User Guide

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vRealize Operations 8.4

vmware®

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About This User Guide

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

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

Intended Audience

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

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…
- Troubleshooting Workbench Home Page
- 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 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. 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.

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

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.
- 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 Add a Standard Email Plug-In for vRealize Operations Manager Outbound Alerts topic in *vRealize Operations Cloud Configuration Guide*.
- Verify that outbound alerts are configured for standard email alerts. See *vRealize Operations Cloud 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 User Scenario: Create a vRealize Operations Manager Email Alert Notification topic in *vRealize Operations Cloud 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 Add a Standard Email Plug-In for vRealize Operations Manager Outbound Alerts topic in *vRealize Operations Cloud Configuration Guide*.
- Verify that outbound alerts are configured for standard email alerts. See *vRealize Operations Cloud 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 User Scenario: Create an Email Alert Notification topic in *vRealize Operations Cloud 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 Cloud 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.
2. In the **Alert Details** tab, see the information under **Symptoms**. Click the object which is displaying the symptoms.
3. The object opens under **Environment**. Click **Alerts > Symptoms**. The symptoms tab includes all the symptoms triggered for the current object.

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.

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 Analyltics 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, 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.

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.

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 **Action** menu next to the cluster, 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.

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.

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.

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.

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.* .

Troubleshooting Workbench Home Page

The **Troubleshooting Workbench** home page is where you find active troubleshooting sessions and recent searches. The active troubleshooting sessions do not persist after you log out from vRealize Operations Manager .

Where You Find the Troubleshooting Workbench Home Page

- Navigate to the **Troubleshooting Workbench** home page from **Home > Troubleshoot > Workbench**.
- From the Quick Start page, click **Workbench** in the **Troubleshoot** section.

The **Troubleshooting Workbench** home page displays a search bar, a list of active troubleshooting sessions, and recent searches. You can open a session to find potential evidences for your problems.

How Troubleshooting Workbench Home Page Works

All troubleshooting workbench sessions that are active in the current login are displayed in the **Active Troubleshooting** section of the **Troubleshooting Workbench** home page. Changes that you make to the scope, time, or potential evidences in the troubleshooting workbench page are not be saved on logging out. The next time you log in to vRealize Operations Manager , the sessions that were earlier under **Active Troubleshooting** are displayed under **Recent Searches**.

Discovering Potential Evidences Using the Troubleshooting Workbench

The Troubleshooting Workbench is where you perform advanced troubleshooting tasks on an alert that triggered on an object. You can investigate both known and unknown issues in vRealize Operations Manager .

Where You Find the Troubleshooting Workbench

You can start the Troubleshooting Workbench with an alert in context from the alert information page, or you can search for an object and start the Troubleshooting Workbench to investigate known or unknown issues related to the object.

- To start the Troubleshooting Workbench with an alert in context, in the menu, click **Alerts**. Click an alert from the alert list and click **Launch Workbench** from the **Potential Evidence** tab.
- To start the Troubleshooting Workbench with an alert in context, in the menu, click **Environment**, then select a group, custom data center, application, or inventory object. Click the object and then the **Alerts** tab. Click **Launch Workbench** from the **Potential Evidence** tab.
- To investigate known or unknown issues with an object in context, search for the object or click **Environment** to locate the object and click **Troubleshoot** on the top.

How the Troubleshooting Workbench Works

You look for potential evidences of a problem within a specific scope and time range. The **Selected Scope** control on the left of the Troubleshooting Workbench page is where you vary the scope. You can vary the scope in the following ways:

- You can select only the object that you are investigating, or include several upstream and downstream relationships by increasing the scope. As you increase the scope, more objects are displayed in the inventory tree.
- You can select a custom scope to include objects of your choice. Click **Custom** to open an interactive window where you use the pointer to visually rearrange your objects, view relationships and add peers to modify the relationships. To see details about the object, place the pointer for a few seconds above the object. You can reset a custom scope to start all over again.
- You can use the drop-down menu to narrow down the type of objects displayed.

The default time range is two hours, and thirty minutes before the alert triggered when the context is alert based, or one hour before the current time, when the context is object based. You can select a different time range, up to seven days, using the date and time controls.

The potential evidences are based on Events, Property Changes, and Anomalous Metrics which are displayed on the right of the Troubleshooting Workbench change in the **Potential Evidence** tab. Information in these sections is displayed as cards.

Events

Displays events, based on a change in the metrics. Events for metrics that have breached the usual behavior, and major events that have occurred within the selected scope and time are displayed. The cards are based on dynamic thresholds for a metric, which is calculated based on historical and incoming data.

Property Changes

Displays important configuration changes that occurred within the selected scope and time. Both single and multiple property changes are displayed. For multiple property changes, you can view the latest and previous changes.

Anomalous Metrics

Metrics which have shown drastic changes within the selected scope and time. Ranks the results based on the degree of change. The most recent anomalous metric based on a time-sliced comparison in the current time range is given the highest weightage.

You can explore more details about any of the cards displayed in the Troubleshooting Workbench by clicking the card pop-out option. You can close a card and it is no longer displayed in the Troubleshooting Workbench. To load the cards again, click **Go** in the **Time Range**.

When you pin a metric, it appears in the **Metrics** tab of the Troubleshooting Workbench. You can perform further investigation on the metric in the Metrics tab. You can compared the pinned metrics with other metrics displayed in the tab. You can close the pinned metrics and browse other metrics for specific objects.

Similarly, the **Alerts** and **Events** tabs are where you investigate the potential evidences further. You can filter and group alerts. If you want to focus on the alerts for a specific object in your selected scope, you can clear all the alerts and then click the object in the scope.

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 can take ownership of an alert or assign alerts to other vRealize Operations Manager users.

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 you are responsible for.

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 effect 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 a memory contention that a few virtual machines cause.
- Cluster has many virtual machines that have a 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 the 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.
6. To assign the ownership of the `Virtual machine has unexpected high CPU workload` alert to another user, click the alert, click **Actions** on the menu bar, and click **Assign to**.

7 Enter the name of user to whom you want to assign the ownership of the alert and click **Save**.

The Assigned to: field in Alert Details updates with the name of the user you have assigned the alert to.

Note You can remove the ownership assigned to a user by clicking the alert and selecting the **Release Ownership** option from the **Actions** menu.

8 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.

9 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.
- 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 Working with Actions That Use Power Off Allowed section in *vRealize Operations Manager Configuration Guide*. .

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 **Configuration > Recommendations** in the left pane .

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

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
Power Off Allowed	Shuts down or powers off the virtual machine before modifying the value. If VMware Tools is installed and running, the virtual machine is shut down. If VMware Tools is not installed or not running, the virtual machine is powered off without 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.
Snapshot	Creates a snapshot of the virtual machine before you add CPUs. If the CPU is changed with CPU Hot Plug enabled, then the snapshot is taken with the virtual machine running, which consumes more disk space.

   c Click **OK**.

   The action adds the 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.

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

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.

Summary Tab

The Summary tab provides an overview of the state of the selected object, group, or application. Use this tab to evaluate the impact that alerts are having on the object and use the information to begin troubleshooting problems.

How the Summary Tab Works

Based on the object selected, the following summary tabs are displayed:

- VM Summary Tab
- Datastore Summary Tab
- Host Summary Tab
- Cluster Summary Tab
- Custom Group and Container Summary Tab

Where to Find the Summary Tab

- In the menu, click **Environment**, then select a group, custom data center, application, or inventory object.

- You can also click **Administration**> **Inventory** > **Select an Object from the List** > click **Show Detail**.
- In the menu, select **Alerts** to display the All Alerts screen. Click an **alert** to display the alert details on the right. Then click **View Additional Metrics** to see more information about the alert and the object that triggered the alert. Click the **Summary** tab.

Understanding the Summary Tab

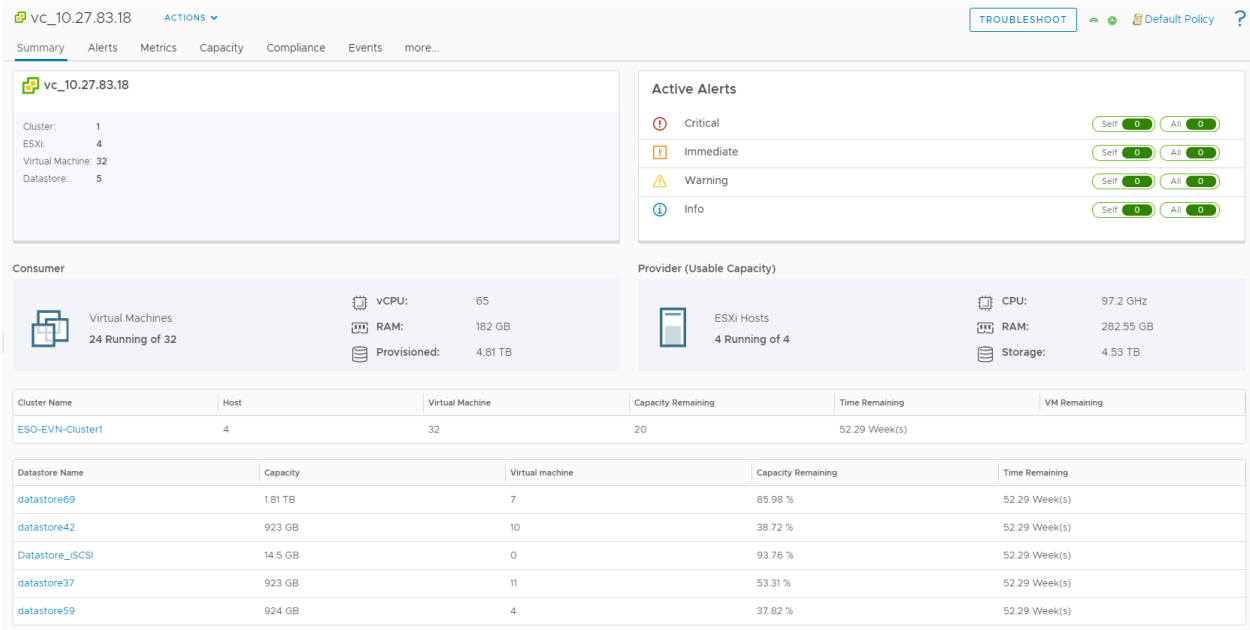


Table 1-1. Summary Tab Options

Option	Description
Troubleshoot	Start the Troubleshooting Workbench with the current object in context.
Object Summary	This widget displays the details of the selected object. It also displays the number of resources associated with the selected object.
Active Alerts	This widget provides a visual indicator of the alert status for the following alert types. ■ Health alerts that usually require immediate attention. ■ Risk alerts indicating that you must look into any problems shortly. ■ Efficiency alerts indicating that you can reclaim resources. To see the alerts for the object, click the labels of the alert.
Consumer	Gives the number of active VMs for the selected object. You can also view the usage details for the virtual machine, CPU, and Memory.
Provider	Gives the details of available resources for the selected object. You can view the number of hosts and capacity remaining for CPU, RAM, Storage.

Table 1-1. Summary Tab Options (continued)

Option	Description
Cluster	Displays the cluster details of the selected object.
Datastore	Displays the datastore details of the selected object.

Datastore Summary Tab

The Datastore Summary tab provides an overview of the state of the selected datastore. For the selected object, the Datastore Summary tab displays the alerts and metrics as they affect the health, risk, or efficiency. Use this tab to evaluate the impact that alerts are having on the datastore and use the information to begin troubleshooting problems.

Understanding the Datastore Summary Tab

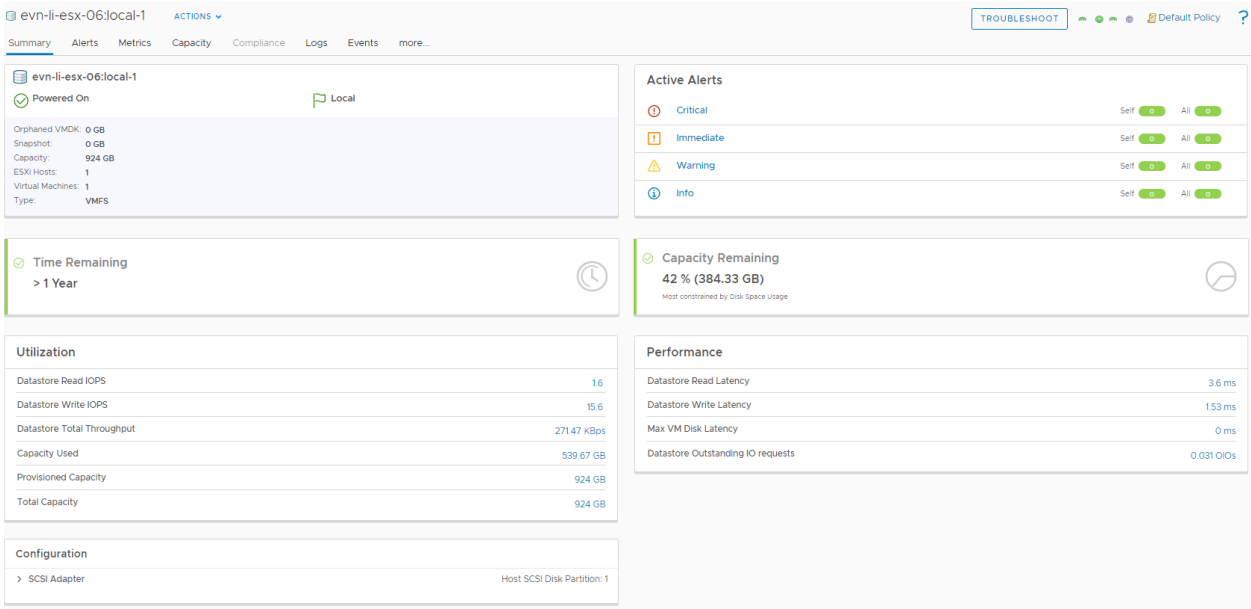


Table 1-2. Datastore Summary Tab Options

Option	Description
Troubleshoot	Start the Troubleshooting Workbench with the current object in context.
Object Summary	This widget displays the details of the selected object. The widget also displays the number of resources associated with the selected object.
Active Alerts	This widget provides a visual indicator of the alert status for the following alert types. ■ Health alerts that usually require immediate attention. ■ Risk alerts indicating that you must look into any problems shortly. ■ Efficiency alerts indicating that you can reclaim resources. To see the alerts for the object, click the labels of the alert.

Table 1-2. Datastore Summary Tab Options (continued)

Option	Description
Time Remaining	This widget displays the number of days remaining till the projected resource utilization crosses the threshold for the usable capacity.
Capacity Remaining	This widget displays the unused capacity of your virtual environment to accommodate new virtual machines.
Utilization	This widget is used to find out the trends in capacity used by a selected datastore as against the total capacity available.
Performance	This widget displays the summary metrics about the overall performance of the object. Click each metric to see the expanded chart.
Configuration	This widget displays the configuration details for the selected datastore object.

Host Summary Tab

The Host Summary tab provides an overview of the state of the selected host. For the selected object, the Host Summary tab displays the alerts and metrics as they affect the health, risk, or efficiency. Use this tab to evaluate the impact that alerts are having on the host and use the information to begin troubleshooting problems.

Understanding the Host Summary Tab

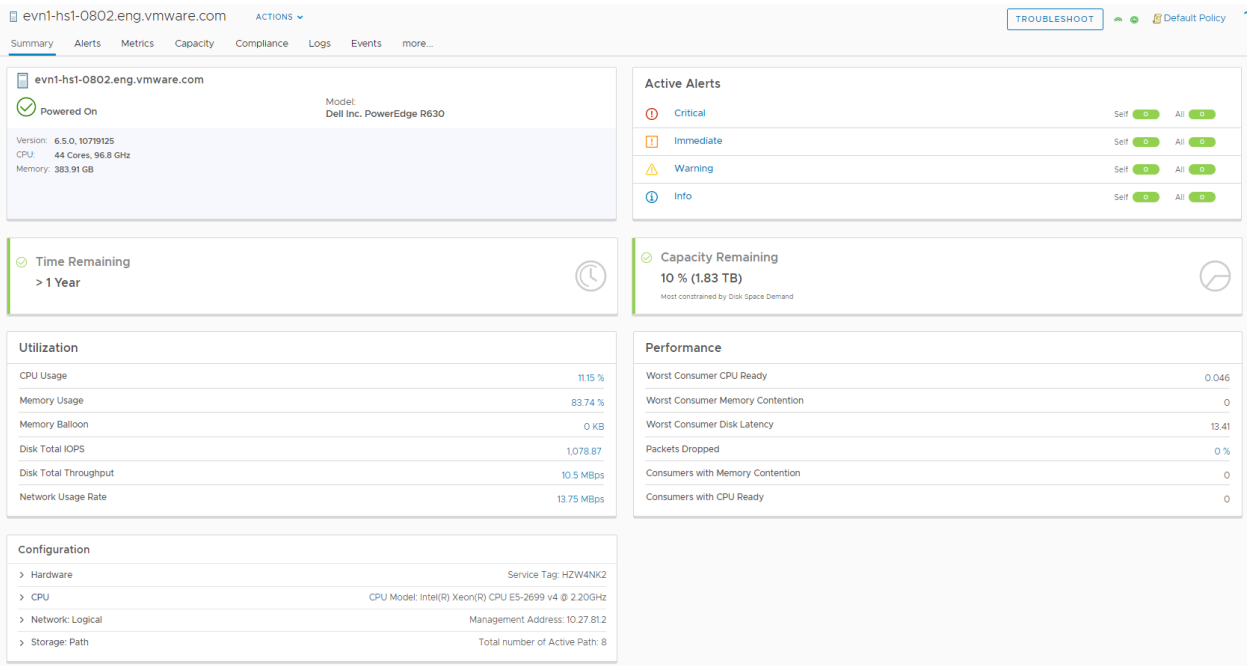


Table 1-3. Host Summary Tab Options

Option	Description
Troubleshoot	Start the Troubleshooting Workbench with the current object in context.
Object Summary	This widget displays the details of the selected object. The widget also displays the number of resources associated with the selected object.
Active Alerts	This widget provides a visual indicator of the alert status for the following alert types. ■ Health alerts that usually require immediate attention. ■ Risk alerts indicating that you must look into any problems shortly. ■ Efficiency alerts indicating that you can reclaim resources. To see the alerts for the object, click the labels of the alert.
Time Remaining	This widget displays the number of days remaining till the projected resource utilization crosses the threshold for the usable capacity.
Capacity Remaining	This widget displays the unused capacity of your virtual environment to accommodate new virtual machines.
Utilization	This widget is used to find out the trends in capacity used by a selected datastore as against the total capacity available.
Performance	This widget displays the summary metrics about the overall performance of the object. Click each metric to see the expanded chart.
Configuration	This widget displays the hardware, CPU, and Network configuration details of the host.

VM Summary Tab

The VM Summary tab provides an overview of the state of the selected VM. For the selected object, the VM Summary tab displays the alerts and metrics as they affect the health, risk, or efficiency. Use this tab to evaluate the impact that alerts are having on the VM and use the information to begin troubleshooting problems.

