

# vRealize Operations Manager User Guide

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# About This User Guide

The VMware<sup>®</sup> *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.

# Monitoring Objects in Your Managed Environment by Using vRealize Operations Manager

# 1

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.

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

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 **Alerts**, **Events**, **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 change objects in the target system, for example, the VMware vCenter Server® system, from vRealize Operations Manager.

This chapter includes the following topics:

- [Enhanced Search Capability](#)
- [What to Do When...](#)
- [Monitoring and Responding to Alerts](#)
- [Monitoring and Responding to Problems](#)
- [Running Actions from vRealize Operations Manager](#)
- [Viewing Your Inventory](#)

## Enhanced Search Capability

The search function on the upper right supports locating named objects, dashboards, alerts, and so on, in the system. The search function attempts to match or partially match any string you enter; additional capabilities enable you to go swiftly to the item you want. The system presents the item in the Edit context.

## Where you Find Search

The search function appears on all the pages of the VMware vRealize Operations Manager in the top menu. Click the magnifying glass icon to open the search bar. Optionally, you can press the Ctrl, Shift and Spacebar keys on your keyboard to open the search bar.

## How Search Works

You start your search by typing in the search bar. VMware vRealize Operations Manager displays matching objects types and objects.

The search function supports several common categories you can employ to find the item you seek quickly, as follows:

- Dashboard
- Object
- Supermetric
- Alert definition
- Symptom definition
- View
- Report
- Notification
- I.P. Address

What this means is that in addition to entering a traditional search phrase, for example, a simple string - "VM" - you can also enter one of the listed categories followed by a string or a name. You can then search for objects within the category. For the Object, View and Dashboard categories, the system displays the object in view mode.

If you want quickly to locate a specific dashboard, for example, start typing "dash..." into the search field. The system offers the search term Dashboards. Select the term using the cursor and then enter the dashboard name or part of the name and press Enter. The system finds the dashboard you want, with editing functions available.

Similarly, you can type "alert" or simply "a" in the search field and the system offers Alert Definition. Select the term and enter part of an alert message, for example, "unbalanced." The system returns the alert, "Cluster has an unbalanced workload," presented in the Alert Definition Workspace where you can edit it.

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**Note** You can type virtual machine in the search bar to list all the virtual machines associated with the host.

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## What to Do When...

As a virtual infrastructure administrator, network operations center engineer, or other IT professional, use vRealize Operations Manager to monitor objects in your environment. Using vRealize Operations Manager, you can ensure that your customers experience the best possible service, 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**

The vice president of sales telephones tech support reporting that a virtual machine, VPSALES4632, is running slowly. The VP is working on sales reports for an upcoming meeting and is running behind schedule because of the slow performance of the virtual machine.

- **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.

- **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 act to resolve the problems.

## User Scenario: A User Calls with a Problem

The vice president of sales telephones tech support reporting that a virtual machine, VPSALES4632, is running slowly. The VP is working on sales reports for an upcoming meeting and is running behind schedule because of the slow performance of the virtual machine.

As an operations engineer, you reviewed the morning alerts and did not see problems with that virtual machine, so you begin troubleshooting the problem.

### Procedure

- 1 **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.

- 2 **Review Alerts Related to Reported Problems**

The sales vice president reports degraded performance in a virtual machine. To determine if the virtual machine has any alerts indicating the cause, review alerts for the virtual machine.



### 3 Use Troubleshooting to Investigate a Reported Problem

To troubleshoot problems with the VPSALES4632 virtual machine, consider evaluating symptoms, examining time line information and events, and creating metric charts to find the root cause.

## 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 on the vRealize Operations Manager title bar, enter the name of the virtual machine.

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

- 2 Select the object in the list.

### Results

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

### What to do next

Look for alerts related to the reported problem for the object. See [Review Alerts Related to Reported Problems](#).

## Review Alerts Related to Reported Problems

The sales vice president reports degraded performance in a virtual machine. To determine if the virtual machine has any alerts indicating the cause, review alerts for the virtual machine.

Alerts on an object can give you an insight into problems beyond the specific problem reported by the user.

### Prerequisites

Locate the customer's virtual machine so that you can review related alerts. See [Search for a Specific Object](#).

### Procedure

- 1 Click the **Summary** tab for the object generating alerts.

The **Summary** tab displays active alerts for the object.

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

Top alerts identify the primary contributors to the current state of the object. Do any of them appear to contribute to the slow response time? For example, any ballooning or swapping alerts indicate that you must add memory to the virtual machine. Are any alerts related to memory contention? Contention can be an indicator that you must add memory to the host.

## 3 If the **Summary** tab does not include top problems 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 canceled alerts, click **Status: Active** to clear the filter and display active and inactive alerts.

The canceled alerts might provide information about the problem.

- b So that you can locate alerts generated on or before the time when your customer reported the problem, click the **Created On** column to sort the alerts.
- c To view alerts for the parent objects in the same list with the alert for the virtual machine, click **View From**, then select, for example, **Host System** under Parents.

The system adds 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 > Symptoms** tabs, 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](#).
- If you cannot locate the cause of the reported problem among the alerts, begin more in-depth troubleshooting. See [Use Troubleshooting to Investigate a Reported Problem](#).

## Use Troubleshooting to Investigate a Reported Problem

To troubleshoot problems with the VPSALES4632 virtual machine, consider evaluating symptoms, examining time line information and events, and creating metric charts to find the root cause.

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

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## Prerequisites

- Locate the object for which the problem was reported. See [Search for a Specific Object](#).
- 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](#).

## Procedure

- 1 In the menu, click **Environment**, then click **Inventory** and select VPSALES4632 from the tree.  
The main pane updates to display the object **Summary** tab.

- 2 Click the **Alerts** 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 use?

- 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.

It appears 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 **Events > Timeline** tabs and review the alerts, symptoms, and change events that might help 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 **View From > Peer**.

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 parent objects.

- b Click **View From** and select **Host System** from the Parent list.

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 > Events** tab to view changes in the collected metrics for the problematic virtual machine. Metrics might direct you toward the cause of the reported problem.
  - a Manipulate the **Date Controls** to identify the approximate time when your customer reported the problem.
  - b Use the Filters to filter on event criticality and status. Select Symptoms if you want to include the filters in your analysis.
  - c Click an **Event** to view the details about the event.
  - d Click **View From**, select **Host System** under Parents, and repeat the analysis.

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

- 5 If the problem relates to CPU or memory use, click **All Metrics** and create metric charts to identify whether it is CPU, memory, or both.
  - a If the host is still the focus, begin 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.

Comparing the four charts shows normal CPU use on both the host and the virtual machine, and normal memory use on the virtual machine. However, memory use on the host is consistently elevated three days before the reported problem on VPSALES4632.

## Results

The host memory is consistently elevated, which impacts virtual machine response time. The number of running virtual machines is well within the supported number. The cause might be many intensive process applications on the virtual machines. 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, use vRealize Operations Manager to power off virtual machines on the host so that you can improve performance in the running virtual machines. See [Run Actions from Toolbars in vRealize Operations Manager](#).
- If you want to use the combination of charts that you created on the **All Metrics** tab again, click **Generate Dashboard**.

## 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. You receive emails when an alert is generated for your monitored objects. In addition to alerting you to problems in your environment, alerts can 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. It also assumes 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 messages when an alert is generated so that you can respond quickly.

### Prerequisites

- Verify that outbound alerts are configured for standard email alerts. See *vRealize Operations Manager Configuration Guide*.

### Procedure

#### 1 Respond to an Alert in Your Email

As a network operations engineer, you receive an email message from vRealize Operations Manager about a datastore 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 Datastore

Because you need more information about the datastore before you decide on the best response, you examine the **Symptoms** tab to see other triggered symptoms for the datastore.

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

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

#### 4 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.

#### 5 Construct Metric Charts to Investigate the Cause of the Datastore Alert

To analyze the capacity metrics related to the generated alert, you create charts 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

As a network operations engineer, you investigated the alert regarding datastore disk space and determined that the provided recommendations can solve the problem. The recommendation to delete unused snapshots is especially useful. 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 about a datastore 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 from 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 use reaching 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 Configuration 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 Configuration 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 problem. If implemented, do the prioritized recommendations resolve the problem?
What is Causing the Problem?	Which symptoms were triggered? Which were not triggered? What effect 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 might resolve the problem, implement them. See [Run a Recommendation on a Datastore to Resolve an Alert](#).
- If you need more information about the affected objects, continue your investigation. Begin by looking at other triggered symptoms for the datastore. See [Evaluate Other Triggered Symptoms for the Affected Datastore](#).

### Evaluate Other Triggered Symptoms for the Affected Datastore

Because you need more information about the datastore before you decide on the best response, you examine the **Symptoms** tab to see other triggered symptoms for the datastore.

If other symptoms are triggered for the object besides the symptom included in the alert, evaluate them as well. Determine what the symptoms reflect about the state of the object to decide whether the related 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](#).

## Procedure

- 1 In the menu, click **Alerts** and select the alert name in the data grid.

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

- 2 Click **View additional metrics > Alerts > Symptoms** 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 that might indicate storage problems?
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 can 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](#).
- If your review of the symptoms did not convince you that the recommendations can resolve the problem or provide you with enough information to identify the root cause, continue your investigation using the **Events > Timeline** tab. See [Compare Alerts and Events Over Time in Response to a Datastore Alert](#).

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

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

As a network operations engineer, you use the **Events > Timeline** tab to compare this alert to other alerts and events in your environment. This way, 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](#).



## Procedure

- 1 In the menu, click **Alerts** and select the alert name in the data grid.

The alert details appear to the right.

- 2 Click **View Events > Timeline**.

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.

- 3 Scroll through the timeline using the week timeline at the bottom.

- 4 To view events that might contribute to the alert, click **Event Filters** 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 determine whether the recommendations can resolve the problem.

- 5 Click **View From** and select **Host** under Parents.

Because the alert is related to disk space, adding the host to the timeline enables you to see what alerts and symptoms are generated for the host. As you scroll through the timeline, ask: 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?

- 6 Click **View From** and select **Peer** under Parents.

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.

- 7 To remove canceled alerts from your timeline, click **Filters** and deselect the **Canceled** check box.

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

## What to do next

- If your evaluation of alerts in the timeline indicated 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](#).
- If you need more information about the affected object, continue your investigation. See [View the Affected Datastore in Relation to Other Objects](#).

## 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.

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

### 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](#).

### Procedure

- 1 In the menu, click **Alerts**, select the alert name in the data grid, and click **View additional metrics > All Metrics**.

- 2 Click **Show Object Relationships**.

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. Objects in the tree show a colored square to indicate the current state of the badge.

- 3 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.

- 4 To view alerts for an object, select the object and click **Alerts**.

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

- 5 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.

- 6 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](#).
- If you need more information about the affected object, continue your investigation. See [Construct Metric Charts to Investigate the Cause of the Datastore Alert](#).

## Construct Metric Charts to Investigate the Cause of the Datastore Alert

To analyze the capacity metrics related to the generated alert, you create charts 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 can resolve the problem that the alert identifies.

### Prerequisites

View the topological map for the datastore to determine if related objects are contributing to the alert or if triggering symptoms indicate that the datastore is contributing to other problems in your environment. See [View the Affected Datastore in Relation to Other Objects](#).

### Procedure

- 1 In the menu, click **Alerts**, select the alert name in the data grid, and click **View additional metrics > All Metrics**.

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

- 2 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, the Capacity | Used Space (%) chart might show an increase in used space, without the Disk Space | Capacity (GB) increasing or the Summary | Number of Capacity Consumers increasing. Then adding capacity can be a solution, but it does not address the root cause.

- 3 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 four charts.

For example, the Summary | Total Number of VMs chart might show that the number of virtual machines did not increase enough to affect the datastore negatively. That result might make moving some of the virtual machines seem the best solution, but it does not address the root cause.

- 4 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, say the amount of Disk Space | Snapshot Space (GB) increases. At the same time, the Disk Space Reclaimable | Snapshot Space | Waste Value (GB) indicates an area where space can be reclaimed. Then deleting unused snapshots positively affects the datastore disk space problem and resolves the alert.

- 5 If this datastore is a problematic one that you must continue to monitor, 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.

## Results

You compared metric charts to determine if the recommendations are valid and which recommendation to implement first. In this example, the recommendation to Delete unused snapshots of Virtual Machines 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](#).

## 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 can solve the problem. The recommendation to delete unused snapshots is especially useful. 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](#).

## Procedure

- 1 In the menu, click **Alerts** and select the alert name in the data grid. The alerts detail information appears on the right.
- 2 Review the Recommendations.  
  
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.
- 3 Click **Delete Unused Snapshots for Datastore**.
- 4 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.
- 5 In the **Delete Unused Snapshots for Datastore** dialog box, review the Snapshot Space, Snapshot Create Time, and the VM Name. Determine which snapshots to delete and select the check box for each one to delete.
- 6 Click **OK**.  
  
The dialog box that appears provides a link to Recent Tasks and a link to the task.
- 7 To verify that the task ran successfully, click **Recent Tasks**.  
  
The Recent Tasks page appears. The Delete Unused Snapshots action includes two tasks, one to retrieve the snapshots and one to delete the snapshots.
- 8 Select the Delete Unused Snapshot task that has the more recent finish time.  
  
This task deletes the snapshots. The status is **Completed**.

## Results

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. Run a few collection cycles 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.

## 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 act 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 emailed, 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 analyze the state of the objects in your environment, examine current problems, investigate solutions, and act to resolve the problems.

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

- Using the Events 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 an alert definition, and create a dashboard and one or more views. 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 Configuration Guide*.

### Procedure

#### 1 Troubleshoot Problems with a Host System

Use the Troubleshooting tabs to identify the root cause of problems that the system does not resolve by alert recommendations or simple analysis.

## 2 Examine the Environment Details

Examine the status of your objects in the views and heat maps 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.

## 3 Examine the Environment Relationships

Use the Environment tab to examine the status of the three badges as they relate to the objects in your environment hierarchy. You can then 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, use **All Metrics > Show Object Relationship**.

## 4 Fix the Problem

Use the troubleshooting features of vRealize Operations Manager to examine problems that put your objects in a critical state, and identify solutions. To resolve the resource and time remaining problems, use the Capacity Optimization function.

## 5 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. These tools apply the troubleshooting solutions that you used to research and solve the problems with your host system, and make the troubleshooting tools and solutions available for future use.

