB)

   ■   Summary | Number of Capacity Consumers

   c   Compare the charts.

   For example, if the Capacity | Used Space (%) chart shows an increase in used space, but the Disk Space | Capacity (GB) did not increase and the Summary | Number of Capacity Consumers did not decrease, then adding capacity is a solution, but it does not address the root cause.

5   To analyze the second recommendation, `vMotion some Virtual Machines to a different Datastore`, add related charts to the workspace.

    a   Enter `vm` in the metric list search text box.

    b   Double-click the **Summary | Total Number of VMs** metric to add it to the workspace

    c   Compare the 4 charts.

        For example, if the Summary | Total Number of VMs chart shows that the number of virtual machines did not increase enough to negatively affect the data store, then moving some of the virtual machines is a solution, but it does not address the root cause.

6   To analyze the third recommendation, Delete unused snapshots of virtual machines, add related charts to the workspace.

    a   Enter `snapshot` in the metric list search text box.

    b   Double-click the following metrics to add the charts to the workspace:

        ■   Disk Space | Snapshot Space (GB)

        ■   Disk Space Reclaimable | Snapshot Space | Waste Value (GB)

    c   Compare the charts.

        For example, if the amount of Disk Space | Snapshot Space (GB) increased and the Disk Space Reclaimable | Snapshot Space | Waste Value (GB) indicates an area where space can be reclaimed, then deleting unused snapshots will positively affect the data store disk space problem and resolve the alert.

7   If this is a problematic data store that you must continue to monitor, you can create a dashboard.

    a   Click the **Generate Dashboard** button on the workspace toolbar.

    b   Enter a name for the dashboard and click **OK**.

        In this example, use a name like `Datastore disk space`.

    The dashboard is added to your available dashboards.

You compared metric charts to determine if the recommendations are valid and which recommendation to implement first. In this example, the Delete unused snapshots of Virtual Machines recommendation appears to be the most likely way to resolve the alert.

What to do next

Implement the alert recommendations. See "Run a Recommendation On a Datastore to Resolve an Alert," on page 18.

Run a Recommendation On a Datastore to Resolve an Alert

As a network operations engineer, you investigated the alert regarding datastore disk space and determined that the provided recommendations will resolve the problem, particularly the recommendation to delete unused snapshots. You use vRealize Operations Manager to delete the snapshots.

If you have not enabled actions in the vCenter adapter, you can manually delete the snapshots on your vCenter Server instance.

Prerequisites

■   Compare the metric charts to identify the likely root cause of the alert. See "Compare Alerts and Events Over Time in Response to a Datastore Alert," on page 15 .

Procedure

1   In the left pane of vRealize Operations Manager, click the **Alerts** icon.

2   Click the alert name link.

3   Click the **Summary** tab.

4   Click the **Other Recommendations** arrow to expand the list.

   Other recommendations include the `Storage vMotion some virtual machines to a different datastore` recommendation and the `Delete unused snapshots for virtual machines` recommendation. The delete unused snapshot recommendation includes an action button.

5   Click **Delete Unused Snapshots for Datastore**.

6   In the **Days Old** text box, select or enter the number of days old the snapshot must be to be retrieved for deletions and click **OK**.

   For example, enter 30 to retrieve all snapshots on the datastore that are 30 days old or older.

7   In the Delete Unused Snapshots for Datastore dialog box, review the Snapshot Space, Snapshot Create Time, and the VM Name to determine which snapshots to delete, and select the check box for each one to delete.

8   Click **OK**.

   The dialog box that appears provides a link to Recent Tasks and a link to the task.

9   To verify that the task ran successfully, click **Recent Tasks**.

   The Recent Tasks page appears. The Delete Unused Snapshots action include two tasks, one to retrieve the snapshots and one to delete the snapshots.

10 Select the Delete Unused Snapshot task that has the more recent completed time.

   This is the delete task. The status should be `Completed`.

In this example, you ran an action on the datastore in vCenter Server. The other recommendations might also be valid.

What to do next

■   Verify that the recommendations resolve the alert. Allow a few collection cycles to run after you run the action and verify that the alert is canceled. Alerts are canceled when the conditions that generated them are no longer true.

■   Implement the other recommendations. The other recommendations for this alert require you to use other applications. You cannot implement the recommendations from vRealize Operations Manager.

■   Use other options to investigate the root cause. See "User Scenario: Investigate the Root Cause of a Problem by Using the Troubleshooting Tab Options," on page 56 for an alternative example for investigating the root cause of a problem.

User Scenario: You See Problems as You Monitor the State of Your Objects

As you investigate your objects in the context of this scenario, vRealize Operations Manager provides details to help you resolve the problems. You analyze the state of your environment, examine current problems, investigate solutions, and take action to resolve the problems.

As a virtual infrastructure administrator, you regularly browse through vRealize Operations Manager at various levels so that you know the general state of the objects in your managed environment. Although no one has called or complained, and you do not see any new alerts, you are starting to see that your cluster is running out of capacity.

This scenario refers to objects that are associated with the VMware vSphere Solution, which connects vRealize Operations Manager to one or more vCenter Server instances. The objects in your environment include multiple vCenter Server instances, data centers, clusters (cluster compute resources), host systems, resource pools, and virtual machines.

As you perform the steps in this scenario, and progress through the stages of troubleshooting, you learn how to use vRealize Operations Manager to help you resolve problems. You will analyze the state of the objects in your environment, examine current problems, investigate solutions, and take action to resolve the problems.

This scenario shows you how to evaluate the problems that occur on your objects, and take action to resolve problems.

- With the Analysis tab, you view the settings for object resources, click the links provided to further analyze the problem, and examine the policy settings and thresholds.

- Using the Troubleshooting tab, you examine the symptoms that triggered on the objects, determine when the problems that triggered those symptoms occurred, identify the events associated with those problems, and examine the metric values involved.

- On the Details tab, you investigate the metric activity as a graph, list, or distribution chart, and view the heat maps to examine the criticality levels of your objects.

- With the Environment tab, you evaluate the health, risk, and efficiency of various objects as they relate to your overall object hierarchy. You view the object relationships to determine how an object that is in a critical state might be affecting other objects.

To support future troubleshooting and ongoing maintenance, you can create a new alert definition, and create a dashboard and one or more views and reports. To plan for growth and account for newly approved projects, you can create and commit capacity projects. To enforce the rules used to monitor your objects, you can create and customize operational policies.

Prerequisites

Verify that you are monitoring one or more vCenter Server instances. See the *vRealize Operations Manager Customization and Administration Guide*.

Procedure

1. Analyze the State of Your Environment on page 21

   The Analysis tabs help you analyze your objects in multiple ways. As a Virtual Infrastructure Administrator, you use the Analysis tabs to evaluate the details about the state of your objects to help you resolve problems.

2. Troubleshoot Problems with a Host System on page 23

   You use the Troubleshooting tabs to identify the root cause of problems that are not resolved by alert recommendations or simple analysis.

3. Examine the Environment Details on page 25

   Examine the status of your objects in the views and heatmaps so that you can identify the trends and spikes that are occurring with the resources on your cluster and objects. To determine whether any deviations have occurred, you can display overall summaries for an object, such as for the cluster disk space usage breakdown.

4. Examine the Environment Relationships on page 26

   You use the Environment Overview and List to examine the status of the badges as they relate to the objects in your environment hierarchy, and determine which objects are in a critical state for a particular badge. To view the relationships between your objects to determine whether an ancestor object that has a critical problem might be causing problems with the descendants of the object, you use the Environment Map.

5   Fix the Problem on page 28

You use the analysis and troubleshooting features of vRealize Operations Manager to examine problems that put your objects in a critical state, and identify solutions. To resolve the problems, where actions exist for the object type, you select an object and an available action that is specific to the object. Or, you can open the object in the vSphere Web Client and modify the object settings to resolve the problem.

6   Create a New Alert Definition on page 30

Based on the root cause of the problem, and the solutions that you used to fix the problem, you can create a new alert definition for vRealize Operations Manager to alert you. When the alert is triggered on your host system, vRealize Operations Manager alerts you and provides recommendations on how to solve the problem.

7   Create Dashboards and Views on page 31

To help you investigate and troubleshoot problems with your cluster and host systems that might occur in the future, you can create dashboards and views that apply the troubleshooting tools and solutions that you used to research and solve the problems with your host system, to make those troubleshooting tools and solutions available for future use.

Analyze the State of Your Environment

The Analysis tabs help you analyze your objects in multiple ways. As a Virtual Infrastructure Administrator, you use the Analysis tabs to evaluate the details about the state of your objects to help you resolve problems.

As you browse through the inventory tree, you notice that one of your clusters, named USA-Cluster, is experiencing capacity problems. You use the Analysis tabs to begin to investigate the cause of the problem on USA-Cluster, and you start to see problems reported with the capacity on one of your host systems and other objects.

Prerequisites

Verify that you understand the context of this scenario. See "User Scenario: You See Problems as You Monitor the State of Your Objects," on page 19.

Procedure

1   Click **Environment > vSphere Hosts and Clusters > USA-Cluster**.
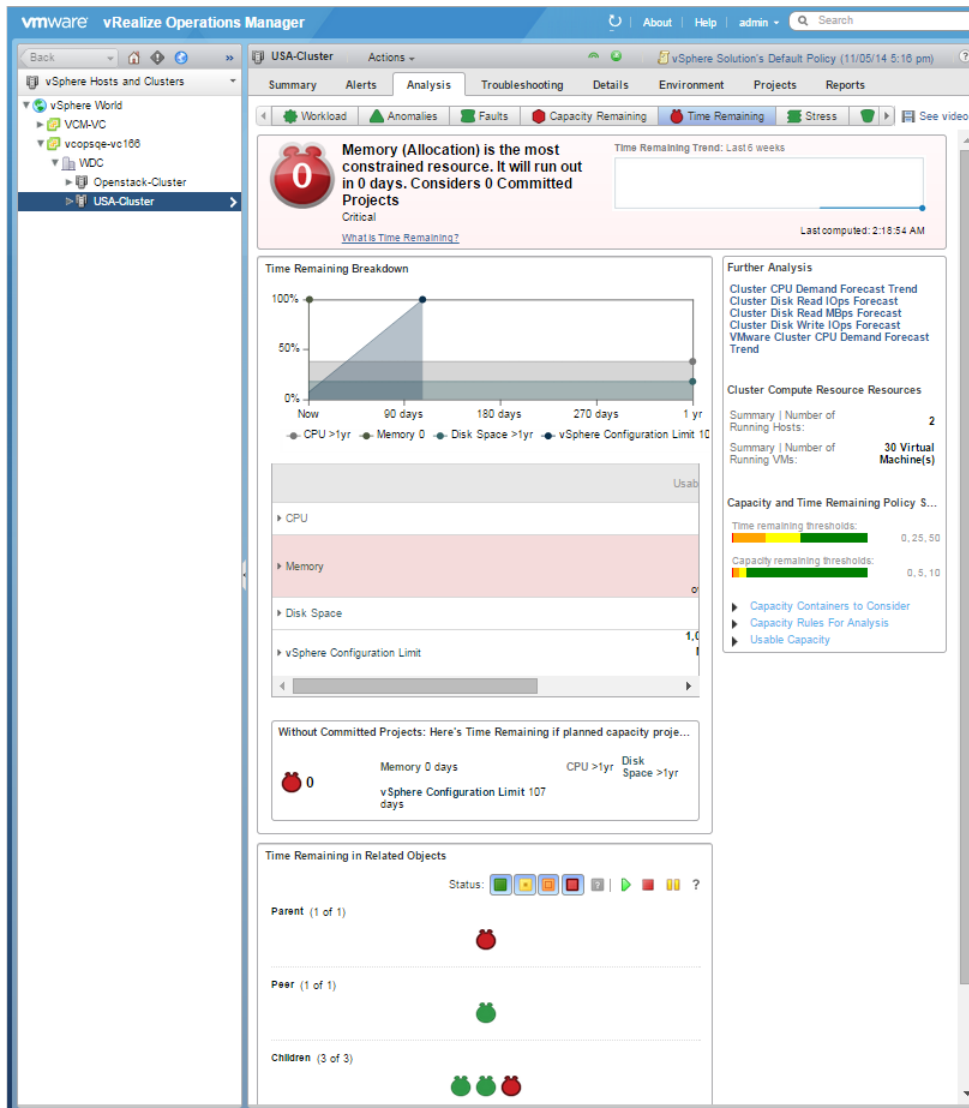
2   Click the **Analysis** tab.

You see red icons on the Capacity Remaining and Time Remaining tabs.

3   Click the **Time Remaining** tab.

You see that the memory allocation is severely constrained.

4   View the time remaining breakdown for the cluster.

The icons indicate that zero days remain, with no planned capacity projects considered.

5   Scroll down until you see the Time Remaining in Related Objects pane.

The parent object is the data center, and the peer represents another cluster. The child objects include the resource pool and host systems. The data center and one of the host systems are experiencing critical memory problems.

6   Hover your mouse over the red parent and child icons.

The memory capacity has expired on the data center and one of the host systems.

The memory capacity problem on the cluster is affecting the memory capacity of the related objects.

What to do next

Use the Troubleshooting tab to further troubleshoot the capacity problems on your cluster and host system. See "Troubleshoot Problems with a Host System," on page 23.

Troubleshoot Problems with a Host System

You use the Troubleshooting tabs to identify the root cause of problems that are not resolved by alert recommendations or simple analysis.

To further troubleshoot the symptoms of the capacity problems that are occurring on the cluster and host system, and determine when those problems occurred, you use the Troubleshooting tabs to continue to investigate the memory problem.

Prerequisites

Use the Analysis tabs to analyze your environment. See "Analyze the State of Your Environment," on page 21.

Procedure

1   Click **Environment > vSphere Hosts and Clusters > USA-Cluster**.

2   Click the **Troubleshooting** tab and review the symptoms.

    The **Symptoms** tab displays the symptoms that triggered on the selected cluster. You notice that several critical symptoms exist.

- `Cluster Compute Resource Time Remaining with committed projects is critically low`
- `Cluster Compute Resource Time Remaining is critically low`
- `Capacity remaining is critically low`

3   Analyze the critical symptoms.

    a   Hover your mouse over each critical symptom to identify the metric used.

    b   To view only the symptoms that affect the cluster, enter `cluster` in the quick filter text box.

        When you hover over `Cluster Compute Resource Time Remaining is critically low`, the metric `Badge|Time Remaining with committed projects (%)` appears. You notice that its value is less than or equal to zero, which caused the capacity symptom to trigger and generate an alert on USA-Cluster.

4   Click the **Timeline** tab to review the triggered symptoms, alerts, and events that occurred on USA-Cluster over time, and identify when the problems occurred.

    a   On the toolbar, click **Select Event Type**.

   b   Click **Date Controls** and select **Last 7 Days**.

        Several events appear in red.

    c   Hover your mouse over each event to view the details.

    d   To display the events that occurred on the cluster's data center, click **Show Ancestor Events**, and select **Datacenter**.

        Warning events for the data center appear in yellow.

    e   Hover your mouse over the warning events.

        You notice that the density is starting to get low, and that a hard threshold violation occurred on the data center late in the evening. The hard threshold violation shows that the Badge|Density metric value was under the acceptable value of 25, and that the violation triggered with a value of 14.89.

    f   To view the affected child objects, click **Show Descendant Events** and select **Host System**.

5   Click the **Events** tab to examine the changes that occurred on USA-Cluster, and determine whether a
     change occurred that contributed to the root cause of the alert or other problems with the cluster.

     a   On the toolbar, click each badge and view the events that occurred.

          The Workload badge displays a graph of the events that occurred on the cluster. Several red
          triangles appear at various points in the graph.
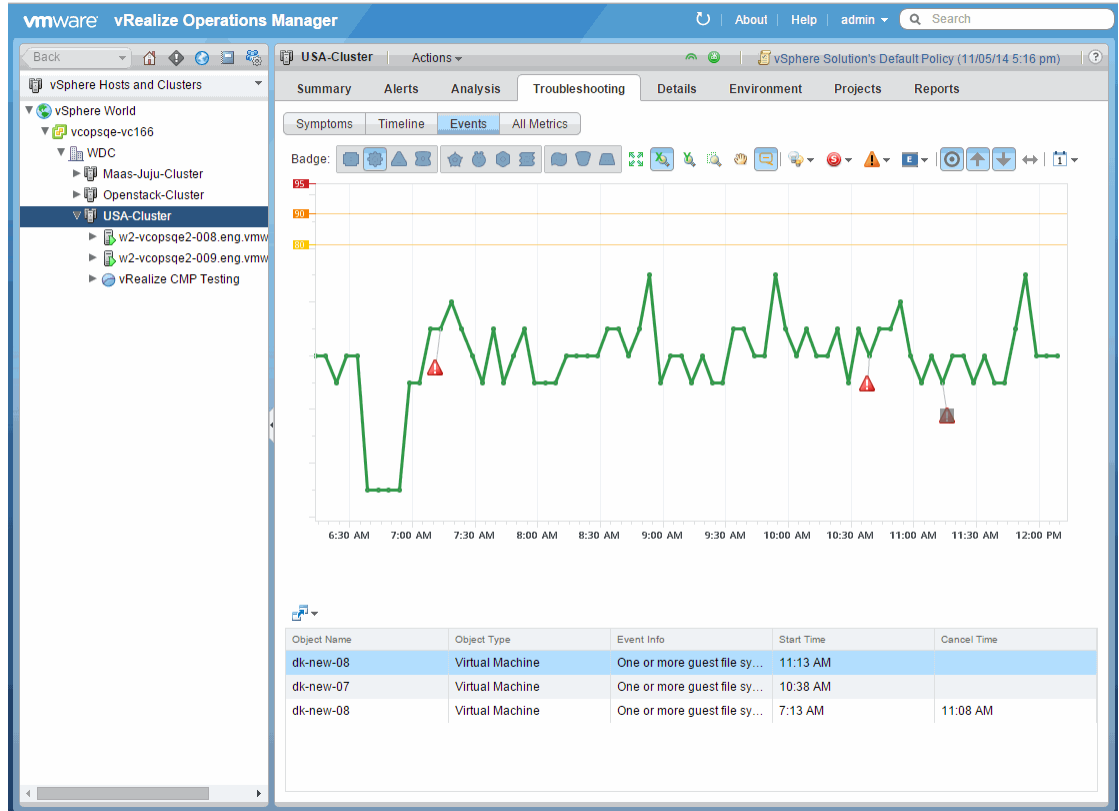
     b   Hover your mouse over each red triangle.

          By reviewing the graph, you can determine whether a reoccurring event has caused the errors.
          Each event indicates that the guest file system is out of disk space. The affected objects appear in
          the pane below the graph.

     c   Click each red triangle to identify the affected object and highlight it in the pane below.

6   Click the **All Metrics** tab to evaluate the objects in their context in the environment topology to help
     identify the possible cause of a problem.

     a   In the top view, select **USA-Cluster**.

     b   In the metrics pane, expand **Badge** and double-click **Badge|Capacity Remaining (%)**.

          The Badge|Capacity Remaining (%) calculation is added to the lower right pane.

     c   In the metrics pane, double-click **Density**.

     d   In the metrics pane, double-click **Workload**.

     e   On the toolbar, click **Date Controls** and select **Last 7 Days**.

          The metric chart indicates that the capacity for the cluster remained at a steady level for the past
          week, but that the cluster density increased to its maximum value in the last several days. The
          Badge|Workload (%) calculation displays the workload extremes that correspond to the density
          problem.

You have analyzed the symptoms, timeline, events, and metrics related to the problems on your cluster, and determined that the heavy workload on the cluster has decreased the cluster density in the last several days, which indicates that the cluster is starting to run out of capacity.

What to do next

Examine the Details views and heatmaps to interpret the properties, metrics, and alerts to look for trends and spikes that occur in the resources for your objects, the distributions of resources across your objects, and data maps to examine the use of various resource types across your objects. See "Examine the Environment Details," on page 25.

Examine the Environment Details

Examine the status of your objects in the views and heatmaps so that you can identify the trends and spikes that are occurring with the resources on your cluster and objects. To determine whether any deviations have occurred, you can display overall summaries for an object, such as for the cluster disk space usage breakdown.

To examine the problems with your USA-Cluster further, use the Details views to display the metrics and collected capacity data for your cluster. Each view includes specific metrics data collected from your objects. For example, trend views use data collected from objects over time to generate trends and forecasts for resources such as memory, CPU, disk space, and so on.

Use the heatmaps to examine the capacity levels on the cluster, host systems, and virtual machines. The block sizes and colors are based on the metrics selected in the heatmap configuration. For example, the heatmap that shows the most abnormal workload for virtual machines is sized by the Badge|Workload (%) metric, and is colored by the Badge|Anomaly metric.