Understanding the VM Summary Tab

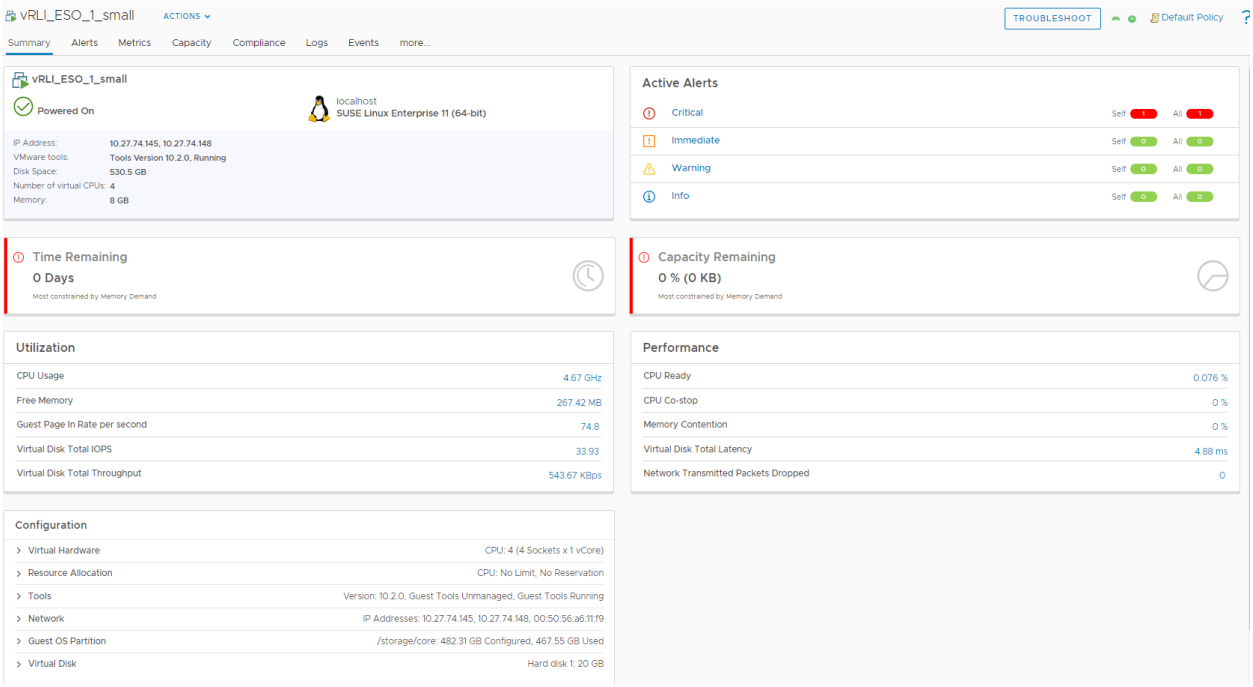


Table 1-4. VM Summary Tab Options

Option	Description
Troubleshoot	Start the Troubleshooting Workbench with the current object in context.
Object Summary	This widget displays the details of the selected object. The widget also displays the number of resources associated with the selected object.
Active Alerts	This widget provides a visual indicator of the alert status for the following alert types. ■ Health alerts that usually require immediate attention. ■ Risk alerts indicating that you must look into any problems shortly. ■ Efficiency alerts indicating that you can reclaim resources. To see the alerts for the object, click the labels of the alert.
Time Remaining	This widget displays the number of days remaining till the projected resource utilization crosses the threshold for the usable capacity.
Capacity Remaining	This widget displays the unused capacity of your virtual environment to accommodate new virtual machines.
Utilization	This widget is used to find out the trends in capacity used by a selected datastore as against the total capacity available.

Table 1-4. VM Summary Tab Options (continued)

Option	Description
Performance	This widget displays the summary metrics about the overall performance of the object. Click each metric to see the expanded chart.
Configuration	This widget displays the virtual hardware, resource allocation, tools, and Network configuration details of the virtual machine.

Cluster Summary Tab

The Cluster Summary tab provides an overview of the state of the selected cluster. For the selected object, the Cluster Summary tab displays the alerts and metrics as they affect the health, risk, or efficiency. Use this tab to evaluate the impact that alerts are having on the cluster and use the information to begin troubleshooting problems.

Understanding the Cluster Summary Tab

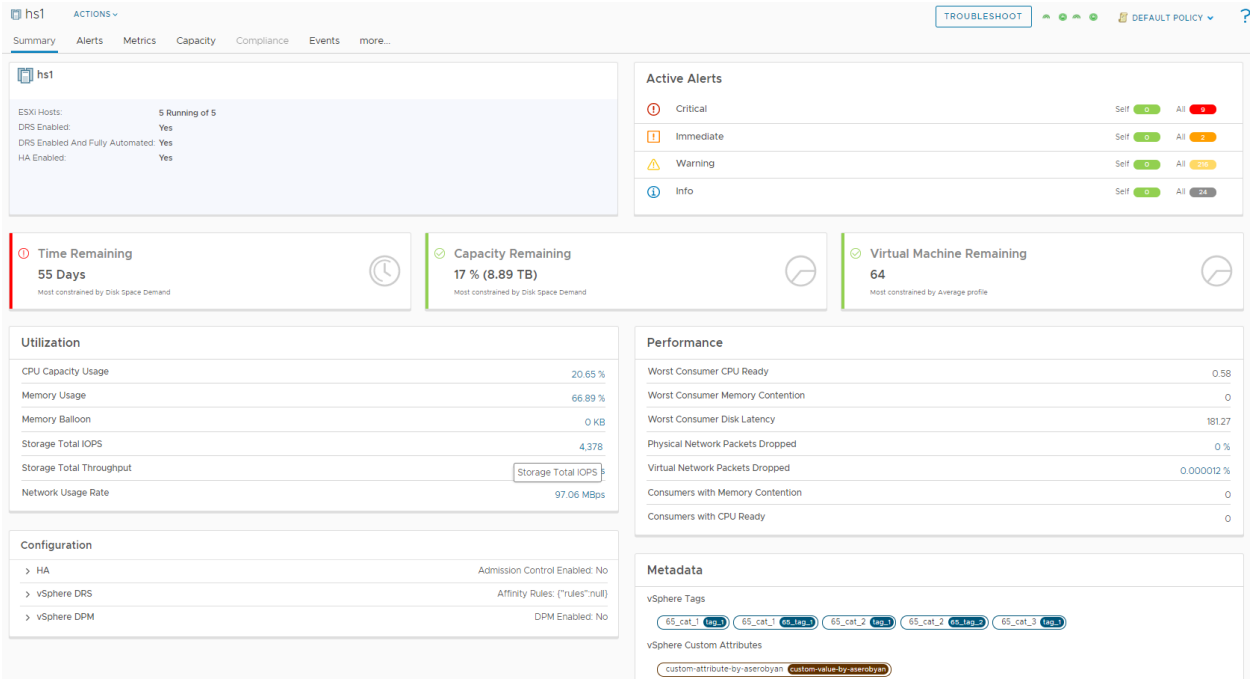


Table 1-5. Cluster Summary Tab Options

Option	Description
Troubleshoot	Start the Troubleshooting Workbench with the current object in context.
Object Summary	This widget displays the details of the selected object. The widget also displays the number of resources associated with the selected object.

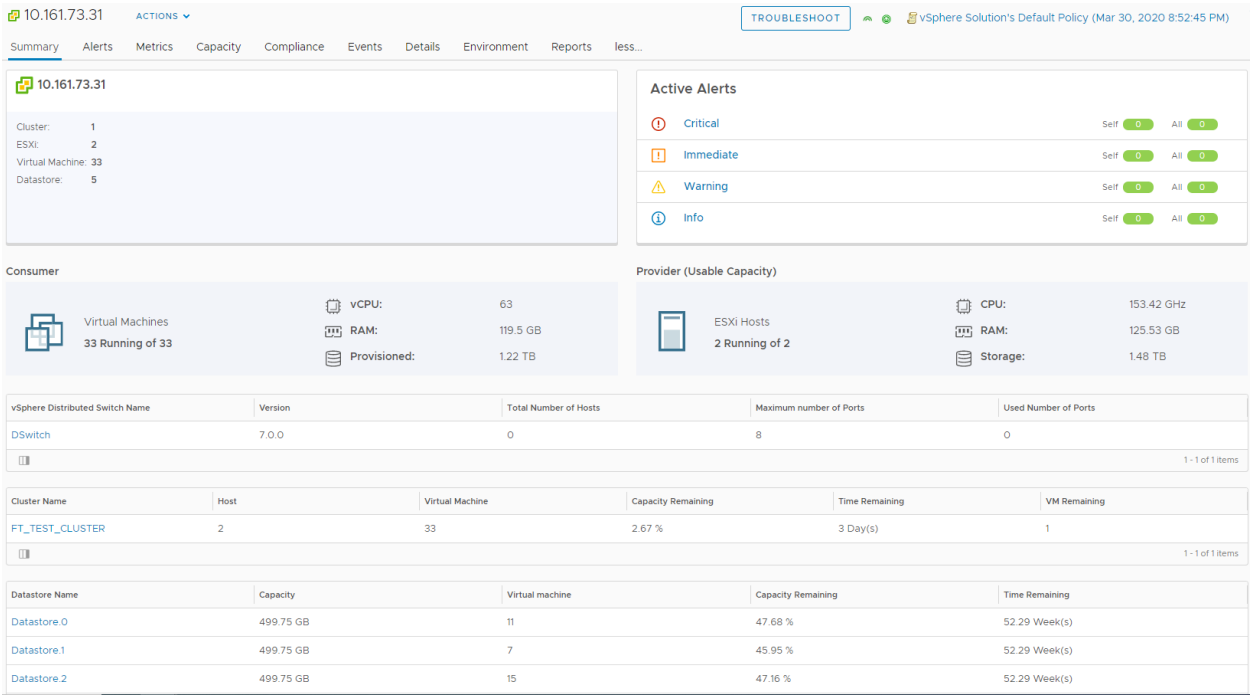
Table 1-5. Cluster Summary Tab Options (continued)

Option	Description
Active Alerts	This widget provides a visual indicator of the alert status for the following alert types. ■ Health alerts that usually require immediate attention. ■ Risk alerts indicating that you must look into any problems shortly. ■ Efficiency alerts indicating that you can reclaim resources. To see the alerts for the object, click the labels of the alert.
Time Remaining	This widget displays the number of days remaining till the projected resource utilization crosses the threshold for the usable capacity.
Capacity Remaining	This widget displays the unused capacity of your virtual environment to accommodate new virtual machines.
Virtual Machine Remaining	This widget displays the remaining virtual machines in the cluster. To see the details of the remaining virtual machines, click the Virtual Machine Remaining card.
Utilization	This widget is used to find out the trends in capacity used by a selected datastore as against the total capacity available.
Performance	This widget displays the summary metrics about the overall performance of the object. Click each metric to see the expanded chart.
Configuration	This widget displays the configuration details of the cluster.
Metadata	This widget displays the metadata details of the cluster.

vCenter Server and Data Center Summary Tab

The vCenter Server and data center Summary tab provides an overview of the state of the selected data center or vCenter. For the selected object, the vCenter server or data center Summary tab displays the alerts as they affect the health, risk, or efficiency. Use this tab to evaluate the impact that alerts are having on the vCenter server or data center and use the information to begin troubleshooting problems.

Understanding the vCenter Server and Data Center Summary Tab

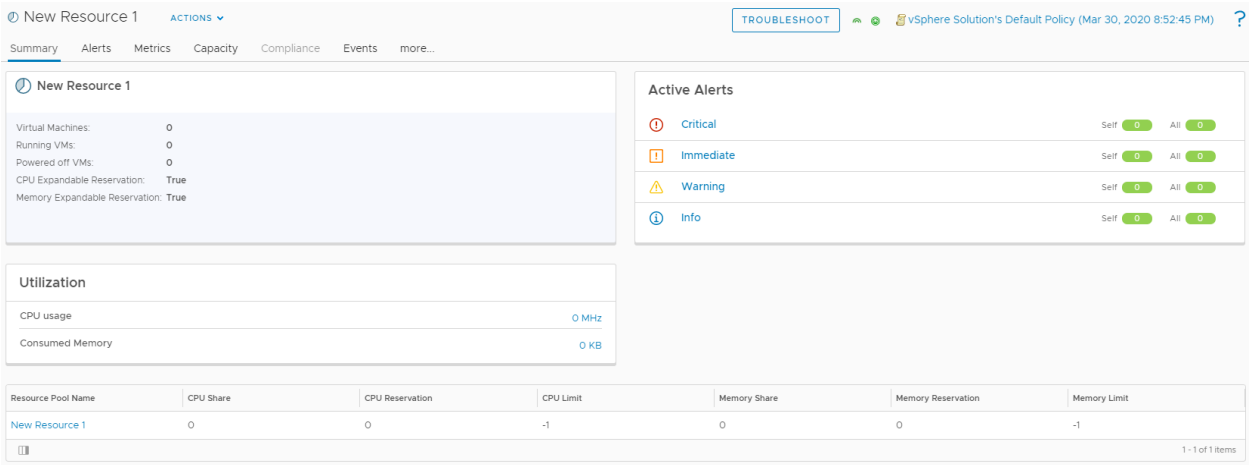


Option	Description
Troubleshoot	Start the Troubleshooting Workbench with the current object in context.
Object Summary	This widget displays the details of the selected object. The widget also displays the number of resources associated with the selected object.
Active Alerts	This widget provides a visual indicator of the alert status for the following alert types. ■ Health alerts that usually require immediate attention. ■ Risk alerts indicating that you must look into any problems shortly. ■ Efficiency alerts indicating that you can reclaim resources. To see the alerts for the object, click the labels of the alert.
Consumer	Gives the number of active VMs for the selected object. You can also view the usage details for the virtual machine, CPU, and Memory.
Provider	Gives the details of available resources for the selected object. You can view the number of hosts and capacity remaining for CPU, RAM, Storage.
vSphere Distributed Switch Name	Displays the details of the vSphere distributed switch.
Metadata	Displays the metadata details of the data center.
Cluster	Displays the cluster details of the selected object.
Datastore	Displays the datastore details of the selected object.

Resource Pool Summary Tab

The Resource Pool Summary tab provides an overview of the state of the resources in the resource pool. For the selected resource, the Resource Pool Summary tab displays the alerts and metrics as they affect the health, risk, or efficiency. Use this tab to evaluate the impact that alerts are having on the resource pool and use the information to begin troubleshooting problems.

Understanding the Resource Pool Summary Tab



Option	Description
Troubleshoot	Start the Troubleshooting Workbench with the current object in context.
Object Summary	This widget displays the details of the selected object. The widget also displays the number of resources associated with the selected object.
Active Alerts	This widget provides a visual indicator of the alert status for the following alert types. ■ Health alerts that usually require immediate attention. ■ Risk alerts indicating that you must look into any problems shortly. ■ Efficiency alerts indicating that you can reclaim resources. To see the alerts for the object, click the labels of the alert.
Utilization	This widget is used to find out the trends in capacity used by the selected resource pool as against the total capacity available.
Performance	This widget displays the summary metrics about the overall performance of the object. Click each metric to see the expanded chart.
Resource Pool	This widget lists the resource pool name, cpu status, and memory status of the resources that are part of the corresponding resource pool.

Custom Group and Container Summary Tab

The Custom Group and Container Summary tab provides an overview of the state of the selected group or a container. For the selected object, the Custom Group and Container Summary tab

displays the alerts and metrics as they affect the health, risk, or efficiency. Use this tab to evaluate the impact that alerts are having on the group or a container and use the information to troubleshoot the problems.

Understanding the Custom Group and Container Summary Tab

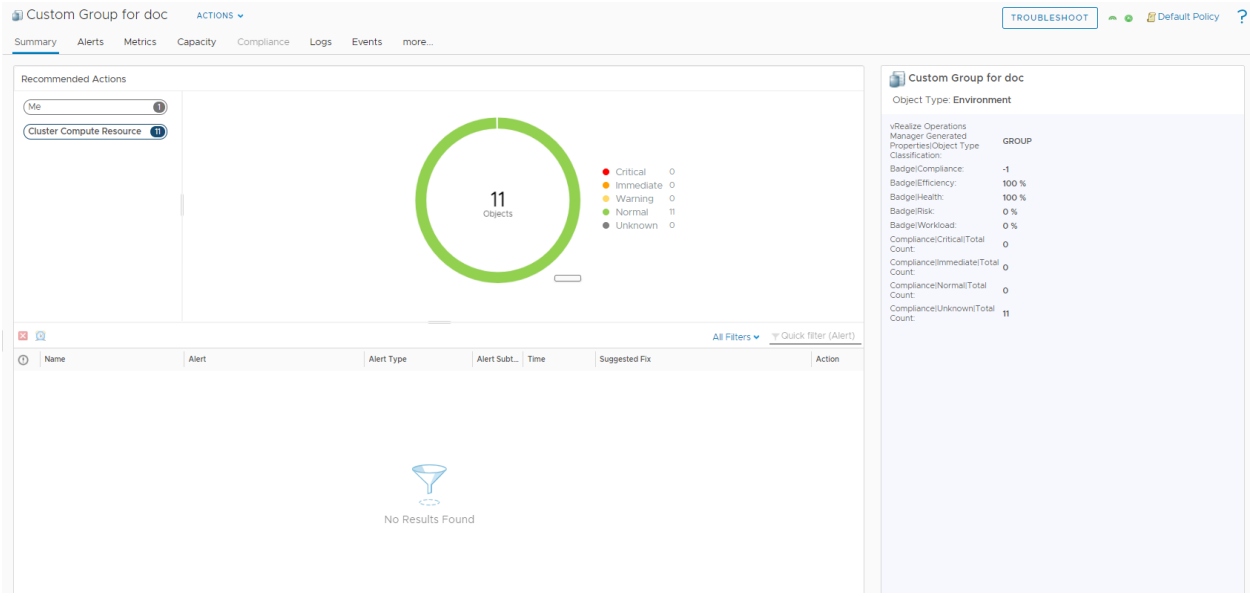


Table 1-6. Custom Group and Container Summary Tab Options

Option	Description
Recommended Actions	This widget displays the health status for the selected object and its descendants. It also displays recommendations to solve problems in an instance. The badges provide a visual indicator of the alert status for the following alert types. ■ Health alerts that usually require immediate attention. ■ Risk alerts indicating that you must look into any problems shortly. ■ Efficiency alerts indicating that you can reclaim resources. To see the alerts for the object, click the badge.

Workload Management Enabled Cluster Summary Tab

The Workload Management enabled cluster is a cluster with Kubernetes enabled, running on vSphere (also called Supervisor cluster). It hosts a type of resource pool called Namespaces. The Workload Management Enabled Cluster Summary tab provides an overview of the state of the selected cluster.