## Troubleshoot Problems with a Host System

Use the Troubleshooting tabs to identify the root cause of problems that the system does not resolve by alert recommendations or simple analysis.

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

### Procedure

- 1 In the menu, click **Environment**, then in the left pane click **vSphere Hosts and Clusters** and select the object. For example, USA-Cluster.
- 2 Click the **Alerts** 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 Investigate the critical symptoms.

- a Point to 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 point to Cluster Compute Resource Time Remaining is critically low, the metric Capacity|Time Remaining 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 the USA-Cluster.

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

- a Click the calendar and select **Last 7 Days** as the range.  
Several events appear in red.
- b Point to each event to view the details.
- c To display the events that occurred on the cluster's data center, click **View From**, and select **Datacenter**.

Warning events for the data center appear in yellow.

- d Point to the warning events.

You notice that a hard threshold violation occurred on the data center late in the evening. The hard threshold violation shows that the Badge|Workload metric value was under the acceptable value, and that the violation triggered.

- e To view the affected child objects, click **View From** and select **Host System**.

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

- a Review the graph.

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 following the graph.

- b Click each red triangle to identify the affected object and highlight it in that pane.

### 6 Click the **Capacity** tab to evaluate details of capacity and time remaining.

### 7 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 **All Metrics > Capacity Analytics Generated** and double-click **Capacity Remaining (%)**.

The Capacity Remaining (%) calculation appears on the right pane.



- c In the metrics pane, expand **All Metrics > Badge** and double-click **Workload (%)**. The Workload (%) calculation appears on the right pane.
- d 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 Badge|Workload (%) calculation displays workload extremes.

## Results

You have analyzed the symptoms, timeline, events, and metrics related to the problems on your cluster. Through your analysis, you have determined that the heavy workload on the cluster has caused the cluster to start running out of capacity.

## What to do next

Examine the Details views and heat maps to interpret the properties, metrics, and alerts. Also, to look for trends and spikes that occur in the resources for your objects, the distributions of resources across your objects, and data maps. You can examine the use of various object types across your objects. See [Examine the Environment Details](#).

## Examine the Environment Details

Examine the status of your objects in the views and heat maps 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.

Use the heat maps 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 heat map configuration.

## Prerequisites

Use the Troubleshooting tabs to look for root causes. See [Troubleshoot Problems with a Host System](#).

## Procedure

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

## 2 Examine the detailed information about the 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 Overview**, and examine the number of virtual machines listed for the 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 **Capacity** tab.

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

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

- d Click the **Details** tab, then click **Views**, and click **Cluster Configuration View**.

- e To reclaim capacity from several virtual machines, select the cluster name

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

- g In the workspace that appears, 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 suggests fewer CPUs for each virtual machine.

- h Click the check box next to each virtual machine that has a suggested lower CPU count, and click **Begin Action**. A confirmation message indicates that the action is underway and provides the task ID that you use to track the action in the Recent Tasks section under Administration. 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 heat maps for the host system and virtual machine objects in the USA-Cluster.

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

- b Click **Details**, click **Heatmaps**, and click through the list of heat map views.

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

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

- d Point to 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.

## Results

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

## What to do next

Examine the status for the objects in your environment hierarchy to determine which objects are in a critical state. Then examine the object relationships to determine whether a problem on one object is affecting one or more other objects. See [Examine the Environment Relationships](#).

## Examine the Environment Relationships

Use the Environment tab to examine the status of the three badges as they relate to the objects in your environment hierarchy. You can then 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, use **All Metrics > Show Object Relationship**.

As you click each of the badges in the Environment tab, you see that several objects are experiencing critical problems with health. Others are reporting critical risk status.

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 heat maps. See [Examine the Environment Details](#).

## 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 the **Environment** tab.
- b On the Badge toolbar, click through the three badges - Health, Risk, and Efficiency - and look for red icons to identify critical problems.

As you click through the badges, you notice that your vCenter Server and other top-level objects appear to be healthy. However, you see that a host system and several virtual machines are in a critical state for health, risk, and efficiency.

- c Point to 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 the **Environment** tab.
- b Examine the badge states for the objects in USA-Cluster.
- c Many of the objects display critical states for 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 to act on.

- 4 Examine the relationship map.

- a Click **All Metrics > Show Object Relationship**.
- 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 following. Use the descendant object list identify all the objects related to the host system that might be experiencing problems.

#### What to do next

Use the user interface to resolve the problems. See [Fix the Problem](#) .

## Fix the Problem

Use the troubleshooting features of vRealize Operations Manager to examine problems that put your objects in a critical state, and identify solutions. To resolve the resource and time remaining problems, use the Capacity Optimization function.

You have used the Alerts, Details, All Metrics, and Environment areas of the user interface to examine critical problems such as resource contention and time remaining issues that occur on your objects. To resolve those problems, you can use the Capacity Optimization function.

### Prerequisites

Examine the environment relationships. See [Examine the Environment Relationships](#).

### Procedure

- 1 In the menu, click **Home**, then click **Overview** under Optimize Capacity in the left pane. The Capacity Overview screen appears.

- 2 **Select** the data center - DC-Denver-19 - that contains the problem objects.

The data in the lower half of the screen refreshes to display time remaining information and reclaim recommendations for selected data center DC-Chicago-12. NOTE: Double-clicking the data center graphic displays the Object Details page for that data center.

- 3 At the graph, select **Most Constrained** from the **Sort By:** choices and **CPU** from CPU|Memory|Disk Space above the graph.

The graph refreshes to show the usage value almost touching 100% and the timeline/projection value nearly intersecting the usage value. The data center is almost out of CPU.

- 4 Scroll down the page to the Recommendations below the graph.

Option 1 lists total resources (CPU, memory, disk space) that can be reclaimed. Option 2 lists the hardware to purchase to increase time remaining to 150 days.

- 5 Click **RECLAIM RESOURCES**.

The Reclaim screen appears, displaying data for DC-Chicago-12. The "How much can you save?" pane shows that \$4140/month can potentially be saved. Looking to the top of the table, you see that the \$4140 sum appears next to Oversized VMs.

- 6 Click **Oversized VMs**. Then click the chevron next to a cluster name on the left of the table. All the VMs in the cluster are listed.

- 7 Select the check box next to VM Name in the table heading.

All the VMs in the cluster are checked.

- 8 Click **RESIZE VM(s)**.

The Resize VMs page appears, showing the 20 VMs available for resizing.

- 9 Leave the recommendation as is, without editing the target reductions, then select the "I understand that workloads may be interrupted..." check box and click **RESIZE VM(s)**.

The system runs the resize action.

## Results

You have used Capacity Optimization to resolve problems on a host system that is experiencing critical problems. The data center does not run out of CPU, and instead realizes projected cost savings of nearly \$50,000 annually.

## 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, configure the Workload Optimization alerts to be automated. See the vRealize Operations Manager Configuration Guide.

## 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. These tools apply the troubleshooting solutions that you used to research and solve the problems with your host system, and make the troubleshooting tools and solutions available for future use.

To 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 Cluster Utilization dashboard to view the use index, CPU demand, and memory use for your clusters. This dashboard also tracks Internet use and disk I/O operations.
- Use the Capacity Summary dashboard to track total environment capacity, system-wide capacity and time remaining, and capacity remaining by CPU, memory, and storage. The dashboard also includes Top 10 lists for clusters running out of CPU, memory, and storage, respectively. Additional details are available.
- Use the Capacity Optimization dashboard to examine the provisioned capacity levels for CPU, disk, and memory and to review potential reclaimable capacity from CPUs, data centers, snapshot waste, and virtual memory.

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. By running the many instances, you can dedicate a monitor to each dashboard and visually track the status of your objects.

## Procedure

- 1 In the menu, click **Dashboards** 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.

- 2 Click the **Self Troubleshooting** dashboard, and review the widgets included on it: Object Type, Select Objects, Metric Picker, and Metric Chart.

By adding the Object List, Alert List, Heatmap, and Top-N widgets, you can easily peruse the status of the host systems that you select in the Object List widget. Configure widget interaction so that the object you select in the Object List widget is the object for which the other widgets display data.

- 3 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 **System Health**, 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 Add the Heatmap and Top\_N widgets.
  - f 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**.
  - g 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 monitor continuously all the objects in your environment. To plan for growth and new projects, see [Chapter 2 Capacity Optimization for Your Managed Environment](#) . To generate reports, and create and customize policies, see the *vRealize Operations Manager Configuration 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 shortly, 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**, **Timeline**, and **Metric Charts** tabs
- **Summary** tab
- **Alerts** tab
- **Events** tab
- Custom dashboards
- Alert notifications

### Working with Alerts

Alerts indicate a problem 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 message event, or metric event are canceled. You cannot manually cancel other types of symptoms. If a message event symptom or metric event symptom triggered the event, then the alert is effectively canceled. If a metric symptom or property symptom triggered the alert, 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 canceled 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 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 the processing, 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 menu, click **Alerts**.
- 2 Select **Time** in the Group By filter and then click the down arrow in the Created On column, so the most recent alerts are listed first .
- 3 In All Filters, select **Criticality > Warning**

You have listed all the Warning alerts in order of when they fired, with the most recent alerts appearing first.

- 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 currently 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, click the selected alerts, click **Actions** on the menu bar, and click **Take Ownership**.

The Assigned to: field in Alert Details 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. Then click **Actions** on the menu bar and click **Suspend**.

- a To suspend the alert for an hour, enter **60**.
- 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. Then click **Actions** on the menu bar and click **Cancel Alert** 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 this action does not resolve the underlying condition. 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.

## Results

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 an Alert in the Health Alert List](#).

## User Scenario: Respond to an Alert in the Health Alert List

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

## Prerequisites

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.

- Process and take ownership of the alerts you troubleshoot and resolve. See [User Scenario: Monitor and Process Alerts in vRealize Operations Manager](#).
- Review information about how the Power Off Allowed setting works when you run actions. See the section Working with Actions That Use Power Off Allowed in the vRealize Operations Manager Information Center.

## Procedure

- 1 In the menu, click **Alerts**.
- 2 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 **Enter**.

The alerts list displays only alerts based on virtual machines.

- 3 To locate the alerts by name, enter **high CPU workload** in the **Quick filter (Alert)** text box.
- 4 In the list, click the **Virtual machine has an unexpected high CPU workload** alert name.
- 5 Review the information. To show the recommendations, click **Alert Settings > Recommendations** in the left pane .

Option	Evaluation Process
<b>Alert Description</b>	Review the description so that you better understand the alert.
<b>Recommendations</b>	Do you think that implementing one or more of the recommendations can resolve the alert?
<b>What is Causing the Issue?</b>	<p>Do the triggered symptoms support the recommendations? Do the other triggered symptoms contradict the recommendation, indicating that you must investigate further?</p> <p>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.</p>
<b>Non-Triggered Symptoms</b>	<p>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.</p> <p>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?</p>

- 6 To resolve the alert based on the recommendation to check the guest applications to determine whether a 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 Start the console for the virtual machine and identify which guest applications are consuming CPU resources.

- 7 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 suggested 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 To allow power off or to create a snapshot, depending on how your virtual machines are configured, select the following options.

Option	Description
<b>Power Off Allowed</b>	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 any regard for the state of the operating system. In addition to the question whether the action shuts down or powers off a virtual machine, you must also consider whether the object is powered on and what settings are applied.
<b>Snapshot</b>	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 suggested number of CPUs to the target virtual machine.

- 8 Allow several collection cycles to run after implementing the suggested 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](#).

## 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**, **Capacity**, 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. The data provided in the **Events** 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 discover which tabs provide the information that you need when you are investigating problems.

## Evaluating Object Information Using Badge Alerts and the Summary Tab

The Summary tab that is associated with the other object tabs summarizes Health, Risk, and Efficiency badge alerts for the selected object and displays the top alerts that lead to the current state.

Use this tab as an overview of alerts for an object, object group, or application - to evaluate the effect that alerts are having on an object and to begin troubleshooting problems. For more detail on the badge Alerts, click **Badge Alerts**, further to the right on the tool bar.

### Badge 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 must be addressed shortly.
- Efficiency alerts tell you where you can improve performance or reclaim resources.

### Alerts for an Object or an Object Group

For a single object, the Top alerts are the alerts generated for the object. The Top Alerts for Children 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, children can include virtual machines and datastores.

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

For an object group, the only Top Alerts that might be generated are the predefined group population alerts. If the average health is above the Warning, Immediate, or Critical threshold, a group population alert considers the health of all group members and is triggered. If a group population alert is generated, the alert affects the badge score and color. 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 children alerts depend on the relationships that the highlighted hierarchy defined 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 children 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. The alerts 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 the alerts on the **Summary** tab, and resolve the problems that the alert indicates.
- Select an object, review the alerts on the **Summary > Alerts** tab, and select other objects, comparing the volume and types of alerts generated for different objects.

## User Scenario: Evaluate the Badge Alerts 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. Using this method, 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. 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.

- Health alert:Host has memory contention caused by a few virtual machines.
- Risk alert:Virtual Machine has a chronic high memory workload.
- Risk alert:Virtual Machine is demanding more CPU than the configured limit.
- Efficiency alert:Virtual Machine has large disk snapshots.

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 the *vRealize Operations Manager Configuration Guide*.
- Review how the **Summary** tab works with object groups and related hierarchies. See [Evaluating Object Information Using Badge Alerts and the Summary Tab](#).

### Procedure

- 1 In the menu, click **Environment**.
- 2 Click the **Custom Groups** tab and click, for example, 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, for example, **Host System** and click the host name in the lower left pane.

The **Summary** tab displays the Health, Risk, and Efficiency badges.

- 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 a member of the object group.

- 6 To view the alert details for an alert in the list, click the 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 **Alerts** tab for the object is displayed.

- 7 On the **Alerts** tab, begin evaluating the recommendations and triggered symptoms.

In this scenario, a recommendation for this generated alert is to move some virtual machines with a 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 child virtual machines, click the back button located in the left pane.

The host is again the focus of the object **Summary** tab. Generated alerts for the child virtual machines appear in the following table.

- 9 Click each virtual machine alert and evaluate the information provided on the **Alerts** tab.

Virtual Machine Alert	Evaluation
Virtual Machine has a chronic high memory workload.	<p>The recommendation is to add more memory to this virtual machine.</p> <p>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.</p>
Virtual Machine is demanding more CPU than the configured limit.	<p>The recommendations include increasing or removing the CPU limits on this virtual machine.</p> <p>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 can allow you to increase the CPU count and resolve the virtual machine alert, and might resolve the host memory contention alert.</p>

- 10 Take the suggested actions.