Prerequisites

Use the Troubleshooting tabs to look for root causes. See "Troubleshoot Problems with a Host System," on page 23

Procedure

1   Click **Environment > vSphere Hosts and Clusters > USA-Cluster**.

2   Examine the detailed information about USA-Cluster in the views.

   a   Click the **Details** tab and click **Views**.

      The views provide multiple ways to look at different types of collected data by using trends, lists, distributions, and summaries.

   b   In the search text box, enter `capacity`.

      The list filters and displays the capacity views for clusters and other objects.

   c   Click the view named **Cluster Capacity Risk Forecast**, and examine the number of virtual machines for USA-Cluster in the lower pane.

      Even though the USA-Cluster has two host systems and 30 virtual machines, no capacity exists.

3   Examine the host systems in the cluster, and reclaim capacity from the descendant virtual machines.

   a   Click the **Analysis** tab, and click **Capacity Remaining**.

   b   In the inventory tree, expand **USA-Cluster**, and click each of the host systems.

      The host system named w2-vcopsqe2-009 is in a critical state, with no capacity remaining.

   c   In the lower pane, expand **Memory**, and expand **Allocation**.

      The stress free value is zero, and the amount of memory available is zero, which indicates that the capacity of the host system has been depleted.

d   Click the **Details** tab, and click **Views**, and click the **Virtual Machine Reclaimable Capacity** view.

e   In the lower pane, click the title of the **Reclaimable Memory** column to sort the list of virtual machines so that the largest amount of reclaimable capacity is on top.

f   To reclaim capacity from several virtual machines, click to the right of the first virtual machine name, then press **Shift** and click to the right of the last virtual machine that has capacity to reclaim.

The virtual machines that have reclaimable capacity are highlighted.

g   Click the gear icon, and select **Set CPU Count and Memory for VM**.

h   Click the **Current CPU** column title to sort the list according to the highest number of CPUs.

Based on the actual use of the virtual machines listed, the **New CPU** column recommends fewer CPUs for each virtual machine.

i   Click the check box next to each virtual machine that has a recommended lower CPU count, and click **OK**.

By reducing the number of CPUs for each virtual machine, you free up capacity on your host system, and improve the USA-Cluster capacity and workload.

4   Examine the heatmaps for the host system and virtual machine objects in USA-Cluster.

a   In the inventory tree, click **USA-Cluster**.

b   Click **Details**, click **Heatmaps**, and click through the list of heatmap views.

c   Click **Which VMs currently have the highest CPU demand and contention?**

The heatmap displays blocks that represent the objects in USA-Cluster. The block for a virtual machine appears in red, which indicates that it has a critical problem.

d   Hover over the red block and examine the details.

The cluster, host system, and virtual machine names appear, with links to more information about the object.

e   Click **Show Sparkline** to display the activity trend on the virtual machine.

f   Click each of the **Details** links to display more information.

To verify that freeing up memory on the virtual machines has improved the workload of the host system and the cluster, you can now examine the status of the host system and cluster.

You used views and heatmaps to evaluate the status of your objects and identify trends and spikes, and free up capacity for your host system and USA-Cluster. To further narrow in on problems, you can examine the other views and heatmaps. You can also create your own views and heatmaps.

What to do next

Examine the badge status for the objects in your environment hierarchy to determine which objects are in a critical state, and examine the object relationships to determine whether a problem on one object is affecting one or more other objects. See

Examine the Environment Relationships

You use the Environment Overview and List to examine the status of the badges as they relate to the objects in your environment hierarchy, and determine which objects are in a critical state for a particular badge. To view the relationships between your objects to determine whether an ancestor object that has a critical problem might be causing problems with the descendants of the object, you use the Environment Map.

As you click each of the badges in the Environment Overview, you see that several objects are experiencing critical problems with health, workload, and faults. Others are reporting critical risk status, and many are in critical time remaining and capacity remaining states.

Several objects are experiencing stress. You notice that you can reclaim capacity from multiple virtual machines and a host system, but the overall efficiency status for your environment displays no problems.

Prerequisites

Examine the status of your objects in views and heatmaps. See "Examine the Environment Details," on page 25.

Procedure

1 Click **Environment > vSphere Hosts and Clusters > USA-Cluster**.

2 Examine the USA-Cluster environment overview to evaluate the badge states of the objects in a hierarchical view.

    a In the inventory tree, click **USA-Cluster**, and click **Environment > Overview**.

    b On the Badge toolbar, click through the badges and look for red icons to identify critical problems.

Option	Evaluation Process
Status icons	When the status of my object is critical, what must I do to resolve the problem? How can I be notified before serious problems occur?
Badges: Health, Workload, Anomalies, and Faults	How might the health and workload of my host systems be affecting my virtual machines? Are anomalies and faults on my host systems and virtual machines affecting other objects?
Badges: Risk, Time Remaining, Capacity Remaining, Stress	How does the stress level of my cluster and host systems affect the virtual machines descendants?
Badges: Efficiency, Reclaimable Capacity, Density	To improve efficiency, how can I reclaim capacity from the cluster, host systems, resource pool, and virtual machines, and apply the reclaimed capacity to other objects in my environment?

As you click through the badges, you notice that your vCenter Server and other top level objects appear to be healthy, but you see that a host system and several virtual machines are in a critical state for health, workload, and faults. Several objects also have critical problems with time remaining and capacity remaining.

    c Hover your mouse over the red icon for the host system to display the IP address.

    d Enter the IP address in the search text box, and click the link that appears.

        The host system is highlighted in the inventory tree. You can then look for recommendations or alerts for the host system on the Summary tab.

3 Examine the environment list and view the badge status for your objects to determine which objects are in a critical state.

    a Click **Environment > List**.

    b Examine the badge states for the objects in USA-Cluster.

    c Click the **Capacity Remaining** badge column name to sort the object list and display the objects that are in a critical state.

        Many of the objects that are at risk for capacity remaining also display critical states for time remaining, risk, and health. You notice that multiple virtual machines and a host system named w2-vropsqe2-009 are critically affected. Because the host system is experiencing the most critical problems, and is likely affecting other objects, you must focus on resolving the problems with the host system.

   d Click the host system named **w2-vropsqe2-009**, which is in a critical state, to locate it in the inventory tree.

   e Click **w2-vropsqe2-009** in the inventory tree, and click the **Summary** tab to look for recommendations and alerts so that you can take action.

  4 Examine the environment map.

   a Click **Environment > Map**.

   b In the inventory tree, click **USA-Cluster**, and view the map of related objects.

    In the relationship map, you can see that the USA-Cluster has an ancestor data center, one descendant resource pool, and two descendant host systems.

   c Click the host system named **w2-vropsqe2-009**.

    The types and numbers of descendant objects for this host system appear in the list below. Use the descendant object list identify all of the objects related objects to the host system that might be experiencing problems.

What to do next

Take action in the user interface to resolve the problems. See .

Fix the Problem

You use the analysis and troubleshooting features of vRealize Operations Manager to examine problems that put your objects in a critical state, and identify solutions. To resolve the problems, where actions exist for the object type, you select an object and an available action that is specific to the object. Or, you can open the object in the vSphere Web Client and modify the object settings to resolve the problem.

You have used the Analysis, Troubleshooting, Details, and Environment areas of the user interface to examine the critical problems that occur on your objects. To resolve those problems, you can select actions from the Actions menu, which appears in list and view menus, and various dashboard widgets.

The actions that you can select are specific to an object type, such as a virtual machine. Although you can select an action when you have selected a host system that is experiencing critical problems related to capacity and time, all but one of the actions that you can take apply to virtual machines. The action to delete unused snapshots applies to datastores.

Prerequisites

Examine the environment relationships. See .

Procedure

1 Click **Environment > vSphere Hosts and Clusters > USA-Cluster**.

2 From the **Details** view, select the host system and take action.

  a In the inventory tree, click the host system named **w2-vropsqe2-009**.

  b Click **Details > Views**, and enter `memory` in the search text box.

    c   Click the view named **Host Rightsizing CPU, Memory, and Disk Space**.

The host system named w2-vropsqe2-009 appears in the lower pane. You see that the provisioned CPUs and memory for the host system are wasting capacity, and realize that you can free up some capacity in an attempt to resolve the capacity problem on the host system.

Provisioned	Recommendation	Reclaimable
16 Core CPUs	10 Core CPUs	35 Core CPUs
127 GB memory	35 GB memory	68 GB memory
4,011 GB disk space	11,158 GB disk space	122 GB disk space

    d   In the lower pane, click to the right of the host system named **w2-vropsqe2-009**.

    e   On the toolbar in the lower pane, click the **Open in external application** icon, and click **Open Host in vSphere Client**.

    f   Log in to the vSphere Web Client, and modify the provisioned CPU and memory for the host system.

3   (Optional) From the Environment view, select the host system and take action.

    a   In the inventory tree, click **USA-Cluster**.

    b   Click **Environment > List**.

    c   Click to the right of the name of the w2-vropsqe2-009 host system.

    d   In the lower pane, click to the right of the host system named **w2-vropsqe2-009**.

    e   On the toolbar in the lower pane, click the **Open in external application** icon, and click **Open Host in vSphere Client**.

    f   Log in to the vSphere Web Client, and modify the provisioned CPU and memory for the host system.

4   (Optional) From the inventory tree, select the host system and take action.

    a   In the inventory tree, click **w2-vropsqe2-009**.

    b   At the top of the toolbar in the right pane, click **Actions**.

    c   Click **Open Host in vSphere Client**.

    d   Log in to the vSphere Web Client, and modify the provisioned CPU and memory for the host system.

You have used the available actions to resolve problems on a host system that is experiencing critical problems. The available action appears in **Content > Actions**.

What to do next

To become aware of critical problems on your objects before they adversely affect the performance of other objects and your environment, create an alert definition, and optionally add actions to the alert definition recommendations. See "Create a New Alert Definition," on page 30.

vRealize Operations Manager User Guide

Create a New Alert Definition

Based on the root cause of the problem, and the solutions that you used to fix the problem, you can create a new alert definition for vRealize Operations Manager to alert you. When the alert is triggered on your host system, vRealize Operations Manager alerts you and provides recommendations on how to solve the problem.

To alert you before your host systems experience critical capacity problems, and have vRealize Operations Manager notify you of problems in advance, you create alert definitions, and add symptom definitions to the alert definition.

Prerequisites

Resolve the problem. See "Fix the Problem," on page 28.

Procedure

1   In the left pane, click **Content > Alert Definitions**.

2   Enter `capacity` in the search text box.

    Review the available list of capacity alert definitions. If a capacity alert definition does not exist for host systems, you can create one.

3   Click the plus sign to create a new capacity alert definition for your host systems.

    a   In the alert definition workspace, for the Name and Description, enter
        `Hosts – Alert on Capacity Exceeded`.

    b   For the Base Object Type, select **vCenter Adapter > Host System**

    c   For the Alert Impact, select the following options.

Option	Selection
Impact	Select **Risk**.
Criticality	Select **Immediate**.
Alert Type and Subtype	Select **Application : Capacity**.
Wait Cycle	Select **1**.
Cancel Cycle	Select **1**.

    d   For Add Symptom Definitions, select the following options.

Option	Selection
Defined On	Select **Self**.
Symptom Definition Type	Select **Metric / Supermetric**.
Quick filter (Name)	Enter `capacity`.

    e   From the Symptom Definition list, click **Host System Capacity Remaining is moderately low** and drag it to the right pane.

        In the Symptoms pane, make sure that the Base object exhibits criteria is set to **All** by default.

    f   For Add Recommendations, enter `virtual machine` in the quick filter text box.

    g   Click **Review the symptoms listed and remove the number of vCPUs from the virtual machine as recommended by the system**, and drag it to the recommendations area in the right pane.

        This recommendation is set to Priority 1.

4   Click **Save** to save the alert definition.

Your new alert appears in the list of alert definitions.

You have added an alert definition to have vRealize Operations Manager alert you when the capacity of your host systems begins to run out.

What to do next

Create dashboards and views for future investigation. See "Create Dashboards and Views," on page 31.

Create Dashboards and Views

To help you investigate and troubleshoot problems with your cluster and host systems that might occur in the future, you can create dashboards and views that apply the troubleshooting tools and solutions that you used to research and solve the problems with your host system, to make those troubleshooting tools and solutions available for future use.

To readily view the status of your cluster and host systems when your CIO asks you about their health, you can use the decision support dashboards on the vRealize Operations Manager Home page. For example, you can:

■   Use the vSphere Clusters dashboard to view the utilization index, CPU demand, and memory use for your clusters. This dashboard also tracks the net use and disk I/O operations.

■   Use vSphere Cluster Configuration Summary dashboard to track the high availability status, and other configuration items.

■   Use the vSphere Hosts Overview to examine the capacity levels of your cluster, host systems, and virtual machines.

■   Use the Health of Host Systems dashboard to view the active alert list, capacity metric chart and heatmap for your host system.

Or, you might need to create your own dashboards to track the status of your clusters and host systems.

If you work in a Network Operations Center environment and have multiple monitors, you can run multiple instances of vRealize Operations Manager, and dedicate a monitor to each specific dashboard so that you can visually track the status of your objects.

Prerequisites

Create an alert definition to alert you when the capacity of your host system is getting low. See "Create a New Alert Definition," on page 30.

Procedure

1   In the left pane, click **Home**.

2   Click **Dashboard List**, and look through the list of existing dashboards to determine whether you can use the cluster and host system dashboards to track your clusters and host systems.

3   Click the **Health of Host Systems** dashboard, and review the widgets included on it.

The inclusion of the Object List, Alert List, Metric Picker, Metric Chart, Heatmap, and Top-N widgets would allow you to easily peruse the status of the host systems that you select in the Object List widget. This dashboard has the widget interaction configured so that the object you select in the Object List widget is the object for which the other widgets display data.

4   Create and configure a new dashboard that has widgets to monitor the health of your host systems and generate alerts.

   a   Above the dashboard view, click **Actions** and select **Create Dashboard**.

   b   In the New Dashboard workspace, for the Dashboard Name, enter `Health of Host Systems`, and leave the other default settings.

   c   In the Widget List workspace, add the Object List widget and configure it to display host system objects.

   d   Add the Alert List widget to the dashboard, and configure it to display capacity alerts when the capacity of your host systems becomes an immediate risk.

   e   In the Widget Interactions workspace, for each widget listed, select the Object List widget as the provider to drive the data to the other widgets, and click **Apply Interactions**.

   f   In the Dashboard Navigation workspace, select the dashboards that receive data from the selected widgets, and click **Apply Navigations**.

After vRealize Operations Manager collects data, if a problem occurs with the capacity of your host systems, the Alert List widget on your new dashboard displays the alerts that are configured for your host systems.

What to do next

Prepare to share information with others, plan for growth and new projects, and use policies to continuously monitor all of the objects in your environment. To plan for growth and new projects, see Chapter 2, "Planning the Capacity for Your Managed Environment Using vRealize Operations Manager," on page 77. To generate reports, and create and customize policies, see the *vRealize Operations Manager Customization and Administration Guide*.

Monitoring and Responding to Alerts

Alerts indicate a problem in your environment. Alerts are generated when the collected data for an object is compared to alert definitions for that object type and the defined symptoms are true. When an alert is generated, you are presented with the triggering symptoms, so that you can evaluate the object in your environment, and with recommendations for how to resolve the alert.

Alerts notify you when an object or group of objects are exhibiting symptoms that are unfavorable for your environment. By monitoring and responding to alerts, you stay aware of problems and can react to them in a timely fashion.

Generated alerts drive the status of the top level badges, Health, Risk, and Efficiency.

In addition to responding to alerts, you can generally respond to the status of badges for objects in your environment.

You cannot assign alerts to vRealize Operations Manager users. Your users must take ownership of an alert.

Monitoring Alerts in vRealize Operations Manager

You can monitor your environment for generated alerts in several areas in vRealize Operations Manager. The alerts are generated when the symptoms in the alert definition are triggered, letting you know when the objects in your environment are not operating within the parameters you defined as acceptable.

Generated alerts appear in many areas of vRealize Operations Manager so that you can monitor and respond to problems in your environment.

Alerts

Alerts are classified as Health, Risk, or Efficiency. Health alerts indicate problems that require immediate attention. Risk alerts indicate problems that must be addressed in the near future, before the problems become immediate health problems. Efficiency alerts indicate areas where you can reclaim wasted space or improve the performance of objects in your environment.

You can monitor the alerts for your environment in the following locations.

- Alerts

- Health

- Risk

- Efficiency

You can monitor alerts for a selected object in the following locations.

- Alert Details, including the **Summary**, **Impacted Object Symptoms**, **Timeline**, **Relationships**, and **Metric Charts** tabs

- **Summary** tab

- **Alerts** tab

- **Troubleshooting** tab

- Custom dashboards

- Alert notifications

Working with Alerts

Alerts indicate a problems that must be resolved so that triggering conditions no longer exist and the alert is canceled. Suggested resolutions are provided as recommendations so that you can approach the problem with solutions.

As you monitor alerts, you can take ownership, suspend, or manually cancel alerts.

When you cancel an alert, the alert and any symptoms of type fault, message event, or metric event are canceled. You cannot manually cancel other types of symptoms. If the alert was triggered by a fault symptom, message event symptom or metric event symptom, then the alert is effectively canceled. If the alert was triggered by a metric symptom or property symptom, a new alert might be created for the same conditions in the next few minutes.

The correct way to remove an alert is to address the underlying conditions that triggered the symptoms and generated the alert.

Migrated Alerts

If you migrated alerts from a previous version of vRealize Operations Manager, the alerts are listed in the overview with a cancelled status, but alert details are not available.

User Scenario: Monitor and Process Alerts in vRealize Operations Manager

Alerts in vRealize Operations Manager notify you when objects in your environment have a problem. This scenario illustrates one way that you can monitor and process alerts for the objects for which you are responsible.

An alert is generated when one or more of the alert symptoms are triggered. Depending on how the alert is configured, the alert is generated when one symptom is triggered or when all of the symptoms are triggered.

As the alerts are generated, you must process the alerts based on the negative affect they have on objects in your environment. To do this, you start with Health alerts, and process them based on criticality.

As a virtual infrastructure administrator, you review the alerts at least twice a day. As part of your evaluation process in this scenario, you encounter the following alerts:

■ Virtual machine has unexpected high CPU workload

■ Host has memory contention that a few virtual machines cause

■ Cluster has many virtual machines that have memory contention because of memory compression, ballooning, or swapping

Procedure

1 In the left pane of vRealize Operations Manager, click the **Alerts** icon.

2 In the left pane, click the **Health** alert lists.

   Health alerts are alerts that require immediate attention.

3 Place your cursor in the Criticality column, click the down arrow, and select **Sort Descending**.

   The list is now in order of criticality, with the Critical alerts at the top of the list, followed by Immediate, Warning, and Info alerts.

4 Review the alerts by name, the object on which it was triggered, the object type, and the time at which the alert was generated.

   For example, do you recognize any of the objects as objects that you are responsible for managing? Do you know that the fix that you will implement in the next hour will fix any of the alerts that are affecting the Health status of the object? Do you know that some of your alerts cannot be resolved at this time because of resource constraints?

5 To indicate to other administrators or engineers that you are taking ownership of the `Virtual machine has unexpected high CPU workload` alerts, hold the Ctrl key, click the selected alerts, and click **Take Ownership**.

   The Owner column updates with your user name. You can only take ownership of alerts, you cannot assign them to other users.

6 To take ownership and temporarily exclude the alert from affecting the state of the object, select the `Host has memory contention caused by a few virtual machines` alert in the list and click **Suspend**.

   a Enter **60** to suspend the alert of an hour.

   b Click **OK**.

   The alert is suspended for 60 minutes and you are listed as the owner in the alert list. If it is not resolved in an hour, it returns to an active state.

7 Select the row that contains the `Cluster has many Virtual Machines that have memory contention due to memory compression, ballooning or swapping` alert and click **Cancel** to remove the alert from the list.

   This alert is a known problem that you cannot resolve until the new hardware arrives.

   The alert is removed from the alert list, but the underlying condition is not resolved by this action. The symptoms in this alert are based on metrics, so the alert will be generated during the next collection and analysis cycle. This pattern continues until you resolve the underlying hardware and workload distribution issues.

You processed the critical health alerts and took ownership of the ones to resolve or troubleshoot further.

What to do next

Respond to an alert. See "User Scenario: Respond to a vRealize Operations Manager Alert in the Health Alert List," on page 35.

User Scenario: Respond to a vRealize Operations Manager Alert in the Health Alert List

Generated alerts in vRealize Operations Manager appear in the alert lists. You use the alert lists to investigate, resolve, and begin troubleshooting problems in your environment.

In this scenario, you investigate and resolve the `Virtual machine has unexpected high CPU workload` alert. The alert might be generated for more than one virtual machine.