Understanding the Cluster Summary Tab

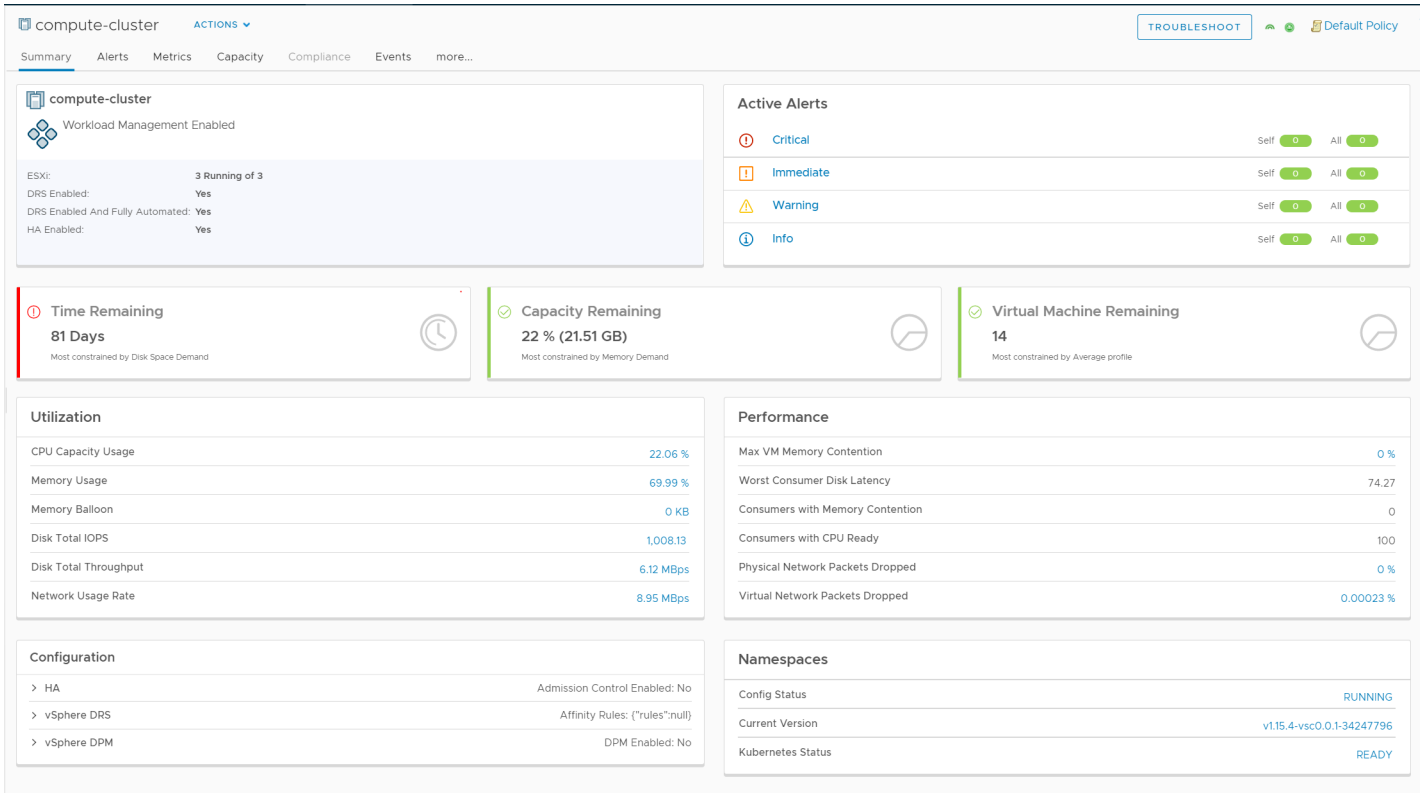


Table 1-7. Workload Management Enabled Cluster Summary Tab Options

Option	Description
Troubleshoot	Start the Troubleshooting Workbench with the current object in context.
Object Summary	This widget displays the details of the selected object. The widget also displays the number of resources associated with the selected object and whether the Workload Management is enabled or disabled.
Active Alerts	This widget provides a visual indicator of the alert status for the following alert types. ■ Health alerts that usually require immediate attention. ■ Risk alerts indicating that you must look into any problems shortly. ■ Efficiency alerts indicating that you can reclaim resources. To see the alerts for the object, click the badge .
Time Remaining	This widget displays the number of days remaining till the projected resource utilization crosses the threshold for the usable capacity.
Capacity Remaining	This widget displays the unused capacity of your virtual environment to accommodate new virtual machines.

Table 1-7. Workload Management Enabled Cluster Summary Tab Options (continued)

Option	Description
Virtual Machine Remaining	The virtual machine remaining number is based on the average profile. The virtual machine remaining numbers are calculated when you enable one or more custom profiles from the policy. The overall virtual machine remaining is based on the most constrained profile.
Utilization	This widget is used to find out the trends in capacity used by a selected cluster as against the total capacity available. The key utilization indicators are: ■ CPU Capacity Usage ■ Memory Usage ■ Memory Balloon ■ Disk Total IOPS ■ Disk Total Throughput ■ Network Usage Rate
Performance	This widget displays the summary metrics about the overall performance of the object. It displays the latest value and a trend line of the various key performance indicators in a color that indicates its health based on the symptom associated with the metrics. Click each metric to see the expanded chart. The key performance indicators are: ■ Max VM Memory Contention ■ Worst Consumer Disk Latency ■ Consumers with Memory Contention ■ Consumers with CPU Ready ■ Physical Network Packets Dropped ■ Virtual Network Packets Dropped
Configuration	This widget displays the hardware, CPU, and Network configuration details of the host.
Namespaces	Lists the configuration status, current version and Kubernetes status of the namespaces in the cluster.

Namespace Summary Tab

A namespace sets the resource boundaries where vSphere Pods and Tanzu Kubernetes clusters created by using the Tanzu Kubernetes Grid Service can run. The Namespace summary tab provides an overview of the state of the selected Namespace.

Understanding the Namespace Summary Tab

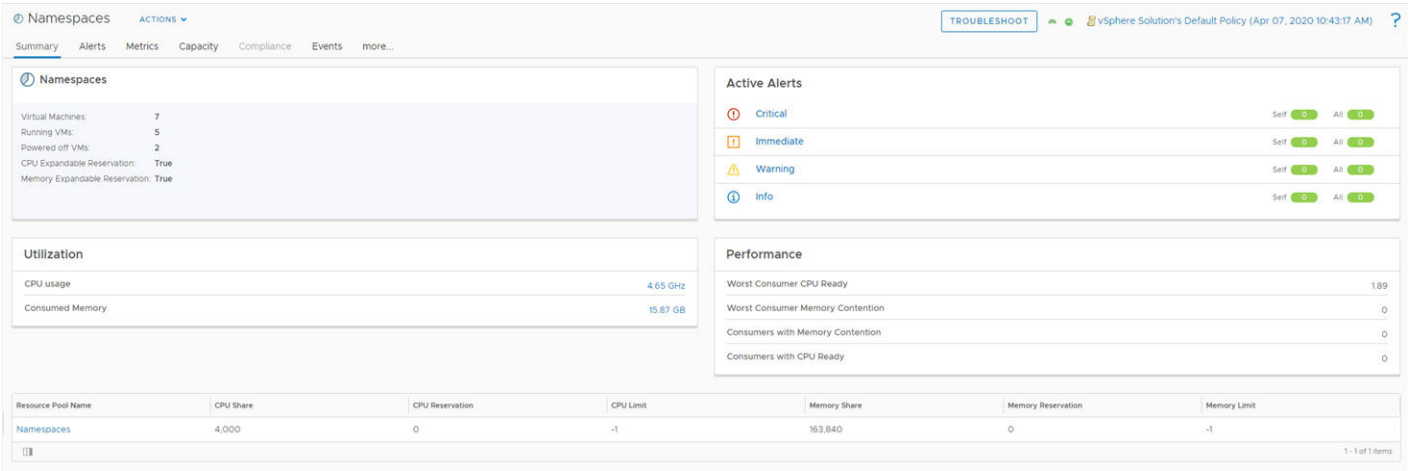


Table 1-8. Namespace Summary Tab Options

Option	Description
Troubleshoot	Start the Troubleshooting Workbench with the current object in context.
Object Summary	This widget displays the details of the selected object. The widget also displays the number of resources associated with the selected object.
Active Alerts	This widget provides a visual indicator of the alert status based on the alert type. To see the alerts for the object, click the badge .
Utilization	This widget is used to find out the trends in capacity used by a selected namespace as against the total capacity available. The key utilization indicators are: ■ CPU Usage ■ Consumed Memory

Table 1-8. Namespace Summary Tab Options (continued)

Option	Description
Performance	This widget displays the summary metrics about the overall performance of the object. It displays the latest value and a trend line of the various key performance indicators in a color that indicates its health based on the symptom associated with the metrics. Click each metric to see the expanded chart. The key performance indicators are: ■ Worst Consumer CPU Ready ■ Worst Consumer Memory Contention ■ Consumers with Memory Contention ■ Consumers with CPU Ready
Configuration	This widget displays the following configuration details about the Namespaces: ■ Configuration status ■ Virtual Machines ■ Number of Tanzu Kubernetes clusters ■ Pods

vSphere Pod Summary Tab

vSphere Pods run containers without needing to customize a Kubernetes cluster. You can deploy vSphere Pods directly on ESXi hosts It hosts a type of resource pool called Namespace. The vSphere Pod Summary tab provides an overview of the state of the vSphere Pods.

Understanding the vSphere Pod Summary Tab

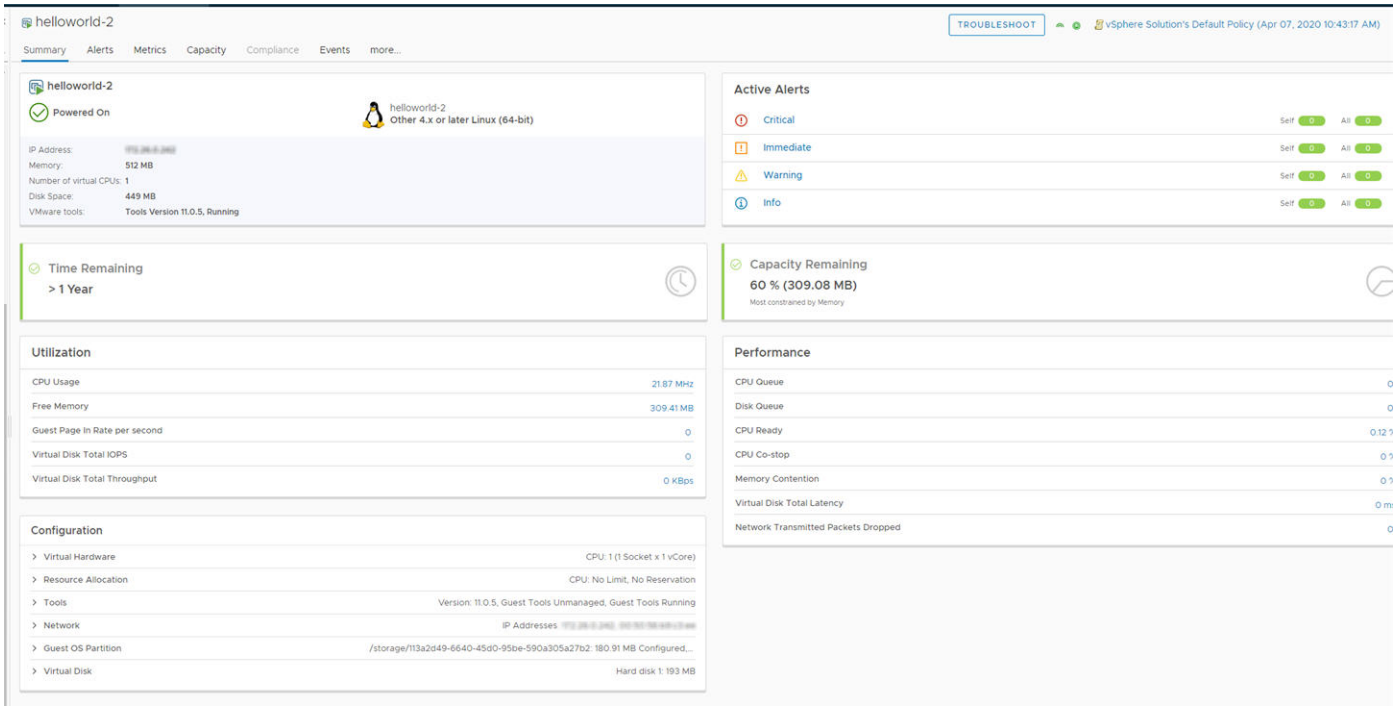


Table 1-9. vSphere Pod Tab Summary Options

Option	Description
Troubleshoot	Start the Troubleshooting Workbench with the current object in context.
Object Summary	This widget displays the details of the selected object. The widget also displays the number of resources associated with the selected object.
Active Alerts	This widget provides a visual indicator of the alert status for the following alert types. ■ Health alerts that usually require immediate attention. ■ Risk alerts indicating that you must look into any problems shortly. ■ Efficiency alerts indicating that you can reclaim resources. To see the alerts for the object, click the labels of the alert.
Time Remaining	This widget displays the number of days remaining until the projected resource utilization crosses the threshold for the usable capacity.
Capacity Remaining	This widget displays the unused capacity of your virtual environment to accommodate new virtual machines.
Utilization	This widget is used to find out the trends in capacity used by a selected vSphere Pod as against the total capacity available. The key utilization indicators are: ■ CPU Usage ■ Free Memory ■ Guest Page in Rate per second ■ Virtual Disk Total IOPS ■ Virtual Disk Total Throughput
Performance	This widget displays the summary metrics about the overall performance of the object. It displays the latest value and a trend line of the various key performance indicators in a color that indicates its health based on the symptom associated with the metrics. Click each metric to see the expanded chart. The key performance indicators are: ■ CPU Queue ■ Disk Queue ■ CPU Ready ■ CPU Co-stop ■ Memory Contention ■ Virtual Disk Total Latency ■ Network Transmitted Packets Dropped
Configuration	This widget displays the hardware, CPU, and Network configuration details of the host.

Tanzu Kubernetes cluster Summary Tab

The Tanzu Kubernetes cluster runs Kubernetes workloads natively on the hypervisor layer. The Tanzu Kubernetes cluster Summary tab provides an overview of the state of the Tanzu Kubernetes clusters.

Understanding the Tanzu Kubernetes cluster Summary Tab

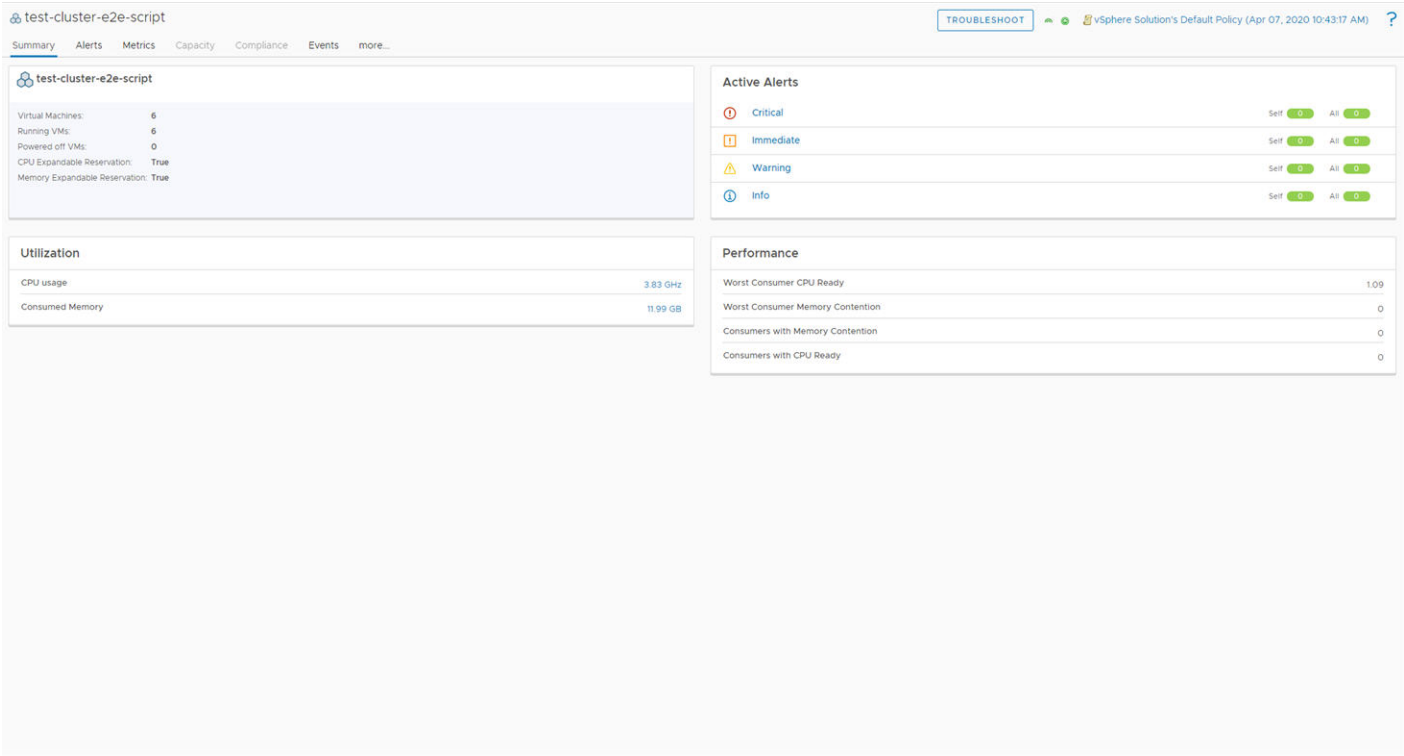


Table 1-10. Tanzu Kubernetes cluster Tab Summary Options

Option	Description
Troubleshoot	Start the Troubleshooting Workbench with the current object in context.
Object Summary	This widget displays the details of the selected object. The widget also displays the number of resources associated with the selected object.
Active Alerts	This widget provides a visual indicator of the alert status for the following alert types. ■ Health alerts that usually require immediate attention. ■ Risk alerts indicating that you must look into any problems shortly. ■ Efficiency alerts indicating that you can reclaim resources. To see the alerts for the object, click the badge .

Table 1-10. Tanzu Kubernetes cluster Tab Summary Options (continued)

Option	Description
Utilization	This widget is used to find out the trends in capacity used by a selected Tanzu Kubernetes cluster as against the total capacity available. The key utilization indicators are: ■ CPU Usage ■ Consumed Memory
Performance	This widget displays the summary metrics about the overall performance of the object. It displays the latest value and a trend line of the various key performance indicators in a color that indicates its health based on the symptom associated with the metrics. Click each metric to see the expanded chart. Key performance indicators are: ■ Worst Consumer CPU Ready ■ Worst Consumer Memory Contention ■ Consumers with Memory Contention ■ Consumers with CPU Ready

VMC Summary Tab

The VMC Summary tab provides organization details, overall SDDC inventory of the organization including key components, bill summary, and so on.

Where To View VMC Summary

On the menu, click **Administration > Cloud Accounts**. Click the vertical ellipses against the VMC Cloud Account and then select **Object Details**.

Table 1-11. VMC Summary Options

Option	Description
Troubleshoot	Start the Troubleshooting Workbench with the current object in context.
Object Summary	This widget displays the details of the selected object. The widget also displays the number of resources associated with the selected object.
Active Alerts	This widget provides a visual indicator of the alert status for the following alert types. ■ Health alerts that usually require immediate attention. ■ Risk alerts indicating that you must look into any problems shortly. ■ Efficiency alerts indicating that you can reclaim resources.
Consumer	Gives the number of active VMs for the selected object. You can also view the usage details for the virtual machine, CPU, and Memory.

Table 1-11. VMC Summary Options (continued)

Option	Description
Provider (Usable Capacity)	Gives the details of available resources for the selected object. You can view the number of hosts and capacity remaining for CPU, RAM, Storage.
Bill Summary	Displays the bill name, total expense, outstanding expense, commit expense, and demand expense.
Configuration Maximums	This widget is used to find out the VMC limits and your consumption against those limits. It displays details of ESXi maximums, Elastic IP Addresses, and SDDCs per organization.
Topology	Gives a graphical representation of objects related to VMC. Click on each object to have an expanded view of the object details.
SDDC Summary	Displays the SDDC name, cluster, ESXi host, virtual machine, and datastore details. Click the SDDC name to view SDDC Summary Tab.

SDDC Summary Tab

The SDDC Summary tab provides details on the overall SDDC inventory of the organization including key components, SDDC health, maximums, alerts, and so on.