## Results

Your actions might resolve 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](#) for an example troubleshooting workflow.

## vSAN Cluster Summary Tab

The vSAN cluster summary tab provides details about Disk Groups, Capacity Disks, Cache Disks, Total Capacity, and Alerts associated with the vSAN cluster.

## Where To View vSAN Cluster Summary Page

On the menu, click **Environment > VMware vSAN > vSAN and Storage Devices > vSAN Cluster**.

You can also view relationship details and heat map details for the selected vSAN cluster. The relationship section provides information about the relationship between the objects in your vSAN cluster. The heat map helps you to identify potential problems for the objects in your vSAN cluster.

## vSAN Cluster Fault Domain Summary Tab

The vSAN cluster fault domain summary tab provides details about CPU, CPU Cores, Memory, Disc Space and Alerts associated with the fault domain of the vSAN cluster.

## Where To View vSAN Cluster Fault Domain Summary

On the menu, click **Environment > VMware vSAN > vSAN and Storage Devices > vSAN Cluster > Fault Domain**.



You can also view relationship details and heat map details for the selected vSAN fault domain. The relationship section provides information about the relationship between the objects in your vSAN cluster. The heat map helps you to identify potential problems for the objects in your vSAN fault domain.

### vSAN Cluster Disk Group Summary Tab

The vSAN cluster disk group summary tab provides details about Disc Capacity, Write Buffers, Read Cache and Alerts associated with the disk group of the vSAN cluster.

### Where To View vSAN Cluster Disk Group Summary

On the menu, click **Environment > VMware vSAN > vSAN and Storage Devices > vSAN Cluster > Host System > Disk Group**.

You can also view relationship details and heat map details for the selected vSAN disk group. The relationship section provides information about the relationship between the objects in your vSAN cluster. The heat map helps you to identify potential problems for the objects in your vSAN disk group.

## 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 early notification about problems in your environment before a user calls you to report a problem. As well, object alerts can 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. Conversely, you can examine how problems reflected in alerts on other objects affect the current object.

Depending on the 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 is removed from a host for replacement. Also cancel alerts that are known issues that you cannot resolve currently because of resource constraints. Canceling an alert that is generated because of only message event or metric event symptoms cancels the alert permanently. If

the underlying metric or property condition remains true, canceling an alert that is generated because of metric, super metric, or property symptoms can result in the alert being regenerated. It is only effective to cancel alerts generated because of 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 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 the section on Working With Actions That Use Power Off Allowed in the vRealize Operations Manager Information Center.

### 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 **All Metrics** tab.

The **All Metrics > Badge > Workload %** generates a graph in the right pane that shows the workload is heavy.

### 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 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 suggested 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.

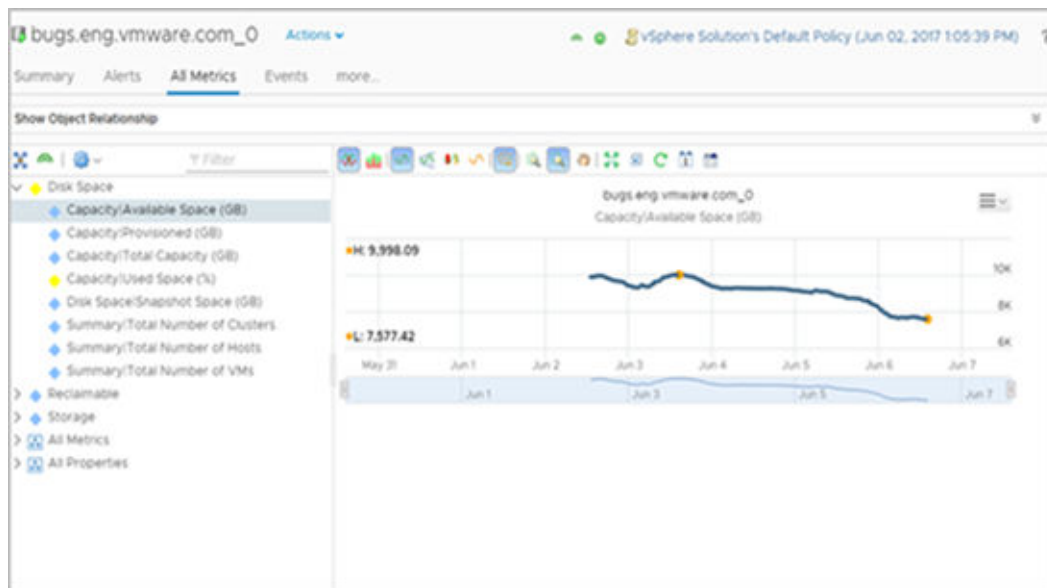
The specified number of CPUs are added to the virtual machine.

### 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](#) 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 helps 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 also works as a hierarchical navigation system. If you double-click an object in the map, that object becomes the focus of the map. The available metrics for the object become active in the lower-left pane.

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

Where available, the **All Metrics** tab provides pre-defined sets of metrics to help you when looking at a specific aspect of an object. For example, if you have a problem with a host, access the most relevant information about the host by looking at the metrics displayed in the pre-defined lists. You can edit these groups of metrics, and create additional groups, by dragging and dropping metrics and properties from the All Metrics and All Properties lists.

For more information about the metrics, refer to the *Definitions for Metrics, Properties, and Alerts* Guide.

## Where You Find the All Metrics Tab

- In the menu, click **Environment**, then select a group, custom data center, application, or inventory object.
- Alternatively, click **Environment**, then use the hierarchies in the left pane to quickly drill down to the objects that you want.

## 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, can contribute significantly to your effort to find the root cause of a problem.

As an administrator investigating a performance problem with a virtual machine, you determined that you must 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 on the menu 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 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.

You can see a 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. However, 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 To determine if sufficient capacity is available on the datastore to support increasing the disk space on the virtual machine, review the datastore capacity chart.

## Results

You know that you must 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**, on the object title bar, and view the virtual machine in the vSphere Web Client.

## Capacity Tab Overview

Use the Capacity tab to assess workload status and resource contention in the selected object. You can determine time, capacity and VM remaining until CPU, memory, or storage resources run out. With robust capacity planning and optimization, you can manage your production capacity effectively as your organization addresses changing requirements.

## Using Troubleshooting Tools to Resolve Problems

The data provided in the **Alerts**, **Symptoms**, **Timeline**, **Events**, and **All Metrics** tabs help you identify the root cause of a complex problem.

You can use the troubleshooting tabs individually or as part of a workflow to resolve problems. Each of the tabs displays the collected data in a different way. Sometimes, as you are troubleshooting problems, you move directly from the **Alerts** tab to the **All Metrics** tab. Under other circumstances, 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. To 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 time. Use the timeline to identify common trends over time that are contributing to the 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. 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 parent, children, 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 the system triggers a symptom and then cancels it 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. Use the **Events** tab to compare the occurrence of events with the generated alerts. These comparisons can help 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.

You might monitor the same virtual machines with other applications that provide information to vRealize Operations Manager, with the adapters for those applications configured to provide change events. In this instance, 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 a 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 production 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 automatically 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 group 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 menu, click **Environment**.
- 2 Select an object to inspect from an inventory tree.
- 3 Click the **Heat Maps** 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
<b>Instance</b>	Track all instances of a metric for an object with a separate rectangle for each metric.
<b>General</b>	Pick a 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. Also select 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 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](#).

#### Procedure

- 1 In the menu, click **Environment** and select an object from an inventory tree.

- 2 Click the **Heat Maps** 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](#).

## Procedure

- 1 In the menu, click **Environment**.
- 2 Select an object to inspect from an inventory tree.
- 3 Click the **Heat Maps** 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 possible 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 data center 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 To examine the resources for the cluster or data center, click **Details** in the pop-up window .

### 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 data center 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 data center 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

When you select an object from the inventory of your environment and display the Object Details screen, you can display an overview of the related objects by clicking the Environment tab. The tab shows all the objects in your environment that are related to the selected object, with a status badge for each object. Use the Environment tab to identify related objects in your environment with health, risk, or efficiency problems.

## Example: Use the Environment Tab to Find Problems

Suppose that you are trying to investigate the reason for slow performance in the environment. You can select key objects such as host systems to see if any related objects such as virtual machines indicate problems.

### Procedure

- 1 In the menu, click **Environment**, then click **vSphere Hosts and Clusters** in the left pane and select the **vSphere World** object.

- 2 Select the **Environment** tab.

The system 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

Now you can investigate the reason for the problem. For example, once it is determined whether the problem is chronic or temporary, you can decide how to address it. See [Using Troubleshooting Tools to Resolve Problems](#).

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

One of your customers reports poor performance for a 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 a virtual machine, sales-10-dk. The reported conditions are poor application performance, including slow load times and slow boot, some applications are taking longer and longer to load, and files are taking longer to save. Today applications 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. The triggered symptoms indicate memory stress and the recommendation is to add more memory.

Based on experience, you are not convinced that this alert indicates the root cause, so you review the **Capacity** tab. The **Capacity** tab 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 **Events** 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 **Capacity** tab 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 In the menu, click **Dashboards**, then click **Troubleshoot a VM** in the left pane.
- 2 Search for a virtual machine to troubleshoot.  
In this example, the virtual machine name is named **sales-10-dk**.
- 3 With the virtual machine selected, click the **Alerts** tab, and click the **Symptoms** tab.
- 4 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 <b>Status: Active</b> 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?

### Results

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 [Compare Symptoms on a Timeline When You Troubleshoot a Virtual Machine Problem](#).

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 enables 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. Look for unusual 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 only one method. Your troubleshooting skills and your knowledge of the specifics 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](#).

### Procedure

- 1 Enter the name of the virtual machine in the **Search** text box on the main title bar.  
In this example, the virtual machine name is **sales-10-dk**.
- 2 Click the **Events** tab and click the **Timeline** tab.
- 3 On the Timeline toolbar, click **Date Controls** 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 **Event Filters** 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 **View From** and select **Host System** under Parent.  
  
Consider whether the host has symptoms, alerts, or events that provide you with more information about memory or disk space problems.

### Results

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

- The host resource use, host disk use, and host CPU use 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 badges and alerts. See [Identify Influential Events When You Troubleshoot a Virtual Machine Problem](#).

## 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 alerts can 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. You identified odd behavior related to a guest file system that you want to examine in the context of other metrics. This investigation can determine whether you 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](#).

### Procedure

- 1 Enter the name of the virtual machine in the **Search** text box, on the main title bar.  
In this example, the virtual machine name is sales-10-dk.
- 2 Click the **Events** tab and select the **Events** button.
- 3 On the Events toolbar, click **Date Controls** and select a time that is on or before the symptoms were triggered.
- 4 Click **Event Filters** and select all the event types.  
Consider whether any changes correspond to other events.
- 5 Click **View From > Parent > Select All** and click through the alerts in the timeline to review 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 **View From > Child > Select All** and click through the alerts to review the events.  
Consider whether any of the events show problems with the datastore.

### Results

Your evaluation shows no particular correlation between the workload 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.

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

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

## Run Actions from Toolbars in vRealize Operations Manager

When you run actions in vRealize Operations Manager, you change the state of vCenter Server objects. 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 Configuration 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 the section Working With Actions That Use Power Off Allowed in the vRealize Operations Manager Information Center.

### Procedure

- 1 Select the object in the Environment page inventory trees or select one or more objects 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 To run the action on the object, select the check box 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 **Environment** in the menu and click **History >Recent Tasks**. Find the task name or task ID in the list and verify that the status is finished. See [Monitor Recent Task Status](#).

## 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 instance, and configured to run actions. See *vRealize Operations Manager Configuration Guide*.

- [Actions Do Not Appear on Object](#)

An action might not appear on an object, such as a host or virtual machine, because vRealize Automation is managing that object.

- [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.

- [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 specify properly a new memory value.

- [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.

### Actions Do Not Appear on Object

An action might not appear on an object, such as a host or virtual machine, because vRealize Automation is managing that object.

### 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 act on the virtual machines that vRealize Automation is not managing.

### 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. They are not available because the action framework excludes actions on objects that vRealize Automation manages. You cannot turn on or turn off the exclusion of actions on objects that vRealize Automation manages. 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.

Make actions available on the objects in your data center or custom data center in one of two ways. 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 Perform the action 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 on one or more objects, some of the fields are empty.

### Cause

There are two possible causes: 1) the VMware vSphere adapter has not collected the data from the vCenter Server instance that manages the object. 2) 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 specify properly 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 omission 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 five-minute collection cycle.

### Solution

- 1 After you create a VMware adapter instance, wait an extra five 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](#).

## Procedure

- 1 In the menu, click **Administration**, then select **History** from the left pane.
- 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](#).

## 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

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](#)

An action task has a **Maximum Time Reached** status and you do not know the status of the task.

- [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.

- [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.

- [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. That outcome requires you to resolve the problem in vCenter Server.

- [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.

- [Troubleshooting Set CPU Resources or Set Memory Resources When the Value Is Too High](#)

You run the Set CPU Resources or Set Memory Resources action and the task fails with an error appearing in the Recent Tasks messages. The reason might be that you entered a value that is greater than the value that your vCenter Server instance supports.

- [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.

- [Troubleshooting Failed Shut Down VM Action Status](#)

A shutdown VM action task has a **Failed** status in the Recent Task list.

- [Troubleshooting VMware Tools Not Running for a Shutdown VM Action Status](#)

A Shutdown 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](#)

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 menu, click **Administration**, then click **History** in the left pane.



**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 status of 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 latest 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

To determine whether the action completed successfully, check the state of the target object. If it did not complete, 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 the 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 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. It fails even though Power Off Allowed was selected, the virtual machine is running, and the VMware Tools are installed and running.

### Cause

The virtual machine must shut down the guest operating system before it powers off the virtual machine to make the requested changes. The shutdown process waits 120 seconds for a response from the target virtual machine, and fails without changing the virtual machine.

### Solution

- 1 To determine if it has jobs running that are delaying the implementation of the action, check the target virtual machine in vCenter Server.
- 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. That outcome requires 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. This change can happen when 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 and the value is changed in vCenter Server. However, the target object is left in a state where you cannot power it on using either actions or the vCenter Server without manually changing the CPU or memory to a supported value.

### Solution

- 1 In the menu, click **Administration**, then select **History** from the left pane.
- 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 the host does not support 4 CPUs. 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 cannot 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

You run the Set CPU Resources or Set Memory Resources action and the task fails with an error appearing in the Recent Tasks messages. The reason might be that you entered a value that is greater than the value that your vCenter Server instance supports.