Prerequisites

■ Process and take ownership of the alerts you will troubleshoot and resolve. See "User Scenario: Monitor and Process Alerts in vRealize Operations Manager," on page 33.

■ Review information about how the Power Off Allowed setting works when you run actions. See "Working With Actions That Use Power Off Allowed," on page 61.

Procedure

1 In the left pane of vRealize Operations Manager, click the **Alerts** icon.

2 In the left pane, click the **Health** alert lists.

3 To limit the list to virtual machine alerts, click **All Filters** on the toolbar.

    a Select **Object Type** in the drop-down menu.

    b Enter `virtual machine` in the text box.

    c Click **OK**.

    The alerts list displays only alerts based on virtual machines.

4 To locate the alerts by name, enter `high CPU workload` in the **Quick filter (Name)** text box.

5 In the list, click the **Virtual machine has unexpected high CPU workload** alert name.

    The **Alert Details Summary** tab for the generated alert and affected object appears.

6 Review the **Summary** tab information.

Option	Evaluation Process
Alert Description	Review the description so that you better understand the alert.
Recommendations	Do you think that implementing one or more of the recommendations will resolve the alert?
What is Causing the Issue?	Do the triggered symptoms support the recommendations? Do the other triggered symptoms contradict the recommendation, indicating that you must investigate further?
	In this example, the triggered symptoms indicate that the virtual machine CPU demand is at a critical level and that the virtual machine anomaly is starting to get high.
Non-Triggered Symptoms	Some alerts are generated only when all the symptoms are triggered. Others are configured to generate an alert when any one of the symptoms are triggered. If you have non-triggered symptoms, evaluate them in the context of the triggered alerts.
	Do the non-triggered symptoms support the recommendations? Do the non-triggered symptoms indicate that recommendations are not valid and that you must investigate further?

7   To resolve the alert based on the recommendation to check the guest applications to determine whether high CPU workload is an expected behavior, click the **Action** menu on the center pane toolbar and select **Open Virtual Machine in vSphere Client**.

   a   Log in to the vCenter Server instance using your vSphere credentials.

   b   Launch the console for the virtual machine and identify which guest applications are consuming CPU resources.

8   To resolve the alert based on the recommendation to add more CPU capacity to this virtual machine, click **Set CPU Count for VM**.

   a   Enter a new value in the **New CPU** text box.

        The value that appears is the calculated recommended size. If vRealize Operations Manager was monitoring the virtual machine for six or more hours, depending on your environment, the value that appears is the CPU Recommended Size metric.

   b   Select the following options to allow power off or to create a snapshot, depending on how your virtual machines are configured.

Option	Description
Power Off Allowed	Shuts down or powers off the virtual machine before modifying the value. If VMware Tools is installed and running, the virtual machine is shut down. If VMware Tools is not installed or not running, the virtual machine is powered off without regard for the state of the operating system. In addition to whether the action shuts down or powers off a virtual machine, you must consider whether the object is powered on and what settings are applied.
Snapshot	Creates a snapshot of the virtual machine before you add CPUs. If the CPU is changed with CPU Hot Plug enabled, then the snapshot is taken with the virtual machine running, which consumes more disk space.

   c   Click **OK**.

        The action adds the recommended number of CPUs to the target virtual machine.

9   Allow several collection cycles to run after implementing the recommended changes and check the alert list.

What to do next

If the alert does not reappear after several collection cycles, it is resolved. If it reappears, further troubleshooting is required. For an alternative scenario for troubleshooting alerts, see "User Scenario: An Alert Arrives in Your Inbox," on page 12.

Monitoring and Responding to Problems

The organization of the tabs and options in vRealize Operations Manager provides a built-in workflow that you can use when you work with objects in your environment.

The tabs, **Summary**, **Alerts**, **Analysis**, and so on, provide a progressive level of detail about the selected object. As you work through the tabs, starting with the high level **Summary** and **Alerts** tabs, you see the general state of an object. If you identify a problem, you use the aggregated metrics in the **Analysis** tabs to view the state of the object in a more detail. The data provided in the **Troubleshooting** tabs is useful when you are investigating the root cause of a problem. The **Details** tabs are specific data views and the **Environment** tabs show object relationships.

As you monitor objects in your environment, you will discover which tabs provide the information that you need when you are investigating problems.

Evaluating Object Summary Information

The **Summary** tab that is associated with the other object tabs summarizes Heath, Risk, and Efficiency alert badges for the selected object and displays the top alerts that lead to the current state. It also displays the top alerts for the descendants of the selected object in the current navigation hierarchy.

As an overview of alerts for an object, object group, or application, you use this tab to evaluate the affect that alerts are having on an object and to begin troubleshooting problems.

Summary Tab Alert Types

The Health, Risk, and Efficiency badge states are based on the number and criticality of the generated alerts for the selected object.

■ Health alerts indicate problems that affect the health of your environment and require immediate attention to ensure that service to your customers is not affected.

■ Risk alerts indicate problems that are not immediate threats but should be addressed in the near future.

■ Efficiency alerts tell you where you can improve performance or reclaim resources.

Summary Tab for an Object or an Object Group

When you are working with a single object, the Top Alerts are the alerts generated for the object and the Top Alerts for Descendants are the alerts generated for any child or other descendant objects in the currently selected navigation hierarchy. For example, if you are working with a host object in the vSphere Host and Clusters navigation hierarchy, descendants can include virtual machines and datastores.

When you are working with object groups, which can include one object type, such as hosts, or multiple objects types, such as hosts, virtual machines, and datastores, all the group member objects are descendants of the group container. The most critical generated alerts for the member objects appear as Top Alerts for Descendants.

For an object group, the only Top Alerts that might be generated are the predefined group population alerts. A group population alert considers the health of all group members and is triggered if the average health is above the Warning, Immediate, or Critical threshold. If a group population alert is generated, then the badge score and color is affected by the alert. If a group population alert is not generated, then the badges are green. This behavior is because an object group is a container for other objects.

Summary Tab and Related Hierarchies

The alerts that appear on the **Summary** tab for an object can vary depending on the currently selected hierarchy in the Related Hierarchies in the left pane.

Depending on the selected hierarchy, you see different alerts and relationships on the **Summary** tab for an object. The current focus object name is on the center pane title bar, but the descendent alerts depend on the relationships that the highlighted hierarchy defines in the Related Hierarchies list in the upper left pane. For example, if you are working with a host object relative to virtual machines in the vSphere Hosts and Clusters hierarchy, then descendants commonly include virtual machines and datastores. But if you are working with the same host as a member of an object group, then any alerts on virtual machines that are also members of the group do not appear because the host and the virtual machines are considered children of the group and peers among each other. In this example, the focus of the **Summary** tab is the host in the context of the group, not the vSphere Hosts and Clusters hierarchy.

Summary Tab Evaluation Techniques

You can evaluate the state of objects, starting with the **Summary** tab, by using one or more of the following techniques.

- Select an object or object group, click on the alerts on the **Summary** tab, and resolve the problems that the alert indicates.

- Select an object and examine the information about the current object that is provided in the other tabs. For example, you start on the object **Summary** tab and compare the generated alerts to the analytic information about the object on the **Analysis** tabs.

- Select an object, review the alerts on the **Summary** tab, and select other objects, comparing the volume and types of alerts generated for different objects.

User Scenario: Evaluate the Alert Badges for Objects for a vRealize Operations Manager Object Group

In vRealize Operations Manager, you use alerts on a group to review the summary alert information for hosts and virtual machine descendant objects so that you can see how the state of one object type can affect the state of the other.

As a network operations center engineer, you are responsible for monitoring a group of hosts and virtual machines for the sales department. As part of your daily tasks, you check the state of the objects in the group to determine if there are any immediate problems or any upcoming problems based on generated alerts. To do this you start with your group of objects, particularly the host systems in the group, and review the information in the **Summary** tab.

In this example, the group includes the following object alerts.

- `Host has memory contention caused by a few virtual machines` is a Health alert

- `Virtual Machine has chronic high memory workload` is a Risk alert

- `Virtual Machine is demanding more CPU than the configured limit` is a Risk alert

- `Virtual Machine has large disk snapshots` is an Efficiency alert

The following method of evaluating alerts on the **Summary** tab is provided as an example for using vRealize Operations Manager and is not definitive. Your troubleshooting skills and your knowledge of the particulars of your environment determine which methods work for you.

Prerequisites

- Create a group that includes virtual machines and the hosts on which they run. For example, Sales Dept VMs and Hosts. For an example of how to create a similar group, see *vRealize Operations Manager Customization and Administration Guide*.

- Review how the **Summary** tab works with object groups and related hierarchies. See "Evaluating Object Summary Information," on page 37.

Procedure

1   In the left pane of vRealize Operations Manager, click the **Environment** icon.

2   In the center pane, click the **Groups** tab and click your **Sales Dept VMs and Hosts** group.

3   To view the alerts for a host and the associated child virtual machines, in the left pane, click **Host System** and click the host name in the lower left pane.

   The **Summary** tab displays the Health, Risk, and Efficiency badges, the top alerts for the host. Because the group is still the focus, the alerts for the child virtual machines do not appear in the Top Alerts for Descendants widgets.

4   To view the Summary tab for the host so that you can also work with the child virtual machines, click the right arrow to the right of the host name in the lower left pane.

5   Select the **vSphere Hosts and Clusters**, located in the upper part of the left pane.

To work with alerts for child virtual machines, the host in the vSphere Hosts and Clusters hierarchy must be the focus of the **Summary** tab rather than the host as member of the object group.

6   To view the alert details for an alert in the Top Health Alert pane, click the **Host has memory contention caused by a few virtual machines** alert name.

When multiple objects are affected, and you click the alert link to view the details, the Health Issues dialog box appears. If there is only one object affected, the Alert Details Summary tab for the object is displayed.

7   On the **Alert Details Summary** tab, begin evaluating the recommendations and triggered symptoms.

A recommendation for this generated alert is to move some virtual machines with high memory workload from this host to a host with more available memory.

8   To return to the object **Summary** tab so that you can review alerts for any descendant virtual machines, click the back button located to the left of the left pane toolbar icons.

The host is again the focus of the object **Summary** tab. Generated alerts for the child virtual machines appear in one or more of the Top Alerts for Descendants panes.

9   Click on each virtual machine alert and evaluate the information provided on the **Alert Details Summary** tab.

Virtual Machine Alert	Evaluation
Virtual Machine has chronic high memory workload	The recommendation is to add more memory to this virtual machine.
	If one or more virtual machines are experiencing high workload, this situation is probably contributing to the host memory contention alert. These virtual machines are candidates for moving to a host with more available memory. Moving the virtual machines can resolve the host memory contention alert and the virtual machine alert.
Virtual Machine is demanding more CPU than the configured limit	The recommendations include increasing or removing the CPU limits on this virtual machine.
	If one or more virtual machines are demanding more CPU than is configured, and the host is experiencing memory contention, then you cannot add CPU resources to the virtual machine without further stressing the host. These virtual machines are candidates for moving to a host with more available memory. Moving the virtual machines would allow you to increase the CPU count and resolve the virtual machine alert, and might resolve the host memory contention alert.

10   Based on your evaluation, take action based on the child virtual machine recommendations.

After you take action, it will take a few collection cycles to determine if your actions resolved the virtual machine and host alerts.

What to do next

After a few collection cycles, look again at your Sales VMs and Hosts group to determine if the alerts are canceled and no longer appear in the object **Summary** tab. If the alerts are still present, see "User Scenario: Investigate the Root Cause of a Problem by Using the Troubleshooting Tab Options," on page 56 for an example troubleshooting workflow.

Investigating Object Alerts

The **Alerts** tab provides a list of generated alerts for the currently selected object. When you are working with objects, reviewing and responding to generated alerts on the **Alert** tab helps you manage problems in your environment.

The alerts notify you when a problem occurs in your environment based on configured alert definitions. Object alerts are useful to you as an investigative tool in two ways. They can provide you with proactive notification about problems in your environment before a user calls you to complain, and they provide information about the object that you can use when troubleshooting general or reported problems.

As you review the **Alerts** tab, you can add ancestors and descendants to the list to broaden your view of the alerts. You can see if alerts on the current object affect other objects or how the current object is affected by the problems indicated by alerts on other objects.

Depending on the best practices and workflows of your infrastructure operations team, you can use the object **Alerts** tab to manage generated alerts on individual objects.

■ Take ownership of alerts so that your team knows that you are working to resolve the problem.

■ Suspend an alert so that is temporarily excluded from affecting the Health, Risk, or Efficiency state of the object while you investigate the problem.

■ Cancel alerts that you know are a result of a deliberate action, for example, a network card was removed from a host for replacement, or that are known issues that you cannot resolve at this time because of resource constraints. Canceling an alert that is generated because of only fault, message event, or metric event symptoms cancels the alert permanently. Canceling an alert that is generated because of metric, super metric, or property symptoms can result in the alert being regenerated if the underlying metric or property condition remains true. It is only effective to cancel alerts generated because of fault, message event, or metric event symptoms.

Investigating and resolving alerts helps you provide the best possible environment to your customers.

User Scenario: Respond to Alerts on the Alerts Tab for Problem Virtual Machines

You respond to alerts for objects so that you can bring the affected objects back to the required level of configuration or performance. Based on the information in the alert and using other information provided in vRealize Operations Manager, you evaluate the alert, identify the most likely solution, and resolve the problem.

As a virtual infrastructure administrator or operations manager, you troubleshoot problems with objects. Reviewing and responding to the generated alerts for objects is part of any troubleshooting process. In this example, you want to resolve workload problems for a virtual machine. As part of that process, you review the **Alerts** tab to determine what alerts might indicate or contribute to the identified problem.

The problem virtual machine is db-01-kyoto, which you use as a database server.

The following method of responding to alerts on the **Alerts** tab is provided as an example for using vRealize Operations Manager and is not definitive. Your troubleshooting skills and your knowledge of the particulars of your environment determine which methods work for you.

Prerequisites

■ Verify that the vCenter Adapter has been configured for the actions in each vCenter Server instance.

■ Verify that you understand how to use the Power Off Allowed option if you are running Set CPU Count, Set Memory, and Set CPU Count and Memory actions. See "Working With Actions That Use Power Off Allowed," on page 61.

Procedure

1   Enter the name of the object, `db-01-kyoto`, in the **Search** text box and select the virtual machine in the list.

The object **Summary** tab appears. The Top Alerts panes display important active alerts for the object.

2   Click the **Analysis** tab.

The **Workload** tab is the first tab. This badge indicates that the workload is highest by CPU, but memory is also above the configured limit.

3   Click the **Alerts** tab.

In this example, the alert list includes the follow alerts that might be related to the problem you are investigating.

■   Virtual machine has unexpected high CPU workload.

■   Virtual machine has unexpected high memory workload.

4   In the upper left pane, select the **vSphere Hosts and Clusters** related hierarchy and select ancestor or descendant alerts to add to the list.

You want to check for possible alerts on ancestor or descendant objects in the context of the selected hierarchy.

a   On the toolbar, click **Show Ancestor Alerts** and select the **Host System** and **Resource Pool** check boxes.

Any alerts for the host system or resource pool related to this virtual machine are added to the list.

b   Click **Show Descendant Alerts** and select **Datastore**.

Any alerts for the datastore are added to the list.

In this example, there are no additional alerts for the host, resource pool, or datastore, so you begin addressing the virtual machine alerts.

5   Click the **Virtual machine has unexpected high CPU workload** alert name.

The **Alert Details Summary** tab appears.

6   Review the recommendations to determine if one or more suggested recommendations can fix the problem.

This example includes the following common recommendations:

■   `Check the guest applications to determine whether high CPU workload is expected behavior.`

■   `Add more CPU capacity for this virtual machine.`

7   To follow the `Check the guest applications to determine whether high CPU workload is expected behavior` recommendation, click **Actions** on the title bar and select **Open Virtual Machine in vSphere Client**.

The vSphere Web Client Summary tab appears so that you can open the virtual machine in the console and check which applications are are contributing to the reported high CPU workload.

8   To follow the `Add more CPU Capacity for this virtual machine` recommendation, click **Set CPU Count for VM** .

a   Enter a value in the **New CPU** text box.

The default value that appears before you provide a value is a recommended value based on analytics.

b   To allow the action to power off the virtual machine before running the action if Hot Add for CPU is not enabled, select the **Power Off Allowed** check box.

      c   To create a snapshot before changing the virtual machine CPU configuration, select the **Snapshot** check box.

      d   Click **OK**.

      e   Click the Task ID link and verify that the task ran successfully.

    The specified number of CPUs are added to the virtual machine.

What to do next

After a few collection cycles, return to the object **Alerts** tab. If the alert no longer appears, then your actions resolved the alert. If the problem is not resolved, see "User Scenario: Investigate the Root Cause of a Problem by Using the Troubleshooting Tab Options," on page 56 for an example troubleshooting workflow.

User Scenario: Respond to Alerts on a Custom Dashboard

You can use a custom dashboard that includes widgets related to alerts to monitor whether alerts exist in your environment. The custom dashboard provides a single interface where you can monitor the general alert status for the objects and object groups, and begin processing the alerts so that you can resolve them.

As a virtual infrastructure administrator, you are responsible for the virtual machines and hosts that are used by the accounting department. You created alerts to manage the accounting department objects, and then create a dashboard where the primary widget displays objects in the accounting object group. You now want to use the dashboard to manage the alerts for this group.

Prerequisites

- Create alerts to manage accounting department objects. See *vRealize Operations Manager Customization and Administration Guide*.

- Create a custom dashboard to which you add the Alert List, Top Alerts, and alert widgets. The widgets are configured to monitor objects in your environment. See *vRealize Operations Manager Customization and Administration Guide*.

Procedure

1   In the left pane of vRealize Operations Manager, click the **Home** icon.

2   On the dashboard title bar, click **Dashboard** and select **Accounting VMs and Hosts**.

3   In the Acct Dept Alert List, click the Status column header to sort so that the active alerts are at the top of the list.

4   On the alert list toolbar, click **Color Row by Alert Criticality**.

    The alerts are now highlighted by color so that you can address those with the highest criticality first.

5   Click the row for the object with the most critical alert to address first.

    Because of the configured widget interactions, the Health, Risk, Efficiency, Alert Volume, and Top Alerts widgets display data for the selected object.

      a   Review the Health, Risk, and Efficiency widgets so that you understand the general alert status of the object.

      b   Review the Top Alerts widget to determine the number of alerts for the object.

    c   Click the alert name in the widget.

        For example, click the **Acct VM CPU early warning Risk** alert. The **Alert Details Summary** tab appears.

    d   Resolve the alert based on recommendations.

        For example, to use the `If this is a standalone host, add more memory to the host` recommendation, click the link to the instructions for adding memory to a host.

6   To return to the Accounting VMs and Hosts dashboard so that you can process more alerts, click the back button located on the left pane toolbar.

7   Select the next alert in the alert list and continue processing the alerts.

What to do next

After a few collection cycles, look again at your alerts to determine if they were canceled and no longer appear in the dashboard. If the alerts are still present, see for an example troubleshooting workflow.

Evaluating Metric Information

The **All Metrics** tab provides a relationship map and user-defined metric charts. The topological map helps you evaluate objects in the context of their place in your environment topology. The metric charts are based on the metrics for the selected object that you think will help you identify the possible cause of a problem in your environment.

Although you might be investigating problems with a single object, for example, a host system, the relationship map allows you to see the host in the context of parent and child objects. It is also works as a hierarchical navigation system. If you double-click an object in the map, that object becomes the focus of the map and the available metrics for the object are active in the lower-left pane.

You can also build your own set of metric charts. You select the objects and metrics so that you can get a more detailed view of changes to different metrics for a single object, or for related objects over time.

Where available, the tab also provides pre-defined sets of metric to help you when looking at a specific aspect of an object. The metrics are organized into the most relevant groups for the selected object, and provide the most relevant metrics. For example, for a host, the metrics are displayed under CPU, Memory, Network, and Storage.

Create Metric Charts When You Troubleshoot a Virtual Machine Problem

You create a custom group of metric charts when you troubleshoot a problem with a virtual machine so that you can compare different metrics. The level of detail that you can create using the **All Metrics** tab in vRealize Operations Manager can contribute significantly to your effort to find the root cause of a problem.

As a virtual infrastructure administrator investigating a reported performance problem with a virtual machine, you determined that you need to see detailed charts about the following reported symptoms.

■   Guest file system overall disk space usage reaching critical limit

■   Guest partition disk space usage

The following method of evaluating problems using the **All Metrics** tab is provided as an example for using vRealize Operations Manager and is not definitive. Your troubleshooting skills and your knowledge of the particulars of your environment determine which methods work for you.

Procedure

1   Enter the name of the virtual machine in the **Search** text box, located on the main title bar.

    In this example, the virtual machine name is `sales-10-dk`.