Table 1-12. SDDC Summary Options

Option	Description
Troubleshoot	Start the Troubleshooting Workbench with the current object in context.
Object Summary	This widget displays the details of the selected object. The widget also displays the number of resources associated with the selected object.
Active Alerts	This widget provides a visual indicator of the alert status for the following alert types. ■ Health alerts that usually require immediate attention. ■ Risk alerts indicating that you must look into any problems shortly. ■ Efficiency alerts indicating that you can reclaim resources.
Consumer	Gives the number of active VMs for the selected object. You can also view the usage details for the virtual machine, CPU, and Memory.
Provider (Usable Capacity)	Gives the details of available resources for the selected object. You can view the number of hosts and capacity remaining for CPU, RAM, Storage.
Configuration Maximums	This widget is used to find out the SDDC limits and your consumption against those limits. It displays details of VPC, Cluster, ESXi, and Virtual Machine maximums.

Table 1-12. SDDC Summary Options (continued)

Option	Description
Topology	Gives a graphical representation of objects related to SDDC. Click on each object to have an expanded view of the object details.
Cluster Summary	This widget provides an overview of the state of the existing clusters. It displays the cluster name, ESXi host, virtual machine, capacity remaining, time remaining, and VM remaining.
Datastore Summary	This widget provides an overview of the state of the existing datastores. It displays the datastore name, capacity, virtual machine, capacity remaining, and time remaining.

vSAN Cluster Summary Tab

The vSAN Cluster tab provides an overview of the state of the selected vSAN cluster. For the selected object, the vSAN cluster tab displays the alerts, time remaining, capacity remaining, utilization, configuration, and metrics as they affect the health, risk, or efficiency. You can use this tab to evaluate the impact that alerts are having on the vSAN cluster and use that information to begin troubleshooting problems.

Where To View vSAN Cluster Summary Page

On the menu, click **Environment** > **VMware vSAN** > **vSAN Core Services and Hardware** > **vSAN Cluster**.

Table 1-13. vSAN Cluster Summary Tab Options

Option	Description
Troubleshoot	Start the Troubleshooting Workbench with the current object in context.
Object Summary	This widget displays the details of the selected object. The widget also displays the number of resources associated with the selected object.
Active Alerts	This widget provides a visual indicator of the alert status for the following alert types. ■ Health alerts that usually require immediate attention. ■ Risk alerts indicating that you must look into any problems shortly. ■ Efficiency alerts indicating that you can reclaim resources. To see the alerts for the object, click the labels of the alert.
Time Remaining	This widget displays the number of days remaining till the projected resource utilization crosses the threshold for the usable capacity.
Capacity Remaining	This widget displays the unused capacity of your virtual environment to accommodate new virtual machines.

Table 1-13. vSAN Cluster Summary Tab Options (continued)

Option	Description
Utilization	This widget is used to find out the trends in capacity used by a selected vSAN cluster as against the total capacity available.
Configuration	This widget displays the configuration details of the cluster.
Contention	This widget displays the memory contention details of the vSAN cluster.

vSAN Cluster Disk Group Summary Tab

The vSAN Cluster Disk Group Summary tab provides an overview of the state of the selected vSAN Disk Group. For the selected object, the vSAN Disk Group tab displays the alerts, time remaining, capacity remaining, utilization, configuration, and metrics as they affect the health, risk, or efficiency. You can use this tab to evaluate the impact that alerts are having on the vSAN Disk Group and use that information to begin troubleshooting problems.

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**.

Table 1-14. vSAN Cluster Disk Group Summary Options

Option	Description
Troubleshoot	Start the Troubleshooting Workbench with the current object in context.
Object Summary	This widget displays the details of the selected object. The widget also displays the number of resources associated with the selected object.
Active Alerts	This widget provides a visual indicator of the alert status for the following alert types. ■ Health alerts that usually require immediate attention. ■ Risk alerts indicating that you must look into any problems shortly. ■ Efficiency alerts indicating that you can reclaim resources. To see the alerts for the object, click the labels of the alert.
Time Remaining	This widget displays the number of days remaining till the projected resource utilization crosses the threshold for the usable capacity.
Capacity Remaining	This widget displays the unused capacity of your virtual environment to accommodate new virtual machines.
Utilization	This widget is used to find out the trends in capacity used by a selected vSAN cluster disk group as against the total capacity available.

Table 1-14. vSAN Cluster Disk Group Summary Options (continued)

Option	Description
Contention	This widget displays the memory contention details of the vSAN cluster.
Resync	This widget displays the throughput and latency details for the vSAN cluster disk group.

vSAN Capacity Disk Summary Tab

The vSAN Capacity Disk tab provides an overview of the state of the selected vSAN capacity disk. For the selected object, the vSAN capacity disk tab displays the alerts, time remaining, capacity remaining, utilization, configuration, and metrics as they affect the health, risk, or efficiency. You can use this tab to evaluate the impact that alerts are having on the vSAN capacity disk and use that information to begin troubleshooting problems.

Table 1-15. vSAN Capacity Disk Summary Tab Options

Option	Description
Troubleshoot	Start the Troubleshooting Workbench with the current object in context.
Object Summary	This widget displays the details of the selected object. The widget also displays the number of resources associated with the selected object.
Active Alerts	This widget provides a visual indicator of the alert status for the following alert types. ■ Health alerts that usually require immediate attention. ■ Risk alerts indicating that you must look into any problems shortly. ■ Efficiency alerts indicating that you can reclaim resources. To see the alerts for the object, click the labels of the alert.
Time Remaining	This widget displays the number of days remaining till the projected resource utilization crosses the threshold for the usable capacity.
Capacity Remaining	This widget displays the unused capacity of your virtual environment to accommodate new virtual machines.
Utilization	This widget is used to find out the trends in capacity used by a selected capacity disk as against the total capacity available.
Contention	This widget displays the memory contention details for the selected capacity disk.

vSAN Cache Disk Summary Tab

The vSAN Cache Disk tab provides an overview of the state of the selected vSAN cache disk. For the selected object, the vSAN cache disk tab displays the alerts, time remaining, capacity remaining, utilization, configuration, and metrics as they affect the health, risk, or efficiency. You

can use this tab to evaluate the impact that alerts are having on the vSAN cache disk and use that information to begin troubleshooting problems.

Table 1-16. vSAN Cache Disk Summary Tab Options

Option	Description
Troubleshoot	Start the Troubleshooting Workbench with the current object in context.
Object Summary	This widget displays the details of the selected object. The widget also displays the number of resources associated with the selected object.
Active Alerts	This widget provides a visual indicator of the alert status for the following alert types. ■ Health alerts that usually require immediate attention. ■ Risk alerts indicating that you must look into any problems shortly. ■ Efficiency alerts indicating that you can reclaim resources. To see the alerts for the object, click the labels of the alert.
Time Remaining	This widget displays the number of days remaining till the projected resource utilization crosses the threshold for the usable capacity.
Capacity Remaining	This widget displays the unused capacity of your virtual environment to accommodate new virtual machines.
Utilization	This widget is used to find out the trends in capacity used by a selected vSAN cache disk as against the total capacity available.
Contention	This widget displays the memory contention details for the selected cache disk.

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.

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 Working with PowerOff section in *vRealize Operations Manager Configuration Guide.* .
- 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.

Alerts Tab

The Alerts tab is a list of all the alerts generated for the selected object, group, or application. Use the alerts list to evaluate the number of generated alerts for the object so that you can begin resolving them.

How the Alerts Tab Works

All the active alerts for the selected object appear in the list. By default, the system groups the alerts by Time. You can select multiple rows in the list using Shift+click, Control+click. Modify the filter if you want to see inactive alerts.

Manage the alerts in the list using the toolbar options. Click the **alert name** to see the alert details for the affected object. The alert details appear on the right, including the symptoms triggered with the alert. The system offers recommendations for addressing the alert and links to additional information. A **Run Action** button might appear in the details. Point to the button to learn what recommendation is performed if you click the button. To return to the list view, click the **X** at the top right of the alert details.

To see the object details, click the **Summary** Tab.

Where You Find the Alerts Tab

- In the menu, click **Environment**, then select a group, custom data center, application, or inventory object. Click the **object** to display the object's **Summary** tab. Click the **Alerts > Alerts** tabs.
- In the menu, select **Search** and locate the object of interest. Click the **object** to display the object's **Summary** tab. Click the **Alerts > Alerts** tabs.

Alerts Tab Options

The alert options include toolbar and data grid options. Use the toolbar options to sort the alert list and to cancel, suspend, or manage ownership. Additional toolbar options enable you to review parent and child alerts related to the alert you are reviewing. Use the data grid to view the alerts and alert details.

Table 1-17. Actions Menu

Option	Description
Actions menu	Select an alert from the list to turn on the Actions menu, then select an option from the menu.
Menu Options:	
Cancel Alert	Cancels the selected alerts. If you configure the alert list to display only active alerts, the canceled alert is removed from the list. You cancel alerts when you do not need to address them. Canceling the alert does not cancel the underlying condition that generated the alert. Canceling alerts is effective if the alert is generated by triggered fault and event symptoms because these symptoms are triggered again only when subsequent faults or events occur on the monitored objects. If the alert is generated based on metric or property symptoms, the alert is canceled only until the next collection and analysis cycle. If the violating values are still present, the alert is generated again.
Delete Canceled Alerts	Delete canceled (inactive) alerts by making a group selection or by individually selecting alerts. You cannot delete active alerts.
Suspend	Suspend an alert for a specified number of minutes. You suspend alerts when you are investigating an alert and do not want the alert to affect the health, risk, or efficiency of the object while you are working. If the problem persists after the elapsed time, the alert is reactivated and it will again affect the health, risk, or efficiency of the object. The user who suspends the alert becomes the assigned owner.
Take Ownership	As the current user, you make yourself the owner of the alert. You can only take ownership of an alert, you cannot assign ownership.
Release Ownership	Alert is released from all ownership.
Go to Alert Definition	Switches to the Alert Definitions page, with the definition for the previously selected alert displayed.
Disable...	Offers two options for disabling the alert: Disable the alert in all policies: this disables the alert for all objects for all the policies. Disable Alert in Selected Policies: this disables the alert for objects having the selected policy. This method works only for objects with alerts.
Open an external application	Actions you can run on the selected object. For example, Open Virtual Machine in vSphere Client.

Table 1-18. View from Menu

Options	Description
Self	The selected object.
Parents <options>	Displays the alerts for the ancestors of the selected object. Parents in this instance include the parents, grandparents, and so on, of the object. For example, the parents of a host are a folder, storage pod, cluster, data center, and vCenter Server instance.
Children <options>	Displays the alerts for the descendants of the selected object. Children in this instance include the children and grandchildren of the object. For example, the descendants of a host are datastores, resources pools, and virtual machines.

Table 1-19. Group by Options

Option	Description
None	Alerts are not sorted into specific groupings.
Time	Group alerts by time triggered. The default.
Criticality	Group alerts by criticality. Values are, from the least critical: Info/Warning/Immediate/Critical. See also Criticality in the "All Alerts Data Grid Options" table, below.
Definition	Group alerts by definition, that is, group like alerts together.
Object Type	Group alerts by the type of object that triggered the alert. For example, group alerts on hosts together.

Table 1-20. Alerts Data Grid

Option	Description
Criticality	Criticality is the level of importance of the alert in your environment. The alert criticality appears in a tooltip when you hover the mouse over the criticality icon. The level is based on the level assigned when the alert definition was created, or on the highest symptom criticality, if the assigned level was **Symptom Based**.
Alert	Name of the alert definition that generated the alert. Click the alert name to view the alert details tabs where you can begin troubleshooting the alert.
Created On	Date and time when the alert was generated.

Table 1-20. Alerts Data Grid (continued)

Option	Description
Status	Current state of the alert. Possible values include Active or Canceled.
Alert Type	Describes the type of alert that triggered on the selected object, and helps you categorize the alerts so that you can assign certain types of alerts to specific system administrators. For example, Application, Virtualization/ Hypervisor, Hardware, Storage, Network, Administrative, and Findings.
Alert Subtype	Describes additional information about the type of alert that triggered on the selected object, and helps you categorize the alerts to a more detailed level than Alert Type, so that you can assign certain types of alerts to specific system administrators. For example, Availability, Performance, Capacity, Compliance, and Configuration.

Table 1-21. All Filters

All Filters	Descriptions
Filtering options	Limit the list of alerts to those matching the filters you select. For example, you might have chosen the Time option in the Group By menu. Now you can select Status -> Active in the all Filters menu, and the All Alerts page displays only the active alerts, ordered by the time they were triggered.
Selected Options (see also the Group By and Alerts Data Grid tables for more filter definitions:)	
Owner	Name of operator who owns the alert.
Impact	Alert badge affected by the alert. The affected badge, health, risk, or efficiency, indicates the level of urgency for the identified problem.
Triggered On	Name of the object for which the alert was generated, and the object type, which appears in a tooltip when you hover the mouse over the object name. Click the object name to view the object details tabs where you can begin to investigate any additional problems with the object.

Table 1-21. All Filters (continued)

All Filters	Descriptions
Control State	State of user interaction with the alert. Possible values include: ■ Open. The alert is available for action and has not been assigned to a user. ■ Assigned. The alert is assigned to the user who is logged in when that user clicks **Take Ownership**. ■ Suspended. The alert was suspended for a specified amount of time. The alert is temporarily excluded from affecting the health, risk, and efficiency of the object. This state is useful when a system administrator is working on a problem and does not want the alert to affect the health status of the object.
Object Type	Type of object on which the alert was generated.
Updated On	Date and time when the alert was last modified. An alert is updated whenever one of the following changes occurs: ■ Another symptom in the alert definition is triggered. ■ Triggering symptom that contributed to the alert is canceled.
Canceled On	Date and time when the alert canceled for one of the following reasons: ■ Symptoms that triggered the alert are no longer active. Alert is canceled by the system. ■ Symptoms that triggered the alert are canceled because the corresponding symptom definitions are disabled in the policy that is applied to the object. ■ Symptoms that triggered the alert are canceled because the corresponding symptom definitions were deleted. ■ Alert definition for this alert is disabled in the policy that is applied to the object. ■ Alert definition is deleted. ■ User canceled the alert.

Table 1-22. Alert Details Tab

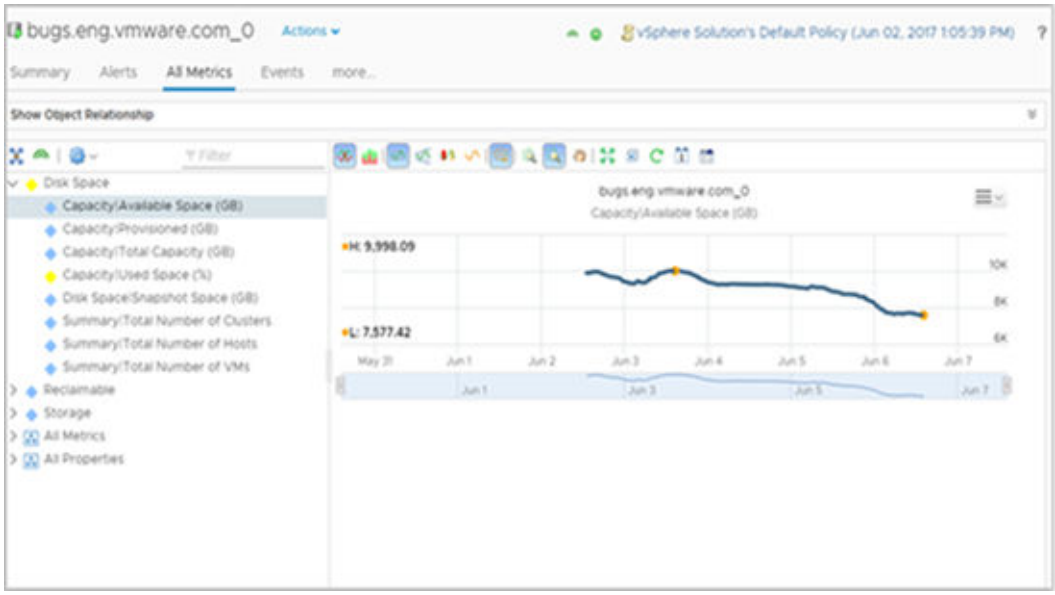
Section	Description
Recommendations	View recommendations for the alert. To resolve the alert, click the **Run Action** button if it appears.
Other Recommendations	Collapse the section to view additional recommendations. See the links in the **Need More Information?** section to view additional metrics, events, or other details that appear as a link.
Symptoms	View the symptoms that triggered the alert. Collapse each symptom to view additional information.

Table 1-22. Alert Details Tab (continued)

Section	Description
Alert Information	View information such as the start time, update time, and status of the alert.
Close	Click the X icon to close the alert details tab.

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.

Note The yellow diamond icon next to the metric indicates dynamic threshold breach, the blue diamond icon next to the metric indicates the metric value is within threshold.

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.

Troubleshooting with the All Metrics Tab

The **All Metrics** tab provides a relationship graph and metric charts. The relationship graph helps you evaluate objects in the context of their place in your environment topology. Metric charts are based on the metrics for the active map object that you think can help you identify the cause of a problem.

How All Metrics Works

You can double-click any object in the graph and view the specific parent-child objects for the focus object. If you point to an object icon, you can see the health, risk, and efficiency details. You can also click the **Alerts** link for the number of generated alerts. Click the purple icon to view the child relationships of the object. If you double-click an object icon, the selected object becomes the focus of the map. The graph is updated for the selected object, and the metrics list shows only the metrics for the selected object.

Using the metrics list, you create charts based on metrics that you think can help you investigate problems. You customize the charts to evaluate the data in detail. To save the configured charts, you create a dashboard using the toolbar option.

Where available, the metrics list also displays pre-defined groups of metrics that contain the most relevant metrics for the selected object. You can edit these groups, and create your own customized groups of metrics by dragging and dropping metrics and properties from the All Metrics and All Properties lists.

Where You Find All Metrics

- 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 locate the objects that you want.

All Metrics Options

The options include the graph toolbar, the metric selector options, the metric charts toolbar, and the toolbar on each chart.

Table 1-23. Relationship Map

Option	Description
Reset to initial object	Returns the map to original object if you double-clicked on an icon to examine another object.
Vertical/Horizontal	Displays a vertical or horizontal view of the graph or tree view.
Hide Text/Show Text	Hides or displays the object names.
Standard View/Fit View	The **Standard View** option fixes the view to a specific zoom level. The **Fit View** option adjusts the graph or tree view to fit the screen.

Table 1-23. Relationship Map (continued)

Option	Description
Group Items/Ungroup Items	Groups by objects types. You can view further details by double-clicking on the object. You can also choose to display the graph or tree view without grouping the object types.
Path Exploration	Displays the relative relationship path between two selected objects on the graph or tree view. To highlight the path, click the Path Exploration icon and then select the two objects from the graph or tree view.

The chart options are used to limit the metric list.

Table 1-24. Metric Chart Selector

Option	Description
Show collecting metrics	Updates the list to display only the currently collected metrics for the object.
Show previewable super metrics	Updates the list to display super metrics for the object. **Note** The super metrics only appear if the super metric is associated with the object, see Create a Super Metric topic in *vRealize Operations Manager Configuration Guide.* .
Actions	Click the **Actions** icon to configure metric groups. Verify that you hold the PowerUser or administrator role. ■ **Add Group**. To add metrics or properties to the group, expand any of the metric groups, and drag one or more metrics to the group. ■ **Remove Group(s)**. To remove one or more groups. ■ **Rename Group**. To enter a new name for the group. ■ **Remove Metric(s) from Group(s)**. To remove one or more metrics or properties from one or more groups, hold down the Ctrl key, and select the metrics or properties that you want to remove.
Search	Use a word search to limit the number of items that appear in the list.
Time Range	Filters the metrics to show only the ones that have received data in the selected time range.
Metric list	Double-click a metric to populate the chart window. To populate the chart window with a separate chart for each of the metrics in the group, double-click a metric group.