### 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 shutdown 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 shutdown 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 shutdown action is not confirmed.

### Solution

- ◆ To determine why the guest operating system did not shut down in the allotted time, check its status in vCenter Server.

## Troubleshooting VMware Tools Not Running for a Shutdown VM Action Status

A Shutdown 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 task 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 is 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 task 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 To determine if the snapshot was deleted, check its status in vCenter Server .
- 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 Information Using Badge Alerts and the Summary Tab](#).

# Capacity Optimization for Your Managed Environment

## 2

Capacity Optimization in vRealize Operations Manager is achieved using powerful integrated functions - capacity overview, workload balancing and optimization, repurposing of underutilized resources, and what-if predictive scenarios - to reach optimal system performance.

Capacity planners must assess whether physical capacity is sufficient to meet current or forecasted demand. With robust capacity planning and optimization, you can manage your production capacity effectively as your organization addresses changing requirements. The objective of strategic capacity optimization is to reach an optimal level where production capabilities meet ongoing demand.

vRealize Operations Manager analytics provide precise tracking, measuring and forecasting of data center capacity, usage, and trends to help manage and optimize resource use, system tuning, and cost recovery. The system monitors stress thresholds and alerts you before potential issues can affect performance. Multiple pre-set reports are available. You can plan capacity based on historical usage, and run what-if scenarios as your requirements expand.

## How Capacity Optimization Works

The Capacity Optimization provides four integrated functions - Overview, Reclaim, Workload Optimization, and What-If Scenarios - that give an overview of the status of all data center activity and trending. You can conduct on-the-spot analysis, including drilling down into further detail on any object to identify possible performance problems or anomalies. You can rebalance and optimize compute resources. The system further identifies underutilized workloads (virtual machines) and calculates the potential cost savings that can accrue when these resources are reclaimed to be deployed more effectively. You can interact with and manipulate data and outcomes based on your requirements.

Use the Capacity Optimization and Reclaim features to assess workload status and resource contention in data centers across your environment. You can determine time remaining until CPU, memory, or storage resources run out and realize cost savings when underutilized VMs can be reclaimed and deployed where needed.



Workload Optimization provides for moving virtual workloads and their file systems dynamically across datastore clusters within a data center or custom data center. You can potentially automate a significant portion of your data center compute and storage optimization efforts. With properly defined policies determining the threshold at which resource contention triggers an alert and automatically runs an action, a data center performs at optimum.

In addition, the What-If Analysis function- can run scenarios that help determine where additional system resources can be brought online.

---

**Note** You may see a data center or cluster labeled as optimized when it has few or no days remaining before CPU, memory, or storage is predicted to run out. That is because these are two different measures of data center and cluster health. A data center can be running at optimum based on policy settings for balance and consolidation, yet be almost out of resources. It is important to consider both measures when managing your environment.

---

This chapter includes the following topics:

- [Capacity Analytics](#)
- [Example: Excluding VMs from Reclaim Action](#)
- [What-If Analysis: Modeling Workload, Capacity, or Migration Planning](#)
- [Example: Run a What-If Scenario](#)
- [Example: Import Workload from an Existing VM Scenario](#)
- [Allocation Model](#)
- [Capacity Overview](#)
- [Reclaim](#)
- [Reclamation Settings](#)
- [What-If Analysis - Workload](#)
- [What-If Analysis - Physical Infrastructure](#)
- [What-If-Analysis - Migration Planning](#)
- [What-If-Analysis - Hyperconverged Infrastructure](#)
- [Custom Profiles in VMware vRealize Operations Manager](#)
- [Custom Data Centers in VMware vRealize Operations Manager](#)

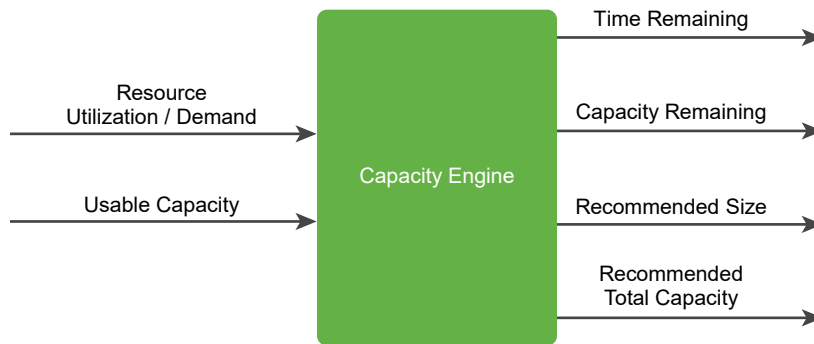
## Capacity Analytics

Capacity analytics helps you assess the utilization and capacity remaining in objects across your environment. An evaluation of the historical utilization of resources generates a projection of the future workload. You can plan for infrastructure procurement or migrations based on the projection and avoid the risk of capacity shortage and high infrastructure costs.

Capacity analytics uses the capacity engine to assess historical trends, which include utilization peaks. The engine chooses an appropriate projection model to predict the future workload. The amount of historical data that is considered depends on the amount of historical utilization data.

## Capacity Engine and Calculations

The capacity engine analyzes historical utilization and projects future workload by using real-time predictive capacity analytics, which is based on an industry-standard statistical analysis model of demand behavior. The engine takes the Demand and Usable Capacity metrics as input and generates the output metrics, which are Time Remaining, Capacity Remaining, Recommended Size, and Recommended Total Capacity, as shown in the following figure.



The projection window for the capacity engine is 1 year into the future. The engine consumes data points every 5 minutes to ensure real-time calculation of output metrics.

The capacity engine projects the future workload in a projected utilization range. The range includes an upper bound projection and a lower bound projection. Capacity calculations are based on the time remaining risk level. The engine considers the upper bound projection for a conservative risk level and the mean of the upper bound projection and lower bound projection for an aggressive risk level. For more information about setting risk levels, see [Analysis Settings Details](#).

The capacity engine calculates the time remaining, capacity remaining, recommended size, and recommended total capacity.

### Time Remaining

The number of days remaining till the projected utilization crosses the threshold for the usable capacity. The usable capacity is the total capacity excluding the HA settings.

### Capacity Remaining

The largest difference between the usable capacity and the projected utilization between now and 3 days into the future. If the projected utilization is above 100% of the usable capacity, the capacity remaining is 0.

### Recommended Size

The maximum projected utilization for the projection period from the current time to 30 days after the warning threshold value for time remaining. The warning threshold is the period during which the time remaining is green. The recommended size excludes HA settings.

If the warning threshold value for time remaining is 120 days, which is the default value, the recommended size is the maximum projected utilization 150 days into the future.

vRealize Operations Manager caps the recommended size that is generated by the capacity engine to keep the recommendations conservative.

- vRealize Operations Manager caps an oversized recommended size at 50% of the currently allocated resources.

For example, a virtual machine that is configured with 8 vCPUs has never used more than 10% CPU historically. Instead of recommending a reclaim of 7 vCPUs, the recommendation is capped to reclaiming 4 vCPUs.

- vRealize Operations Manager caps an undersized recommended size at 100% of the currently allocated resources.

For example, a virtual machine that is configured with 4 vCPUs has been constantly running very hot historically. Instead of recommending the addition of 8 vCPUs, the recommendation is capped at adding 4 vCPUs.

### Recommended Total Capacity

The maximum projected utilization for the projection period from the current time to 30 days after the warning threshold value for time remaining. The recommended total capacity includes HA settings.

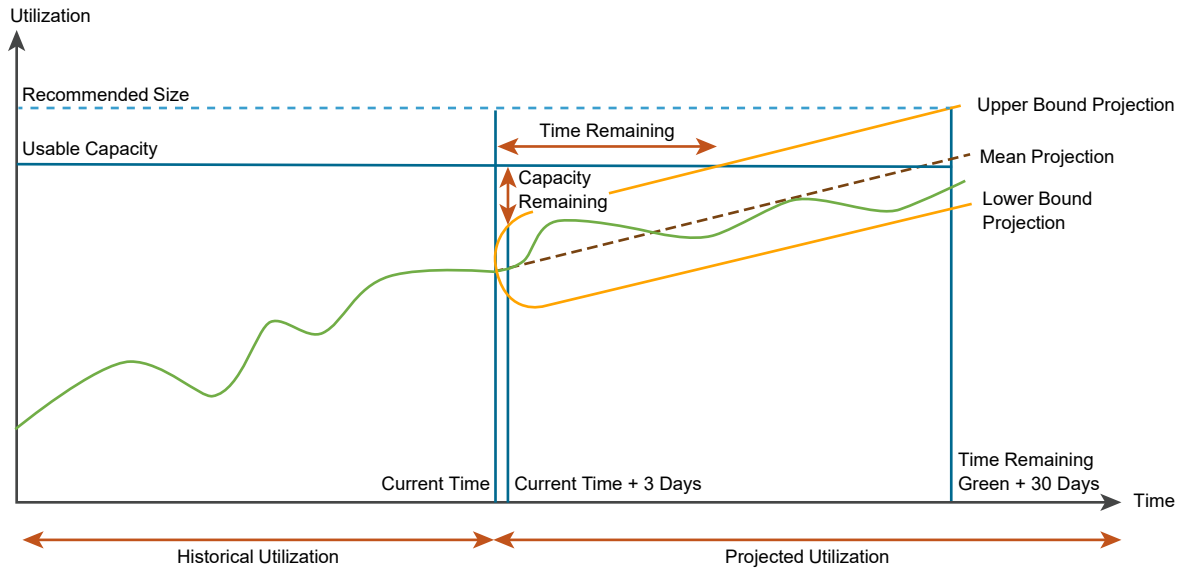
For example, if the warning threshold value for time remaining is 120 days, which is the default value, the recommended size is the maximum projected utilization including HA values, 150 days into the future.

---

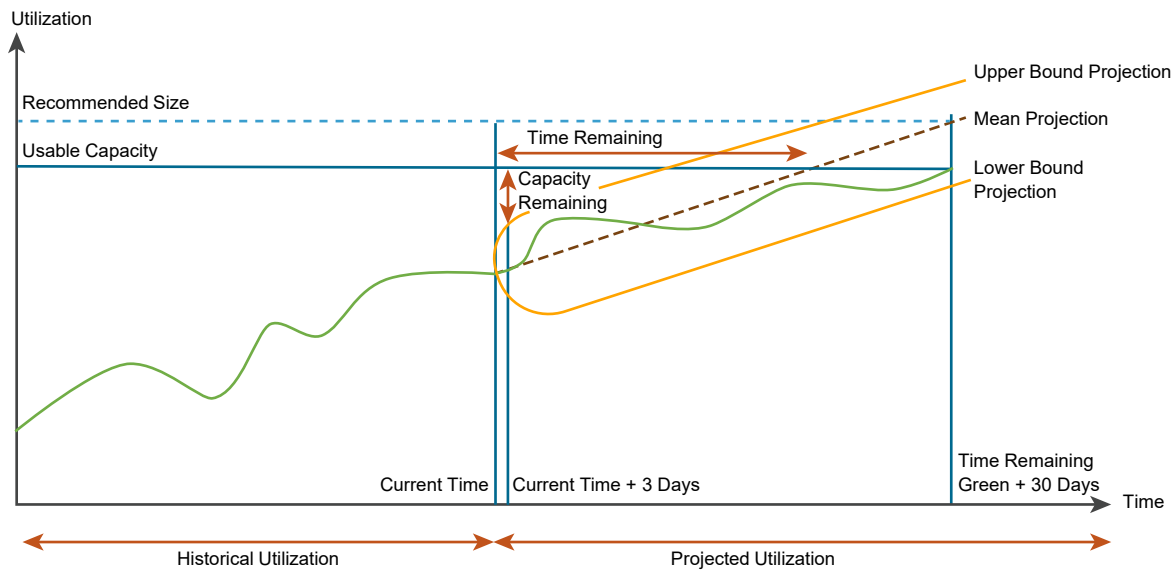
**Note** Recommended total capacity is not available for objects.

---

The following figure shows the capacity calculations for a conservative risk level.



The following figure shows the capacity calculations for an aggressive risk level.



## Utilization Peaks

The historical utilization of resources can have peaks, which are periods of maximum utilization. The projection of future workload depends on the types of peaks. According to the frequency of peaks, they can be momentary, sustained, or periodic.

### Momentary Peaks

Short-lived peaks that are a one-time occurrence. The peaks are not significant enough to require additional capacity, so they do not impact capacity planning and projection.

### Sustained Peaks

Peaks that last for a longer time and impact projections. If a sustained peak is not periodic, the impact on the projection lessens over time because of exponential decay.

### **Periodic Peaks**

Peaks that exhibit cyclical patterns or waves. The peaks can be hourly, daily, weekly, monthly, during the last day of the month, and so on. The capacity engine also detects multiple overlapping cyclical patterns.

## **Projection Models**

The capacity engine uses projection models to generate projections. The engine constantly modifies projections and chooses the model that best fits the pattern of historical data. The projection range predicts the general usage pattern that covers 90% of the future data points. Projection models can be linear or periodic.

### **Linear Models**

Models that have a steadily increasing or decreasing trend. Multiple linear models run in parallel and the capacity engine chooses the best model.

Examples of linear models are linear regression and autoregressive moving average (ARMA).

### **Periodic Models**

Models that discover periodicity of various lengths, such as hours, days, weeks, months, or the last day of the week or month. Periodic models detect square waves that represent batch jobs and handle data streams that contain multiple overlapping periodic patterns. These models ignore random noise.

Examples of periodic models are fast Fourier transforms (FFTs), pulses (edge detection), and wavelets.

## **Historical Data Window**

The capacity engine captures historical data over a period of time depending on the historical data window. The historical data window that the engine uses is an exponential decay window.

The exponential decay window is a window of unlimited size in which the capacity engine gives more importance to the most recent data points. Beginning from the projection calculation start point, the engine consumes all the historical data points and weighs them exponentially, based on how far back in time they are.

## **Example: Excluding VMs from Reclaim Action**

In this example, an administrator starts the UI, chooses the Reclaim function on the Quick Start page, and identifies a data center with an excessive number of snapshots. The administrator wants to run the action for reclaiming resources, but chooses to exclude some VMs from the action.

The administrator is reviewing system resources at the start of the shift.