2   Click the **All Metrics** tab.

3   In the relationship topology map, click the virtual machine, **dk-new-10**.

      The metrics list, located in the lower left of the center pane, displays virtual machine metrics.

4   On the chart toolbar, click **Date Control** and select a time that is on or before the symptoms were triggered.

5   Add metric charts to the display area for the virtual machine.

      a   In the metric list, select **Guest Files System Stats > Total Guest File System Free (GB)** and double-click the metric name.

      b   To add the guest partition, for example, C:\, select **Guest Files System Stats > C:\ > Guest File System Free (GB)** and double-click the metric name.

      c   To add disk space for comparison, select **Disk Space > Capacity Remaining (%)** and double-click the metric name.

6   Compare the charts.

      A comparison of the charts shows a similar decrease in the file system free space, and that the virtual machine disk space capacity remaining is decreasing at a steady rate. You determine that you must add disk space to the virtual machine, but you do not know if the datastore can support the change to the virtual machine.

7   Add the datastore capacity chart to the charts.

      a   In the topology map, double-click the host.

         The topology map refreshes with the host as the focus object.

      b   Click the datastore.

      c   In the metric list, which is updated to display datastore metrics, select **Capacity > Available Space (GB)** and double-click the metric name.

8   Review the datastore capacity chart to determine if sufficient capacity is available on the datastore to support increasing the disk space on the virtual machine.

You know that you need to increase the size of the virtual disk on the virtual machine.

What to do next

Expand the virtual disk on the virtual machine and assign it to stressed partitions. Click **Actions**, located on the object title bar, and open the virtual machine in the vSphere Web Client.

Host-Related Metrics

vRealize Operations Manager provides groups of metrics for selected hosts. Each group displays the most relevant metrics for the host to help you monitor your environment.

To display metric groups, select a host in the Environment Overview, and then select the **All Metrics** tab.
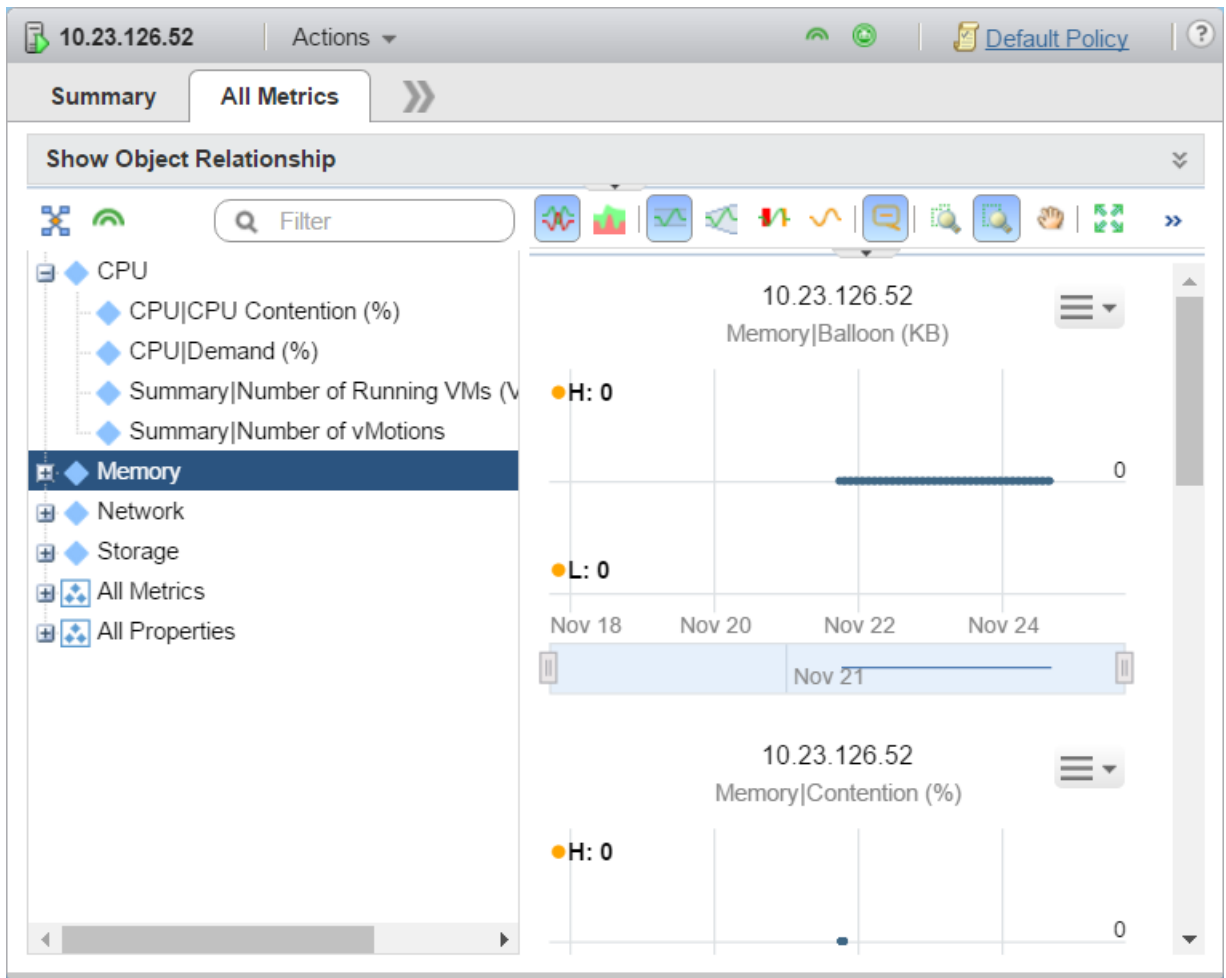
To display the metrics contained within a group, click the plus sign next to the group. You can double-click a group to populate the chart window with a separate chart for each of the metrics in the group. In the screenshot above, the metrics of the memory group populate the chart window.

Table 1-1. CPU Metric Group

Metric	Description
CPU|CPU contention (%)	This metric shows the percentage of time the VMs in the ESXi hosts are unable to run because they are contending for access to the physical CPUs. The number shown is the average number for all VMs. The number will be lower than the highest number experienced by the VM that is most impacted by CPU contention.
	Use this metric to verify if the host can serve all its VMs efficiently. Low contention means that the VM can access everything it demands to run smoothly. It means that the infrastructure is providing good service to the application team.
	When using this metric, ensure that the number is within your expectation. Look at both the relative number and the absolute number. Relative means a drastic change in value, meaning that the ESXi is unable to serve the VMs. Absolute means that the real value itself is high. Investigate why the number is high. One factor that impacts this metric is CPU Power Management. If CPU Power Management clocks down the CPU speed from 3 GHz to 2 GHz, the reduction in speed is accounted for because it shows that the VM is not running at full speed.
	This metric is calculated in the following way: `cpu|capacity_contention / (200 * summary|number_running_vcpus)`
CPU|Demand (%)	This metric shows the amount of CPU resources a VM would use if there were no CPU contention or CPU limit. This metric represents the average active CPU load for the past five minutes.
	Keep this number below 100% if you set the power management to maximum.
	This metric is calculated in the following way: `( cpu.demandmhz / cpu.capacity_provisioned)*100` .

Table 1-1. CPU Metric Group (Continued)

Metric	Description
Summary|Number of running VMs	This metric shows the number of running VMs at a given point in time. The data is sampled every five minutes.
	A large number of running VMs might be a reason for CPU or memory spikes because more resources are used in the host. The number of running VMs gives you a good indicator of how many requests the ESXi host must juggle. Powered off VMs are not included because they do not impact ESXi performance. A change in the number of running VMs can contribute to performance problems. A high number of running VMs in a host also means a higher concentration risk, because all the VMs will fail if the ESXi crashes.
	Use this metric to look for a correlation between spikes in the running VMs and spikes in other metrics such as CPU contention, or memory contention.
Summary|Number of vMotions	This metric shows the number of times a live migration (vMotion) with no VM downtime or service disruption took place in a host in the last (x) minutes.
	The number of vMotions is a good indicator of stability. In a healthy environment, this number is stable and relatively low.
	When using this metric, look for a correlation between vMotions and spikes in other metrics such as CPU contention and memory contention. Although the vMotion should not create any spikes, it is highly likely that some spikes in memory usage contention, and CPU demand and contention are experienced.

Table 1-2. Memory Metric Group

Metric	Description
Memory|Balloon (KB)	This metric shows the total amount of memory currently used by the VM memory control.
	Use this metric to monitor how much VM memory the ESXi has reclaimed through memory ballooning.
	The presence of ballooning indicates that the ESXi has been under memory pressure. ESXi activates ballooning when its consumed memory reaches a specific threshold. For example, in vRealize Operations Manager 6.0, the threshold is >98%.
	When using this metric, verify if the size of the ballooning is increasing. An increase in ballooning indicates that the lack of memory is not a one time occurrence, and that the memory shortage is worsening. Look for memory fluctuations which indicate that the VM required the ballooned out page. If the VM requests a ballooned out page, this translates into a memory performance problem for the VM because the page has to be returned from the disk.
	When the balloon target value is greater than the value shown by the metric, it means that there is more available memory that can be reclaimed.
Memory|Contention (%)	This metric shows the percentage of time VMs are waiting to access swapped memory.
	Use this metric to monitor ESXi memory swapping. A high value indicates that the ESXi is running low on memory, and a large amount of memory is being swapped.
Memory|Usage (%)	This metric shows the amount of physical memory actively used. The memory usage is displayed as a percentage of the total configured or available memory. This metric maps to the Consumed counter in vCenter.
	When the metric displays a high value, it indicates that the ESXi is using a large percentage of available memory. Check other memory-related metrics to see if the ESXi requires more memory.

Table 1-3. Network Metric Group

Metric	Description
Network I/O | Aggregate of all instances | Packet Dropped (%)	This metric shows the percentage of received and transmitted packets dropped in the collection interval.
	Use this metric to monitor the reliability and performance of the ESXi network. A high value indicates that the network is not reliable and performance decreases.
Network I/O | Aggregate of all instances | Packet Received per second	This metric shows the number of packets received in the collection interval.
	Use this metric to monitor the network usage of the ESXi.
Network I/O | Aggregate of all instances | Packet Transmitted per second	This metric shows the number of packets transmitted during the collection interval.
	Use this metric to monitor the network usage of the ESXi.

Table 1-4. Storage Metric Group

Metric	Description
Datastore I/O	Average observed virtual machine disk I/O workload	
Storage adapter	Aggregate of all instances	Read latency (ms)	This metric shows the average amount of time required for a read operation by all the storage adapters.
	Use this metric to monitor the read operation of the storage adapter. A high value indicates that the ESXi is experiencing storage read operation slowness.
	The total latency is the sum of kernel latency and device latency.
Storage adapter	Aggregate of all instances	Write latency (ms)	This metric shows the average amount of time required for a write operation by all the storage adapters.
	Use this metric to monitor the write operation performance of the storage adapter. A high value indicates that the ESXi is experiencing storage write operation slowness.
	The total latency is the sum of the kernel latency and device latency.

Analyzing the Resources in Your Environment

In addition to monitoring, vRealize Operations Manager provides you with powerful tools for analyzing the resources and the performance of your virtual environment.

You can use the Analysis tab to analyze the current condition of your virtual environment.

Using Troubleshooting Tools to Resolve Problems

The data provided in the **Symptoms**, **Timeline**, **Events**, and **All Metrics** tabs help you identify the root cause of a problem that is not resolved by alert recommendations or simple analysis.

As you are troubleshooting problems with objects in your environment, you can use the troubleshooting tabs individually or as part of a workflow. Each of the tabs displays the collected data in a different way. Sometimes, as you are troubleshooting problems, you move directly from an analysis tab to the All Metrics**All Metrics** tab. Under other circumstances, you know that the **Timeline** tab might provide the information that you need.

Symptoms Tab Overview

You can view a list of triggered symptoms for the selected object. You use the symptoms when you are troubleshooting problems with an object.

The **Symptoms** tab displays all the triggered symptoms for the currently selected object. A review of the triggered symptoms provides you with a list of the problems that the currently selected object is experiencing. If you need to better understand which symptoms are associated with currently generated alerts, go to the **Alerts** tab for the object.

As you evaluate the triggered symptoms, consider the time at which they were created and the configuration information and trend charts, where applicable.

Timeline Tab Overview

The timeline provides a view of the triggered symptoms, generated alerts, and events for an object over a period of time. You use the timeline to identify common trends over time that are contributing to the current status of objects in your environment.

The timeline provides a three-tier scrolling mechanism that you can use to move quickly through large spans of time, or slowly and minutely through individual hours when you are focusing on a particular period of time. To ensure that you have the data that you need, configure the Date Controls to encompass the problem you are investigating.

It is not always effective to investigate a problem on an individual object by looking only at the object. Use the ancestor, descendant, and peer options to examine the object in a broader environmental context. This context often reveals unexpected influences or consequences for the problem.

The timeline is a tool that provides you a graphical view of patterns. If a symptom is triggered and canceled by the system at various intervals over time, you can compare the event to other changes to the object or to the related objects. These changes might be the root cause of the problem.

Events Tab Overview

Events are changes in vRealize Operations Manager metrics that reflect changes that occurred on managed objects because of user actions, system actions, triggered symptoms, or generated alerts on an object. You use the **Events** tab to compare the occurrence of events with the generated alerts to determine if a change on your managed object contributed to the root cause of the alert or other problems with the object.

Events can occur on any object, not just the one listed.

The following vCenter Server activities are some of the activities that generate vRealize Operations Manager events:

- Powering a virtual machine on or off

- Creating a virtual machine

- Installing VMware Tools on the guest OS of a virtual machine

- Adding a newly configured ESX/ESXi system to a vCenter Server system

Depending on alert definitions, these events might generate alerts.

If you monitor the same virtual machines with other applications that provide information to vRealize Operations Manager, and the adapters for those applications are configured to provide change events, the **Events** tab includes certain change events that occur on the monitored objects. These change events might provide further insight into the cause of problems that you are investigating.

Creating and Using Object Details

The views and heat map details provide you with specific data about the object. You use this information to evaluate problems in more detail. If the current views or heat maps do not provide the information that you need, you can create one to use as tool as you investigate your specific problem.

Working with Heat Maps

With the vRealize Operations Manager heat map feature, you can locate trouble areas based on the metric values for objects in your virtual infrastructure. vRealize Operations Manager uses analytics algorithms that you can use to compare the performance of objects across the virtual infrastructure in real time using heat maps.

You can use predefined heat maps or create your own custom heat maps to compare the metric values of objects in your virtual environment. vRealize Operations Manager has predefined heat maps on the **Details** tab that you can use to compare commonly used metrics. You can use this data to plan to reduce waste and increase capacity in the virtual infrastructure.

What a Heat Map Shows

A heat map contains rectangles of different sizes and colors, and each rectangle represents an object in your virtual environment. The color of the rectangle represents the value of one metric, and the size of the rectangle represents the value of another metric. For example, one heat map shows the total memory and percentage of memory use for each virtual machine. Larger rectangles are virtual machines with more total memory, green indicates low memory use, and red indicates high use.

vRealize Operations Manager updates the heat maps in real time as new values are collected for each object and metric. The colored bar below the heat map is the legend. The legend identifies the values that the endpoints represent and the midpoint of the color range.

Heat map objects are grouped by parent. For example, a heat map that shows virtual machine performance, groups the virtual machines by the ESX hosts on which they run.

Create a Custom Heat Map

You can define an unlimited number of custom heat maps to analyze exactly the metrics that you need.

Procedure

1 In the left pane of vRealize Operations Manager, click **Environment**.

2 Select an object to inspect from an inventory tree.

3 Click the **Heat Map** tab under the **Details** tab.

4 Select the tag to use for first-level grouping of the objects from the **Group By** drop-down menu.

If a selected object does not have a value for this tag, it appears in a group called Other Groups.

5 Select the tag to use to separate the objects into subgroups from the **Then By** drop-down menu.

If a selected object does not have a value for this tag, it appears in a subgroup called Other Groups.

6 Select a **Mode** option.

Option	Description
Instance	Track all instances of a metric for an object with a separate rectangle for each metric.
General	Pick an specific instance of a metric for each object and track only that metric.

7 If you selected General mode, select the attribute to use to set the size of the rectangle for each resource in the Size By list and the attribute to use to determine the color of the rectangle for each object in the Color By list.

Objects that have higher values for the Size By attribute have larger areas in the heat map display. You can also select fixed-size rectangles. The color varies between the colors you set based on the value of the Color By attribute.

In most cases, the attribute lists include only metrics that vRealize Operations Manager generates. If you select an object type, the list shows all of the attributes that are defined for that object type.

    a   To track metrics only for objects of a particular kind, select the object type from the **Object Type** drop-down menu.

8   If you selected Instance mode, select an attribute kind from the **Attribute Kind** list.

    The attribute kind determines the color of the rectangle for each object.

9   Configure colors for the heat map.

    a   Click each of the small blocks under the color bar to set the color for low, middle, and high values.

        The bar shows the color range for intermediate values. You can also set the values to match the high and low end of the color range.

    b   (Optional) Enter minimum and maximum color values in the **Min Value** and **Max Value** text boxes.

        If you leave the text boxes blank, vRealize Operations Manager maps the highest and lowest values for the Color By metric to the end colors. If you set a minimum or maximum value, any metric at or beyond that value appears in the end color.

10   Click **Save** to save the configuration.

    The custom heat map you created appears in the list of heat maps on the **Heat Maps** tab.

Find the Best or Worst Performing Objects for a Metric

You can use heat maps to find the objects with the highest or lowest values for a particular metric.

Prerequisites

If the combination of metrics that you want to compare is not available in the list of defined heat maps, you must define a custom heat map first. See "Create a Custom Heat Map," on page 51.

Procedure

1   In the left pane, click **Environment** and select an object from an inventory tree.

2   Click the **Heat Map** tab under the **Details** tab.

    All metric heat maps related to the selected resource appear in the list of predefined heat maps.

3   In the list of heat maps, click the map to view.

    The name and metrics values for each object shown on the heat map appear in the list below the heat map.

4   Click the column header for the metric you are interested in to change the sort order, so that the best or worst performing objects appear at the top of the column.

Compare Available Resources to Balance the Load Across the Infrastructure

A heat map can be used to compare the performance of selected metrics across the virtual infrastructure. You can use this information to balance the load across ESX hosts and virtual machines.

Prerequisites

If the combination of metrics to compare is not available in the list of defined heat maps, you must define a custom heat map first. See "Create a Custom Heat Map," on page 51.

Procedure

1   In the left pane of vRealize Operations Manager, click **Environment**.

2   Select an object to inspect from an inventory tree.

3   Click the **Heat Map** tab under the **Details** tab.

4   In the list of heat maps, click the one to view.

The heat map of the selected metrics appears, sized and grouped according to your selection.

5   Use the heat map to compare objects and click resources and metric values for all objects in your virtual environment.

The list of names and metric values for all objects shown on the heat map appear in the list below the heat map. You can click column headers to sort the list by column. If you sort the list by a metric column, you can see the highest or lowest values for that metric on top.

6   (Optional) To see more information about an object in the heat map, click the rectangle that represents this object or click the pop-up window for more details.

What to do next

Based on your findings, you can reorganize the objects in your virtual environment to balance the load between ESX hosts, clusters, or datastores.

Using Heat Maps to Analyze Data for Capacity Risk

Planning for capacity risk involves analyzing data to determine how much capacity is available and whether you make efficient use of the infrastructure.

Identify Clusters That Have Enough Space for Virtual Machines

Identify the clusters in a datacenter that have enough space for your next set of virtual machines.

Procedure

1   In the left pane of vRealize Operations Manager, click **Environment**.

2   Select **vSphere World**.

3   Click the **Heat Map** tab under the **Details** tab.

4   Select the **Which clusters have the most free capacity and least stress?** heat map.

5   In the heat map, point to each cluster area to view the percentage of remaining capacity.

A color other than green indicates a potential problem.

6   Click **Details** in the pop-up window to examine the resources for the cluster or datacenter.

What to do next

Identify the green clusters with the most capacity to store virtual machines.

Examine Abnormal Host Health

Identifying the source of a performance problem with a host involves examining its workload.

Procedure

1   In the left pane of vRealize Operations Manager, click **Environment**.

2   Select **vSphere World**.

3   Click the **Heat Map** tab under the **Details** tab.

4   Select the **Which hosts currently have the most abnormal workload?** heat map.

5   In the heat map, point to the cluster area to view the percentage of remaining capacity.

A color other than green indicates a potential problem.

6   Click **Details** for the ESX host in the pop-up window to examine the resources for the host.

What to do next

Adjust workloads to balance resources as necessary.

Identify Datastores with Enough Space for Virtual Machines

Identify the datastores that have the most space for your next set of virtual machines.