To visualize the specific metric data over time, and compare the results for different metrics, select different combinations of options.

Table 1-25. Metric Chart Toolbar

Option	Description
Split Charts	Displays each metric in a separate chart.
Stacked Chart	Consolidates all charts into one chart. This chart is useful for seeing how the total or sum of the metric values vary over time. To view the stacked chart, ensure that the split chart option is turned off.
Y Axis	Shows or hides the Y-axis scale.
Metric Chart	Shows or hides the line that connects the data points on the chart.
Trend Line	Shows or hides the line and data points that represents the metric trend. The trend line filters out metric noise along the timeline by plotting each data point relative to the average of its adjoining data points.
Dynamic Thresholds	Shows or hides the calculated dynamic threshold values for a 24-hour period.
Show Entire Period Dynamic Thresholds	Shows or hides dynamic thresholds for the entire time period of the graph.
Anomalies	Shows or hides anomalies. Time periods when the metric violates a threshold are shaded. Anomalies are generated when a metric crosses a dynamic or static threshold, either above or below.
Show Data Point Tips	Shows or hides the data point tooltips when you hover the mouse over a data point in the chart.
Zoom All Charts	Resizes all the charts that are open in the chart pane based on the area captured when you use the range selector. You can switch between this option and **Zoom the View**.
Zoom the View	Resizes the current chart when you use the range selector.
Pan	When you are in zoom mode, allows you to drag the enlarged section of the chart so that you can view higher or lower, earlier or later values for the metric.
Show Data Values	Enables the data point tooltips if you switched to a zoom or pan option. **Show Data Point Tips** must be enabled.
Refresh Charts	Reloads the charts with current data.
Date Controls	Opens the date selector. Use the date selector to limit the data that appears in each chart to the time period you are examining.

Table 1-25. Metric Chart Toolbar (continued)

Option	Description
Generate Dashboard	Saves the current charts as a dashboard.
Remove All	Removes all the charts from the chart pane, allowing to you begin constructing a new set of charts.

Manage individual charts with the toolbar options.

Table 1-26. Individual Metric Charts Toolbar

Option	Description
Navigation	If an adapter includes the ability to link to another application for information about the object, click the button to access a link to the application.
Correlation	Runs metric correlation using the following options: **Self-Metrics**: Runs metric correlation on all metrics for the selected object, to find metrics of similar, or opposite behavioral change for the same time period. The instanced metrics are not assessed in the self-metrics correlation method. **Peers**: Runs metric correlation on the same metrics for all peer objects, to find the same metrics with behavioral changes within peer objects. Peer objects are the direct child objects of the parent for the selected objects. The child objects have the same object type. **Note** The correlation results only appears if there are at least 11 data points and the time range is within the three months period to run the metric correlation. **Scope**: Runs metric correlation on all metrics for the selected object with the selected scope, to find metrics of similar, or opposite behavioral change for the same time period. The instanced metrics are not assessed in the scope correlation method. After you run the correlation, the results are displayed in the **Correlation** window. By default, only the first 10 results for correlated metrics are displayed. To view the full list, click **Show More**. You can zoom in to view the correlated metrics and also pin them so that they appear in the preview section of the **All Metrics** tab. **Note** During the correlation process, some metrics are left out. For example, the badge and vRealize Operations Manager generated metrics. By default, the instanced metrics are omitted, except those in the **Aggregate of all instances** group.

Table 1-26. Individual Metric Charts Toolbar (continued)

Option	Description
Save a Snapshot	Creates a PNG file of the current chart. The image is the size that appears on your screen. You can retrieve the file in your browser's download folder.
Save a Full Screen Snapshot	Downloads the current graph image as a full-page PNG file, which you can display or save. You can retrieve the file in your browser's download folder.
Create an Alert Definition	Allows you to create an alert for an object type or metric in a quick and easier way. For details, see Create a Simple Alert Definition section in *vRealize Operations Manager Configuration Guide.* .
Download comma-separated data	Creates a CSV file that includes the data in the current chart. You can retrieve the file in your browser's download folder.
Scales	You can choose a scale for a stacked chart. ■ Select **Linear** to view a chart in which the Y-axis scale increases in a linear manner. For example, the Y-axis can have ranges from 0 to 100, 100 to 200, 200 to 300, and so on. ■ Select **Logarithmic** to view a chart in which the Y-axisaxis scale increases in a logarithmic manner. For example, the Y axis can have ranges from 10 to 20, 20 to 300, 300 to 4000, and so on. This scale gives a better visibility of minimum and maximum values in the chart when you have a large range of metric values. **Note** If you select a logarithmic scale, the chart does not display data points for metric values less than or equal to 0, which leads to gaps in the graph. ■ Select **Combined** to view overlapping graphs for the metrics. The chart uses individual scales for each graph instead of using a relative scale, and displays a combined view of the graphs. ■ Select **Combined by Unit** to view a chart that groups the graphs for similar metric units together. The chart uses a common scale for the combined graphs.
Move Down	Moves the chart down one position.
Move Up	Moves the chart up one position.
Close	Deletes the chart.
Vertical resize	Resizes the height of a graph in the chart.
Remove icon next to each metric name in a stacked chart	Removes the graph for the metric from the chart.

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.

Capacity Tab

The **Capacity** tab provides Time Remaining and Capacity Remaining data for the selected object. Virtual Machine Remaining data is available for Clusters, Data centers, CDC, and VC based on the average profile, or when you enable one or more custom profiles in the policy.

Where You Find the Capacity Tab

- In the menu, click **Environment**, then select a group, custom data center, application, or inventory object. The Object details screen appears. Click the **Capacity** tab.
- In the menu, select **Alerts** to display the **All Alerts** screen. Click an **alert** to show the alert details on the right, then click **View Additional Metrics** to see more information about the alert and the object that triggered the alert. Click the **Capacity** tab.

Understanding the Capacity Tab

For the selected object, the **Capacity** tab lists two panes with the Time Remaining and Capacity information. These panes display the value of the resources remaining till they run out.

Below the **Time Remaining** and **Capacity** panes, the time and capacity utilization metric for CPU, memory, and disk space are displayed in three panes. By default, the most constrained resource is selected. Click **CPU**, **Memory**, or **Disk Space** to change the views to these resources. These panes display the resource information based on the Demand model (default) or Allocation model (if configured).

Time Remaining Pane

When you select the **Time Remaining** pane and click one of the resource types, the utilization graph displays the historical value of the utilization metric and its forecast plotted against time, projecting how swiftly resource utilization is approaching the usable capacity.

Capacity Pane

The **Capacity Remaining** pane indicates the unused capacity of your virtual environment to accommodate new virtual machines. vRealize Operations Manager calculates the Capacity Remaining as a percentage of the remaining capacity, compared to the total. Capacity Remaining is calculated as the utilization metric forecast 3 days from now subtracted from the Usable Capacity. vRealize Operations Manager calculates the average profile and always computes the virtual machine remaining number based on the average profile. You can

change the profile by clicking the + icon above the bar chart. vRealize Operations Manager calculates virtual machine remaining numbers when you enable one or more custom profiles from the policy. The overall virtual machine remaining is based on the most constrained profile.

When you select Capacity and click one of the resource types, a bar chart and a table of values based on the Demand and Allocation model (if configured) appears. The bar chart displays total usable resource, the percentage used, the percentage allocated for high availability and buffer, and the percentage remaining based on the Demand and Allocation models (if configured).

The table displays the following information for each resource type:

- **Total**: The total usable capacity for each resource type based on the Demand model or Allocation model (if configured). The difference in Total capacity and Usable capacity is set in the HA (admission control) that is set in the clusters in vSphere.
- **Usable**: The total usable capacity for each resource type based on the Demand model or Allocation model (if configured).
- **Used**: Approximate value how much utilization do you have now. Shows the forecast value of utilization metric in 3 days from now. If Capacity Remaining is greater than zero, then Used = Usable - Capacity Remaining.
- **Recommended Size**:The Total Capacity that must be available for a green level of Time Remaining. The slider in the policy controls the Time Remaining green zone, and the default value is 150 days.
- **Remaining**: The Capacity Remaining metric value and also the percentage. The value of Capacity Remaining metric is calculated by forecasting the utilization metric 3 days from now and subtracting it from Usable capacity.
- **Buffer**: The percentage of the capacity buffer based on the buffer value that you set in the policy. The Capacity Buffer element determines how much extra headroom you have and ensures that you have extra space for growth inside the cluster when required.
- **High Availbility**: The percentage of the high avaibility based on the high availability buffer.

The **Capacity** tab is a subset of the Capacity optimization capability. For additional details, refer to Capacity Overview.

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.

Symptoms Tab

The symptoms tab includes all the symptoms triggered for the current object. Use the symptom list to identify problems with an object so that you can resolve alerts generated for the object.

How the Symptoms Work

The list is the active triggered symptoms for an object, either as part of a generated alert or as a triggered symptom that is not included in an alert. This complete symptom list is useful for identifying problems that occur on an object but are not currently included in your alert definitions.

Click a symptom in the list to display the symptom details. An arrow in each column heading enables you to order the list in ascending or descending order. You can select multiple rows in the list using Shift+click, Control+click.

Where You Find the Symptoms Tab

- In the menu, select **Environment**, then select a group, application, or inventory object. Click the **object** to display the object's **Summary** tab. Click the **Alerts > Symptoms** tabs.
- In the menu, select **Search** and locate the object of interest. Click the **object** to display the object's **Summary** tab. Click the **Alerts > Symptoms** tabs.

Table 1-27. Symptoms Data Grid

Option	Description
Criticality	Criticality is the level of importance of a symptom in your environment. The level is based on the same level assigned when the symptom was created. The possible values include: ■ Critical ■ Immediate ■ Warning ■ Information
Symptom	Name of the triggered symptom.
Status	Current state of the symptom. Possible values are Active or Inactive.
Created On	Date and time when the alert was generated.

Table 1-27. Symptoms Data Grid (continued)

Option	Description
Canceled On	Date and time when the symptom was canceled.
Information	Information about the triggering condition for the symptom, including the trend and current value. The sparkline displays a range of data that includes six hours before the symptom update time and one hour after the update time.

Table 1-28. Filters

Filtering options	Limits the list of symptoms to those matching the filter you select. Some filters are similar to data grid headings: Symptom, Status, Criticality, Created on, Canceled on.
Triggered On	Name of the object for which the symptom was generated. Click the object name to view the object details tabs where you can begin to investigate any additional problems with the object.

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 Timeline Tab

The generated alerts, triggered symptoms, and change events for the current object over time appear on the **Timeline** tab. You use the timeline to identify common trends over time that are contributing to the status of objects in your environment.

How the Events Timeline Works

The timeline view includes alerts, symptoms, and events for the selected object for the last 6 hours. To view the data for a particular time, click the timeline in one of the three tiers. Then move your mouse to the left to see data from the past or to the right to move back to the present.

The view is limited to approximately 50 alerts, symptoms, and events. If your timeline includes more than this number, you can use the toolbar options to remove data from the timeline until it contains data that you find useful for your investigation.

Where You Find the Events Timeline

- In the menu, click **Environment**, then select a group, custom data center, application, or inventory object. Click the **object** to display the object's **Summary** tab. Click the **Events > Timeline** tabs.
- In the menu, select **Search** and locate the object of interest. Click the **object** to display the object's **Summary** tab. Click the **Events > Timeline** tabs.

Table 1-29. View From Menu

Option	Description
Self	Shows or hides events for the current object.
Peer	Shows or hides events for objects like the impacted object.
Parents <options>	Shows or hides events for the parent, grandparent, and so on, objects of the current object.
Children <options>	Shows or hides the events for the descendants of the impacted object.

Table 1-30. Alert Filters

Option	Description
Criticality <options>	Limits the alerts to those matching the selected criticality level. If no criticality is selected, all alerts are displayed.
Status <options>	Limits the alerts in the chart to the canceled or active alerts. If no status is selected, all alerts are displayed. This option applies only to alerts, not to fault and change events. Change events and active faults are always displayed in the chart.
Alert Type <options>	Select one or more alert types. The types are assigned when the alert is defined. If no type is selected, all alerts are displayed.

Table 1-31. Event Filters

Option	Description
Dynamic Threshold Violation	vRealize Operations Manager calculates dynamic thresholds for each metric that is collected for an object based on policies set.
Hard Threshold Violation	Events that represent a hard threshold violation, based on policies set. The system analyses the number of metrics that are violating their hard thresholds to determine trends.
Data Availability	Events reflecting datastore performance. Data availability is the capacity to provide data on demand to users and applications.
System Degradation	Events that reflect negative impacts on system performance.
Environment	Events indicating a change in the environment.
Change	Shows or hides the change events. Change events are changes to the object that might or might not result in an alert.
Notification	Routine notification events.
Fault	Events indicating any observed behavior that differs from the expected one.

Table 1-32. Date Controls, Data Values, Events Chart

Option	Description
Date Controls	Limits the data in the chart to the selected time frame.
Data Values	When you click a data point, the event is highlighted in the event data grid.
Events chart	Shows the events and alerts over time by criticality, and other data options you select in the toolbar.

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.

Events Tab

An event is any change to an object defined by a change in the metrics for that object. You can compare changes to an object with symptoms and other data to identify a possible cause for a generated alert.

How the Events Tab Works

If you arrive at the Events tab from the Alerts page or tab, the Events tab opens with the timeline centered on the moment the alert occurred for the selected object.

You can configure the chart to display various combinations of data, allowing you to identify events that contribute to the alert you are investigating. Use the range selectors to shift the larger time frame in the timeline, then click and drag on the graph area to zoom in on a specific period. Click the data points on the graph to see pop-up descriptions of the various events.

Click the **Actions** menu to open an external application, for example, vSphere Client.

Where You Find the Events Tab

- In the menu, click **Environment**, then select a group, custom data center, application, or inventory object. Click the **object** to display the object's **Summary** tab. Click the **Events > Events** tabs.
- In the menu, select **Search** and locate the object of interest. Click the **object** to display the object's **Summary** tab. Click the **Events > Events** tabs.
- In the menu, click **Alerts**, then click an **alert** of interest to display the alert details on the right. Click **View events**. The object that triggered the alert is displayed with associated events.

Table 1-33. View From

Option	Description
Self	Shows or hides events for the current object.
Peer	Shows or hides events for objects like the impacted object.

Table 1-33. View From (continued)

Option	Description
Parents <options>	Shows or hides events for the parent, grandparent, and so on, objects of the current object.
Children <options>	Shows or hides the events for the descendants of the impacted object.

Table 1-34. Alert Filters

Option	Description
Criticality <options>	Limits the alerts to those matching the selected criticality level. If no criticality is selected, all alerts are displayed.
Status <options>	Limits the alerts in the chart to the canceled or active alerts. If no status is selected, all alerts are displayed. This option applies only to alerts, not to fault and change events. Change events and active faults are always displayed in the chart.
Alert Type <options>	Select one or more alert types. The types are assigned when the alert is defined. If no type is selected, all alerts are displayed.

Table 1-35. Event Filters

Option	Description
Dynamic Threshold Violation	vRealize Operations Manager calculates dynamic thresholds for each metric that is collected for an object based on policies set.
Hard Threshold Violation	Events that represent a hard threshold violation, based on policies set. The system analyses the number of metrics that are violating their hard thresholds to determine trends.
Data Availability	Events reflecting datastore performance. Data availability is the capacity to provide data on demand to users and applications.
System Degradation	Events that reflect negative impacts on system performance.
Environment	Events indicating a change in the environment.
Change	Shows or hides the change events. Change events are changes to the object that might or might not result in an alert.
Notification	Routine notification events.
Fault	Events indicating any observed behavior that differs from the expected one.

Table 1-36. Date Controls, Events Chart, Events Data Grid

Option	Description
Date Controls	Limits the data in the chart to the selected time frame.
Events chart	Shows the events and alerts over time by criticality, and other data options you select in the toolbar.
Events data grid	Shows a list of events when you select at least one of the following display options: ■ Self ■ Parent ■ Child ■ Peer

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.

Details Views Tab

The **Views** tab is divided into two panels. The bottom panel updates, depending on what you select on the top panel.

In the top panel you can create, edit, delete, clone, export, and import views. The views list depends on the object you select from the environment. Each view is associated with an object. For example, the predefined VM inventory - Memory list view is available when you select a host.

You can limit the views list by adding a filter from the right side of the panel. Each of the provided filter groups limits the list by the word you type. For example, if you select **Description** and type **`my view`**, the listed views are all views that are applicable for the selected object and contain *my view* in the description.

Table 1-37. Views List Table Columns

Column	Description
Name	Name of the view.
Type	Type of the view. A view type is the way the collected information for the object is presented.
Description	Description of the view as it is defined when the view is created.
Subject	Object type with which a view is associated.
Owner	Owner of the view is the user, who created it or edited it for the last time.

In the bottom panel of the **Views** tab, you can see the data of the object, calculated by a selected view from the top panel. Say, for example, the selected object is a host and you select Virtual Machine Configuration Summary List View. The result is a list of all the virtual machines on that host, and their data calculated by the view.

For Trend views, you can select a parent object and see the data of the associated child objects and metrics in the bottom panel of the **Views** tab.

For Distribution views, you can click on a section of the pie chart or on one of the bars in the bar chart to view the list of objects filtered by the selected segment, in the bottom panel of the **Views** tab.

Where You Find the Details View Tab

- In the menu, click **Environment**, then select a group, custom data center, application, or inventory object. Click the **Details** tab, then select the **Views** button.
- Alternatively, click **Environment**, then use the hierarchies in the left pane to locate quickly the object you want.

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
Instance	Track all instances of a metric for an object with a separate rectangle for each metric.
General	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.

Workload Tab

Workload metrics measure an object's demand for resources versus the actual capacity that the object can access. Use Workload values as an investigative tool when you are researching capacity constraints or evaluating the general state of objects in your environment.

Object Workload

The Workload tab present data about a single object as follows:

- The Business Week Workload - this measure reflects the system's calculation of how much capacity an object demands over a time period. The analysis compares an object's overall average workload against its capacity for a six-week period, hour by hour. Results are color-coded to show different demand levels. See the color key that follows these descriptions.
- Workload Breakdown - Data is given for the individual resources of the workload, for example, CPU and memory. The values are recalculated every five minutes.

Custom Group Workload

The Workload tab presents information for a custom group, for example vSphere World, differently from how it presents object data:

- Current Workload Breakdown - the system presents workload constraints in several formats: pie chart, badges, bar chart, and grid. See the color key that follows these descriptions.

  Table 1-38. Custom Workload Breakdown

Format	Content
Pie Chart	Each slice of the pie represents the percentage of total workload being occupied by objects in a given state: normal, warning, critical, and so on. Point to a slice to make the percentage appear as a tool tip.
Badges	Each colored badge represents a state and includes the number of objects in a given state, for example, immediate (attention needed). You can toggle the data between the number of objects in a given state and the percentage of objects in a given state. A caption notes the total number of objects in the group.
Bar chart	A visual presentation of the percentage of all objects experiencing workload issues during that past four weeks.
Grid	All objects in the group are listed by name, object type, current level of criticality, and general issue description. You can click any object name to view the details for that object, including its Object Workload details.