## Prerequisites

The administrator must have credentials for operating vRealize Operations Manager and managing vCenter Server objects.

## Procedure

- 1 At the Home screen, clicks **Reclaim** in the Optimize Capacity column.

The Reclaim screen appears. In reviewing the status of data centers across the network, the administrator sees that data center DC-Evanston-6 has 3 days of time remaining.

- 2 The administrator clicks the **DC-Evanston-6 graphic**.

The data in the lower half of the screen refreshes to display total reclaimable capacity and cost savings potential for recommendations for selected data center DC-Denver-19. (NOTE: Double-clicking the DC-Evanston-6 graphic at this point displays the Object Details page for that data center.)

- 3 At the table, selects **Snapshots** from the header row.

The table refreshes to list clusters with excess snapshots.

- 4 The administrator clicks the **chevron** next to a cluster name on the left in the table.

All the VMs in the cluster are listed.

- 5 The administrator wants to keep snapshots for some VMs in the cluster, so selects two VMs and clicks **EXCLUDE VM(s)**.

A dialog box appears asking for confirmation.

- 6 Clicks **EXCLUDE VM(s)** to confirm.

The excluded VMs disappear from view and the potential cost savings drops.

- 7 Back at the table, with the VMs selected whose snapshots are to be deleted, the administrator clicks **DELETE SNAPSHOT(s)**.

The Delete Snapshots confirmation dialog box appears, showing how many snapshots are to be deleted and the monthly savings in cost and disk space.

- 8 Clicks **DELETE SNAPSHOT(s)** to confirm.

The system deletes the snapshots.

## Results

Excessive snapshots are deleted and cost savings are realized.

## What to do next

Under Optimize Capacity in the left menu, click **Overview** to display the Capacity Overview screen. Confirm that DC-Evanston-6 now has 15 days of time remaining.

# What-If Analysis: Modeling Workload, Capacity, or Migration Planning

Using the what-if tool, you can plan for an increase or decrease in workload or capacity requirements in your virtual infrastructure. To evaluate the demand and supply for capacity on your system objects, and to assess the potential risk to your current capacity, you can create scenarios for adding and removing workloads. You can also determine how much capacity you require to make a migration work. You can run one scenario or group scenarios and run them cumulatively.

## Why Create a Scenario

A scenario is a detailed estimation of the resources you must have available in your environment to incorporate upcoming changes. You define scenarios that can potentially add resources to actual data centers. VMware vRealize Operations Manager models the scenario and calculates whether your desired workload can fit in the targeted data center. You can save multiple scenarios for comparison or review.

## Where You Find What-If Analysis

From the Home screen, select **What-If Analysis** under **Optimize Capacity** in the left pane. The Overview tab of the What-If analysis page has four panes. Each pane lets you run What-If scenarios to optimize capacity based on workload, physical infrastructure HCI nodes, or migration to the cloud.

## How What-If Analysis Works

You can run What-If scenarios to see how much capacity will remain after you add or remove VMs or hosts and add hyperconverged infrastructure (HCI) nodes. Migration planning shows you the capacity and cost information after migrating to cloud based infrastructure.

Scenarios that you save for later are displayed as a list in the **Saved Scenarios** tab. You can run, edit or delete the saved scenarios. You can select more than one compatible scenarios and run them together. For example, you can create a scenario to remove hosts using the **Physical Infrastructure Planning** pane, because your organization has hardware that will soon become obsolete. You can create another scenario to add hosts to your physical infrastructure to account for new hardware that will replace the obsolete ones. You can run both these scenarios together to see the capacity after removing old hardware and adding new hardware.

You can only combine scenarios that pertain to the same object. Use the filters in the **Saved Scenarios** tab to narrow down the list based on scenario name, type, data center, or cluster.

You can select the following combinations of scenarios and run them together:

### Workload Planning and Physical Infrastructure Planning

- Add VMs
- Remove VMs

- Add Hosts
- Remove Hosts

The Scenario Summary page displays the results of running one or more saved scenarios. To add or remove saved scenarios and run them again cumulatively, click **Edit** in the **Scenario Summary** page .

## Example: Run a What-If Scenario

In this example, an IT administrator at a financial data center must plan for an increase in workloads as tax season approaches. To evaluate whether additional workloads can be added to existing virtual infrastructure, the administrator runs a what-if scenario.

### Prerequisites

The administrator must have credentials for operating vRealize Operations Manager and managing vCenter Server objects.

### Procedure

- 1 The administrator clicks **Home > Optimize Capacity > What-If Analysis**.

The What-If Analysis screen appears.

- 2 Clicks **Add VMS** in the Workload Planning pane.

The Workload Planning screen appears.

- 3 Enters Workload Tax 2018 in the **SCENARIO NAME** field, then selects DC-Chicago-16 (vc\_10.27.83.19) from the list under **LOCATION - WHERE WOULD YOU LIKE TO ADD YOUR WORKLOAD?**

The field to the right populates with the words, Any cluster. The administrator selects Cluster - Mich2long from the list.

- 4 The administrator clicks the **Configure** radio button.

- 5 For the CPU row, the administrator increments the count to 4. For the Memory row, enters 18. For the Disk Space row, enters 65. Enters 45% in the Expected Utilization column. For number of VMs, enters 20.

The configuration is nearly complete.

- 6 The administrator clicks **SAVE**

The **Saved Scenarios** screen appears. The data entered on the previous screen appears under Saved Scenarios.

- 7 The administrator researches the time period for which the workload is needed online.

The administrator identifies the start and end dates.



- 8 Back at the What-If Analysis screen, the administrator selects Workload Tax 2018 in the list under Saved Scenarios and clicks **EDIT** in the command bar.

The Workload Planning screen appears with the data filled in for the requested scenario.

- 9 In the **DATE** area, the administrator selects 3/25/18 and 5/30/18 as the start and end dates, respectively, then clicks **RUN SCENARIO**.

The scenario runs and the results appear. To the administrator's surprise, the workload does not fit.

- 10 At the top right of the screen, the administrator selects a different cluster: Cluster - Mich3long. Then clicks the **RUN SCENARIO** button to the right of the list.

The scenario runs and the results appear. This time the workload fits. It is projected to cost \$84/month to run in the VMware hybrid cloud.

## Results

The administrator identifies a location in the virtual infrastructure where the required workload can reside and support the coming increase in production requirements.

## What to do next

Assuming this plan is the best of the scenarios the administrator has run, it can be implemented in time to support the added workload. The administrator can monitor the workload performance using the Workload Optimization and [Chapter 2 Capacity Optimization for Your Managed Environment](#) features. For information on Workload Optimization, see the *vRealize Operations Manager Configuration Guide*.

## Example: Import Workload from an Existing VM Scenario

In this example, an IT administrator at a data center must plan for an increase in workloads as more staff is hired. To evaluate whether additional workloads can be added to existing virtual infrastructure, the administrator runs a what-if scenario using an actual VM as the workload.

## Prerequisites

The administrator must have credentials for operating vRealize Operations Manager and managing vCenter Server objects.

## Procedure

- 1 The administrator clicks **Home > Optimize Capacity > What-If Analysis**.

The What-If Analysis screen appears.

- 2 Clicks **Add VMS** in the Workload Planning pane.

The Workload Planning screen appears.

- 3 Enters Workload Staff Hire in the **SCENARIO NAME** field, then selects DC-Boston-16 (vc\_10.27.83.18) from the list under **LOCATION - WHERE WOULD YOU LIKE TO ADD YOUR WORKLOAD?**

The field to the right populates with the words, Any cluster. The administrator selects Cluster - 1860 from the list.

- 4 The administrator clicks the **Import from existing VM** radio button in the **APPLICATION PROFILE** field, then clicks **SELECT VMs**.

The Select VMs dialog box appears.

- 5 In the column on the left, double-click the name of each VM whose attributes you want use in this scenario. The VM names appear in a **SELECTED** column on the right.

- 6 Click **OK**.

The Workload Planning screen appears. The data entered on the previous screen appears in the **APPLICATION PROFILE** field.

- 7 At the Workload Planning screen, under **APPLICATION PROFILE**, in the **SELECTED VMS** table, enter in the **Quantity** column the number of copies you want of each VM you selected.

The scenario is almost ready to run.

- 8 In the **DATE** area, the administrator selects 3/25/18 and 6/30/18 as the start and end dates, respectively, then clicks **RUN SCENARIO**

The scenario is successful: the workload will fit. By default, vRealize Operations Manager compares the cost of running the workload on two providers, typically Hybrid Cloud (VMware) and AWS. The corresponding cost details are updated for your private cloud and public cloud providers. The planning scenario also provides a public cloud comparison between Hybrid Cloud and VMware Cloud on AWS. You can see that the monthly cost is displayed for each of the public clouds.

VMware Cloud on AWS	Hybrid Cloud
Shows the number of hosts required on VMare Cloud on AWS for the migration to accommodate the selected workload, considering the minimum purchase of four hosts.	Shows the allocated cost for a month.
The actual utilized capacity of each host, with balanced workload distribution.	Displays the utilization of CPU, memory, and storage. Provides overall requirement of hosts for the given capacity.
Total purchase cost is derived by multiplying the effective monthly purchase cost for each host by the number of required hosts.	
Total Utilized Cost per month is computed based on utilized CPU and RAM, allocated storage, this indicates how well all three resources are being utilized as a fraction of the purchase cost.	
Required CPU and memory are calculated based on utilization.	
Required storage is calculated based on allocated storage capacity in your private cloud.	

**VMware Cloud on AWS****Hybrid Cloud**

Shows on-demand, one and three-year subscription cost.

Shows the cost for a selected AWS region and its equivalent resources required for the selected region.

**Results**

In the Public Cloud text box, the system displays the monthly cost of running the workload on the VMware Hybrid Cloud versus the AWS Public Cloud.

**What to do next**

Assuming this plan is the best of the scenarios the administrator has run, it can be implemented in time to support the added workload. The administrator can monitor the workload performance using the Workload Optimization and [Chapter 2 Capacity Optimization for Your Managed Environment](#) features. For information on Workload Optimization, see the *vRealize Operations Manager Configuration Guide*.

## Allocation Model

The allocation model determines how much compute, memory, and storage resources are allocated to object types. You define the allocation values by modifying the policy which is applied to the objects. The allocation values, also known as overcommit ratios, affect performance and cost.

The allocation model works alongside the demand model. Unlike the demand model which always affects the capacity calculations, the allocation model can be turned on or off in the policy setting. You can control the ratio by which vRealize Operations Manager overcommits either the CPU, memory, or disk space. By specifying the allocation values in the policy, you can choose whether you want to overcommit your resources or not. Overcommitting helps you measure utilization of resources in a pay-as-you-go model. When you do not overcommit, the utilization of your cluster will never exceed 100%. If your resource utilization is over the allocation ratio that you set, Capacity Remaining becomes zero.

To modify a policy and configure overcommit ratios, see [Policy Allocation Model Element](#).

## Capacity Overview

Use the Capacity Overview screen to assess workload status and how much capacity is remaining in data centers across your environment.

## Where You Find Capacity Overview

In the menu, select home and then click **Overview** under **Optimize Capacity** in the left pane. From the **Quick Start** screen, select **Assess Capacity** in the second-from-left column.

---

**Note** Double-click on a data center graphic to display the object details screen for the data center.

---

## How the Capacity Overview Works

The Capacity Optimization and Reclaim features are tightly integrated functions that enable you to assess workload status in data centers across your environment. You can determine time remaining until CPU, memory, or disk space resources run out and realize cost savings when underutilized VMs can be reclaimed and deployed where needed.

When you open the Capacity Overview page, graphical representations of all the data centers and custom data centers in your environment appear. VMware Cloud on AWS data centers has a unique icon to differentiate it from the other data centers.

By default, they are shown in order of time remaining, beginning from the upper left, where the most constrained data centers appear. To review the status of a data center, click the graphic. The page refreshes to display the following data:

### Time Remaining

Time Remaining specifies which clusters are most constrained and displays the criticality of the cluster.

### Optimization Recommendations

vRealize Operations Manager shows you the number of reclaimable VMs and the associated cost savings. Click **View Reclaimable VMs** to navigate to the **Reclaim** page.

### Cluster Utilization

Cluster Utilization displays an interactive graph that shows time remaining by component. You can explore the demand percentage over time by CPU, memory, and disk space or by the most constrained component. By default, the data displayed is for the Demand model. If you have configured the Allocation model then you can also see the CPU, memory, and disk space time remaining model based on the overcommit ratios that you have set in the policy.

Set the **Show History** and **Show Forecast** variables to create the slice of time in which you want to see time-remaining data. The vertical axis of the graph shows the total capacity being used by the current amount of CPU, memory, or disk space respectively. The bold, black line across the top of the graph depicts the historical value of usable capacity. The horizontal axis is the timeline. Vertical lines in the graph are labeled at the bottom of each

line. The first vertical dotted line on the left marks the projection calculation start point. The next line is the current date - now. The third vertical marks the date the resource runs out. If a resource has little time remaining, the current date and the date that time runs out may be the same.

vRealize Operations Manager can make recommendations for increasing time remaining based on the data it receives and these recommendations appear at the bottom of the screen. You might see two options: Option 1 shows what you can achieve by reclaiming resources. Option 2 shows the results of adding capacity.

If you choose to reclaim resources, you can run that process immediately by clicking **RECLAIM RESOURCES**. To see the details or choose additional options before running a reclaim action, review the information provided in the **Optimization Recommendations** pane and then click **VIEW RECLAIMABLE VMS** to go to the **Reclaim** page.