Procedure

1   In the left pane of vRealize Operations Manager, click **Environment**.

2   Select **vSphere World**.

3   Click the **Heat Map** tab under the **Details** tab.

4   Select the **Which datastores have the highest disk space overcommitment and the lowest time remaining?** heat map.

5   In the heat map, point to each datacenter area to view the space statistics.

6   If a color other than green indicates a potential problem, click **Details** in the pop-up window to investigate the disk space and disk I/O resources.

What to do next

Identify the datastores with the largest amount of available space for virtual machines.

Identify Datastores with Wasted Space

To improve the efficiency of your virtual infrastructure, identify datastores with the highest amount of wasted space that you can reclaim .

Procedure

1   In the left pane of vRealize Operations Manager, click **Environment**.

2   Select **vSphere World**.

3   Click the **Heat Map** tab under the **Details** tab.

4   Select the **Which datastores have the most wasted space and total space storage?** heat map.

5   In the heat map, point to each datacenter area to view the waste statistics.

6   If a color other than green indicates a potential problem, click **Details** in the pop-up window to investigate the disk space and disk I/O resources.

What to do next

Identify the red, orange, or yellow datastores with the highest amount of wasted space.

Identify the Virtual Machines with Resource Waste Across Datastores

Identify the virtual machines that waste resources because of idle, oversized, or powered-off virtual machine states or because of snapshots.

Procedure

1   In the left pane of vRealize Operations Manager, click **Environment**.

2   Select **vSphere World**.

3   Click the **Heat Map** tab under the **Details** tab.

4   Select the **For each datastore, which VMs have the most wasted disk space?** heat map.

5   In the heat map, point to each virtual machine to view the waste statistics.

6   If a color other than green indicates a potential problem, click **Details** for the virtual machine in the pop-up window and investigate the disk space and I/O resources.

What to do next

Identify the red, orange, or yellow virtual machines with the highest amount of wasted space.

Examining Relationships in Your Environment

Most objects in an environment are related to other objects in that environment. The **Environment** tab shows how objects in your environment are related. You use this display to troubleshoot problems that might not be about the object that you originally chose to examine. For example, a problem alert on a host might be because a virtual machine related to the host lacks capacity.

Environment Tab Selections

When you select an object from the inventory of your environment, you can display the related objects in an overview, list, or map.

■   The Overview shows all the objects in your environment with a status badge for each object. By clicking a badge, you can see which objects are related.

■   The List shows only the objects related to your object selection. Depending on the object selected, you can initiate an action or launch an external application.

■   The Map shows the objects as icons in a hierarchical display. You select an icon to display the number of related objects.

Use the Overview to identify objects in your environment with health, risk, or efficiency problems. Depending on the object type, you might be able to take action on the object from the List view.

Use the Environment Overview to Find Problems

If you are system administrator who is trying to investigate the reason for slow performance in your environment, you can select key objects such as host systems to see if any related objects such as virtual machines indicate problems.

Procedure

1   Select **Environment > vSphere Hosts and Clusters** and select the **vSphere World** object.

2   Select the **Environment** tab.

vRealize Operations Manager displays health badges for all objects in the vSphere World.

3   Click each of the host system badges.

The health badge of the virtual machines that belong to the host are highlighted. A host that displays a good health badge, may have virtual machines that display a warning status.

What to do next

Investigate the reason for the problem. For example, once you determine if the problem is chronic or temporary, you can decide how to address it. See "Using Troubleshooting Tools to Resolve Problems," on page 49.

User Scenario: Investigate the Root Cause of a Problem by Using the Troubleshooting Tab Options

One of your customers reports poor performance for his virtual machine, including slowness and fails. This scenario provides one way that you can use vRealize Operations Manager to investigate the problem based on information available in the **Troubleshooting** tabs.

As a virtual infrastructure administrator, you respond to a help ticket in which one of your customers reports problems with his virtual machine, sales-10-dk. The reported conditions are poor application performance, including slow load times and slow boot, some of his programs are taking longer and longer to load, and his files are taking longer to save. Today his programs started to fail and an update failed to install.

When you look at the **Alerts** tab for the virtual machine you see an alert for chronic high memory workload leading to memory stress, where the triggered symptoms indicate memory stress and the recommendation is to add memory.

Based on past experience, you are not convinced that this alert indicates the root cause, so you review the **Analysis** tabs. All of the associated badges are green except for Capacity Remaining, which indicates memory and disk space problems, and Time Remaining, which has 0 days remaining for memory and disk space.

From this initial review, you know that problems exist in addition to the memory alert, so you use the **Troubleshooting** tabs to do a more thorough investigation.

Review the Triggered Symptoms When You Troubleshoot a Virtual Machine Problem

As a virtual infrastructure administrator, you respond to customer complaints and alerts, and identify problems that occur on the objects in your environment. You use the information on the **Symptoms** tab to help determine whether the triggered symptoms indicate conditions that contribute to the reported or identified problem.

You must research a problem of poor performance on one of your virtual machines, as reported by one of your customers. When you view the **Alerts** tab for the virtual machine, the only alert that appears is named `Virtual Machine is Violating Risk Profile 1 in vSphere Hardening Guide`.

When you reviewed the **Analysis** tabs for the virtual machine, you identified that problems were occurring with memory and disk space. Now, you focus your attention to the triggered symptoms on the virtual machine.

The following method of using the **Symptoms** tab to evaluate problems is provided as an example for using vRealize Operations Manager, and is not definitive. Your troubleshooting skills and your knowledge of the particular aspects of your environment determine which methods work for you.

Procedure

1   On the main title bar in vRealize Operations Manager, enter the name of the virtual machine in the **Search** text box.

In this example, the virtual machine name is named `sales-10-dk`.

2   With the virtual machine selected, click the **Troubleshooting** tab, and click the **Symptoms** tab.

3   Review and evaluate the triggered symptoms.

Option	Evaluation Process
Symptom	Are any of the triggered symptoms related to the critical states you see for memory or disk space?
Status	Are the symptoms active or inactive? Even inactive symptoms can provide information about the past state of the object. To add any inactive symptoms, click **Status: Active** on the toolbar to remove the filter.
Created On	When did the symptoms trigger? How does the time of the triggered symptom compare with the other symptoms?
Information	Can you identify a correlation between the triggered symptoms and the state of the Time Remaining and Capacity Remaining badges?

From your review, you determine that some of the triggered symptoms are associated with compliance alerts for the virtual machine as defined in the *vSphere Hardening Guide*. The violated symptoms triggered for the alert named *vSphere Hardening Guide*, which is one of several compliance risk profiles provided with vRealize Operations Manager.

The following symptoms triggered in the compliance alert named `Virtual Machine is Violating Risk Profile 1 in vSphere Hardening Guide`:

- `Independent nonpersistent disks are being used`

- `Autologon feature is enabled`

- `Copy/paste operations are enabled`

- `Users and processes without privileges can remove, connect and modify devices`

- `Guests can receive host information`

Other symptoms also triggered, which are related to memory and time remaining.

- `Guest file system overall disk space usage reaching critical limit`

- `Virtual machine disk space time remaining is low`

- `Virtual machine CPU time remaining is low`

- `Guest partition disk space usage`

- `Virtual machine memory time remaining is low`

What to do next

Review the symptoms for the object on a timeline. See

You can find the *vSphere Hardening Guides* at http://www.vmware.com/security/hardening-guides.html.

Compare Symptoms on a Timeline When You Troubleshoot a Virtual Machine Problem

Looking at the triggered symptoms for an object over time allows you to compare triggered symptoms, alerts, and events when you are troubleshooting problems with objects in your environment. The **Timeline** tab in vRealize Operations Manager provides a visual chart on which to see triggered symptoms that you can use to investigate problems in your environment.

After you identify the following symptoms as possible indicators of the root cause of the reported performance problems on the sales-10-dk virtual machine, you compare them to each other over time, looking for interesting or common patterns.

- Guest file system overall disk space use reaching critical limit

- Virtual machine disk space time remaining low

- Virtual machine CPU time remaining low

- Guest partition disk space use

- Virtual machine memory time remaining is low

The following method of evaluating problems using the **Timeline** tab is provided as an example for using vRealize Operations Manager and is not definitive. Your troubleshooting skills and your knowledge of the particulars of your environment determine which methods work for you.

Prerequisites

Review the triggered object symptoms. See "Review the Triggered Symptoms When You Troubleshoot a Virtual Machine Problem," on page 56.

Procedure

1   Enter the name of the virtual machine in the **Search** text box, located on the main title bar.

    In this example, the virtual machine name is `sales-10-dk`.

2   Click the **Troubleshooting** tab and click the **Timeline** tab.

3   On the Timeline toolbar, click **Date Control** and select a time that is on or before the reference symptoms were triggered.

    The default time range is the last 6 hours. For a broader view of the virtual machine over time, configure a range that includes triggered symptoms and generated alerts.

4   To view the point at which the symptoms were triggered and to identify which line represents which symptom, drag the timeline week, day, or hour section left and right across the page.

5   Click **Select Event Type** and select all the event types.

    Consider whether events correspond to triggered symptoms or generated alerts.

6   In the Related Hierarchies list in the upper left pane, click **vSphere Hosts and Clusters**.

    The available ancestors and descendant objects depend on the selected hierarchy.

7   To see if the host is experiencing a contributing problems, click **Show Ancestor Events**.

    Consider whether the host has symptoms, alerts, or events that provide you with more information about memory or disk space issues.

Comparing virtual machine symptoms to host symptoms, and looking at the symptoms over time indicates the following trends:

- The host resource usage, host disk usage, and host CPU usage symptoms are triggered for about 10 minutes approximately every 4 hours.

- The virtual machine guest file system out of space symptom is triggered and canceled over time. Sometimes the symptom is active for an hour and canceled. Sometimes it is active for two hours. But no more than 30 minutes occur between cancellation and the next triggering of the symptom.

What to do next

Look at events in the context of the analysis badges and alerts. See "Identify Influential Events When You Troubleshoot a Virtual Machine Problem," on page 59.

Identify Influential Events When You Troubleshoot a Virtual Machine Problem

Events are changes to objects in your environment that are based on changes to metrics, properties, or information about the object. Examining the events for the problematic virtual machine in the context of the analysis badges and alerts might provide visual clues to the root cause of a problem.

As a virtual infrastructure administrator investigating a reported performance problem with a virtual machine, you compared symptoms on the timeline and identified interesting behavior around the guest file system that you want to examine in the context of other badge metrics to determine if you can find the root cause of the problem.

The following method of evaluating problems using the **Events** tab is provided as an example for using vRealize Operations Manager and is not definitive. Your troubleshooting skills and your knowledge of the particulars of your environment determine which methods work for you.

Prerequisites

Examine triggered symptoms, alerts, and events over time. See "Compare Symptoms on a Timeline When You Troubleshoot a Virtual Machine Problem," on page 57

Procedure

1   Enter the name of the virtual machine in the **Search** text box, located on the main title bar.

    In this example, the virtual machine name is sales-10-dk.

2   Click the **Troubleshooting** tab and click the **Events** tab.

3   On the Events toolbar, click **Date Control** and select a time that is on or before the symptoms were triggered.

4   Click **Select Event Type** and select all of the event types.

    Consider whether any changes correspond to other events.

5   Click **Show Parent Events** and click through the badges on the toolbar to review the events.

    Consider whether any of the events, which are listed in the data grid below the chart, correspond to problems with the host that might contribute to the reported problem.

6   Click **Show Child Events** and click through the badges on the toolbar to review the events.

    Consider whether any of the events show problems with the datastore.

Your evaluation shows no particular correlation between the workload or anomalies and the time at which the guest file system out of space symptom was triggered each time.

Running Actions from vRealize Operations Manager

The actions available in vRealize Operations Manager allow you to modify the state or configuration of selected objects in vCenter Server from vRealize Operations Manager. For example, you might need to modify the configuration of an object to address a problematic resource issue or to redistribute resources to optimize your virtual infrastructure.

The most common use of the actions is to solve problems. You can run them as part of your troubleshooting procedures or add them as a resolution recommendation for alerts.

When you grant a user access to actions in vRealize Operations Manager, that user can take the granted action on any object that vRealize Operations Manager manages, and not only on objects that the user can access outside of vRealize Operations Manager.

Use Actions with vRealize Operations Manager
(http://link.brightcove.com/services/player/bcpid2296383276001?bctid=ref:video_actions_vrom)

When you are troubleshooting problems, you can run the actions from the center pane Actions menu or from the toolbar on list views that contain the supported objects.

When an alert is triggered, and you determine that the recommended action is the most likely way to resolve the problem, you can run the action on one or more objects.

List of vRealize Operations Manager Actions

The list of actions includes the name of the action, the objects that each one modifies, and the object levels at which you can run the action. You use this information to ensure that you correctly apply the actions as alert recommendations and when the actions are available in the **Actions** menu.

Actions and Modified Objects

vRealize Operations Manager actions make changes to objects in your managed vCenter Server instances.

When you grant a user access to actions in vRealize Operations Manager, that user can take the granted action on any object that vRealize Operations Manager manages, and not only on objects that the user can access outside of vRealize Operations Manager.

Action Object Levels

The actions are available when you work with different object levels, but they modify only the specified object. If you are working at the cluster level and select **Power On VM**, all the virtual machines in the cluster for which you have access permission are available for you to run the action. If you are working at the virtual machine level, only the selected virtual machine is available.

Table 1-5. vRealize Operations Manager Actions Affected Objects

Action	Modified Object	Object Levels
Rebalance Container	Virtual Machines	■ Data Center ■ Custom Data Center
Delete Idle VM	Virtual Machines	■ Clusters ■ Host Systems ■ Virtual Machines
Set DRS Automation	Cluster	■ Clusters
Move VM	Virtual Machine	■ Virtual Machines
Power Off VM	Virtual Machine	■ Clusters ■ Host Systems ■ Virtual Machines
Shut Down Guest OS for VM	Virtual Machine VMware Tools must be installed and running on the target virtual machines to run this action.	■ Clusters ■ Host Systems ■ Virtual Machines
Power On VM	Virtual Machine	■ Clusters ■ Host Systems ■ Virtual Machines
Delete Powered Off VM	Virtual Machine	■ Clusters ■ Host Systems ■ Virtual Machines
Set Memory for VM and Set Memory for VM Power Off Allowed	Virtual Machine	■ Clusters ■ Host Systems ■ Virtual Machines

Table 1-5. vRealize Operations Manager Actions Affected Objects (Continued)

Action	Modified Object	Object Levels
Set Memory Resources for VM	Virtual Machine	■ Clusters ■ Host Systems ■ Virtual Machines
Set CPU Count for VM and Set CPU Count for VM Power Off Allowed	Virtual Machine	■ Clusters ■ Host Systems ■ Virtual Machines
Set CPU Resources for VM	Virtual Machine	■ Clusters ■ Host Systems ■ Virtual Machines
Set CPU Count and Memory for VM and Set CPU Count and Memory for VM Power Off Allowed	Virtual Machine	■ Clusters ■ Host Systems ■ Virtual Machines
Delete Unused Snapshots for VM	Snapshot	■ Clusters ■ Host Systems ■ Virtual Machines
Delete Unused Snapshots for Datastore	Snapshot	■ Clusters ■ Datastores ■ Host Systems

Working With Actions That Use Power Off Allowed

Some of the actions provided with vRealize Operations Manager require the virtual machines to shut down or power off, depending on the configuration of the target machines, to run the actions. You should understand the impact of the Power Off Allowed option before running the actions so that you select the best options for your target virtual machines.

Power Off and Shut Down

The actions that you can run on your vCenter Server instances include actions that shut down virtual machines and actions that power off virtual machines. It also includes actions where the virtual machine must be in a powered off state to complete the action. Whether the virtual machine is shut down or powered off depends on how it is configured and what options you select when you run the action.

The shut down action shuts down the guest operating system and then powers off the virtual machine. To shut down a virtual machine from vRealize Operations Manager, the VMware Tools must be installed and running on the target objects.

The power off action turns the virtual machine off without regard for the state of the guest operating system. In this case, if the virtual machine is running applications, your user could lose data. After the action is finished, for example, modifying the CPU count, the virtual machine is returned to the power state it was in when the action began.

Power Off Allowed and VMware Tools

For the actions where you are increasing the CPU count or the amount of memory on a virtual machine, some operating systems support the actions if the Hot Plug is configured on the virtual machine, but for other operating systems, the virtual machine must be in a powered off state to change the configuration. To accommodate this need where the VMware Tools are not running, the Set CPU Count, Set Memory, and Set CPU Count and Memory actions include the Power Off Allowed option.

If you select Power Off Allowed, and the machine is running, the action verifies whether VMware Tools is installed and running.

■ If VMware Tools are installed and running, the virtual machine is shut down before completing the action.

■ If VMware Tools are not running or not installed, the virtual machine is powered off without regard for the state of the operating system.

If you do not select Power Off Allowed and you are decreasing the CPU count or memory, or the hot plug is not enabled for increasing the CPU count or memory, the action does not run and the failure is reported in Recent Tasks.

Power Off Allowed When Changing CPU Count or Memory

When you run the actions that change the CPU count and the amount of memory, you must consider several factors to determine if you want to use the Power Off Allowed option. These factors include whether you are increasing or decreasing the CPU or memory and whether the target virtual machines are powered on. If you increasing the CPU or memory values, whether hot plug is enabled also affects how you apply the option when you run the action.

How you use Power Off Allowed when you are decreasing the CPU count or the amount of memory depends on the power state of the target virtual machines.

Table 1-6. Decreasing CPU Count and Memory Behavior Based On Options

Virtual Machine Power State	Power Off Allowed Selected	Results
On	Yes	If VMware Tools is installed and running, the action shuts down the virtual machine, decreases the CPU or memory, and powers the machine back on.
		If VMware Tools is not installed, the action powers off the virtual machine, decreases the CPU or memory, and powers the machine back on.
On	No	The action does not run on the virtual machine.
Off	Not applicable. The virtual machine is powered off.	The action decreases the value and leaves the virtual machine in a powered off state.

How you use Power Off Allowed when you are increasing the CPU count or the amount of memory depends on several factors, including the state of the target virtual machine and whether hot plug is enabled. Use the following information to determine which scenario applies to your target objects.

If you are increasing the CPU count, you must consider the power state of the virtual machine and whether CPU Hot Plug is enabled when determining whether to apply Power Off Allowed.

Table 1-7. Increasing CPU Count Behavior.

Virtual Machine Power State	CPU Hot Plug Enabled	Power Off Allowed Selected	Results
On	Yes	No	The action increases the CPU count to the specified amount.
On	No	Yes	If VMware Tools is installed and running, the action shuts down the virtual machine, increases the CPU count, and powers the machine back on. If VMware Tools is not installed, the action powers off the virtual machine, increases the CPU count, and powers the machine back on.
Off	Not applicable. The virtual machine is powered powered off.	Not required.	The action increases the CPU count to the specified amount.

If you are increasing the memory, you must consider the power state of the virtual machine, whether Memory Hot Plug is enabled, and whether there is a Hot Memory Limit when determining how to apply Power Off Allowed.

Table 1-8. Increasing Memory Amount Behavior

Virtual Machine Power State	Memory Hot Plug Enabled	Hot Memory Limit	Power Off Allowed Selected	Results
On	Yes	New memory value ≤ hot memory limit	No	The action increases the memory the specified amount.
On	Yes	New memory value > hot memory limit	Yes	If VMware Tools is installed and running, the action shuts down the virtual machine, increases the memory, and powers the machine back on. If VMware Tools is not installed, the action powers off the virtual machine, increases the memory, and powers the machine back on.

Table 1-8. Increasing Memory Amount Behavior (Continued)

Virtual Machine Power State	Memory Hot Plug Enabled	Hot Memory Limit	Power Off Allowed Selected	Results
On	No	Not applicable. The hot plug is not enabled.	Yes	If VMware Tools is installed and running, the action shuts down the virtual machine, increases the memory, and powers the machine back on. If VMware Tools is not installed, the action powers off the virtual machine, increases the memory, and powers the machine back on.
Off	Not applicable. The virtual machine is powered off.	Not applicable.	Not required	The action increases the memory the specified amount.

Actions Supported for Automation

Recommendations can identify ways to remediate problems indicated by an alert. Some of these remediations can be associated with actions defined in your vRealize Operations Manager instance. You can automate several of these remediation actions for an alert when that recommendation is the first priority for that alert.

You enable actionable alerts in your policies. By default, automation is disabled in policies. To configure automation for your policy, you select **Administration > Policies > Policy Library**. Then, you edit a policy, access the Alert / Symptom Definitions workspace, and select **Local** for the **Automate** setting in the Alert Definitions pane.

When an action is automated, you can use the **Automated** and **Alert** columns in **Administration > Recent Tasks** to identify the automated action and view the results of the action.