Object State Color Key

Table 1-39. Object Workload States

Badge Color	Description	User Action
	Workload on the object is not excessive.	No attention required.
	Object is experiencing some high-resource workloads.	Check and take appropriate action.
	Workload on the object is approaching its capacity in at least one area.	Check and take appropriate action as soon as possible.
	Workload on the object is at or over its capacity in one or more areas.	Act immediately to avoid or correct problems.
	No data is available.	
	Object is offline.	

Here is a list of metrics by which the data in the Workload Tab is represented, for all interested object types.

Table 1-40. vCenter Server

Data	Metric Name
CPU-Capacity	CPU|Total Capacity
CPU-Demand	CPU|Demand Without Overhead
CPU-Usage	CPU|VM CPU usage
CPU-Reserved	CPU|Reserved Capacity
CPU-Overhead	CPU|Overhead
Memory-Capacity	Memory|Total Capacity
Memory-Demand	Memory|Machine Demand
Memory-Usage	Memory|Host Usage
Memory-Reserved	Memory|Reserved Capacity
Memory-Overhead	Memory|ESX System Usage
Memory-Entitlement	Memory|Usable Capacity

Table 1-41. Datacenter

Data	Metric Name
CPU-Capacity	CPU|Total Capacity
CPU-Demand	CPU|Demand Without Overhead
CPU-Usage	CPU|VM CPU usage
CPU-Reserved	CPU|Reserved Capacity
CPU-Overhead	CPU|Overhead
CPU-Entitlement	CPU|Usable Capacity
Memory-Capacity	Memory|Total Capacity
Memory-Demand	Memory|Machine Demand
Memory-Usage	Memory|Host Usage
Memory-Reserved	Memory|Reserved Capacity
Memory-Overhead	Memory|ESX System Usage
Memory-Entitlement	Memory|Usable Capacity

Table 1-42. Cluster Compute Resource

Data	Metric Name
CPU-Capacity	CPU|Total Capacity
CPU-Demand	CPU|Demand Without Overhead
CPU-Usage	CPU|VM CPU usage
CPU-Reserved	CPU|Reserved Capacity
CPU-Entitlement	CPU|Usable Capacity
CPU-Overhead	CPU|Overhead
Memory-Capacity	Memory|Total Capacity
Memory-Demand	Memory|Machine Demand
Memory-Usage	Memory|Host Usage
Memory-Reserved	Memory|Reserved Capacity
Memory-Entitlement	Memory|Usable Capacity
Memory-Overhead	Memory|ESX System Usage

Table 1-43. Host System

Data	Metric Name
CPU-Capacity	CPU|Total Capacity
CPU-Demand	CPU|Demand Without Overhead
CPU-Usage	CPU|VM CPU usage
CPU-Reserved	CPU|Reserved Capacity
CPU-Overhead	CPU|Overhead
Memory-Capacity	Memory|Total Capacity
Memory-Demand	Memory|Machine Demand
Memory-Usage	Memory|Host Usage
Memory-Reserved	Memory|Reserved Capacity
Memory-Overhead	Memory|ESX System Usage

Table 1-44. Virtual Machine

Data	Metric Name
CPU-Capacity	CPU|Total Capacity
CPU-Demand	CPU|Demand
CPU-Usage	CPU|Usage
CPU-Limit	CPU|Effective limit
Memory-Capacity	Memory|Total Capacity
Memory-Demand	Memory|Utilization
Memory-Usage	Memory|Guest Usage
Memory-Reserved	Memory|Reservation Used
Memory-Limit	Memory|Effective limit

Table 1-45. Resource Pool

Data	Metric Name
CPU-Capacity	CPU|Total Capacity
CPU-Demand	CPU|Usage
CPU-Usage	CPU|Usage
CPU-Reserved	CPU|Reservation Used
Memory-Capacity	Memory|Total Capacity
Memory-Demand	Memory|Guest Demand
Memory-Usage	Memory|Consumed
Memory-Reserved	Memory|Reservation Used

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.

Environment Objects Tab

vRealize Operations Manager collects data for all objects in your environment. You can compare the status of an object with the status of all related objects to determine the possible cause for a problem in your environment.

How the Environment Objects Tab Works

When you select an object in your inventory, vRealize Operations Manager highlights badges for the object and all its related objects. Point to a badge to display current key conditions for an object.

Where You Find the Environment Objects Tab

- In the menu, click **Environment**, then **click** a group, custom data center, application, or inventory object to display the Object Summary screen. Click the **Environment tab**.
- Alternatively, click **Environment**, then use the hierarchies in the left pane to click down to the object you want. **Click** the object to display the Object Summary screen, then click the **Environment** tab.

Table 1-46. Environment Objects Overview Options

Option	Description
Badge	Displays the selected badge with the color appropriate to the state of the badge.
Status	All statuses appear by default. Select a status to toggle off the display of badges.
Power State Options	Toggle on to display badges for objects in the On, Off, Standby, or Unknown power states. Selections are additive. For example, you can display objects in both the on and off states. Actions depend on the power state of the object. Use the display to help determine why an action for an object might not be available. See "List of vRealize Operations Actions" in the *vRealize Operations Manager Configuration Guide.* . Toggle on to display badges for objects in the On, Off, Standby, or Unknown power states. Selections are additive. For example, you can display objects in both the on and off states. Actions depend on the power state of the object. Use the display to help determine why an action for an object might not be available. See "List of vRealize Operations Actions" in the *vRealize Operations Manager Configuration Guide*.
Sort	Changes the order in which the objects are listed. Alphabetical sort is by object name.

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 **Status: Active** on the toolbar to remove the filter.
Created On	When did the symptoms trigger? How does the time of the triggered symptom compare with the other symptoms?
Information	Can you identify a correlation between the triggered symptoms and the state of the Time Remaining and Capacity Remaining badges?

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 Configure a vCenter Serve Cloud Account in *vRealize Operations Manager Configuration Guide.* .
- 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 Working with Actions That Use Power Off Allowed section in *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 it in a list view.
2. Click **Actions** on the main toolbar or in an embedded view.
3. Select one of the actions.

   If you are working with a virtual machine, only the virtual machine is included in the dialog box. If you are working with clusters, hosts, or datastores, the dialog box that appears includes all objects.
4. 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.

Rebalance Container Action

When the workload in your environment becomes imbalanced, you can move the workload across your objects to rebalance the overall workload. The container for the rebalance action can be a data center or a custom data center, and the objects that are moved are the virtual machines in the suggested list provided by the action.

DRS Must be Enabled on Clusters

Your vCenter Server instance must have a cluster that passes a DRS-enabled check for the Rebalance Container action to appear in the Actions drop-down menu.

To get the Rebalance Container action from a custom data center or data center, and the related alerts, you must have the following:

- A vCenter Adapter configured with the actions enabled for each vCenter Server instance
- A vCenter Server instance with at least one cluster that is DRS-enabled.

If your cluster does not have DRS fully automated, the Rebalance Container action notifies you that one or more clusters under the selected container do not have DRS set to fully automated.

To ensure that the Rebalance Container action is available in your environment, you must add DRS. Then, wait one collection cycle for the Rebalance Container action to appear.

You Must Have Access to All Objects in the Container

If you have access to all objects in a cluster, data center, or custom data center, you can run the Rebalance Container action to move virtual machines to other clusters. When you do not have access to all of the objects in the container, the Rebalance Container action is not available.

How the Rebalance Container Action Works

If two data centers are experiencing extreme differences in workload - one high and one low - use the Rebalance Container action to balance the workload across those objects. For example, if the CPU demand on a host in one data center exceeds its available CPU capacity, critical pressure occurs on the host. To identify the cause of stress, monitor the CPU demand. Some virtual machines on each host might be experiencing high CPU demand, whereas others might be experiencing a low demand.

The Rebalance Container action moves all affected objects in the suggested list provided by the action to balance the workload. If you do not want to act on the entire set of objects to resolve the problem with workload, you can use the Move VM action to move an individual object.

Important Do not attempt to move virtual machines that are members of a vApp, because the vApp can become nonfunctional. Instead, add affinity rules for these virtual machines to keep them together so that the Move VM and Rebalance Container actions will ignore them.

When workloads become imbalanced, the following alerts can trigger on data centers and custom data centers. These alerts are disabled by default in the policies.

- Custom data center has unbalanced workload
- Data center has unbalanced workload

When the workloads on hosts in a data center or custom data center differ significantly, click **Home > Alerts** and verify whether the alert triggered. For example, to verify whether the alert triggered on a custom data center, check the alert named `Custom data center has unbalanced workload`. You can click the alert to view the causes of the alert and identify the source of the imbalance problem on the **Summary** tab.

To display the recommendations about the objects to move so that you can rebalance the workload, click the **Rebalance Container** action on the **Summary** tab. The recommendations indicate that you move one or more virtual machines to another host. When you click **OK**, a pop-up message provides a link to track the status of the action in **Recent Tasks**.

The action moves the virtual machines identified in the recommendation to the host machine that has a low workload or stress. You can view the status of the action in the list of recent tasks in **Administration > Recent Tasks**. You can also use the vSphere Web Client to view the status of the action and the performance for the host.

After the action runs and vRealize Operations Manager performs several collection cycles, view the workload on the data center to confirm that the workload was rebalanced and that the alert is gone.

Where You Run the Action

You can run the Rebalance Container action from the Actions menu for a data center or custom data center, or you can provide it as a suggested action on an alert.

For the supported objects and object levels, this action is available in the following locations in vRealize Operations Manager :

- On the toolbar when you click **Environment** in the menu, select an object, click the **Details** tab, click **Views**, and select a view of type List.
- On the toolbar when you click **Environment** in the menu, select an object, click the **Environment** tab, and select an object in the list view.
- In the Inventory list when you click **Administration** in the menu, click **Inventory**, then click the **List** tab, and select an object in the list.
- In configured alert recommendations.
- In the Object List and Topology Graph dashboard widgets.

Action Recommendations

Review the following information about the hosts and virtual machines to ensure that you are submitting the action for the correct objects.

Option	Description
Virtual Machine	Name of the virtual machine on the host that is experiencing an excessive workload.
Source Cluster	Name of the cluster on which the virtual machine is running.
Datastores	Datastore associated with the virtual machine.
Destination Cluster	Cluster where the virtual machine is to be moved. DRS selects the host automatically.
Reason	Describes the action to be taken and the reason why the move is suggested. For example, the recommendation is to move part of the workload on the cluster to another cluster to reduce the imbalance in CPU demand.
Parent vCenter	Identifies the vCenter Server adapter associated with the affected cluster.

After you click **OK**, the next dialog box provides the task ID and a link to the task list.

Table 1-47. Task ID Dialog Box

Option	Description
Recent Tasks	To view the status of the job and verify that the job finished, click **Recent Tasks**.
OK	To close the dialog box without further action, click **OK**.

Delete Idle VM Action

The Delete Idle VM action in vRealize Operations Manager removes from your vCenter Server instances those selected virtual machines that are in an idle state. Use this action to reclaim redundant resources.

How the Action Works

The Delete Idle VM action removes from your vCenter Server instances those virtual machines that are powered on, but that are in an idle state.

Where You Run the Action

For the supported objects and object levels, this action is available in the following locations in vRealize Operations Manager :

- Embedded just below the top menu.
- On the toolbar when you click **Environment** in the menu, select an object, click the **Details** tab and click **Views**.
- On the toolbar when you click **Environment** in the menu, select an object, click the **Environment** tab, and select an object in the list view.
- In the Inventory list click **Administration** in the menu, then click **Inventory**, then click the **List** tab, and select an object in the list.
- In configured alert recommendations.
- In the Object List and Topology Graph dashboard widgets.

Action Menu Items

Review the following information about the virtual machines to ensure that you are submitting the action for the correct objects.

Menu Items	Description
Name	Name of the virtual machine as it appears in the environment inventory.
Host	Name of the host on which the virtual machine is running.
Parent vCenter	Parent vCenter Server instance where the virtual machine resides.

After you click **Begin Action**, the next dialog box provides the task ID and a link to the task list.

Table 1-48. Task ID Dialog Box

Option	Description
Recent Tasks	To view the status of the job and verify that the job finished, click **Recent Tasks**.
OK	To close the dialog box without further action, click **OK**.

Set DRS Automation Action

You can monitor and configure the vSphere Distributed Resource Scheduler (DRS) automation rules from vRealize Operations Manager . DRS monitors and allocates the resources in your environment, and balances the computing capacity across your hosts and virtual machines.

How the Action Works

The Set DRS Automation action monitors and configures DRS automation rules. With the Set DRS Automation action, you can enable and disable DRS.

If vRealize Automation manages any of the virtual machines in your environment, the Set DRS Automation action is not available for that object.

Where You Run the Action

For the supported objects and object levels, this action is available in the following locations in vRealize Operations Manager :

- Embedded just below the top menu.
- On the toolbar when you click **Environment** in the menu, select an object, click the **Details** tab and click **Views**.
- On the toolbar when you click **Environment** in the menu, select an object, click the **Environment** tab, and select an object in the list view.
- In the Inventory list when you click **Administration** in the menu, click **Inventory**, then click the **List** tab, and select an object in the list.
- In configured alert recommendations.
- In the Object List and Topology Graph dashboard widgets.

Action Menu Items

To ensure that you are submitting the correct action for the correct objects, review the following information about the clusters.

Menu Items	Description
Name	Name of the cluster in the vCenter Server instance.
Automation Level	Level of DRS automation. When DRS is fully automated on the selected cluster, you can run the Set DRS Automation action.
Migration Threshold	Recommendations for the migration level of virtual machines. Migration thresholds are based on DRS priority levels, and are computed based on the workload imbalance metric for the cluster.
Parent vCenter	Parent vCenter Server instance where the cluster resides.

After you click **Begin Action**, the next dialog box provides the task ID and a link to the task list.

Table 1-49. Task ID Dialog Box

Option	Description
Recent Tasks	To view the status of the job and verify that the job finished, click **Recent Tasks**.
OK	To close the dialog box without further action, click **OK**.

Execute Script Action

To troubleshoot particular processes, you can upload a script or run a command to receive specific information. You can view the standard output or standard error as applicable.

Where You Run the Action

For supported objects and object levels, in the main menu, select the **Environment** tab and then select the relevant VM from the Inventory tree. This action is available from the **Actions** menu just below the top menu in vRealize Operations Manager .

Prerequisites

- VMware Tools must be installed and running on the VM. For details see KB 75122
- Service discovery is enabled with the successful discovery of VMs.
- The VM must be powered on and connected.

Action Options

Enter the VM credentials to authenticate even when the VM guest OS authentication status is "Success". You can run a script by entering it directly or by uploading a script file by optionally providing arguments.

Option	Description
Upload File	Use this option to browse and upload the script that you want to run.
File	Browse and upload the script file.
Args	List the arguments in the script.
Command	Select the option and enter a command in the text box.
Timeout	Script execution timeout on VMs. Script execution continues even if the dialog box is closed. You can verify the status from **Administration > History > Recent Tasks**.
Execute	Runs the script or command.
stdout	Displays the standard output.
stderr	Displays errors, if any.

Get Top Processes Action

The Get Top Processes action is used for troubleshooting process issues and resource issues related to the applications of the virtual machine.

How the Action Works

The Get Top Processes action, provides the status of top 10 processes for the selected virtual machine. You can troubleshoot issues related to the resources that are affecting the applications in the virtual machine.

By default, the details of top 10 processes are displayed for the selected virtual machine. You can change the number of processes and view the details for top N processes where N is between 1-100. You have the option to view the processes based on CPU and Memory.

The Get Top Processes action is run on both Windows virtual machine and Linux virtual machine. You can view the summary information for the commands only in a Linux virtual machine.

Where You Run the Action

For supported objects and object levels, in the main menu, select the **Environment** tab and then select the relevant VM from the Inventory tree. This action is available from the **Actions** menu just below the top menu in vRealize Operations Manager .

Prerequisites

- VMware Tools must be installed and running on the VM. For details see KB 75122
- Service discovery is enabled with the successful discovery of VMs.
- The VM must be powered on and connected.

Action Options

You must enter the VM credentials to authenticate when the VM is monitored in a credential-less mode or when the VM is monitored in a credential-based mode where the user is not authenticated. To ensure that you are taking the right action, review the following information.

Option	Description
Number of Processes	Displays the number of processes for which the details are displayed.
Refresh	Displays new data about processes, when you change the value for the number of processes.
Command	Displays the name of the application
PID	Displays the process ID.
CPU	Displays the CPU usage in percentage for Linux VMs. Displays the CPU usage in seconds for Winows VMs. The count starts when you start the operating system in the VM .
Mem (%)	Displays the Memory usage in KB.
User	Displays the user name.
Status	Displays the process status. It can be in one these states: ■ For Linux - I, R, S ■ For Windows - Unknown, Running, and Sleeping
Run	Displays data about the specified numbers of processes.

Move Virtual Machine Action

You can use the Move VM action to move virtual machines from one host and datastore to another host and datastore to balance the workload in your environment.

How the Action Works

When you initiate this action, the **Move VM** wizard opens and scopes the possible destinations. You select the destination host and datastore from the list of available destinations.

To see all destinations, you must have view access to the following object types:

- Scope object, which includes a vCenter Server, data center, custom data center, or cluster.
- Host in the scope object.
- Datastore in the host.

The destinations include combinations of objects for the move, such as a specific host and datastore, or a different host with the same datastore. You select one of the available combinations. If your environment includes many destination objects, such as many hosts or datastores, enter text in the filter text box to search for specific destination objects.

vRealize Operations Manager uses vSphere DRS rules that you define in vCenter Server to help determine good placement decisions for your virtual machines in the move action. The Affinity Rules column indicates whether those rules are violated by the Move VM action.

Important Do not attempt to move virtual machines that are members of a vApp, because the vApp can become nonfunctional. Instead, add affinity rules for these virtual machines to keep them together so that the Move VM and Rebalance Container actions will ignore them.

To initiate the action, you click the **Begin Action** button.

When you finish the wizard, vRealize Operations Manager displays a dialog box to indicate that the action has started. To track the status of the action, click the link in the dialog box and view the state of the action in **Administration > Recent Tasks**.

Moving Virtual Machines is Not Allowed Across Data Centers

When you attempt to use the **Move VM** action to move a virtual machine across data centers, vRealize Operations Manager must be able to identify the matching network and storage objects for the destination data center. Network objects include VMware virtual switches and distributed virtual switches. Storage objects include datastores and datastore clusters.

Moving a virtual machine across data centers requires vRealize Operations Manager to move the virtual machine files and change the virtual machine network configuration. vRealize Operations Manager does not currently move the virtual machine files across datastores, nor does it change the virtual machine network configuration. As a result, vRealize Operations Manager does not allow you to move virtual machines across data centers.

When you use the **Move VM** action, be aware of the following behavior:

- If you select a single virtual machine, vRealize Operations Manager displays the data center where the virtual machine resides.
- If you select multiple virtual machines, but those virtual machines do not share a common data center, the **Move VM** action does not display the data centers, and the **Move VM** action does not appear in the actions menu.

Where You Run the Action

For the supported objects and object levels, this action is available in the following locations in vRealize Operations Manager :

- Embedded just below the top menu.
- On the toolbar when you click **Environment** in the menu, select an object, click the **Details** tab and click **Views**.
- On the toolbar when you click **Environment** in the menu, select an object, click the **Environment** tab, and select an object in the list view.
- In the Inventory list when you click **Administration** in the menu, click **Inventory**, then click the **List** tab, and select an object in the list.
- In configured alert recommendations.
- In the Object List and Topology Graph dashboard widgets.

Action Options

Review the following information about the virtual machines to ensure that you are submitting the action for the correct objects.