Table 2-1. Capacity Optimization Options

Option	Description
<b>Select a datacenter</b>	Select a data center from the carousel across the top of the page. Information about the datacenter is displayed below.
<b>ALL DATACENTERS   X</b>	Toggle: click <b>ALL DATACENTERS</b> on the upper right when you want to switch the view to a filtered list of all data centers. Click <b>X</b> to return to a carousel view of data centers.
View:	Filter results to include data centers, custom data centers, or both. This option appears if you select <b>ALL DATACENTERS</b> on the upper right.
Group BY:	Filter results by criticality (least time remaining data centers/custom data centers listed first) or by the vCenter Server to which each data center belongs. This option appears if you select <b>ALL DATACENTERS</b> on the upper right.
Sort by:	Options (Options appear if you select <b>ALL DATACENTERS</b> on the upper right): <ul style="list-style-type: none"> <li>■ Alarm clock graphic - lists data centers/custom data centers by time remaining.</li> <li>■ Dollar sign - lists data centers/custom data centers by potential cost savings.</li> <li>■ Scales graphic - lists data centers/custom data centers by level of optimization.</li> </ul>
<b>Select datacenter or ADD NEW CUSTOM DATACENTER</b>	Options (options appear if you select <b>ALL DATACENTERS</b> on the upper right): <ul style="list-style-type: none"> <li>■ Select a data center from the carousel across the top of the page. All data following refreshes with information for the selected object.</li> <li>■ Select <b>ADD NEW CUSTOM DATACENTER</b> to display a dialog box that enables you to define a custom data center.</li> </ul>

Table 2-1. Capacity Optimization Options (continued)

Option	Description
Time Remaining	<p>Appears when you select a data center or custom data center from the top of the screen.</p> <p>Gives overview of cluster status, including how many are at:</p> <ul style="list-style-type: none"> <li>■ Critical</li> <li>■ Medium</li> <li>■ Normal</li> <li>■ Unknown</li> </ul> <p>"Critical" can indicate a resource contention, imbalance, or other stress condition. Thresholds you set in the policies define what is critical.</p>
Optimization Recommendations	<p>Lists potential cost savings by reclaiming unused resources.</p> <p>Indicates if workloads can be optimized across clusters.</p> <p><b>VIEW RECLAIMABLE VMS</b> - displays the <b>Reclaim</b> screen, where you can research and run potential VM reclamation actions.</p> <p><b>VIEW OPTIMIZATION</b> - displays the <b>Workload Optimization</b> screen, where you can optimize workloads based on your policy settings.</p>
Cluster Utilization and Time Remaining	<p>Overall view of cluster health in the selected data center. You can select a cluster from the list to display information about that cluster, or use the options to sort and filter results. The options you choose dictate the data displayed in the graph.</p> <p>Sort by:</p> <ul style="list-style-type: none"> <li>■ Most Constrained: most constrained element</li> <li>■ CPU (allocation or demand)</li> <li>■ Memory (allocation or demand)</li> <li>■ Disk Space (allocation or demand)</li> </ul> <p><b>Note</b> Demand model is always on and is the default.</p> <p><b>Filter:</b> search field.</p> <p><b>Show History for:</b> The period before forecasting begins (does not impact the forecast calculation).</p> <p><b>Show Forecast For:</b> The forecast period.</p> <p><b>How is the criticality determined?</b> Displays the criticality threshold you set for this type of object in the Policies Library.</p>
Time Remaining graph	<p>Data shows current and trending resource usage and pinpoints when a given cluster is projected to run out of CPU, memory, or disk space based on the allocation or demand model (default).</p>
Recommendations	<p>Option 1: Reclaim Resources.</p> <p>Shows resources that can be reclaimed to increase time remaining for the selected cluster.</p> <p><b>RECLAIM RESOURCES</b> - displays the <b>Reclaim</b> screen, where you can research and run potential VM reclamation actions.</p> <p>Option 2: Add Capacity.</p> <p>Shows resources that can be added to increase time remaining.</p>

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**Note** You may see that a data center or cluster is labeled optimized when it has few or no days remaining before CPU, memory, or disk space is predicted to run out. The seemingly odd assessment is due to optimization and time remaining being two different measures of data center and cluster health. A data center can be running at optimum based on policy settings for balance and consolidation, yet be almost out of resources. It is important to consider both measures when managing your environment.

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## Reclaim

Use the **Reclaim** screen to identify underutilized workloads and reclaim resources from across your environment.

### Where You Find Reclaim

From the **Home** screen, select **Reclaim** under **Optimize Capacity** in the left pane. From the **Quick Start** screen, select **Reclaim** in the second-from-left column.

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**Note** Double-click on a data center graphic to display the object details screen for the data center.

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### How Reclaim Works

The Capacity Optimization and Reclaim features are tightly integrated functions that enable you to assess workload status and resource contention in data centers across your environment. You can determine time remaining until CPU, memory, or storage resources run out, and realize cost savings when underutilized VMs can be reclaimed and deployed where needed.

When you open the **Reclaim** page, graphical representations of all the data centers and custom data centers in your environment appear. By default, they are shown in order of time remaining, beginning from the upper left, where the most constrained data centers appear. To review the status of a data center, click the graphic. The area following refreshes to display details about the selected data center. The **How much you can potentially save** pane reflects potential capacity savings and indicates a possible cost savings once you have reclaimed underused or powered off VMs. The **Total Reclaimable Capacity** pane gives details of the reclaimable percentages for CPU, memory, and disk space.

The table at the bottom of the page provides important information about the VMs that offer the most cost savings. The VMs are listed by **Powered VMs**, **Idle VMs**, **Snapshots**, and **Orphaned Disks**. The highest priority heading is at the far left. You can specify what information is included in your reclaim action. For example, when you click a column heading, the table lists, by data center and then by VM, the allocated and reclaimable CPUs and memory, respectively. Then, for example, you can check the box next to one or more VM names and click the **EXCLUDE VM(S)** button to keep those VMs from being included in any reclaim action. You can also select VMs to resize.

## Reclamation Settings

Select the gear icon next to the page heading to customize Reclamation Settings. This affects all data centers. Using the Reclamation Settings, you can exclude, for example all snapshots from being included in the reclaim action - by deselecting the Snapshots checkbox. Similarly, you can include or exclude powered-off VMs, idle VMs, and orphaned disks. For more information, see [Reclamation Settings](#).

## Run a Reclaim Action

Run a reclaim action as follows:

- 1 In the table headings, **Select** the types of VMs to reclaim.
- 2 **Click** the name of a listed cluster to show its VM list.
- 3 **Select** each VM or snapshot you want to reclaim.
- 4 Click **Delete VM(s)** to reclaim their resources.

Table 2-2. Reclaim Options

Option	Description
Select a data center.	Select a data center from the carousel across the top of the page. All data refreshes with information for the selected object.
<b>ALL DATACENTERS   X</b>	Toggle: click <b>ALL DATACENTERS</b> on the upper right when you want to switch the view to a filtered list of all data centers. Click <b>X</b> to return to a carousel view of data centers.
View:	Filter results to include data centers, custom data centers, or both. Option appears when you select <b>ALL DATACENTERS</b> on the upper right.
Group BY:	Filter results by criticality (least time remaining data centers/custom data centers listed first) or by the vCenter Server to which each data center belongs. Option appears when you select <b>ALL DATACENTERS</b> on the upper right.
Sort by:	Options (Options appear when you select <b>ALL DATACENTERS</b> on the upper right): <ul style="list-style-type: none"> <li>■ Alarm clock graphic - list data centers/custom data centers by time remaining.</li> <li>■ Dollar sign - list data centers/custom data centers by potential cost savings.</li> <li>■ Scales graphic - list data centers/custom data centers by level of optimization.</li> </ul>
<b>Select data center or ADD NEW CUSTOM DATACENTER.</b>	Options (Options appear when you select <b>ALL DATACENTERS</b> on the upper right): <ul style="list-style-type: none"> <li>■ Select a data center from the carousel across the top of the page. All data refreshes with information for the selected object.</li> <li>■ Select <b>ADD NEW CUSTOM DATACENTER</b> to display a dialog box that enables you to define a custom data center.</li> </ul>
How much you can potentially save.	Appears when you select a data center or custom data center from the top of the screen. Shows the total calculated potential cost savings when you accept system reclamation recommendations.



Table 2-2. Reclaim Options (continued)

Option	Description
Total Reclaimable Capacity	<p>Lists potential cost savings for the selected data center when you reclaim unused resources.</p> <p>Resource: CPU, memory, or disk space</p> <p>Reclaimable Capacity: how much capacity is available to reclaim from idle resources</p> <p>% Reclaimable: percentage of total CPU, memory, or storage you can reclaim.</p>

Table 2-2. Reclaim Options (continued)

Option	Description
Duration older than:	Shows idle or powered off VMs that have been idle or powered off for at least the selected time period: one week, two weeks, or a month.
Table of Potential Cost Savings	<p>Tabular representation of the VMs, Idle VMs, Snapshots and Orphaned disks in the selected data center from which resources can be reclaimed.</p> <p>Click one of the elements - powered off VMs, idle VMs, and so on - to refresh the table with data for that element. The table lists the relevant clusters. To see the VMs hosted in a given cluster, click the chevron to the left of the cluster name.</p> <p>Click the check box next to the VMs you want to act on, or click the check box next to the column heading VM Name to act on all the VMs.</p> <p>Once you select a VM or VMs, the dimmed options above the table become visible, as follows.</p> <p><b>Exclude VM(s):</b> the selected VMs are excluded from your subsequent action. Excluding VMs from a reclamation action can reduce the potential cost savings.</p> <p>For powered Off VMs:</p> <ul style="list-style-type: none"> <li>■ <b>DELETE VM(s):</b> deletes the selected VMs.</li> <li>■ <b>EXCLUDE VM(s):</b> excludes the selected VMs.</li> </ul> <p>For idle VMs:</p> <ul style="list-style-type: none"> <li>■ <b>DELETE VM(s):</b> deletes the selected VMs.</li> <li>■ <b>POWER OFF:</b> powers off the selected VMs.</li> <li>■ <b>EXCLUDE VM(s):</b> excludes the selected VMs.</li> </ul> <p>For Snapshots:</p> <ul style="list-style-type: none"> <li>■ <b>DELETE SNAPSHOT(s):</b> deletes the selected snapshots.</li> <li>■ <b>EXCLUDE VM(s):</b> excludes the selected snapshot.</li> </ul> <p><b>SHOW/HIDE EXCLUDED VMS:</b> toggle displays or hides the list of VMs you previously excluded.</p> <hr/> <p><b>Note</b> By default, calculations for reclaimable resources are based on the demand model. But if you turn on the allocation model in the policy settings, the calculations are based on the allocation model.</p> <hr/> <p>For Orphaned Disks:</p> <ul style="list-style-type: none"> <li>■ <b>EXCLUDE DISK(S):</b> exclude the selected disks in the actionable list.</li> <li>■ <b>EXPORT ALL:</b> exports the list of orphaned disks into a CSV file. You cannot reclaim orphaned disks from the UI. Instead, export the list into a CSV file and then reclaim the orphaned disks manually.</li> </ul> <hr/> <p><b>Note</b> vRealize Operations Manager reports orphaned VMDKs conservatively. There might be a false positive situation when the used VMDK is reported as orphaned, particularly if the VMDK is located on a datastore which is shared among multiple VCs, while not all the VCs are monitored by vRealize Operations Manager.</p> <p>Check the accuracy of the VMDK reported as an orphaned disk, and then perform a reclamation.</p> <hr/> <p><b>SHOW/HIDE EXCLUDED DISKS:</b> toggle displays or hides the list of disks you previously excluded. Excluded disks are not listed in the exported CSV file.</p>

## Reclamation Settings

Displays information about powered off VMs, idle VMs, snapshots and orphaned disks. This information helps to identify the amount of resources that can be reclaimed and provisioned to other objects in your environment or amount of potential savings that can be done in each month.

The types of VMs are ranked in the order of their importance in a reclamation action. A VM whose attributes match more than one VM type is included with the higher-ranking VM type. Grouping the VMs this way eliminates duplicates during calculations. As an example, powered-off VMs are ranked higher than snapshots, so that a powered-off VM that also has a snapshot appears only in the powered-off VM group.

If you exclude a given type of VM, all VMs matching this type are included with the next lower-ranked group they match. For example, to list all snapshots regardless of whether their corresponding VMs are powered-off or idle, deselect the Powered-off VMs and Idle VMs check boxes.

Further, you can configure how long a given class of VMs must be in the designated state - powered-off, for example, or idle - to be included in the reclamation exercise. You also can choose to hide the cost savings calculation.

**Table 2-3. Reclamation Settings**

Property	Description
Show Cost Savings	Controls whether to show Cost savings in 'Assess Capacity' and 'Reclaim' pages.
Powered-Off VMs	The total storage capacity used is reclaimable. Total storage reclaimable cost is computed by multiplying storage rate with storage utilization. The direct cost of VM is also attributed.
Idle VMs	Total CPU, memory, and storage capacity allocated to the VMs is reclaimable. Resource level costs are computed by multiplying resource base rate with utilization levels. VMs that are running cost past 30 days are considered as idle. Direct cost of VM is also attributed.

Table 2-3. Reclamation Settings (continued)

Property	Description
Snapshots	Snapshots of a VM use storage space and such storage is reclaimable. The reclaimable cost is computed by multiplying storage rate with reclaimable storage value.
Orphaned Disks	<p>Orphaned disks are VMDKs which are associated with a VM which are not in inventory, but still available in a datastore. You can configure the minimum number of days for which VMDKs not related to any existing VM will be reported as orphaned and appear under Orphaned Disks in Reclaim page.</p> <p><b>Note</b> You can navigate to <b>Global Settings</b> under <b>Administration &gt; Management</b> and change the value of the <b>Orphaned Disks Collection</b> time. At this time that you set, vRealize Operations Manager checks for orphaned VMDKs in vSphere Client instances. The settings for <b>Cost Calculation</b> and <b>Orphaned Disks Collection</b> are interrelated. The default value for <b>Cost Calculation</b> is 9:00 PM, and the default for <b>Orphaned Disks Collection</b> is 8:00 PM. It is recommended to schedule <b>Cost Calculation</b> after <b>Orphaned Disks Collection</b>.</p>

## What-If Analysis - Workload

You define scenarios that can potentially add workloads to actual data centers. vRealize Operations Manager models the scenario and calculates whether your desired workload can fit in the targeted data center or custom data center. You can also define scenarios that can potentially remove workloads from data centers. vRealize Operations Manager calculates the time remaining and capacity remaining on the cluster when workloads are removed from the cluster.

### Where You Find What-If Analysis - Workload

From the Home screen, select **What-If Analysis** under Optimize Capacity in the left pane. From the What-If Analysis screen, click **Add VMs** or **Remove VMs** in the pane titled Workload Planning.

### How What-If Analysis - Add Workload Works

This feature of Capacity Optimization enables you to forecast successfully the impact of adding a workload to an application. By trying various scenarios, you can arrive at an optimum configuration. Once you select the Workload Planning screen, you can choose the exact data center or custom data center where you want to locate the new workload. You can even pick a specific cluster where the workload is to reside.

In choosing the profile of your workload, you have two options:

- Configure the workload manually by specifying vCPUs, memory, storage, and expected use percentage. You have the further option to click Advanced Configuration and specify more precise characteristics for your workload.
- Use an existing VM or VMs as templates, importing all the attributes of the selected VMs to your workload scenario. The system allows you to specify how many copies of each selected VM you want to add to the proposed workload.