■ vRealize Operations Manager uses the **automationAdmin** user account to trigger automated actions. For these automated actions that are triggered by alerts, the Submitted By column displays the **automationAdmin** user.

■ The Alert column displays the alert that triggered the action. When an alert is triggered that is associated to the recommendation, it triggers the action without any user intervention.

The following actions are supported for automation:

■ Delete Powered Off VM

■ Delete Idle VM

■ Move VM

■ Power Off VM

■ Power On VM

■ Set CPU Count And Memory for VM

■ Set CPU Count And Memory for VM Power Off Allowed

■ Set CPU Count for VM

■ Set CPU Count for VM Power Off Allowed

■ Set CPU Resources for VM

- Set Memory for VM

- Set Memory for VM Power Off Allowed

- Set Memory Resources for VM

- Shut Down Guest OS for VM

How to Use Alerts and Actions Together for Automation
(http://link.brightcove.com/services/player/bcpid2296383276001?
bctid=ref:video_vrealize_alerts_actions_automation)

How to Automate an Alert that has an Associated Action
(http://link.brightcove.com/services/player/bcpid2296383276001?
bctid=ref:video_vrom_automate_alert_with_action)

How to Create and Automate a New Alert with a Symptom Definition and Action
(http://link.brightcove.com/services/player/bcpid2296383276001?
bctid=ref:video_vrom_create_alert_automate_symptom_definition)

Roles Needed to Automate Actions

To automate actions, your role must have the following permissions:

- Create, edit, and import policies in **Administration > Policy Management**.

- Create, clone, edit, and import alert definitions in **Content > Alert Definition Management**.

- Create, edit, and import recommendation definitions in **Content > Recommendations Management**.

IMPORTANT You set the permissions used to run the actions separately from the alert and recommendation definition. Anyone who can modify alerts, recommendations, and policies can also automate the action, even if they do not have permission to run the action.

For example, if you do not have access to the Power Off VM action, but you can create and modify alerts and recommendations, you can see the Power Off VM action and assign it to an alert recommendation. Then, if you automate the action in your policy, vRealize Operations Manager uses the `automationAdmin` user to run the action.

Example Action Supported for Automation

For the Alert Definition named `Virtual machine has chronic high CPU workload leading to CPU stress`, you can automate the action named `Set CPU Count for VM`.

When CPU stress on your virtual machines exceeds a critical, immediate, or warning level, the alert triggers the recommended action without user intervention.

Integration of Actions with vRealize Automation

vRealize Operations Manager restricts actions on objects that vRealize Automation manages, so that the actions do not violate any constraints set forth by vRealize Automation.

When objects in your environment are managed by vRealize Automation, actions in vRealize Operations Manager are not available on those objects. For example, if a host or parent object is being managed by vRealize Automation, actions are not available on that object.

This behavior is true for all actions, including **Power Off VM**, **Move VM**, **Rebalance Container**, and so on. For a complete list of actions, see "List of vRealize Operations Manager Actions," on page 60.

You cannot turn on or turn off the exclusion of actions on vRealize Automation managed objects.

Actions Determine Whether Objects Are Managed

Actions check the objects in the vRealize Automation managed resource container to determine which objects are being managed by vRealize Automation.

■ Actions such as Rebalance Container check the child objects of the data center container or custom data center container to determine whether the objects are managed by vRealize Automation. If the objects are being managed, the action does not appear on those objects.

■ The Move VM action checks whether the virtual machine to be moved is being managed by vRealize Automation.

Is the Virtual Machine Managed?	Result of Move VM Action
Yes	The Move VM action does not appear in the vRealize Operations Manager user interface for that virtual machine.
No	The Move VM action moves the virtual machine to a new host, datastore, or new host and datastore. The Move VM action does not check whether the new host or datastore is being managed by vRealize Automation.

■ The Delete Snapshots action checks whether the virtual machine or datastore is being managed by vRealize Automation.

Actions on Objects that vRealize Automation Does Not Manage

For a host or parent object that is not managed by vRealize Automation, only the virtual machines that are not being managed by vRealize Automation appear in the action dialog, and you can only take action on the virtual machines that are not being managed by vRealize Automation. If all child objects are being managed by vRealize Automation, the user interface displays the message `No objects are eligible for the selected action.`

If You Attempt to Run an Action on Multiple Objects

If you select multiple objects and attempt to run an action, such as Power Off VM, only the objects that are not being managed by vRealize Automation, which might include a subset of the virtual machines, appear in the Power Off VM action dialog box.

Run Actions From Toolbars in vRealize Operations Manager

When you run actions in vRealize Operations Manager, you change the state of vCenter Server objects from vRealize Operations Manager. You run one or more actions when you encounter objects where the configuration or state of the object is affecting your environment. These actions allow you to reclaim wasted space, adjust memory, or conserve resources.

This procedure for running actions is based on the vRealize Operations Manager **Actions** menus and is commonly used when you are troubleshooting problems. The available actions depend on the type of objects with which you are working. You can also run actions as alert recommendations.

Prerequisites

■ Verify that the vCenter Adapter is configured to run actions for each vCenter Server instance. See the *vRealize Operations Manager Customization and Administration Guide*.

■ Ensure that you understand how to use the Power Off Allowed option if you are running Set CPU Count, Set Memory, and Set CPU Count and Memory actions. See

Procedure

1   In vRealize Operations Manager, select the object in the environment inventory or select one or more objects it in a list view.

2   Click **Actions** on the main toolbar or in an embedded view.

3   Select one of the actions.

    If you are working with a virtual machine, only the virtual machine is included in the dialog box. If you are working with clusters, hosts, or datastores, the dialog box that appears includes all objects.

4   Select the check box to run the action on the object, and click **OK**.

    The action runs and a dialog box appears that displays the task ID.

5   To view the status of the job and verify that the job finished, click **Recent Tasks** or click **OK** to close the dialog box.

    The Recent Tasks list appears, which includes the task you just started.

What to do next

To verify that the job completed, click **Administration** in the left pane and click **Recent Tasks**. Find the task name or task ID in the list and verify that the status is finished. See "Monitor Recent Task Status," on page 69.

Troubleshoot Actions in vRealize Operations Manager

If you are missing data or cannot run actions from vRealize Operations Manager, review the troubleshooting options.

Verify that your vCenter Adapter is configured to connect to the correct vCenter Server instances, and configured to run actions. See *vRealize Operations Manager Customization and Administration Guide*.

■   Actions Do Not Appear on Object on page 67

    An action might not appear on an object, such as a host or virtual machine, because that object is being managed by vRealize Automation.

■   Missing Column Data in Actions Dialog Boxes on page 68

    Data is missing for one or more objects in an Actions dialog box, making it difficult to determine if you want to run the action.

■   Missing Column Data in the Set Memory for VM Dialog Box on page 68

    The read-only data columns do not display the current values, which makes it difficult to properly specify a new memory value.

■   Host Name Does Not Appear in Action Dialog Box on page 69

    When you run an action on a virtual machine, the host name is blank in the action dialog box.

Actions Do Not Appear on Object

An action might not appear on an object, such as a host or virtual machine, because that object is being managed by vRealize Automation.

Problem

Actions such as Rebalance Container might not appear in the drop-down menu when you view the actions for your data center.

■   If a data center is managed by vRealize Automation, actions do not appear.

■   If a data center is not managed by vRealize Automation, you can take action on the virtual machines that are not being managed by vRealize Automation.

Cause

When vRealize Automation manages the child objects of a data center or custom data center container, the actions that are normally available on those objects do not appear, because the action framework excludes actions on objects that vRealize Automation manages. You cannot turn on or turn off the exclusion of actions on vRealize Automation managed objects. This behavior is normal.

If you removed the vRealize Automation adapter instance, but did not select the **Remove related objects** check box, the actions are still disabled.

To make actions available on the objects in your data center or custom data center, either confirm that vRealize Automation is not managing the objects, or perform the steps in this procedure to remove the vRealize Automation adapter instance.

Solution

1   To allow actions on an object, go to your vRealize Automation instance.

2   Make the change in vRealize Automation, such as to move a virtual machine.

Missing Column Data in Actions Dialog Boxes

Data is missing for one or more objects in an Actions dialog box, making it difficult to determine if you want to run the action.

Problem

When you run an action one or more objects, some of the fields are empty.

Cause

The VMware vSphere adapter has not collected the data from the vCenter Server instance that manages the object or the current vRealize Operations Manager user does not have privileges to view the collected data for the object.

Solution

1   Verify that vRealize Operations Manager is configured to collect the data.

2   Verify that you have the privileges necessary to view the data.

Missing Column Data in the Set Memory for VM Dialog Box

The read-only data columns do not display the current values, which makes it difficult to properly specify a new memory value.

Problem

Current (MB) and Power State columns do not display the current values, which are collected for the managed object.

Cause

The adapter responsible for collecting data from the vCenter Server on which the target virtual machine is running has not run a collection cycle and collected the data. This can occur when you recently created an VMware adapter instance for the target vCenter Server and initiated an action. The VMware vSphere adapter has a 5-minute collection cycle.

Solution

1   After you create a VMware adapter instance, wait an additional 5 minutes.

2   Rerun the **Set Memory for VM** action.

The current memory value and the current power state appear in the dialog box.

Host Name Does Not Appear in Action Dialog Box

When you run an action on a virtual machine, the host name is blank in the action dialog box.

Problem

When you select virtual machine on which to run an action, and click the **Action** button, the dialog box appears, but the Host column is empty.

Cause

Although your user role is configured to run action on the virtual machines, you do not have a user roll that provides you with access to the host. You can see the virtual machines and run actions on them, but you cannot see the host data for the virtual machines. vRealize Operations Manager cannot retrieve data that you do not have permission to access.

Solution

You can run the action, but you cannot see the host name in the action dialog boxes.

Monitor Recent Task Status

The Recent Task status includes all the tasks initiated from vRealize Operations Manager. You use the task status information to verify that your tasks finished successfully or to determine the current state of tasks.

You can monitor the status of tasks that are started when you run actions, and investigate whether a task finished successfully.

Prerequisites

You ran at least one action as part of an alert recommendation or from one of the toolbars. See "Run Actions From Toolbars in vRealize Operations Manager," on page 66.

Procedure

1   In the left pane of vRealize Operations Manager, click the **Administration** icon.

2   Click **Recent Tasks**.

3   To determine if you have tasks that are not finished, click the **Status** column and sort the results.

Option	Description
`In Progress`	Indicates running tasks.
`Completed`	Indicates finished tasks.
`Failed`	Indicates incomplete tasks on at least one object when started on multiple objects.
`Maximum Time Reached`	Indicates timed out tasks.

4   To evaluate a task process, select the task in the list and review the information in the **Details of Task Selected** pane.

The details appear in the Messages pane. If the information message includes `No action taken`, the task finished because the object was already in the requested state.

5   To view the messages for an object when the task included several objects, select the object in the Associated Objects list.

To clear the object selection so that you can view all the messages, press the space bar.

What to do next

Troubleshoot tasks with a status of `Maximum Time Reached` or `Failed` to determine why a task did not run successfully. See "Troubleshoot Failed Tasks," on page 70.

Troubleshoot Failed Tasks

If tasks fail to run in vRealize Operations Manager, review the Recent Tasks page and troubleshoot the task to determine why it failed.

This information is a general procedure for using the information in Recent Tasks to troubleshoot problems identified in the tasks.

■ Determine If a Recent Task Failed on page 71

The Recent Tasks provide the status of action tasks initiated from vRealize Operations Manager. If you do not see the expected results, review the tasks to determine if your task failed.

■ Troubleshooting Maximum Time Reached Task Status on page 71

An action task has a `Maximum Time Reached` status and you do not know the current status to the task.

■ Troubleshooting Set CPU or Set Memory Failed Tasks on page 72

An action task for Set CPU Count or Set Memory for VM has a `Failed` status in the recent task list because power off is not allowed.

■ Troubleshooting Set CPU Count or Set Memory with Powered Off Allowed on page 72

A Set CPU Count, Set Memory, or a Set CPU Count and Set Memory action indicates that the action failed in Recent Tasks.

■ Troubleshooting Set CPU Count and Memory When Values Not Supported on page 73

If you run the Set CPU Count or Set Memory actions with an unsupported value on a virtual machine, the virtual machine might be left in an unusable state and require you to resolve the problem in vCenter Server.

■ Troubleshooting Set CPU Resources or Set Memory Resources When the Value is Not Supported on page 74

If you run the Set CPU Resources action with an unsupported value on a virtual machine, the task fails and an error appears in the Recent Task messages.

■ Troubleshooting Set CPU Resources or Set Memory Resources When the Value is Too High on page 74

If you run the Set CPU Resources or Set Memory Resources action with a value that is greater than the value that your vCenter Server instance supports, the task fails and an error appears in the Recent Tasks messages.

■ Troubleshooting Set Memory Resources When the Value is Not Evenly Divisible by 1024 on page 75

If you run the Set Memory Resources action with a value that cannot convert from kilobytes to megabytes, the task fails and an error appears in the Recent Task messages.

■ Troubleshooting Failed Shut Down VM Action Status on page 75

A shut down VM action task has a `Failed` status in the Recent Task list.

■ Troubleshooting VMware Tools Not Running for a Shut Down VM Action Status on page 76

A Shut down VM action task has a `Failed` status in the Recent Task list and the Message indicates that VMware Tools were required.

■ Troubleshooting Failed Delete Unused Snapshots Action Status on page 76

A Delete Unused Snapshots action task has a `Failed` status in the Recent Task list.

Determine If a Recent Task Failed

The Recent Tasks provide the status of action tasks initiated from vRealize Operations Manager. If you do not see the expected results, review the tasks to determine if your task failed.

Procedure

1   In the left pane of vRealize Operations Manager, click the **Administration** icon.

2   Click **Recent Tasks**.

3   Select the failed task in the task list.

4   In the Messages list, locate the occurrences of `Script Return Result: Failure` and review the information between this value and `<–– Executing:[script name] on {object type}`.

    `Script Return Result` is the end of action run and `<–– Executing` indicates the beginning. The information provided includes the parameters that are passed, the target object, and unexpected exceptions that you can use to identify the problem.

Troubleshooting Maximum Time Reached Task Status

An action task has a `Maximum Time Reached` status and you do not know the current status to the task.

Problem

The Recent Tasks list indicates that a task had a status of `Maximum Time Reached`.

The task is running past the amount of time that is the default or configured value. To determine the current status, you must troubleshoot the initiated action.

Cause

The task is running past the amount of time that is the default or configured value for one of the following reasons:

■   The action is exceptionally long running and did not finish before the threshold timeout was reached.

■   The action adapter did not receive a response from the target system before reaching the timeout. The action might have completed successfully, but the completion status was not returned to vRealize Operations Manager.

■   The action did not start correctly.

■   The action adapter might have an error and be unable to report the status.

Solution

Check the state of the target object to determine whether the action completed successfully. If it did not, continue investigating to find the root cause.

Troubleshooting Set CPU or Set Memory Failed Tasks

An action task for Set CPU Count or Set Memory for VM has a Failed status in the recent task list because power off is not allowed.

Problem

The Recent Tasks list indicates that a Set CPU Count, Set Memory, or Set CPU and Memory task has a status of Failed. When you evaluate the Messages list for the selected task, you see this message.

```
Unable to perform action. Virtual Machine found
    powered on, power off not allowed
```

When you increase memory or CPU count, you see this message.

```
Virtual Machine found powered on, power off not allowed, if hot add is
    enabled the hotPlugLimit is exceeded
```

Cause

You submitted the action to increase or decrease the CPU or memory value without selecting the **Allow Power Off** option. When you ran the action where a target object is currently powered on and where **Memory Hot Plug** is not enabled for the target object in vCenter Server, the action fails.

Solution

1   Either enable **Memory Hot Plug** on your target virtual machines in vCenter Server or select **Allow Power Off** when you run the Set CPU Count, Set Memory, or Set CPU and Memory actions.

2   Check your hot plug limit in vCenter Server.

Troubleshooting Set CPU Count or Set Memory with Powered Off Allowed

A Set CPU Count, Set Memory, or a Set CPU Count and Set Memory action indicates that the action failed in Recent Tasks.

Problem

When you run an action that changes the CPU count, the memory, or both, the action fails even though you know that the Power Off Allowed was selected, the virtual machine is running, and the VMware Tools are installed and running.

Cause

The virtual machine should shut down the guest operating system before it powers off the virtual machine to make the requested changes. The shut down process waits 120 seconds for a response from the target virtual machine, and fails without making changes to the virtual machine.

Solution

1   Check the target virtual machine in vCenter Server to determine if it has jobs running that are delaying the implementation of the action.

2   Retry the action from vRealize Operations Manager.

Troubleshooting Set CPU Count and Memory When Values Not Supported

If you run the Set CPU Count or Set Memory actions with an unsupported value on a virtual machine, the virtual machine might be left in an unusable state and require you to resolve the problem in vCenter Server.

Problem

You cannot power on a virtual machine after you successfully run the Set CPU Count or Set Memory actions. When you review the messages in Recent Tasks for the failed Power On VM action, you see messages stating that the host does not support the new CPU count or new memory value.

Cause

Because of the way that vCenter Server validates changes in the CPU and memory values, you can use the vRealize Operations Manager actions to change the value to an unsupported amount if you run the action when the virtual machine is powered off.

If the object was powered on, the task fails, but rolls back any value changes and powers the machine back on. If the object was powered off, the task succeeds, the value is changed in vCenter Server, but the target object is left in a state where you cannot power it on using the actions or in vCenter Server without manually changing the CPU or memory to a supported value.

Solution

1   In the left pane of vRealize Operations Manager, click the **Administration** icon.

2   Click **Recent Tasks**.

3   In the task list, locate your failed Power On VM action, and review the messages associated with the task.

4   Look for a message that indicates why the task failed.

   For example, if you ran a Set CPU Count action on a powered off virtual machine to increase the CPU count from 2 to 4, but 4 CPUs is not supported by the host. The Set CPU tasks reported that it completed successfully in recent tasks. However, when you attempt to power on the virtual machine, the tasks fails. In this example the message is `Virtual machine requires 4 CPUs to operate, but the host hardware only provides 2`.

5   Click the object name in the Recent Task list.

   The main pane updates to display the object details for the selected object.

6   Click the **Actions** menu on the toolbar and click **Open Virtual Machine in vSphere Client**.

   The vSphere Web Client opens with the virtual machine as the current object.

7   In the vSphere Web Client, click the **Manage** tab and click **VM Hardware**.

8   Click **Edit**.

9   In the Edit Settings dialog box, change the CPU count or memory to a supported value and click **OK**.

   You can now power on the virtual machine from the Web client or from vRealize Operations Manager.

Troubleshooting Set CPU Resources or Set Memory Resources When the Value is Not Supported

If you run the Set CPU Resources action with an unsupported value on a virtual machine, the task fails and an error appears in the Recent Task messages.

Problem

The Recent Tasks list indicates that a Set CPU Resource or Set Memory Resource action has a state of `Failed`. When you evaluate the Messages list for the selected task, you see a message similar to the following examples.

```
RuntimeFault exception, message:[A specified parameter was not correct.
spec.cpuAllocation.reservation]
```

```
RuntimeFault exception, message:[A specified parameter was not correct.
spec.cpuAllocation.limits]
```

Cause

You submitted the action to increase or decrease the CPU or memory reservation or limit value with an unsupported value. For example, if you supplied a negative integer other than -1, which sets the value to unlimited, vCenter Server could not make the change and the action failed.

Solution

◆ Run the action with a supported value.

The supported values for reservation include 0 or a value greater than 0. The supported values for limit include -1, 0, or a value greater than 0.

Troubleshooting Set CPU Resources or Set Memory Resources When the Value is Too High

If you run the Set CPU Resources or Set Memory Resources action with a value that is greater than the value that your vCenter Server instance supports, the task fails and an error appears in the Recent Tasks messages.

Problem

The Recent Tasks list indicates that a Set CPU Resource or Set Memory Resource action has a state of `Failed`. When you evaluate the Messages list for the selected task, you see messages similar to the following examples.

If you are working with Set CPU Resources, the information message is similar to the following example, where 1000000000 is the supplied reservation value.

```
Reconfiguring the Virtual Machine Reservation to:[1000000000] Mhz
```

The error message for this action is similar to this example.

```
RuntimeFault exception, message:[A specified parameter was not correct. reservation]
```

If you are working with Set Memory Resources, the information message is similar to the following example, where 1000000000 is the supplied reservation value.

```
Reconfiguring the Virtual Machine Reservation to:[1000000000] (MB)
```

The error message for this action is similar to this example.

```
RuntimeFault exception, message:[A specified parameter was not correct.
spec.memoryAllocation.reservation]
```

Cause

You submitted the action to change the CPU or memory reservation or limit value to a value greater than the value supported by vCenter Server, or the submitted reservation value is greater than the limit.