Option	Description
Priority	Indicates the priority of the proposed move destination. When the action is automated, the proposed destination with priority of 1 is automatically selected.
Destination Host	Name of the host to which the virtual machine will be moved.
Current CPU Workload	Amount of CPU in GHz available on the host.
Current Memory Workload	Amount of memory in GB available on the host.
Destination Datastore	Datastore to which the virtual machines storage will be moved.
Current Disk Space Workload	Amount of disk space available on the datastore.
Will it fit	Calculated estimation of whether the virtual machine fits on the selected destination.
VM Power Off Required	When set to `No`, the action does not power off the virtual machine before the move. When set to `Yes`, the action powers off the virtual machine before the move takes place, and powers on the virtual machine after the move is complete. If VMware Tools is installed, a guest OS shutdown is used to power off the virtual machine.
Affinity Rules	Indicates whether vSphere DRS rules exist, as defined in vCenter Server. For example, a rule might exist to keep virtual machines together, and another rule might exist to separate virtual machines. This column indicates the following status. ■ Empty. vSphere DRS rules are not defined. ■ Green check mark. The move of virtual machines does not violate affinity rules. ■ Red circle with bar. The move of virtual machines does break affinity rules. If you choose to break the affinity rules, you must resolve any problems manually.
Affinity Rule Details	Identifies the virtual machine and the vSphere DRS rule name as defined in vCenter Server.

After you click **OK**, the next dialog box provides the task ID and a link to the task list.

Table 1-50. Task ID Dialog Box

Option	Description
Recent Tasks	To view the status of the job and verify that the job finished, click **Recent Tasks**.
OK	To close the dialog box without further action, click **OK**.

Power Off Virtual Machine Action

The Power Off VM action in vRealize Operations Manager stops one or more selected virtual machines that are in a powered on state. You power off a virtual machine when you are managing resources and reclaiming wasted space.

How the Action Works

The Power Off VM action turns off the virtual machine. If VMware Tools is installed and running, the guest operating system is shut down before the machine is powered off. If VMware Tools is not installed and running, the virtual machine is powered off regardless of the state of the guest operating system. In this case, use this action only when you are powering off virtual machines where stopping the guest operating system does not adversely affect the installed applications.

If the target virtual machine is already powered off, the recent task status reports success on the machine, even though the state of the virtual machine did not change.

Where You Run the Action

For the supported objects and object levels, this action is available in the following locations in vRealize Operations Manager :

- Embedded just below the top menu.
- On the toolbar when you click **Environment** in the menu, select an object, click the **Details** tab and click **Views**.
- On the toolbar when you click **Environment** in the menu, select an object, click the **Environment** tab, and select an object in the list view.
- In the Inventory list when you click **Administration** in the menu, click **Inventory**, then click the **List** tab, and select an object in the list.
- In configured alert recommendations.
- In the Object List and Topology Graph dashboard widgets.

Action Options

Review the following information about the virtual machines to ensure that you are submitting the action for the correct objects.

Option	Description
Selected objects	Check box indicates whether the action is applied to the object. To not run the action on one or more objects, deselect the associated check boxes. This option is available when two or more objects are selected.
Name	Name of the virtual machine as it appears in the environment inventory.
Power State	Indicates whether the virtual machine is powered on or powered off.
Idle VM	Indicates whether the virtual machine is considered to be in the idle state based on the configured idle virtual machine metric. Possible values include: ■ false. The virtual machine is active. ■ true. The virtual machine is idle. ■ unknown. vRealize Operations Manager does not have the data required to calculate the idle metric.
Idle VM Percentage	Calculated threshold of the idle virtual machine percentage based on the configured reclaimable wasted space policy.
CPU Usage Percentage	Calculated threshold of the virtual machine CPU percentage based on the metric named `cpu | usage_average`.
Host	Name of the host on which the virtual machine is running.
Adapter Instance	Name of the VMware Adapter as it is configured in vRealize Operations Manager . The adapter manages the communication with the vCenter Server instance.

After you click **OK**, the next dialog box provides the task ID and a link to the task list.

Table 1-51. Task ID Dialog Box

Option	Description
Recent Tasks	To view the status of the job and verify that the job finished, click **Recent Tasks**.
OK	To close the dialog box without further action, click **OK**.

Shut Down Guest Operating System for Virtual Machine Action

The Shut Down Guest OS for VM action shuts down the guest operating system and powers off the virtual machine. You shut down a virtual machine when you are managing resources and reclaiming wasted space.

How the Action Works

The Shut Down Guest OS for VM action checks that VMware Tools, which is required, is installed on the target virtual machines, then shuts down the guest operating system and powers off the virtual machine. If VMware Tools is not installed or installed but not running, the action does not run and the job is reported as failed in **Recent Tasks**.

If the target virtual machine is already powered off, the recent task status reports success on the machine, even though the state of the virtual machine did not change.

Where You Run the Action

For the supported objects and object levels, this action is available in the following locations in vRealize Operations Manager :

- Embedded just below the top menu.
- On the toolbar when you click **Environment** in the menu, select an object, click the **Details** tab, and click **Views**.
- On the toolbar when you click **Environment** in the menu, select an object, click the **Environment** tab, and select an object in the list view.
- In the Inventory list when you click **Administration** in the menu, click **Inventory**, then click the **List** tab, and select an object in the list.
- In configured alert recommendations.
- In the Object List and Topology Graph dashboard widgets.

Action Options

Review the following so you can be sure you are taking the right action.

Option	Description
Selected objects	Check box indicates whether the action is applied to the object. To not run the action on one or more objects, deselect the associated check boxes. This option is available when two or more objects are selected.
Name	Name of the virtual machine as it appears in the environment inventory.
Power State	Indicates whether the virtual machine is powered on or powered off.
Idle VM	Indicates whether the virtual machine is considered to be in the idle state based on the configured idle virtual machine metric. Possible values include: ■ false. The virtual machine is active. ■ true. The virtual machine is idle. ■ unknown. vRealize Operations Manager does not have the data required to calculate the idle metric.
Idle VM Percentage	Calculated threshold of the idle virtual machine percentage based on the configured reclaimable wasted space policy.
Host	Name of the host on which the virtual machine is running.
Adapter Instance	Name of the VMware Adapter as it is configured in vRealize Operations Manager. The adapter manages the communication with the vCenter Server instance.

After you click **OK**, the next dialog box provides the task ID and a link to the task list.

Table 1-52. Task ID Dialog Box

Option	Description
Recent Tasks	To view the status of the job and verify that the job finished, click **Recent Tasks**.
OK	To close the dialog box without further action, click **OK**.

Power on Virtual Machine Action

To start one or more virtual machines that are in a powered off state, use the Power On VM action. You power on a virtual machine so that you can shift resources. For example, power on a machine so that you can use it, run applications, or verify that actions that were run on already powered down machines contribute to improved performance.

How the Action Works

The Power On VM action powers on virtual machines that are powered off. The action does not affect virtual machines that are currently powered on.

If the target virtual machine is already powered on, the task status reports success for the machine even though the state of the virtual machine did not change.

Where You Run the Action

For the supported objects and object levels, this action is available in the following locations in vRealize Operations Manager :

- Embedded just below the top menu.
- On the toolbar when you click **Environment** in the menu, select an object, click the **Details** tab, and click **Views**.
- On the toolbar when you click **Environment** in the menu, select an object, click the **Environment** tab, and select an object in the list view.
- In the Inventory list when you click **Administration** in the menu, click **Inventory**, then click the **List** tab, and select an object in the list.
- In configured alert recommendations.
- In the Object List and Topology Graph dashboard widgets.

Action Options

To ensure that you are taking the right action, review the following information .

Option	Description
Selected objects	Check box indicates whether the action is applied to the object. To not run the action on one or more objects, deselect the associated check boxes. This option is available when two or more objects are selected.
Name	Name of the virtual machine as it appears in the environment inventory.
Power State	Indicates whether the virtual machine is powered on or powered off.

Option	Description
Host	Name of the host on which the virtual machine is running.
Adapter Instance	Name of the VMware Adapter as it is configured in vRealize Operations Manager. The adapter manages the communication with the vCenter Server instance.

After you click **OK**, the next dialog box provides the task ID and a link to the task list.

Table 1-53. Task ID Dialog Box

Option	Description
Recent Tasks	To view the status of the job and verify that the job finished, click **Recent Tasks**.
OK	To close the dialog box without further action, click **OK**.

Delete Powered Off Virtual Machine Action

The Delete Powered Off VM action in vRealize Operations Manager removes selected virtual machines that are in a powered off state from your vCenter Server instances. Use this action to reclaim redundant resources.

How the Action Works

The Delete Powered Off VM action removes virtual machines from the vCenter Server instances. If the virtual machine is powered on, the action does not delete the virtual machine.

Where You Run the Action

For the supported objects and object levels, this action is available in the following locations in vRealize Operations Manager :

- Embedded just below the top menu.
- On the toolbar when you click **Environment** in the menu, select an object, click the **Details** tab, and click **Views**.
- On the toolbar when you click **Environment** in the menu, select an object, click the **Environment** tab, and select an object in the list view.
- In the Inventory list when you click **Administration** in the menu, click **Inventory** , then click the **List** tab, and select an object in the list.
- In configured alert recommendations.
- In the Object List and Topology Graph dashboard widgets.

Action Options

To ensure that you are submitting the action for the right objects, review the following information.

Option	Description
Selected objects	Check box indicates whether the action is applied to the object. To not run the action on one or more objects, deselect the associated check boxes. This option is available when two or more objects are selected.
Name	Name of the virtual machine as it appears in the environment inventory.
Power State	Indicates whether the virtual machine is powered on or powered off.
Disk Space	Amount of disk space currently consumed by the virtual machine.
Snapshot Space	Amount of disk space currently consumed by the virtual machine snapshots.
Memory (MB)	Amount of memory allocated to the virtual machine.
CPU Count	Number of CPUs currently configured for the virtual machine.
Host	Name of the host on which the virtual machine is running.
Adapter Instance	Name of the VMware Adapter as it is configured in vRealize Operations Manager. The adapter manages the communication with the vCenter Server instance.

After you click **OK**, the next dialog box provides the task ID and a link to the task list.

Table 1-54. Task ID Dialog Box

Option	Description
Recent Tasks	To view the status of the job and verify that the job finished, click **Recent Tasks**.
OK	To close the dialog box without further action, click **OK**.

Set Memory for Virtual Machine Action

The Set Memory for VM action in vRealize Operations Manager is used to add or remove memory on virtual machines. You increase the memory to address performance problems or decrease the memory to reclaim resources.

How the Action Works

The Set Memory for VM action perform several tasks. The action determines the power state of the target virtual machines, takes a snapshot when you request it and powers off the machine if necessary and you request it. As well, the action changes the memory to the new value, and returns the virtual machines their original power states.

An alternative form of the Set Memory for Virtual Machine action is available for automation. This action can run when the virtual machine is powered on or off.

Use this version of the action if the automated action has permission to power off the virtual machine, and hot add of memory is not enabled on the virtual machine. With hot add enabled, you can add memory, but you cannot remove it.

This version of the action would be required if a virtual machine is powered on and the amount of memory must be reduced.

This version of the action has the Power Off Allowed flag set to true. You can select this Power Off Allowed version of the action when you create or edit alerts and associate the alert with a recommendation. When the Power Off Allowed version of this action is automated, you do not select this version of the action.

If Hot Plug is enabled on the virtual machines, then power off is not required. If power off is required and VMware Tools is installed, then the virtual machines are shut down before they are powered off.

Where You Run the Action

For the supported objects and object levels, this action is available in the following locations in vRealize Operations Manager :

- Embedded just below the top menu.
- On the toolbar when you click **Environment** in the menu, select an object, click the **Details** tab, and click **Views**.
- On the toolbar when you click **Environment** in the menu, select an object, click the **Environment** tab, and select an object in the list view.
- In the Inventory list when you click **Administration** in the menu, click **Inventory**, then click the **List** tab, and select an object in the list.
- In configured alert recommendations.
- In the Object List and Topology Graph dashboard widgets.

Action Options

Review the following information about the virtual machines to ensure that you are submitting the action for the correct objects.

Option	Description
Selected objects	Check box indicates whether the action is applied to the object. To not run the action on one or more objects, deselect the associated check boxes. This option is available when two or more objects are selected. If you modify a value, the check box is selected. The check box must be selected to enable the OK button.
Name	Name of the virtual machine as it appears in the environment inventory.
New CPU	Number of CPUs when the action is completed. If the value is less than 1 or a value not supported for the virtual machine in vCenter Server, and the virtual machine is powered on and Hot Add is not enabled, the number of CPUs does not change and Recent Tasks shows the action as failed. If the virtual machine is powered off when you submit an unsupported value, the task reports success, but the virtual machine will fail when you run a power on action. The value that appears is the calculated suggested size. If the target virtual machine is new or offline, this value is the current number of CPUs. If vRealize Operations Manager has been monitoring the virtual machine for six or more hours, depending on your environment, the value that appears is the CPU Recommended Size metric.
Current CPU	Number of configured CPUs.

Option	Description
Power State	Indicates whether the virtual machine is powered on or powered off.
Power Off Allowed	If selected, the action shuts down or powers off the virtual machine before modifying the value. If VMware Tools is installed and running, the virtual machine is shut down. If VMware Tools is not installed or not running, the virtual machine is powered off without regard for the state of the operating system. In addition to whether the action shuts down or powers off a virtual machine, you must consider whether the object is powered on and what settings are applied. See Working with Actions That Use Power Off section in *vRealize Operations Manager Configuration Guide.* .
Snapshot	Creates a snapshot before changing the number of CPUs. Use this option if you need a snapshot to which you can revert the virtual machine if the action does not produce the expected results. The name of the snapshot is supplied in the Recent Tasks messages for the action. If the CPU is changed with CPU Hot Plug enabled, then the snapshot is taken with the virtual machine is running, which consumes more disk space.
Host	Name of the host on which the virtual machine is running.
Adapter Instance	Name of the VMware Adapter as it is configured in vRealize Operations Manager . The adapter manages the communication with the vCenter Server instance.

After you click **OK**, the next dialog box provides the task ID and a link to the task list.

Table 1-55. Task ID Dialog Box

Option	Description
OK	To close the dialog box without further action, click **OK**.
Recent Tasks	To view the status of the job and verify that the job finished, click **Recent Tasks**.

Set Memory Resources for Virtual Machine Action

The Set Memory Resources for VM action is used to modify the memory reservation and memory limit on virtual machines. You modify the memory reservation and limit to manage resources in your environment, either to reclaim unused resources or to ensure that your virtual machines have the resources they need to run efficiently.

How the Action Works

The Set Memory Resources for VM action determines how memory resources are allocated to the virtual machine. The reservation value is the minimum amount of guaranteed memory allocated for the virtual machine. The limit is the maximum amount of memory that the virtual machine can consume.

The reservation and limit values in vCenter Server are set in megabytes. vRealize Operations Manager calculates and reports on memory in kilobytes. When you run this action, the values are presented in kilobytes so that you can implement recommendations from vRealize Operations Manager .

To run the action, all options must be configured in the dialog box for the objects on which your are running the action. If you are changing one option to a new value, but not another option, ensure that the option that you do not want to change is configured with the current value.

Where You Run the Action

For the supported objects and object levels, this action is available in the following locations in vRealize Operations Manager :

- Embedded just below the top menu.
- On the toolbar when you click **Environment** in the menu, select an object, click the **Details** tab, and click **Views**.
- On the toolbar when you click **Environment** in the menu, select an object, click the **Environment** tab, and select an object in the list view.
- In the Inventory list when you click **Administration** in the menu, click **Inventory**, then click the **List** tab, and select an object in the list.
- In configured alert recommendations.
- In the Object List and Topology Graph dashboard widgets.

Action Options

To ensure that you are submitting the action for the right objects, review the following information.

Option	Description
Selected objects	Check box indicates whether the action is applied to the object. To not run the action on one or more objects, deselect the associated check boxes. This option is available when two or more objects are selected. If you modify a value, the check box is selected. The check box must be selected to enable the OK button.
Name	Name of the virtual machine as it appears in the environment inventory.
New Resv (KB)	Amount of memory in kilobytes reserved for the virtual machine when the action is finished. The new reservation value must be less than or equal to the new limit value unless your new limit is unlimited (-1). The reservation supports the following possible values: ■ If you set the value to 0, the virtual machine is allocated only the currently configured amount of RAM. ■ If you add or remove reserved memory, the value must be evenly divisible by 1024.
Current Resv (KB)	Amount of memory in kilobytes that is configured as the guaranteed memory for the virtual machine.
New Limit (KB)	Maximum amount of memory in kilobytes that the virtual machine can consume when the action is completed. The limit supports the following possible values: ■ If you set the value to 0, then the maximum memory is no greater than the allocated reservation amount. ■ If you set the value to -1, then the virtual machine memory is unlimited. ■ It you increase or decrease the limit, the value must be evenly divisible by 1024.

Option	Description
Current Limit (KB)	Maximum amount of memory that the virtual machine is currently allowed to consume.
Host	Name of the host on which the virtual machine is running.
Adapter Instance	Name of the VMware Adapter as it is configured in vRealize Operations Manager. The adapter manages the communication with the vCenter Server instance.

After you click **OK**, the next dialog box provides the task ID and a link to the task list.

Table 1-56. Task ID Dialog Box

Option	Description
Recent Tasks	To view the status of the job and verify that the job finished, click **Recent Tasks**.
OK	To close the dialog box without further action, click **OK**.

Set CPU Count for Virtual Machine Action

The Set CPU action modifies the number of vCPUs on a virtual machine. You increase the number of CPUs to address performance problems or decrease the number of CPU to reclaim resources.

How the Action Works

The Set CPU Count action shuts down or powers off the target virtual machines. If you are decreasing the CPU count, the action is required. This action creates a snapshot if you request it, changes the number of vCPUs based on the new CPU count you provided, and returns the virtual machines to their original power states.

An alternative form of the Set CPU Count for Virtual Machine action is available for automation. This action can run when the virtual machine is powered on or off.

Use this version of the action if the automated action has permission to power off the virtual machine, and hot add of memory is not enabled on the virtual machine. With hot add enabled, you can add CPUs, but you cannot remove them.

This version of the action is required if a virtual machine is powered on and the number of CPUs must be reduced.

This version of the action has the Power Off Allowed flag set to true. You can select this Power Off Allowed version of the action when you create or edit alerts and associate the alert with a recommendation. When the Power Off Allowed version of this action is automated, you do not select this version of the action.

If Hot Plug is enabled on the virtual machines, then power off is not required. If power off is required and VMware Tools are installed, then the vurtual machines are shut down before they are powered off.

Where You Run the Action

For the supported objects and object levels, this action is available in the following locations in vRealize Operations Manager :

- Embedded just below the top menu.
- On the toolbar when you click **Environment** in the menu, select an object, click the **Details** tab, and click **Views**.
- On the toolbar when you click **Environment** in the menu, select an object, click the **Environment** tab, and select an object in the list view.
- In the Inventory list when you click **Administration** in the menu, click **Inventory**, then click the **List** tab, and select an object in the list.
- In configured alert recommendations.
- In the Object List and Topology Graph dashboard widgets.

Action Options

Review the following information about the virtual machines to ensure that you are submitting the action for the correct objects.