When you have set the profile for the new workload, enter the start and end date for the period when you want the workload to be active. The default is: starting today and ending one year from today. The system can project scenarios ending up to one year from the current date.

At this point, you can save the scenario to edit or run later on. A list of saved scenarios is available on the What-If Analysis main page. Otherwise, run the scenario to get the vRealize Operations Manager analysis and assessment of your plan.

The system lets you know immediately if the proposed workload fits or does not fit in the suggested location. If it fits, the results list the prime target cluster and any additional possible locations. The system also projects time remaining before the workload runs out of resources. If you select scenario details, the system displays a graphic depiction of resource use. For each attribute value - vCPU, memory, and storage - the amount by which the workload increases the percentage of total application capacity used is shown against a time line. The graph shows the existing percentage used in blue and the total of existing usage and added usage as a percentage of total capacity in green.

If the proposed workload does not fit, the system announces the outcome and provides the following information:

- How much the added workload reduces the time remaining for the target cluster, for example, from one year to zero.
- The discrepancy between the space available in the target cluster and what the proposed workload requires, for example, 100 GB of memory.
- The cost of the workload on the VMware Hybrid Cloud and on the public cloud.

## About Clouds

When you run a scenario in What-If Analysis, you get a recommendation based on cost relative to workload placement on different clouds. This cost-based recommendation varies for different clouds.

Private Cloud and VMware Cloud on AWS costs are computed based on resource usage levels.

Public clouds, AWS, IBM Cloud, Google Cloud, Microsoft Azure and user-defined cloud costs are dependent on the selected configuration, that is, for the allocated resources. These public cloud instances are selected based on the close proximity rule, with simulated resource allocation values and in some scenarios, the exact configuration match available in the cloud instance list is not available. Due to this issue, these public cloud costs can be inherently higher in comparison.

## How What-If Analysis - Remove Workload Works

This feature of Capacity Optimization enables you to forecast successfully the impact of removing a workload. By trying various scenarios, you can arrive at an optimum configuration. Once you select the Workload Planning screen, you can choose VMs from the concrete cluster data center or from the customer data center from which you want to remove the existing workload.

While removing workloads, you have two options to define the workload:

- Select existing VMs and use their projected utilization to evaluate the impact of removing workloads.
- Configure the workload manually by specifying the vCPUs, memory, storage, and expected use percentage.

Enter the start and end date for the period during which you want the workload to be removed. By default, the start date is today and the end date is one year from today. The end date is left empty by default. The system can project scenarios ending up to one year from the current date.

At this point, you can save the scenario to edit or run later on. A list of saved scenarios is available on the What-If Analysis main page. Otherwise, run the scenario to get the vRealize Operations Manager analysis and assessment of your plan.

**Table 2-4. What-If Analysis Workload Page Options**

Option	Description
Add/Remove VMs	Click <b>Add VMs</b> or <b>Remove VMs</b> to create a scenario for adding or removing workload. When clicked, the command displays the Add Workload or Remove Workload screen.
Scenario Name	In the heading of the Saved Scenarios table. Selecting the check box next to the name selects all scenarios in the list and turns on the dimmed <b>Delete</b> button.
Scenario type	Name of the scenario type. Values are Add Workload, Remove Workload, Add Capacity, Remove Capacity, and Migrate.
<scenario_name>	Name of a saved scenario. Selecting the check box next to a name turns on the dimmed <b>Run Scenario</b> , <b>Edit</b> , and <b>Delete</b> buttons.
All Filters	Use the filter to search for a specific scenario by name or type.
Show Columns	Click the small button on the lower left to display the Show Columns dialog box. You can select up to four columns to display in the table: Scenario Name, Scenario Type, Date Created, and Scenario Start and End Date.

## Add or Remove Workloads

As part of the What-If Analysis function, Workload Planning is the form you use to fill in the details of your what-if scenario. You choose where to add or remove the workload, configure it yourself or use an existing VM as a template, and establish a time frame. You also have an advanced configuration option that lets you define your configuration more precisely.

## Where You Find Workload Planning

At the What-If Analysis screen, click **Add VMs** or **Remove VMs** in the Workload Planning pane.

Table 2-5. Workload Planning Add Options

Option	Description
<b>Scenario Name</b>	Name of your scenario
<b>Location</b>	Where do you want to add the workload? Select from the list of existing data centers. You can optionally choose the exact cluster where you want the workload to reside.
<b>Application Profile/Configure</b>	Allows you to configure the virtual compute resource, including vCPU, memory, and storage.
<b>Application Profile/Import Import from existing VM</b>	Displays the Select VMs dialog box where you can choose one or more existing VMs to use as templates for your workload. Once you have made your selections, you return to this screen to enter the quantity of each chosen VM you want to incorporate as templates into your workload.
Choose Your Workload: <ul style="list-style-type: none"> <li>■ <b>CPU</b></li> <li>■ <b>Memory</b></li> <li>■ <b>Disk space</b></li> </ul>	With the Configure radio button selected, you can size your workload by defining values for vCPU, memory, and disk space.
<b>Expected Utilization</b>	Set the projected percentage of total workload capacity you expect to average.
<b>Advanced Configuration</b>	Displays a dialog box where you can configure more details for your workload, such as thin or thick provisioning.
Number of VMs (optional)/ <b>Quantity</b>	You can optionally choose how many VMs to spread the workload across.
<b>Start Date/End Date</b>	Select from pop-up calendars the start and end date for the workload. The end date cannot be later than one year from the current date.
<b>Run Scenario</b>	Click to run the scenario. The system calculates whether it fits into the location you chose.
<b>Save</b>	<b>Save</b> the scenario.
<b>Cancel</b>	<b>Cancel</b> the scenario.

Table 2-6. Workload Planning Remove Options

Option	Description
<b>Scenario Name</b>	Name of your scenario.
<b>Location</b>	From where do you want to remove the workload? Select from the list of existing data centers. You can optionally choose the exact cluster from where you want to remove the workload.
<b>Application Profile/Configure</b>	Allows you to configure the virtual compute resource, including vCPU, memory, and storage.  After you have configured the scenario, enter the quantity of custom VMs that you want to remove.

Table 2-6. Workload Planning Remove Options (continued)

Option	Description
<b>Application Profile/Import Existing VMs</b>	Displays the Select VMs dialog box where you can choose one or more existing VMs. Once you have made your selections, you return to this screen to enter the quantity of each chosen VM you want to remove from your workload.  <b>Note</b> The recommended limit is 100 VMs as a maximum for workload removal.
<b>Application Profile / Custom:</b> Choose your workload ■ CPU ■ Memory ■ Disk space	With the Configure radio button selected, you can size your workload by defining values for vCPU, memory, and disk space.
<b>Start Date/End Date</b>	Select from pop-up calendars the start and end date for the workload. The end date cannot be later than one year from the current date. You can also leave the end date blank.
<b>Run Scenario</b>	Click to run the scenario. The system calculates the impact on the cluster (time remaining and capacity remaining) when removing the workload.
<b>Save</b>	<b>Save</b> the scenario.
<b>Cancel</b>	<b>Cancel</b> the scenario.

You can see the cost of capacity that was freed up. This matches the potential savings if reclaimable VMs were selected

## Select VMs

Use the **Select VMs** dialog box to choose the VMs whose attributes you want to copy or remove for your What-If Analysis - Workload scenario.

### Where You Find Select VMs

From the What-If Analysis screen, click **Add** or **Remove**. When you have entered a **Scenario Name** and **Location**, click the **Import from existing VM/Existing VMs** radio button, then click **Select VMS**. On the left is a selection box that allows you optionally to choose all VMs. To add a VM to the selected list on the right, double-click on the VM name. Following are the rest of your options:

### Select VMs

Option	Description
All Filters	Filter options: VM Name: name of the VM you want. vCenter: all VMs in this vCenter. VM Tag: all VMs with this tag. Custom Group: all VMs in this custom group.
Select all (nnn).	A list of all available VMs from which to import or remove characteristics. Double-click the VMs whose attributes you want to copy or remove.



Option	Description
Selected	List of VMs you selected from RESULTS.
OK	When you have selected the VMs you want, click <b>OK</b> to return to the Add Workload or Remove Workload screen, where your selected VMs are listed.

At the Add Workload or Remove Workload screen, under Application Profile, in the Selected VMS table, enter in the Quantity column the number of copies of each VM you selected to add or remove.

## Advanced Configuration - Workload

The Advanced Configuration workspace allows you to more precisely define the attributes of the workload you want to use in your what-if analysis.

### Where You Find Advanced Configuration

From the What-If Analysis screen, click **Add**. When you have entered a **Scenario Name** and **Location**, click the **Configure** radio button, then click **Advanced Configuration**.

### Advanced Configuration Options

Option	Description
Resource Amount	Enter the number of vCPUS, the amount of memory, and the number of storage GBs to include in your scenario configuration.
Expected Utilization	For CPUs, memory, and storage units, respectively, increment the relevant counter to the percentage of total potential usage you expect the resource to use.
Disk space provisioning	Click the radio button for Thin or Thick provisioning.

## What-If Analysis - Physical Infrastructure

You define scenarios that can potentially add capacity to actual data centers or remove capacity from actual data centers. vRealize Operations Manager models the scenario and calculates whether your desired workload can fit in the targeted data center or custom data center.

### Where You Find What-If Analysis - Physical Infrastructure

From the Home screen, select **What-If Analysis** under Optimize Capacity in the left pane. From the Quick Start screen, select **Plan** in the second-from-left column. Click **Add Hosts** or **Remove Hosts** in the pane titled Physical Infrastructure Planning.

### How What-If Analysis Works

This feature of Capacity Optimization enables you to forecast successfully the impact of adding capacity to your environment or removing capacity from your environment. By trying various scenarios, you can arrive at an optimum configuration. Once you select the Physical Infrastructure Planning screen, you can choose where you want to locate the additional capacity or from where you can remove the existing capacity.

In choosing the profile while removing capacity, you can choose a profile only from server types that already exist in your cluster.

In choosing the profile while adding capacity, you have two options:

- Select a server type from a list of commercially available servers. You can choose from a list of 1) server types already in your cluster or 2) all server types approved for purchase.
- Configure a custom server manually by specifying CPU attributes, memory, and cost.

When you have set the profile for the new server, enter the number of servers to purchase or remove and the start and end date for the period when you want the scenario to be active. The number of servers that you plan to remove is limited by the number of selected server types available in the selected cluster. The system can project scenarios ending up to one year from the current date. By default, the starting date is today and the ending date is one year from today.

At this point, you can save the scenario to edit or run later on. A list of saved scenarios is available on the What-If Analysis main page. Otherwise, run the scenario to get the vRealize Operations Manager analysis and assessment of your plan.

The system displays immediately the impact on cluster size of the additional or lesser amount of CPU and memory, and shows the total cost of adding or removing the specified capacity. The system also shows whether adding new capacity or removing capacity extends or shrinks the time remaining before CPU or memory runs out.

As well, the system displays a graphic depiction of resource use. For each attribute value - CPU and memory - the amount by which the workload increases or decreases the percentage of total capacity used is shown against a time line.

**Table 2-7. What-If Analysis Page Options**

Option	Description
Physical Infrastructure Planning	Click <b>Add Hosts</b> or <b>Remove Hosts</b> to create a scenario for adding or removing capacity. When clicked, the command displays the Physical Infrastructure Planning screen.
Scenario Name	In the heading of the Saved Scenarios table. Checking the box selects all scenarios in the list and turns on the dimmed <b>Delete</b> button.
<scenario_name>	Name of a saved scenario. Selecting the check box next to a name turns on the dimmed <b>Run Scenario</b> , <b>Edit</b> , and <b>Delete</b> buttons.
Scenario type	Name of the scenario type. Values are Add Workload, Remove Workload, Add Capacity, Remove Capacity, and Migrate.
All Filters	Use the filter to search by name for a specific scenario name or scenario type.
Show Columns	Click the small button on the lower left to display the Show Columns dialog box. You can choose up to four columns to display in the table: Scenario Name, Scenario Type, Date Created, and Scenario Start and End Date.

## Add or Remove Physical Infrastructure

As part of the What-If Analysis function, Add or Remove Physical Infrastructure is the form you use to fill in the details of your what-if scenario. You choose where to add or remove the capacity, use an existing server type or configure it yourself (when you add capacity), and establish a time frame.

### Where You Find Physical Infrastructure

At the What-If Analysis screen, click **Add Hosts** or **Remove Hosts** in the Physical Infrastructure pane.

Table 2-8. Add Capacity Options

Option	Description
<b>Scenario Name</b>	Name of your scenario
<b>Location</b>	Where do you want to add capacity? Select from the list of existing data centers, then choose the cluster where you want the server(s) to reside.
<b>Server Details</b>	Clicking <b>Select Server</b> displays the Select Server Type dialog box, where you can choose a commercial brand server or configure a custom server.  Number of Servers to add: increment the Quantity counter up to the number of servers you want.
<b>Start Date/End Date</b>	Select from pop-up calendars the start and end date for the what-if scenario.
<b>Run Scenario</b>	Click to run the scenario. The system calculates the cost of the scenario and determines any new time remaining number.
<b>Save</b>	<b>Save</b> the scenario.
<b>Cancel</b>	<b>Cancel</b> the scenario.

The system displays immediately the impact on cluster size of the additional CPU and memory, and shows the total cost of adding the specified capacity. The system also shows in graphical form whether adding the new capacity extends the time remaining before CPU or memory runs out.

Table 2-9. Remove Capacity Options

Option	Description
<b>Scenario Name</b>	Name of your scenario
<b>Location</b>	From where do you want to remove capacity? Select from the list of existing data centers, then choose the cluster from where you want to remove the server(s).
<b>Server Details</b>	Clicking <b>Select Server</b> displays the Select Server Type dialog box, where you can choose only the server types that exist in your selected cluster.  The number of servers that you plan to remove is limited by the number of selected server types available in the selected cluster.
<b>Start Date/End Date</b>	Select from pop-up calendars the start and end date for the what-if scenario. You can choose to keep the end date blank.
<b>Run Scenario</b>	Click to run the scenario. The system determines any new time remaining number.

Table 2-9. Remove Capacity Options (continued)

Option	Description
<b>Save</b>	<b>Save</b> the scenario.
<b>Cancel</b>	<b>Cancel</b> the scenario.