Solution

◆ Run the action using a lower value.

Troubleshooting Set Memory Resources When the Value is Not Evenly Divisible by 1024

If you run the Set Memory Resources action with a value that cannot convert from kilobytes to megabytes, the task fails and an error appears in the Recent Task messages.

Problem

The Recent Tasks list indicates that a Set Memory Resource action has a state of `Failed`. When you evaluate the Messages list for the selected task, you see a message similar to the following example.

```
Parameter validation;[newLimitKB] failed conversion to (MB, (KB)[2000] not evenly divisible by
1024
```

Cause

Because vCenter Server manages memory reservations and limit values in megabytes, but vRealize Operations Manager calculates and reports on memory in kilobytes, you must provide a value in kilobytes that is directly convertible to megabytes. To do that, the value must be evenly divisible by 1024.

Solution

◆ Run the action where the reservation and limit values are configured with supported values.

The supported values for reservation include 0 or a value greater than 0 that is evenly divisible by 1024. The supported values for a limit include -1, 0, or a value greater than 0 that is evenly divisible by 1024.

Troubleshooting Failed Shut Down VM Action Status

A shut down VM action task has a `Failed` status in the Recent Task list.

Problem

The Shut Down VM action did not run successfully.

The Recent Tasks list indicates that a Shut Down VM action has a task status of `Failed`. When you evaluate the Messages list for the selected job, you see `Failure: Shut down confirmation timeout`.

Cause

The shut down process involves shutting down the guest operating system and powering off the virtual machine. The wait time is 120 seconds to shut down the guest operating system. If the guest operating system does not shut down in this time, the action fails because the shut down action is not confirmed.

Solution

◆ Check the status of the guest operating system in vCenter Server to determine why is did not shut down in the allotted time.

Troubleshooting VMware Tools Not Running for a Shut Down VM Action Status

A Shut down VM action task has a `Failed` status in the Recent Task list and the Message indicates that VMware Tools were required.

Problem

The Shutdown VM action did not run successfully.

The Recent Tasks list indicates that a Shutdown VM action has a tasks status of `Failed`. When you evaluate the Messages list for the selected job, you see `VMware Tools: Not running (Not installed)`.

Cause

The Shutdown VM action requires that VMware Tools be installed and running on the target virtual machines. If you ran the action on more than one object, then VMware Tools was not installed, or installed but not running, on at least one of the virtual machines.

Solution

◆ In the vCenter Server instance that manages the virtual machine that failed to run the action, install and start VMware Tools on the affected virtual machines.

Troubleshooting Failed Delete Unused Snapshots Action Status

A Delete Unused Snapshots action task has a `Failed` status in the Recent Task list.

Problem

The Delete Unused Snapshots action did not run successfully.

The Recent Tasks list indicates that a Delete Unused Snapshots action has a tasks status of `Failed`. When you evaluate the Messages list for the selected job, you see this message.

```
Remove snapshot failed, response wait expired after:[120] seconds,
     unable to confirm removal
```

Cause

The delete snapshot process involves waiting for access to datastores. The wait time is 600 seconds to access the datastore and delete the snapshot. If the delete request is not passed to the datastore in that time, the action does not finish the delete snapshot action.

Solution

1 Check the status of the snapshot in vCenter Server to determine if it was deleted.

2 If it was not, submit the delete snapshot request at a different time.

Viewing Your Inventory

vRealize Operations Manager collects data from all the objects in your environment and displays a health, risk, and efficiency status for each object.

Survey your entire inventory to get a quick idea of the state of any object or click an object name for more detailed information. See "Evaluating Object Summary Information," on page 37.

Planning the Capacity for Your Managed Environment Using vRealize Operations Manager

2

You can use the Projects feature in vRealize Operations Manager to plan for capacity allocations and upgrades in your virtual environment, or to optimize your existing resources. To plan your upcoming capacity needs, you create a project that anticipates forthcoming changes that affect the capacity of your objects.

In addition to creating projects to plan for hardware changes or virtual infrastructure changes, you can create custom profiles and custom data centers to help forecast your capacity needs. With custom profiles, you can determine how many instances of an object can fit in your environment depending on the available capacity and configuration. With custom data centers, you can see capacity analytics and badge computations based on the objects contained in the custom data center.

How Projects Work

A project is a detailed estimation of the capacity that you must have available in your environment based on upcoming changes. You can define projects to add or remove resources from objects such as your vCenter Server instance, clusters, data centers, hosts, virtual machines, and datastores.

With projects, you plan for changes in capacity, and examine the possible outcomes. You can plan for increases or decreases in the demand for capacity on your objects.

For example, if you plan to hire more staff in the next month, you must increase the capacity on the objects that they will use. To plan for this upcoming demand, you can create projects. In your projects, you add hosts to a data center, add memory and CPUs to a host, and increase the capacity of your virtual machines.
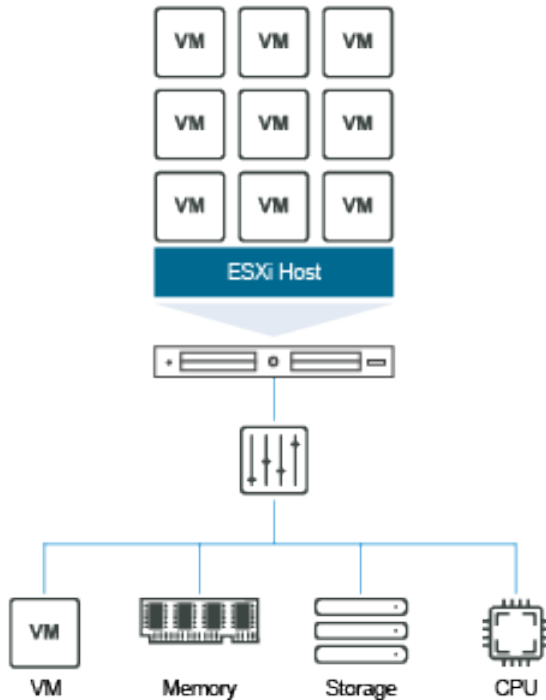
When you create a project, you add one or more capacity scenarios to the project to determine your future needs. Project scenarios anticipate the changes to capacity or demand that affect the object at an upcoming time and date. After you save each project, you drag the project to the visualization pane to chart the capacity forecast. You can see the anticipated capacity needs in the chart based on the values that you defined in your project scenarios. The visual representation shows how the needs for planned capacity compare to the resources that you currently have on those objects.

When you are sure that the objects require the planned capacity, you can commit the project to have vRealize Operations Manager reserve the capacity on those objects.

A project is a supposition about how the capacity and load change on your objects when you change the conditions in your virtual infrastructure environment. You do not have to implement the changes that your project represents. By creating the project, you can determine your capacity requirements before you implement the actual changes.

Projects List

The defined projects appear in a list below the visualization chart. vRealize Operations Manager filters the list according to the object that you select in the inventory tree. Use the toolbar to create, edit, or delete a project. To sort by columns in the list, click a column heading. To add a project to the visualization pane, click the plus icon, or drag the project to the pane between the list and the chart.

Visualization Chart

When you drag one or more projects into the visualization pane, the visualization chart displays each scenario that you defined in the projects.

The chart displays a numeric value for each scenario that you added to the project. For example, in a project for a host machine, the scenario named `Add Capacity: Percentage` is numbered 1.1, and the scenario named `Add Demand: Percentage` is 1.2.

To plan another host for your data center, you might also have a second project that includes a scenario named `Add Capacity: Add Host System`. The scenario in your second project is 2.1.

When you view both projects, the chart displays 1.1, 1.2, and 2.1 to indicate the point in time when each scenario takes effect.
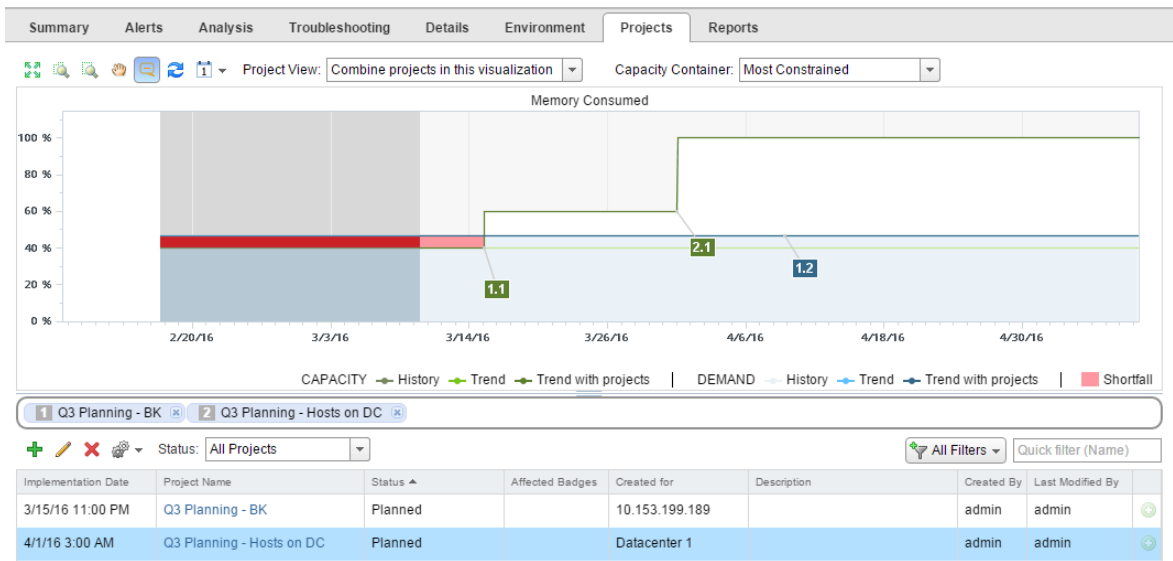
To view the details about the scenario, move the pointer to the number in the chart.

The projects and scenarios continue to appear in the chart until you delete them or refresh the view.

Project Scenarios Model Changes to Resources

You can use the following project scenarios to forecast capacity.

Table 2-1. Project Scenarios for Selected Objects

Selected Object	Project Scenarios
vCenter Server	Capacity ■ Add or remove host system, datastore, or percentage of capacity. ■ Change absolute capacity. Demand ■ Add or remove virtual machine or percentage of demand. ■ Change absolute demand.
Cluster	■ Add, remove, or update hosts. ■ Add, remove, or update datastores. ■ Add or remove virtual machines.
Host	Capacity ■ Add or remove datastore, or percentage of capacity. ■ Change absolute capacity. Demand ■ Add or remove virtual machine or percentage of demand. ■ Change absolute demand.

Table 2-1. Project Scenarios for Selected Objects (Continued)

Selected Object	Project Scenarios
Datastore	Capacity ■ Add or remove percentage of capacity. ■ Change absolute capacity. Demand ■ Add or remove virtual machine or percentage of demand. ■ Change absolute demand.
Virtual Machine	■ Add, change, or remove capacity. ■ Add, change, or remove demand.

This chapter includes the following topics:

Right-Sizing Capacity for Stress-Free Demand and Value

Performance management and capacity planning vary across organizations and environments. Because the demand for capacity fluctuates in each environment, the top contenders for priority often include high efficiency versus low risk of poor performance. To plan and manage your capacity needs and intelligently calculate the capacity of your resources, vRealize Operations Manager uses sophisticated models.

With the capacity calculations in vRealize Operations Manager, you can use various sophisticated models to produce practical correlations between objective measured metrics and subjective goals of acceptable performance and efficiency.

In vRealize Operations Manager, stress involves how high and how long the demand persists relative to the capacity available, and vRealize Operations Manager uses this value to measure the potential for performance problems. The higher the stress score, the worse the potential is for degraded performance on your objects. Depending on the configuration of the policy analysis settings for stress, a score of green might indicate 0–24 percent of stress. A score of red might indicate more than 50 percent of stress. With the five-minute data collections and the intelligent stress calculations, vRealize Operations Manager can easily identify periods of poor performance.

Demand drives stress. vRealize Operations Manager bases the calculations for right-sizing capacity on past demand. The goal of right-sizing is to produce a green level of stress, marked by a green Stress badge.

Usable capacity is equal to the total capacity available minus any buffers that administrators or users defined. To measure the right-sized amounts of usable capacity, the capacity calculations use what is called a stress-free value. Using the demand, stress, and the stress-free value, vRealize Operations Manager calculates the right size.

The capacity analytics determine the actual and effective demand for resources based on having no contention. The calculations consider the capacity to be unlimited and free of contention for resources, which results in no stress on the available capacity. The result is called the stress-free demand or the stress-free value.

Where to Find Stress-Free Demand and Stress-Free Value

In some areas of the user interface, vRealize Operations Manager identifies capacity as Stress Free Demand, and in other areas it is identified as Stress Free Value. Both terms mean that the calculated capacity for an object is free from unacceptable levels of contention and stress, as defined in the policy for the Stress score.

Stress Free Demand appears in **Troubleshooting > All Metrics**, Views, and Reports.

- In **Troubleshooting > All Metrics**, you can use the metric named Stress Free Demand to examine the CPU demand, disk space allocation and demand, memory consumed, and the vSphere configuration limit on an object. When you apply this metric to these resources, you can build a metric graph to display the stress-free demand for an object. The graph displays the high and low stress-free capacity values over time.

- In **Content > Views**, when you add or edit a view, in the Data and Configuration areas of the workspace, you can use the metric named Stress Free Demand. Use this metric to build views for CPU demand, disk space allocation and demand, memory consumed, and the vSphere configuration limit.

- In **Content > Reports**, you can use a view that includes the metric named Stress Free Demand to generate a report. The table in the report displays Stress Free Demand as the label. For example, this metric appears in the report named Cluster CPU Demand (%) Trend View.

Stress Free Value appears on the **Object > Analysis > Time Remaining** tab, and on the **Object > Analysis > Stress** tab.

- On the **Object > Analysis > Time Remaining** tab, you can view the time remaining for CPU demand, memory consumed, disk space demand and allocation, and the vSphere configuration limit. In this view, the table column name is Stress Free Value.

- On the **Object > Analysis > Stress** tab, the table column name is Stress Free Value. The tables display Stress Free Value as the calculated values for CPU demand, memory consumed, and the vSphere configuration limit.

Setting the Thresholds for the Stress Score

The analysis settings in the policy that you apply to your objects defines the thresholds for the stress score. The policy includes default settings for the stress score to be green, yellow, orange, or red. If the settings are too strict or loose for your environment, you can modify them.

To modify the stress score thresholds, edit the policy that applies to your objects, and click **Analysis Settings**. Select an object type and click the filter icon to display the policy analysis settings. In the Stress area, click the lock icon, expand **Stress**, and modify the stress thresholds.

In the analysis stress settings, vRealize Operations Manager uses the selected resources, such as Memory Demand, CPU Demand, and vSphere Configuration Limit to calculate the stress score.

You can set the stress thresholds to your own values, or turn them off. To change a stress score threshold, click and drag an icon along the slider. To remove a scoring range, such as the default range of 35–49 identified by orange, double-click an icon to disable the range.
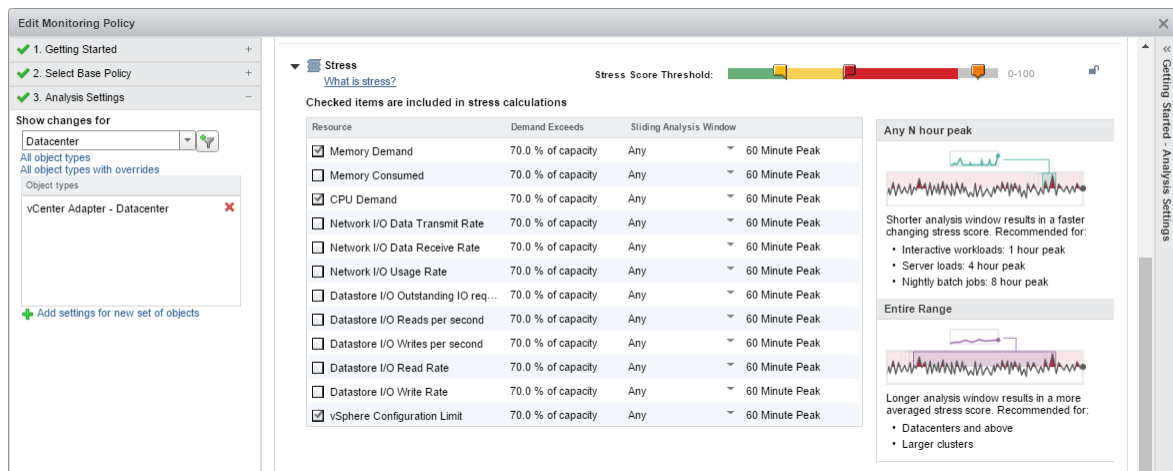
Demand Exceeds is a percentage of capacity. Capacity is also called provisioned capacity. To change the stress threshold for a resource, double-click the Demand Exceeds percentage, and enter the desired value. This value defines the point at which vRealize Operations Manager considers the percentage of demand to be stress. For example, to change the stress threshold for **Memory Demand**, double-click the current percentage, such as **70.0 % of capacity**, and enter the new percentage of demand to exceed for vRealize Operations Manager to identify stress.

For each resource, you can change the sliding analysis window value to include the entire range, and set the peak value to a different time depending on how you need vRealize Operations Manager to derive the stress score.

More About the Stress Score

vRealize Operations Manager calculates the stress zone and stress score for you. The following explanations cover typical scenarios where Demand does not exceed Capacity.

To determine the stress on an object for a specific time period, you can examine the demand curve to determine how much of the stress zone the demand occupies. The stress zone is typically where demand exceeds 70 percent of the total capacity. For example, stress occurs when CPU demand, memory demand, or memory consumed exceeds 70 percent of the capacity.

In a 60-minute peak period, vRealize Operations Manager bases the Stress score calculation on the following variables:

- Stress threshold, which is the `Demand Exceeds` setting

- Stress score threshold, which determines the color of the Stress badge

- Time range, as in 30 days of analysis

- Peak detection window, which is the 60-minute peak setting that you can adjust to either a non-zero number of minutes or the entire range.

When the demand exceeds 70 percent, that data point in time is in the Stress zone.

In the policy stress analysis settings, to examine an example graph used to calculate stress, click **What is stress?**.

Another example to explain the calculation used for CPU stress is shown here.
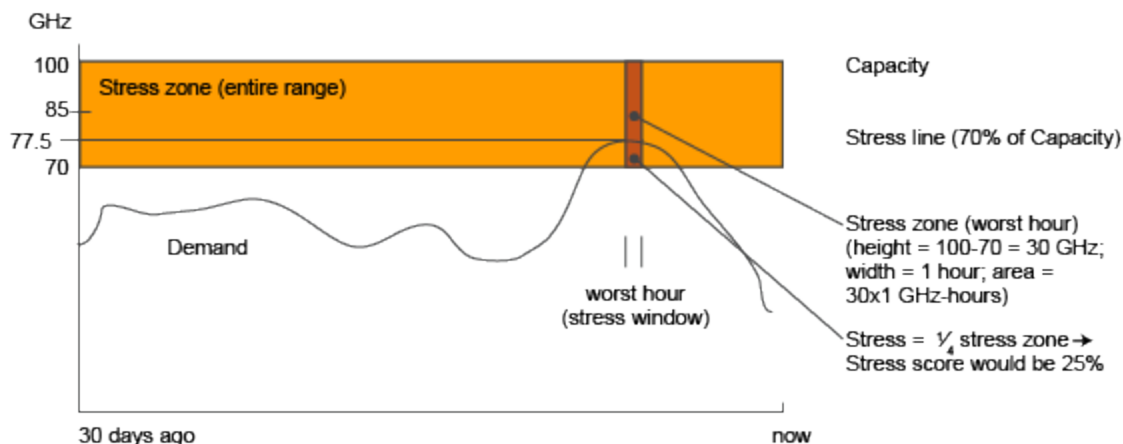
With a peak detection window size of 60 minutes, vRealize Operations Manager calculates the CPU stress score. It uses the area under the demand curve and above the stress threshold line as a percentage of the area covered by the total capacity curve.

Using time stamps of *t1* and *t2* to identify a 60-minute window in the last 30 days, the stress score depends on demand, stress threshold, and total capacity over time.

```
Maximum((Demand – Stress Threshold) ÷ (Total Capacity – Stress Threshold))
```

This equation applies to the stress calculations for each resource, such as memory demand, memory consumed, and CPU demand.

If `Total Capacity` varies during the time range being considered, `Stress Threshold` must also become variable, because (Stress Threshold) = (Stress Threshold in %) × (Total Capacity).

Since (`Total Capacity`) can be a different value at a different time, as identified by *t*, then "Stress Threshold"*(t)* = "Stress Threshold in %" × "Total Capacity"*(t)*.

As a result, the Stress score is the highest aggregate of demand that exceeds 70 percent of capacity, as a percentage of the aggregate of capacity within any contiguous interval of 60 minutes in the last 30 days. The formula for the score is as follows:

```
Maximum((Demand(t1, t2) – "Stress Threshold"(t1, t2)) ÷ ("Total Capacity"(t1, t2) – "Stress Threshold"(t1, t2)))
```

Where:

■ *t1* and *t2* are time stamps in the time continuum within the last 30 days.

■ *t1* < *t2*

■ *t2* - *t1* = 60 minutes

■ Demand(*t1*, *t2*) is the demand curve between time *t1* and *t2*.

■ "Stress Threshold"(*t1*, *t2*) is the stress threshold curve (as absolute values) between time *t1* and *t2*.

■ "Total Capacity"(*t1*, *t2*) is the capacity threshold curve between time *t1* and *t2*.

vRealize Operations Manager calculates the aggregate during a contiguous time interval of 60 minutes in the last 30 days. The Stress score is the percentage of aggregate capacity in the same contiguous time interval of 60 minutes. An acceptable score yields a green Stress badge.

To view the Stress zone for an object, click **Object > Analysis > Stress**. Then, examine the Stress breakdown areas for CPU and memory, the Stress Zone column in the table, and the graph of actual demand.

By calculating the stress score, vRealize Operations Manager provides an intelligent way to evaluate peaks and fluctuations of the capacity of your objects over time.

User Scenario: Planning Capacity for an Increase in Workload

You are an IT administrator for one of your financial data centers. You must forecast the capacity requirements for your virtual infrastructure to plan for an increase in the workload of your cluster and data center over the next month. To evaluate the demand and supply for capacity on your objects, and forecast the risk to your current capacity, you create projects and scenarios in vRealize Operations Manager.

Your data center is named `Fina_RDDC-01`, and includes a cluster named `Fina_RDCL-01`. You plan to increase the overall workload on the cluster in this data center by 50 percent in the next month. You must also plan to add virtual machines and add one or more hosts to this cluster.

In this example, you create a project that includes scenarios to determine the impact of future capacity needs on your cluster objects. You then create a second project to plan for more capacity needs. Finally, you examine these projects together in the context of your current capacity so that you can understand the projected impact of these projects on your future capacity needs.

Prerequisites

Verify that vRealize Operations Manager has collected data for the last several weeks. For information about connecting vRealize Operations Manager to data sources, see the vRealize Operations Manager Information Center.

Procedure

1   Create a Sample Project to Increase Workload Capacity on page 84

     You are the IT administrator for the financial data center named `Fina_RDDC-01` in your company. You create a project to plan for an increase in the workload on the cluster named `Fina_RDCL-01` by 50 percent in the next month. In the project, you create scenarios that anticipate the effect of the capacity needs on the hosts, virtual machines, and cluster in the data center.

2   Create a Sample Project to Add a Host and Virtual Machines on page 85

     You are the IT administrator for the financial data center in your company. To plan for capacity needs on the cluster named `Fina_RDCL-01` in the data center named `Fina_RDDC-01`, you create another project. In your project, you add virtual machines and a host to the cluster.

3   View the Result of Your Capacity Projects on page 86

     You are the IT administrator responsible for the data center named `Fina_RDDC-01`. You view the effects of the projects and scenarios that you created on the overall capacity of the cluster in your data center.

Create a Sample Project to Increase Workload Capacity

You are the IT administrator for the financial data center named `Fina_RDDC-01` in your company. You create a project to plan for an increase in the workload on the cluster named `Fina_RDCL-01` by 50 percent in the next month. In the project, you create scenarios that anticipate the effect of the capacity needs on the hosts, virtual machines, and cluster in the data center.

You use your new project and scenario to determine what happens to the capacity of the objects in your environment when you plan for an increase in demand.

Prerequisites

■   Understand the scope of this sample workflow. See "User Scenario: Planning Capacity for an Increase in Workload," on page 84.

■   Verify that the cluster named `Fina_RDCL-01` in your data center named `Fina_RDDC-01` includes multiple hosts and virtual machines.

Procedure

1   In the vRealize Operations Manager inventory tree, select your data center named `Fina_RDDC-01`. Then select your cluster named `Fina_RDCL-01`.

2   Click the **Projects** tab.

3   On the toolbar above the Projects list pane, click **Add**.

4   In the Projects workspace, enter a name and description for the project.

For example, `Fina RDCL Q1 Planning`.

5   For the Status, select **Planned - no badges affected**.

6   In the workspace, click **Scenarios**.

7   Under Add Demand, drag the scenario named **add percentage of demand** to the Scenarios pane.

The scenario is numbered 1.1.

8   In the Configuration pane, configure the demand.

a   Click the **Implementation Date** calendar icon, and select the date one month from today.

b   In the Use Global Value text box, enter **50**.

9   To add the scenario to your project, click **Save** and click **Close**.

vRealize Operations Manager saves the scenario in the project.

What to do next

To add virtual machines and hosts to the cluster named `Fina_RDCL-01`, create another project and scenario. See "Create a Sample Project to Add a Host and Virtual Machines," on page 85.

Create a Sample Project to Add a Host and Virtual Machines

You are the IT administrator for the financial data center in your company. To plan for capacity needs on the cluster named `Fina_RDCL-01` in the data center named `Fina_RDDC-01`, you create another project. In your project, you add virtual machines and a host to the cluster.

You create another project to add a host and virtual machine to the cluster named `Fina_RDCL-01` so that you can see the effect on the capacity of the cluster. The cluster already includes several hosts named `Fina_RDH-01` and `Fina_RDH-02`.

Prerequisites

Create a project to plan for an increase in the workload on the cluster named `Fina_RDCL-01` by 50 percent in the next month. See "Create a Sample Project to Increase Workload Capacity," on page 84.

Procedure

1   In the vRealize Operations Manager inventory tree, select the data center named `Fina_RDDC-01`, and the cluster named `Fina_RDCL-01`.

2   Click the **Projects** tab.

3   On the toolbar above the Projects list pane, click **Add**.

4   In the Projects workspace, enter a name and description for the project.

For example, `Fina RDCL-01 Hosts_VMs Q1 Planning`.

5   For the Status, select **Planned - no badges affected**.

6   In the workspace, click **Scenarios**.

7   Under Add Demand, drag the scenario named **add Virtual Machine** to the Scenarios pane.

The scenario is numbered 1.1.

8   In the Configuration pane, configure the capacity requirements.

    a   Under Changes, enter `10` for the number of virtual machines.

    b   Under Metrics, enter `4 GB` for Memory (Consumed).

    c   For CPU - Allocation model for vCPUs, enter `2`.

9   Under Add Capacity, drag the scenario named **add Host System** to the Scenarios pane.

The scenario is numbered 1.2.

10 In the Configuration pane, configure the host.

    a   Under Changes, enter `2` for the number of hosts.

    b   Under Metrics, enter `8 GB` for Memory Demand.

    c   For CPU Allocation, enter `4` for the number of vCPUs.

11 To add the scenario to your project, click **Save** and click **Close**.

vRealize Operations Manager saves the scenario in the project.

What to do next

Visualize the effect of your capacity planning projects in the visualization chart.

View the Result of Your Capacity Projects

You are the IT administrator responsible for the data center named `Fina_RDDC-01`. You view the effects of the projects and scenarios that you created on the overall capacity of the cluster in your data center.

View both of your projects so that you can visualize the anticipated requirements simultaneously. Use the results to plan your overall capacity needs for the cluster named `Fina_RDCL-01` in the data center named `Fina_RDDC-01`.

Prerequisites

Create a project so that you can plan to add hosts and virtual machines to the cluster named `Fina_RDCL-01`. See

Procedure

1   Select your cluster named `Fina_RDCL-01`, and click the **Projects** tab.

2   In the Projects list, select the project named `Fina RDCL Q1 Planning`, and drag it to the pane just above the Projects list.

3   Select the project named `Fina RDCL-01 Hosts_VMs Q1 Planning`, and drag it to the pane just above the Projects list.

4   To view both projects in the visualization chart, from the Project View drop-down menu above the chart, select **Combine projects in this visualization**.

The combined values for your projects appear in the visualization chart.

What to do next

Determine whether to commit the projects so that you can reserve the capacity on the objects in your data center.

Planning Hardware Projects in vRealize Operations Manager

Planning a capacity project for the hardware in your infrastructure involves changes to the host hardware and datastore hardware. To determine whether you must purchase new hardware, you can create projects.

Before you change your hardware objects, you can create and implement a hardware project to determine the result of the change. With hardware projects, you can determine the capacity requirements for your objects before you change the hardware in your environment.

You might need to plan for hardware changes under various circumstances.

- If you implement new applications, you must ensure that your objects have enough resources to support the amount of disk space required after you deploy the applications.

- If you add hosts to an existing cluster, you must ensure that the cluster can sustain the increase in capacity used during the following quarter of the year.

- If you make a configuration change to the demand for memory or CPU on your objects, you must understand the capacity requirements and workloads of your existing objects.

Create a Project to Plan for Hardware Changes

To support an increase in the capacity requirements for the objects in your environment, you can create projects to determine whether a purchase of new hardware is necessary.

To forecast the capacity requirements for your objects when you add, update, or remove hardware capacity, you create projects and add scenarios to those projects. This procedure creates a hardware project that forecasts changes to a host in your cluster.

Prerequisites

vRealize Operations Manager has collected data for the last several weeks. For information about connecting vRealize Operations Manager to data sources, see the vRealize Operations Manager Information Center.

Procedure

1 In the vRealize Operations Manager inventory tree, select a host.

2 Click the **Projects** tab.

3 On the toolbar above the visualization area, from the Capacity Container drop-down menu, click **Most Constrained**.

4 On the toolbar below the visualization area, click **Add**.

5 In the Projects workspace, enter a name and description for the project.

6 For the Status, select **Planned - no badges affected**.

7 In the workspace, click **Scenarios**.

8 Under Add Capacity, drag the scenario named **add Datastore** to the Scenarios area.

9 In the Configuration area, enter the general parameters for the project scenario.

Option	Description
Implementation Date	Set the date and time to implement the project scenario.
Changes	Set the number of datastores to add.
Populate metrics from	Copy the disk space use and allocation metrics from an existing datastore, and select an existing datastore.
Metrics	Set the amount of disk space use and allocation.

10 To view the effect of your selections in the visualization chart, click **Save project and continue editing**.

With the Capacity Container set to **Most Constrained**, the visualization chart might indicate a CPU shortfall when you implement the project scenario. This shortfall might occur because the CPU allocation might be greater than the available capacity. In this case, you might need to add CPU capacity before you implement the project scenario.

11 When you are satisfied with the capacity forecast based on your settings, click **Save** to add the scenario to the project.

12 On the Projects tab, click your project in the list and drag it to the area above the project list.

vRealize Operations Manager applies your project and scenario to the visualization chart. The capacity forecasted in the project appears as a gray line in the chart.

What to do next

Add the scenario named **Add Demand: add percentage of demand** to the project, and set the Capacity Container to **Disk Space Allocation**. The visualization chart might indicate that when you implement the project scenario, you have a disk space shortfall. In this case, you might need to add disk space capacity before you implement the project scenario.

In the visualization chart, evaluate the current available capacity with the actual capacity required if you change your environment as defined in your project. Determine whether to commit the project so that it reserves the capacity required for the hardware change.

Planning Virtual Machine Projects and Scenarios

Virtual machine projects help you assess the consequences of changing resources on virtual machines without applying the changes to your virtual environment. Before you apply changes to your virtual environment, you can create sample virtual machine projects to model adding or removing virtual machines to a host or a cluster.

■ Create a Virtual Machine Project Using Populated Metrics on page 88

You can create a project scenario that uses an existing virtual machine profile as a model. The project scenario simulates the resource requirements when you add one or more virtual machines to a host or cluster.

■ Create a Sample Project for a New Virtual Machine on page 89

Virtual machine projects assess the consequences of adding a new virtual machine to a cluster or host, without applying the actual changes to your virtual environment.

■ Create a Sample Project to Simulate Removing a Virtual Machine on page 90

You can create a project that simulates removing one or more virtual machines from a host or a cluster. You might remove virtual machines when you no longer need them, or when you must move them.

Create a Virtual Machine Project Using Populated Metrics

You can create a project scenario that uses an existing virtual machine profile as a model. The project scenario simulates the resource requirements when you add one or more virtual machines to a host or cluster.

When you configure the settings in a project scenario to add virtual machines, you can populate the resource values for the planned virtual machine from an existing profile. Or, you can copy the values from an existing virtual machine.

To calculate the capacity metrics values for the virtual machine, vRealize Operations Manager partitions the capacity for CPU, memory, and disk dimensions, according to the profile that you select.

For information about CPU and memory maximums, see the VMware vSphere documentation.

Procedure

1 In the vRealize Operations Manager navigation tree, click the host or cluster that contains the planned virtual machine reside, and click **Projects**.

2 Click **Add New Project**.

3 In the Projects workspace, enter a name and description for the project.

4 For the Status, select **Planned - no badges affected**.

5 In the workspace, click **Scenarios**.

6 Under Add Demand, drag the scenario named **add Virtual Machine** to the Scenarios area.

7 In the Configuration area, enter the general parameters for the project scenario.

   a Select the date and time to implement the project scenario.

   b Click **Populate metrics from**, select an existing profile or an existing virtual machine, and click **OK**.

Option	Action
Copy metric values from a pre-defined profile.	From the Profile drop-down menu, select an existing profile to populate the metrics values for the planned virtual machine.
Copy metric values from an existing object.	From the Existing Virtual Machine drop-down menu, select a virtual machine to populate the metrics values for the planned virtual machine. The list displays the virtual machines that reside on the selected object.

   c (Optional) To duplicate virtual machines, increase the virtual machine count.

   d To see the effect of the planned virtual machines in the visualization chart, click **Save project and continue editing**.

   With the Capacity Container set to **Most Constrained**, the visualization chart might indicate that you have a CPU shortfall when you implement the project scenario. The shortfall might occur because the CPU allocation might be greater than the available capacity. In this case, you might need to add CPU capacity before you implement the project scenario.

8 When you are satisfied with the capacity forecast based on your settings, click **Save** to add the scenario to the project.

9 On the Projects tab, click your project in the list and drag it to the area above the project list.

vRealize Operations Manager applies your project and scenario to the visualization chart. The capacity forecasted in the project appears as a gray line in the chart.

What to do next

In the visualization chart, evaluate the current available capacity with the actual capacity required if you change your environment as defined in your project. Determine whether to commit the project so that it reserves the capacity required for the new virtual machines.

Create a Sample Project for a New Virtual Machine

Virtual machine projects assess the consequences of adding a new virtual machine to a cluster or host, without applying the actual changes to your virtual environment.

For information about relevant CPU and memory maximums, see the VMware vSphere documentation.

Procedure

1   Select the destination object in the inventory pane.

     If you implement your scenario, the destination object is a cluster or host where you locate the new virtual machines.

2   Click the **Projects** tab and click the **Add New Project** icon.

3   From the Projects workspace, enter the name and a description of the project.

4   Select the **Planned** status.

5   To add scenarios to this project, click **Scenarios**.

6   Select the **add Virtual Machine** scenario and drag it to the Scenarios area.

7   Set the virtual machine count and the configuration for the virtual machine.

     vRealize Operations Manager does not require you to set the disk I/O and network I/O use of the new virtual machines. vRealize Operations Manager uses the average disk I/O and network I/O use across virtual machines in the host or cluster as an estimation of the new virtual machine use.

8   To see the effect in the visualization chart when your configuration selections are finished, click **Save project and continue editing**.

9   To add the scenario to the project, click **Save**.

10   To close the Project workspace, click **Close**.

     Clicking **Close** discards all changes. Clicking **Save project and continue editing** persists any changes that were not previously saved.

vRealize Operations Manager applies the project to the object you selected. The project shows the current capacity compared to the expected capacity when you add the virtual machines to the target object.

Create a Sample Project to Simulate Removing a Virtual Machine

You can create a project that simulates removing one or more virtual machines from a host or a cluster. You might remove virtual machines when you no longer need them, or when you must move them.

Procedure

1   In the vRealize Operations Manager inventory tree, select a host or cluster.

2   Click the **Projects** tab.

3   On the toolbar below the visualization area, click **Add**.

4   In the Projects workspace, enter a name and description for the project.

5   For the Status, select **Planned - no badges affected**.

6   In the workspace, click **Scenarios**.

7   Under Remove Demand, drag the scenario named **remove selected object** to the Scenarios area.

8   In the Configuration area, under Changes, click **Select one or more objects to remove**.

9   From the list of objects, click the check box for a **Virtual machine**, and click **OK**.

10   To add the scenario to the project, click **Save**.

11   On the Projects tab, click your project in the list and drag it to the area above the project list.

vRealize Operations Manager applies your project and scenario to the visualization chart. The capacity forecasted in the project appears as a gray line in the chart. Compare the current capacity to the expected capacity if you commit this project to remove one or more virtual machines from the selected object.

What to do next

You can create other projects, and combine or compare the outcomes in the visualization chart.

Custom Profiles in VMware vRealize Operations Manager

A custom profile is a user-defined instance of the capacity allocation and demand for a specific object type. You can use custom profiles to help forecast the capacity needs for your environment.

To determine how many instances of the object can fit in your environment, use custom profiles with projects and scenarios. Depending on the available capacity in your environment, you can add one or more instances of the object that the custom profile capacity requirements represent.

When you create a custom profile for an object type, such as a virtual machine, you create a project and add a virtual machine scenario to it. In the project scenario, you select your custom profile to populate the metrics and capacity for that object type to the project scenario. You use the capacity sizing of your custom profile to forecast the capacity needs for the parent object of the virtual machine.

To determine how many instances of the custom profile object you can include on the parent object, you select the parent object, click **Analysis**, and click **Capacity Remaining**. The custom profiles appear on the What Will Fit section of the Capacity Remaining Breakdown area, and indicate how many instances of the object fit in your environment.

Custom Datacenters in VMware vRealize Operations Manager

A custom data center is a user-defined container for a group of objects that includes clusters, hosts, and virtual machines. Custom data centers provide capacity analytics and capacity badge computations based on the objects it contains. You can use custom data centers to forecast and analyze the capacity needs for your environment.

When you create a custom data center, you can include multiple cluster objects that span multiple vCenter Server instances. For example, you might have a production environment that spans multiple clusters, and you must monitor and manage the performance and capacity of the entire production environment.

After you create your custom data center, you can select it in the list of custom data centers to display a summary of its health, risk, and efficiency. This view displays the top alerts for the data center. To examine the capacity remaining for the custom data center, click the **Analysis** tab, and click **Capacity Remaining**.

You can use your custom data center objects to balance the workload across the clusters in your environment. Click **Home**, click **Dashboard List**, click the dashboard named **Workload Distribution**, and view the use of your custom data center in the dashboard.
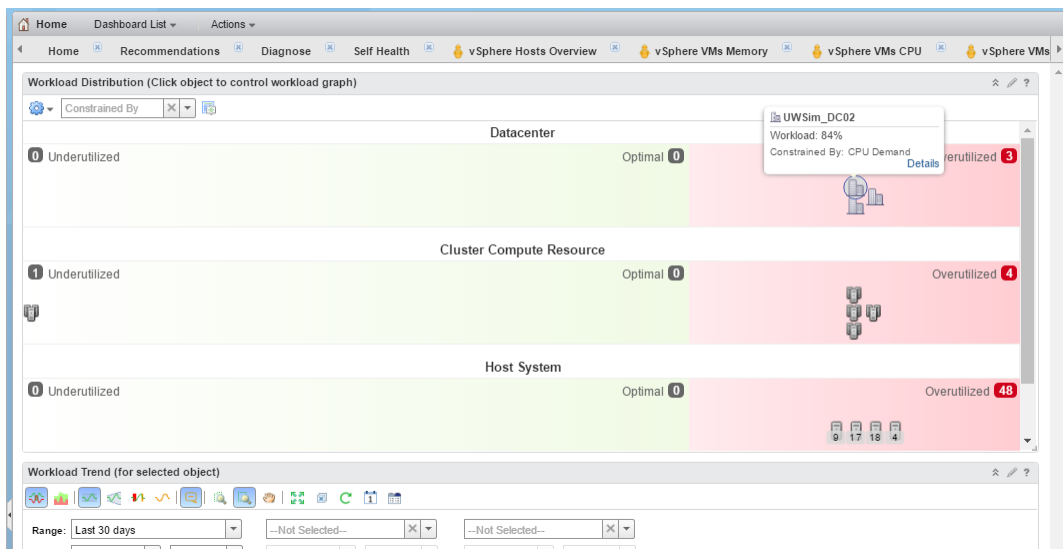
Click the icon for your data center to view its workload trend, CPU and memory workload measurements, and the vSphere configuration limit.

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