The system displays the time remaining and the impact on CPU and memory with reduced capacity. The system also shows in graphical form whether removing capacity decreases the time remaining before CPU or memory runs out.

You can also see that the cost is based on the original purchase cost.

## What-If-Analysis - Migration Planning

You define scenarios that can potentially migrate workloads to a public clouds or to VMware Cloud on AWS. Use this scenario to determine where to move the workloads. vRealize Operations Manager models the scenario and calculates the cost and capacity to fit your desired workload.

### Where You Find What-If Analysis - Migration Planning

From the Home screen, select **What-If Analysis** under Optimize Capacity in the left pane. From the Quick Start screen, select **Plan** in the second-from-left column. Click **Select** in the pane titled Migration Planning.

### How What-If Analysis - Migration Planning Works

This feature of Capacity Optimization enables you to forecast successfully the impact of migrating a workload to a public cloud instance such as AWS, IBM Cloud, Microsoft Azure, Google Cloud or to VMware Cloud on AWS. Once you select the Migration Planning screen, choose whether you want to run the scenario against a public cloud or VMware Cloud on AWS. For a public cloud, choose the region where you want to migrate the workload. If the public clouds listed out of the box do not suit your needs you can also define your own public cloud and upload a rate card.

In defining the profile of your workload, you have two options:

- Configure the workload manually by specifying vCPUs, memory, storage, and expected use percentage.
- Use an existing VM or VMs as templates, importing all the attributes of the selected VMs to your workload scenario. The system allows you to specify how many copies of each selected VM you want to add to the proposed workload.

When you have set the profile for the migrating workload, run the scenario to get the vRealize Operations Manager analysis and assessment of your plan. You can also select up to three public clouds (but not VMware Cloud on AWS) to compare results. Alternatively, you can save the scenario to edit or run later on. A list of saved scenarios is available in the **Saved Scenarios** tab on the What-If analysis page.

For a public cloud target, the system lets you know immediately if the workload proposed for migration fits or does not fit in the suggested location. For example, if you selected AWS and the workload fits, the results list the Amazon Web Services Assessment, with details of the VMware Configuration and the AWS Equivalent. If the proposed workload does not fit, an error message appears: "Unable to identify a matching configuration instance in target location."

If you selected VMware Cloud on AWS for your scenario, the results list the VMware Cloud on AWS Assessment, with details of the VMware configuration. The system also displays the resource-use-level cost and the monthly purchase cost for an on-demand subscription. In addition, the system displays the resource-use-level cost and monthly purchase cost for one-year and three-year subscriptions.

## About Clouds

The system may provide a recommendation based on the cost of placing the workload on different clouds. This cost-based recommendation varies for different clouds. You can modify the costs for public clouds by uploading a new rate card.

For VMware Cloud on AWS, the system displays the resource-use-level cost and the monthly purchase cost for an on-demand subscription, plus those same costs for one-year and three-year subscriptions.

Public cloud costs are based on the selected configuration, that is, the allocated resources.

The public instance is selected based on the close proximity rule, with simulated resource allocation values. In some scenarios, an exact configuration match is not available in the list. Due to this lack of availability, the public cost can be inherently higher in comparison.

## Migration Planning

As part of the What-If Analysis function, Migrate is the form you use to fill in the details of your what-if scenario. You choose where to migrate the workload, then select the region.

### Where You Find Migration Planning

At the What-If Analysis screen, click **SELECT** in the Migrate pane.

When you run a scenario for What If: Migration for Public Clouds (Not VMC), vRealize Operations Manager might suggest the Public Cloud Instance suitable for the Workload Configuration selected by you. vRealize Operations Manager also calculates the cost for that Public Cloud's instance and displays the same.

Table 2-10. Migrate Options

Option	Description
<b>SCENARIO NAME</b>	Name of your scenario
<b>SELECT CLOUDS</b>	<p>Where do you want to migrate the workload?</p> <p>Options:</p> <ul style="list-style-type: none"> <li>■ AWS</li> <li>■ VMware Cloud on AWS - You can now select regions for VMware Cloud on AWS.</li> <li>■ IBM Cloud</li> <li>■ Microsoft Azure</li> <li>■ Google Cloud</li> </ul> <p><b>Note</b> The cloud providers added in the Add Cloud Provider page are also included in the list.</p> <p>You can select a maximum of three public clouds at a time for comparison. Hold the <b>Shift</b> key to select more than one public cloud provider. You cannot choose VMware Cloud on AWS with other public clouds for comparison because it has a host-based pricing model, while other clouds are instance based.</p>
<b>ADD CLOUD PROVIDERS</b>	You can add or edit the cloud providers and also edit the rate card of each individual cloud provider.
<b>APPLICATION PROFILE/Configure</b>	Using the Application Profile you can configure the virtual compute resources, like vCPU, memory, and storage.
Select Your Workload: <ul style="list-style-type: none"> <li>■ CPU</li> <li>■ Memory</li> <li>■ Disc Space</li> </ul>	With the Configure radio button selected, you can size your migrating workload by defining values for vCPU, memory, and storage.
<b>APPLICATION PROFILE/Import from existing VM</b>	<p>Displays the Select VMs button. When selected, displays the Select VMs workspace, where you can choose one or more existing VMs to use as templates for your workload. You can filter VMs by name, tags, vCenter Server, or custom group.</p> <p>Once you have made your selections, you return to this screen to enter the quantity of each chosen VM you want to incorporate as templates into your workload.</p>
Number of VMs (OPTIONAL)/ <b>Quantity</b>	You can optionally choose how many VMs to spread the workload across.
<b>RUN SCENARIO</b>	Click to run the scenario. The system calculates whether it fits into the location you chose.
<b>SAVE</b>	<b>SAVE</b> the scenario.
<b>CANCEL</b>	<b>CANCEL</b> the scenario.

The scenario results are displayed when you run the scenario. For VMware Cloud on AWS Assessment, when you can edit the configuration from the results page, the change in Reserved Capacity CPU, Reserved Memory Capacity, Fault Tolerance and RAID Level values are not saved to the original configuration after you edit it and run the scenario.

## What-If-Analysis - Hyperconverged Infrastructure

You can perform infrastructure planning by adding Hyperconverged Infrastructure (HCI) nodes to vSAN enabled clusters and running What-If scenarios. vRealize Operations Manager displays the time remaining and capacity remaining for CPU, memory and disk space in the scenario results.

### Where You Find What-If Analysis - Hyperconverged Infrastructure

From the Home screen, select **What-If Analysis** under Optimize Capacity in the left pane. From the Quick Start screen, select **Hyperconverged Infrastructure**. To run a What-If scenario click **Add HCI Nodes**.

### How What-If Analysis - Hyperconverged Infrastructure Works

You can add hyperconverged infrastructure to your VMware vSAN enabled environment and evaluate the increase in HCI capacity and cost. You can add up to 64 hosts per vSAN cluster. This number takes into account existing hosts in the cluster. vRealize Operations Manager only lists vSAN and vXRail clusters in the location property. You can select existing server types from these locations and change the number of instances of these servers to add to your scenario.

### Add HCI Nodes

As part of the What-If Analysis function, Add HCI Nodes is the form you use to fill in the details of your What-If scenario. When you add an HCI node, you can select an existing server type from your vSAN and vXRail enabled data center and change the number of instances of this server to calculate storage, capacity, and time remaining.

### Where You Find Workload Planning

At the **What-If Analysis** page, click **Add HCI Nodes** in the **Hyperconverged Infrastructure** pane.

Table 2-11. Add HCI Nodes Options

Option	Description
<b>Scenario Name</b>	Name of your scenario.
<b>Location</b>	Where do you want to add the HCI node? Select from the list of existing data centers. You can optionally choose the exact cluster where you want the HCI node to reside.
<b>Server Details</b>	Allows you to select an existing server type to calculate capacity, time and storage remaining based on the number of instances of the server.
<b>Number of servers to add</b>	How many instances of the server do you want to add?
<b>Start Date/End Date</b>	Select from pop-up calendars the start and end date for the workload. The end date cannot be later than one year from the current date.
<b>Run Scenario</b>	Click to run the scenario. The system calculates whether it fits into the location you chose.

Table 2-11. Add HCI Nodes Options (continued)

Option	Description
<b>Save</b>	<b>Save</b> the scenario.
<b>Cancel</b>	<b>Cancel</b> the scenario.

## Custom Profiles in VMware vRealize Operations Manager

A custom profile defines a specific configuration of an object instance. With profiles, you can determine how many instances of that object can fit in your environment, depending on the capacity remaining and the configuration of that object instance.

To determine how many instances of the object can fit in your environment, use custom profiles with projects and scenarios. Enter the profile numbers or pre-populate the values from specific VMs. 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.

To determine how many instances of the custom profile object you can include on the parent object, you select the parent object and the Capacity tab. The custom profiles appear on the VM remaining section and indicate how many instances of the object fit in your environment.

### Custom Profiles Details and Related Policies

A custom profile defines a specific configuration of an object instance. With profiles, you can determine how many instances of that object can fit in your environment, depending on the capacity available and the configuration of that object instance.

### How Custom Profiles Work

As with default profiles, custom profiles define metrics configurations for an object. You can create as many custom profiles as you need for an object type. For example, you might create one custom profile for a virtual machine that has a memory demand model of 2 GB. You create another custom profile that has a memory demand model of 4 GB.

vRealize Operations Manager uses custom profiles of virtual machines to calculate the number of virtual machines that can fit in your environment. The number of virtual machines is based on the capacity allocation and demand defined in the profile.

### Where You Find Custom Profiles

In the menu, click **Administration** then **Configuration > Custom Profiles** in the left pane.



Table 2-12. Custom Profiles Options

Option	Description
Toolbar options	Use the toolbar options to manage custom profiles. <ul style="list-style-type: none"> <li>■ <b>Add Profile.</b> Add a custom profile for a specific object type.</li> <li>■ <b>Edit Profile.</b> Modify the selected profile.</li> <li>■ <b>Delete Profile.</b> Remove the selected profile.</li> </ul>
Filtering options	Filter the list to display profiles that match the filter you create. You can sort by name, description, object type, or adapter type. Or, enter filter text in the Quick filter text box.
Profile Details tab	Displays the name, description, adapter, object type, and metrics applied to the custom profile.

## Custom Profiles Add and Edit Workspace

You can add a custom profile for an object type to determine how many instances of a specific object can fit in your environment. In the Custom Profiles workspace, you create a custom profile for an object and define its capacity configuration.

### Where You Create or Edit a Custom Profile

To create a custom profile, click **Administration** in the menu, then **Configuration > Custom Profiles** in the left pane. To create a custom profile, click the plus sign. To edit the selected profile, click the edit icon.

Table 2-13. Custom Profiles Configuration Options

Option	Description
Profile Name	Descriptive name of the custom profile.
Profile Description	Meaningful description for the custom profile. Provide specific information that other users must know about this profile.
Object Type	Basic object for the profile, such as a virtual machine.
Value and Unit	Populate the value and unit for the capacity metrics. You can optionally import the values for an existing VM by clicking the <b>IMPORT FROM EXISTING VM</b> button.

## Custom Data Centers 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. To access the list of custom data centers, click **Environment** on the top menu.

This view displays the top alerts for the data center. To examine the capacity remaining for the custom data center, click the **Capacity** tab.

## Custom Datacenters List

You can view the list of custom data centers that exist in your environment, and a summary view of its health, risk, and efficiency. In this view, you can click a custom data center to display the top alerts that the objects in the custom data center triggered.

## How Custom Datacenters Work

In vSphere, a data center serves as a container for objects that a vCenter Server instance manages. A custom data center is a container that can include objects from multiple vCenter Server instances.

Custom data centers can contain vCenter Server instances, data centers, clusters, hosts, virtual machines, and datastores. You can add vSphere object types to a custom data center.

When you add an object, the hierarchical children of that object become part of the custom data center. An object can belong to multiple custom data centers.

When you create custom data centers, the system runs capacity analytics on the objects in the custom data center, even if those objects span multiple vCenter Server instances. For example, you might need to examine the capacity analytics data across multiple clusters, and the multiple vCenter Server instances that manage those clusters. You do not have to analyze the capacity of one cluster or one vCenter Server instance at a time. You can create a custom data center, add all the clusters to it, and see the capacity analysis in a single location.

## Where You Find Custom Datacenters

Select **Environment** in the menu and click the **Custom Datacenters** tab.

Table 2-14. Custom Datacenters Toolbar and Grid Options

Option	Description
Toolbar options	<p>Use the toolbar options to manage your custom data centers.</p> <ul style="list-style-type: none"> <li>■ <b>Add New Custom Datacenter.</b> Add a custom data center.</li> <li>■ <b>Edit Custom Datacenter.</b> Modify the selected custom data center.</li> <li>■ <b>Delete Custom Datacenter.</b> Remove the selected custom data center.</li> <li>■ <b>Clone Custom Datacenter.</b> Create a copy of the selected custom data center and customize it for your needs.</li> </ul>
Filter	Limit the list of custom data centers to those data centers that match the text that you enter in the <b>Filter</b> text box.
Data grid	<p>Lists the custom data centers in your environment, and displays the health, risk, and efficiency for each one.</p> <p>To view a summary of the custom data center health, risk, and efficiency on the <b>Summary</b> tab, click the custom data center name. To edit, delete, or clone a custom data center, click to the right of the custom data center name. Then, click the toolbar option.</p>

## Custom Datacenters Add and Edit Workspace

A custom data center is an object type that provides capacity analytics and capacity badge computations based on the objects it contains. You create a custom datacenter object and add inventory objects to it.

### Where You Create or Edit a Custom Datacenter

To create a custom data center, in the menu click **Environment**, click the **Custom Datacenters** tab, and click the plus sign.

To edit a selected custom data center, click to the right of the custom data center name, and click the edit icon. To use an existing custom data center as a template, click to the right of the custom data center name, and click the clone icon.

Table 2-15. Add and Edit Custom Datacenters Configuration Options

Option	Description
Name	Descriptive name of the custom data center.
Description	Meaningful description for the custom data center. Provide specific information that other users must know about this custom data center.
Objects	<p>Lists the objects in your environment. Select the check box for each object to add to the custom data center.</p> <p>You can add vCenter Server instances, vSphere data centers, vSphere clusters, and ESXi hosts.</p> <p>When you add an object, the hierarchical children of that object become part of the custom data center. An object can belong to multiple custom data centers.</p>