Option	Description
Selected objects	Check box indicates whether the action is applied to the object. To not run the action on one or more objects, deselect the associated check boxes. This option is available when two or more objects are selected. If you modify a value, the check box is selected. The check box must be selected to enable the OK button.
Name	Name of the virtual machine as it appears in the environment inventory.
New CPU	Number of CPUs when the action is completed. If the value is less than 1 or a value not supported for the virtual machine in vCenter Server, and the virtual machine is powered on and Hot Add is not enabled, the number of CPUs does not change and Recent Tasks shows the action as failed. If the virtual machine is powered off when you submit an unsupported value, the task reports success, but the virtual machine will fail when you run a power on action. The value that appears is the calculated suggested size. If the target virtual machine is new or offline, this value is the current number of CPUs. If vRealize Operations Manager has been monitoring the virtual machine for six or more hours, depending on your environment, the value that appears is the CPU Recommended Size metric.
Current CPU	Number of configured CPUs.
Power State	Indicates whether the virtual machine is powered on or powered off.
Power Off Allowed	If selected, the action shuts down or powers off the virtual machine before modifying the value. If VMware Tools is installed and running, the virtual machine is shut down. If VMware Tools is not installed or not running, the virtual machine is powered off without regard for the state of the operating system. In addition to whether the action shuts down or powers off a virtual machine, you must consider whether the object is powered on and what settings are applied. See Working with Actions That Use Power Off section in *vRealize Operations Manager Configuration Guide.* .

Option	Description
Snapshot	Creates a snapshot before changing the number of CPUs. Use this option if you need a snapshot to which you can revert the virtual machine if the action does not produce the expected results. The name of the snapshot is supplied in the Recent Tasks messages for the action. If the CPU is changed with CPU Hot Plug enabled, then the snapshot is taken with the virtual machine is running, which consumes more disk space.
Host	Name of the host on which the virtual machine is running.
Adapter Instance	Name of the VMware Adapter as it is configured in vRealize Operations Manager . The adapter manages the communication with the vCenter Server instance.

After you click **OK**, the next dialog box provides the task ID and a link to the task list.

Table 1-57. Task ID Dialog Box

Option	Description
OK	To close the dialog box without further action, click **OK**.
Recent Tasks	To view the status of the job and verify that the job finished, click **Recent Tasks**.

Set CPU Resources for Virtual Machine Action

The Set CPU Resources for VM action is used to modify the CPU reservation and CPU limit on virtual machines. You modify the CPU reservation and limit to manage workload demands in your environment.

How the Action Works

The Set CPU Resources for VM action determines how CPU resources can be allocated to the virtual machines. The reservation limit is the minimum amount of guaranteed CPU resources allocated to the virtual machine. The limit is the maximum amount of CPU resources that the virtual machine can consume.

To run the action, all options where you configure a value must contain a value for the objects that you want to change. If you are changing one option to a new value, but not another option, ensure that the option that you are not changing is configure with the current value.

Where You Run the Action

For the supported objects and object levels, this action is available in the following locations in vRealize Operations Manager :

- Embedded just below the top menu.
- On the toolbar when you click **Environment** in the menu, select an object, click the **Details** tab, and click **Views**.
- On the toolbar when you click **Environment** in the menu, select an object, click the **Environment** tab, and select an object in the list view.

- In the Inventory list when you click **Administration** in the menu, click **Inventory**, then click the **List** tab, and select an object in the list.
- In configured alert recommendations.
- In the Object List and Topology Graph dashboard widgets.

Action Options

To ensure that you are submitting the action for the right objects, review the following information.

Option	Description
Selected objects	Check box indicates whether the action is applied to the object. To not run the action on one or more objects, deselect the associated check boxes. This option is available when two or more objects are selected. If you modify a value, the check box is selected. The check box must be selected to enable the OK button.
Name	Name of the virtual machine as it appears in the environment inventory.
New Resv (MHz)	Amount of CPU resources in megahertz reserved for the virtual machine when the action is finished. The new reservation value must be less than or equal to the new limit value unless your new limit is unlimited (-1). The reservation supports the following possible values: ■ If you set the value to 0, the virtual machine is allocated only the configured CPU consumption level. ■ If you add or removed reserved CPU consumption, supply a positive integer unless you set the value to 0.
Current Resv (MHz)	Amount of CPU resources that is configured as the guaranteed CPU resources for the virtual machine.
New Limit (MHz)	Maximum amount of CPU consumption in megahertz that the virtual machine can consume when the action is completed. The limit supports the following possible values: ■ If you set the value to 0, the maximum CPU consumption is not greater than the allocated reservation amount. ■ If you set the value to -1, then the virtual machine CPU consumption is unlimited. ■ If you add or remove CPU consumption limits, supply a positive integer, unless you set the value to 0 or -1.
Current Limit (MHz)	Maximum amount of CPU that the virtual machine can consume.
Host	Name of the host on which the virtual machine is running.
Adapter Instance	Name of the VMware Adapter as it is configured in vRealize Operations Manager. The adapter manages the communication with the vCenter Server instance.

After you click **OK**, the next dialog box provides the task ID and a link to the task list.

Table 1-58. Task ID Dialog Box

Option	Description
Recent Tasks	To view the status of the job and verify that the job finished, click **Recent Tasks**.
OK	To close the dialog box without further action, click **OK**.

Set CPU Count and Memory for Virtual Machine Action

The Set CPU Count and Memory for VM action is used to add or remove CPUs and memory on virtual machines with only one power off of the virtual machines to perform the combined actions. You modify the CPU and memory to address performance problems or to reclaim resources.

How the Action Works

The Set CPU Count and Memory action powers off the target virtual machines. The action also creates a snapshot when requested and changes the number of vCPUs and memory based on the new CPU count and memory values you provided. As well, the action returns the virtual machines their original power states.

An alternative form of the Set CPU Count and Memory for Virtual Machine action is available for automation. This version of the action has the Power Off Allowed flag set to true so that the action is available for automation and can run when the virtual machine is in the powered on state. You can select the Power Off Allowed version of the action when you create or edit alerts and associate the alert with a recommendation. When the Power Off Allowed version of this action is automated, you do not select this version of the action.

If Hot Plug is enabled on the virtual machines, then power off is not required. If power off is required and VMware Tools are installed, then the virtual machines are shut down before they are powered off.

To run the action, all options where you configure a value must contain a value for the objects that you want to change. If you are changing one option to a new value, but not another option, ensure that the option that you are not changing is configure with the current value.

Where You Run the Action

For the supported objects and object levels, this action is available in the following locations in vRealize Operations Manager :

- Embedded just below the top menu.
- On the toolbar when you click **Environment** in the menu, select an object, click the **Details** tab, and click **Views**.
- On the toolbar when you click **Environment** in the menu, select an object, click the **Environment** tab, and select an object in the list view.
- In the Inventory list when you click **Administration** in the menu, click **Inventory**, then click the **List** tab, and select an object in the list.

- In configured alert recommendations.
- In the Object List and Topology Graph dashboard widgets.

Action Options

Review the following information about the virtual machines to ensure that you are submitting the action for the correct objects.

Option	Description
Selected objects	Check box indicates whether the action is applied to the object. To not run the action on one or more objects, deselect the associated check boxes. This option is available when two or more objects are selected. If you modify a value, the check box is selected. The check box must be selected to enable the OK button.
Name	Name of the virtual machine as it appears in the environment inventory.
New CPU	Number of CPUs when the action is completed. If the value is less than 1 or a value not supported for the virtual machine in vCenter Server, and the virtual machine is powered on and Hot Add is not enabled, the number of CPUs does not change and Recent Tasks shows the action as failed. If the virtual machine is powered off when you submit an unsupported value, the task reports success, but the virtual machine will fail when you run a power on action. The value that appears is the calculated suggested size. If the target virtual machine is new or offline, this value is the current number of CPUs. If vRealize Operations Manager has been monitoring the virtual machine for six or more hours, depending on your environment, the value that appears is the CPU Recommended Size metric.
Current CPU	Number of configured CPUs.
Power State	Indicates whether the virtual machine is powered on or powered off.
Power Off Allowed	If selected, the action shuts down or powers off the virtual machine before modifying the value. If VMware Tools is installed and running, the virtual machine is shut down. If VMware Tools is not installed or not running, the virtual machine is powered off without regard for the state of the operating system. In addition to whether the action shuts down or powers off a virtual machine, you must consider whether the object is powered on and what settings are applied. See Working with Actions That Use Power Off section in *vRealize Operations Manager Configuration Guide.* .
Snapshot	Creates a snapshot before changing the number of CPUs. Use this option if you need a snapshot to which you can revert the virtual machine if the action does not produce the expected results. The name of the snapshot is supplied in the Recent Tasks messages for the action. If the CPU is changed with CPU Hot Plug enabled, then the snapshot is taken with the virtual machine is running, which consumes more disk space.
Host	Name of the host on which the virtual machine is running.
Adapter Instance	Name of the VMware Adapter as it is configured in vRealize Operations Manager . The adapter manages the communication with the vCenter Server instance.

After you click **OK**, the next dialog box provides the task ID and a link to the task list.

Table 1-59. Task ID Dialog Box

Option	Description
OK	To close the dialog box without further action, click **OK**.
Recent Tasks	To view the status of the job and verify that the job finished, click **Recent Tasks**.

Delete Unused Snapshots for Virtual Machine Action

The Delete Unused Snapshots for Virtual Machines action in vRealize Operations Manager deletes snapshots that are older than the specified age from your datastores. Deleting unused snapshots reclaims wasted space in your environment.

How the Action Works

The Delete Unused Snapshots for Virtual Machine action comprises two dialog boxes. The first dialog box allows you to select the snapshot age criteria, which must be greater than one day. The second step allows you to select the snapshots to delete, and runs the Delete Unused Snapshots for Virtual Machine action.

The number of days that you specify for each virtual machine is the age of the snapshots based on the creation date. The Delete Unused Snapshots for Virtual Machine action retrieves the snapshot and displays the snapshot name, space consumed, and location so that you can evaluate the snapshots before you delete them.

When you click **Begin Action**, vRealize Operations Manager displays a dialog box to indicate that the action has started. To track the status of the action, click the link in the dialog box and view the state of the action in **Administration > Recent Tasks**.

Where You Run the Action

For the supported objects and object levels, this action is available in the following locations in vRealize Operations Manager :

- Embedded just below the top menu.
- On the toolbar when you click **Environment** in the menu, select an object, click the **Details** tab, and click **Views**.
- On the toolbar when you click **Environment** in the menu, select an object, click the **Environment** tab, and select an object in the list view.
- In the Inventory list when you click **Administration** in the menu, click **Inventory** , then click the **List** tab, and select an object in the list.
- In configured alert recommendations.
- In the Object List and Topology Graph dashboard widgets.

Action Options

To ensure that you are submitting the action for the right objects, review the following information.

You first retrieve snapshots based on age, then select the snapshots to delete.

Table 1-60. Retrieve Snapshots

Option	Description
Name	Name of the virtual machine on which you are running the Delete Unused Snapshots for VM action.
Days Old	Age of the snapshots to be deleted. This action retrieves snapshots for the virtual machine that are older than one day.
Host	Name of the host with which the virtual machine is associated.
Parent vCenter	Name of the VMware Adapter as it is configured in vRealize Operations Manager. The adapter manages the communication with the vCenter Server instance.

Select the snapshots to delete.

Table 1-61. Delete Snapshots

Option	Description
Selected objects	Check box indicates whether the action is applied to the object. To not run the action on one or more objects, deselect the associated check boxes. This option is available when two or more objects are selected.
VM Name	Name of the virtual machine from which the snapshot was created.
Snapshot Name	Name of the snapshot in the datastore.
Snapshot Space (MB)	Number of megabytes consumed by the snapshot.
Snapshot Create Time	Date and time when the snapshot was created.
Snapshot Age	Age of the snapshot in days.
Datacenter Name	Name of the data center with which the datastore is associated.
Datastore Name	Name of the datastore where the snapshot is managed.
Host Name	Name of the host with which the datastore is associated.

After you click **OK**, the next dialog box provides the task ID and a link to the task list.

Table 1-62. Task ID Dialog Box

Option	Description
Recent Tasks	To view the status of the job and verify that the job finished, click **Recent Tasks**.
OK	To close the dialog box without further action, click **OK**.

The Delete Unused Snapshots action creates a job for the retrieve snapshots action, and a job for the delete snapshots action.

Delete Unused Snapshots for Datastore Action

The Delete Unused Snapshots for Datastore action in vRealize Operations Manager deletes snapshots that are older than the specified age from your datastores. Deleting unused snapshots reclaims wasted space in your environment.

How the Action Works

The Delete Unused Snapshots for Datastore action comprises two dialog boxes. The first dialog box allows you to select the snapshot age criteria, which must be greater than one day. The second step allows you to select the snapshots to delete, and runs the Delete Unused Snapshots for Datastore action.

The number of days that you specify for each datastore is the age of the snapshots based on the creation date. The Delete Unused Snapshots dialog box provides details regarding snapshot name, space consumed, and location so that you can evaluate the snapshots before you delete them.

When you click **Begin Action**, vRealize Operations Manager displays a dialog box to indicate that the action has started. To track the status of the action, click the link in the dialog box and view the state of the action in **Administration > Recent Tasks**.

Where You Run the Action

For the supported objects and object levels, this action is available in the following locations in vRealize Operations Manager :

- Embedded just below the top menu.
- On the toolbar when you click **Environment** in the menu, select an object, click the **Details** tab, and click **Views**.
- On the toolbar when you click **Environment** in the menu, select an object, click the **Environment** tab, and select an object in the list view.
- In the Inventory list when you click **Administration** in the menu, click **Inventory**, then click the **List** tab, and select an object in the list.
- In configured alert recommendations.
- In the Object List and Topology Graph dashboard widgets.

Action Options

To ensure that you are submitting the action for the right objects, review the following information.

You first retrieve snapshots based on age, then select the snapshots to delete.

Table 1-63. Retrieve Snapshots

Option	Description
Name	Name of the datastore on which you are running the delete snapshot action.
Days Old	Age of the snapshots to be deleted. This action retrieves snapshots for the datastore that are older than one day.

Table 1-63. Retrieve Snapshots (continued)

Option	Description
Host	Name of the host with which the datastore is associated.
Parent vCenter	Name of the VMware Adapter as it is configured in vRealize Operations Manager. The adapter manages the communication with the vCenter Server instance.

Select the snapshots to delete.

Table 1-64. Delete Snapshots

Option	Description
Selected objects	Check box indicates whether the action is applied to the object. To not run the action on one or more objects, deselect the associated check boxes. This option is available when two or more objects are selected.
Datastore Name	Name of the datastore where the snapshot is managed.
Snapshot Name	Name of the snapshot in the datastore.
Snapshot Space (MB)	Number of megabytes consumed by the snapshot.
Snapshot Create Time	Date and time when the snapshot was created.
Snapshot Age	Age of the snapshot in days.
Datacenter Name	Name of the data center with which the datastore is associated.
Host Name	Name of the host with which the datastore is associated.
VM Name	Name of the virtual machine from which the snapshot was created.

After you click **OK**, the next dialog box provides the task ID and a link to the task list.

Table 1-65. Task ID Dialog Box

Option	Description
Recent Tasks	To view the status of the job and verify that the job finished, click **Recent Tasks**.
OK	To close the dialog box without further action, click **OK**.

The Delete Unused Snapshots action creates a job for the retrieve snapshots action, and a job for the delete snapshots action.

Export Guest User Mapping Action

You can create a template CSV file in any selected directory of vRealize Operations Manager VM and enter credentials for VMs of the selected vCenter Servers.

Where You Run the Action

For the supported objects and object levels, this action is available in the following location in vRealize Operations Manager .

- In the **Administration** tab, select the relevant vCenter Server from Cloud Accounts. Click the vertical ellipsis and select **Object Details**. This action is available from the **Actions** menu below the top menu.

Note This action is deprecated and will be removed in the next release.

Action Menu Items

1 Enter the **Export CSV Path** and click **Begin Action**.

You can view the status of the action under **History > Recent Tasks**.

2 After the action is successful, log in to vRealize Operations Manager VM with any remote session tool and edit the exported guest user mappings CSV template.

3 Encrypt the file with the gpg tool available on vRealize Operations Manager VM by running the command:

```
# cd <guestmappings file parent dir>

# gpg --symmetric <guestmappings filename>
```

a Enter the same password that you entered in the **Guest User Mapping CSV** field when configuring the Service Discovery adapter.

The gpg tool creates a gpg file which is the encrypted version of the plain-text comma-separated-values file next to the CSV file.

Apply Guest User Mapping Action

You can apply the guest user mappings that you have configured on the vCenter Server.

Where You Run the Action

For the supported objects and object levels, this action is available in the following location in vRealize Operations Manager .

- In the **Administration** tab, select the relevant vCenter Server from Cloud Accounts. Click the vertical ellipsis and select **Object Details**. This action is available from the **Actions** menu below the top menu.

Note This action is deprecated and will be removed in the next release.

Prerequisites

Ensure that the Export Guest User Mapping action is performed successfully.

Action Menu Items

1 Enter the **Encrypted CSV Path** (gpg file) and the **Status CSV Path**.

2 Select the **Overwrite** check box to overwrite the already configured guest user mapping.

3 Click **Begin Action**.

You can view the status of the action under **History > Recent Tasks**.

Note If the user mapping for a VM is not successful, review the CSV path that you entered in the **Status CSV Path** field.

Clear Guest User Mapping Action

You can clear the guest user mapping by specifying an encrypted gpg file.

Where You Run the Action

For the supported objects and object levels, this action is available in the following location in vRealize Operations Manager .

- In the **Administration** tab, select the relevant vCenter Server from Cloud Accounts. Click the vertical ellipsis and select **Object Details**. This action is available from the **Actions** menu below the top menu.

Note This action is deprecated and will be removed in the next release.

Prerequisites

Ensure that the Export Guest User Mapping and the Apply Guest User Mapping actions are performed successfully.

Action Menu Items

1 Enter the **Encrypted CSV Path** (gpg file) and the **Status CSV Path**.

2 Click **Begin Action**.

You can view the status of the action under **History > Recent Tasks**.

Note If the user mapping for a VM is not successful, review the CSV path that you entered in the **Status CSV Path** field.

Configure Included Services Action

You can extend the set of out-of-the-box discoverable services by adding additional service details.

Where You Run the Action

For the supported objects and object levels, this action is available in the following location in vRealize Operations Manager .

- In the **Administration** tab, select the relevant vCenter Server from **Other Accounts** that have the Service Discovery adapter configured. Click the vertical ellipsis and select **Object Details**. This action is available from the **Actions** menu below the top menu.

Note This action is deprecated and will be removed in the next release.

Action Menu Items

1 Add the service details in the format: **`<service executable>, <port>, <service name>`**. For example, **`sshd, 22, SSH Service`**.

2 Click **Begin Action**.

You can view services under **Home > Manage Applications > Discovered Services**.

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 Configure a vCenter Server Cloud Account section in *vRealize Operations Manager Configuration Guide.*

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 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.

Recent Tasks in vRealize Operations Manager

The status of the tasks that were recently initiated from vRealize Operations Manager appears in the Recent Task list. You can determine whether a task is finished, still in process, or failed.

How Recent Tasks Work

The Recent Tasks page reports on logged task events, and the log entries appear in the messages area so that you can troubleshoot failed tasks.

Where You View Recent Tasks

In the menu, select **Administration**, then select **History** from the left pane and click **Recent Tasks**.

Recent Task Options

Review the information in the task list to determine if a task is completed or if you must troubleshoot a failed task. To see the details about a task, select the task in the list and review the associated objects and task messages.

Table 1-66. Task List

Option	Description
Export	Exports the selected task to an XML file. The exported information, which includes the messages, is useful when you are troubleshooting a problem.
Edit Properties	Determines how long the recent task data is retained in your system. Set the number of days that vRealize Operations Manager keeps the data, after which it is purged from the system. The default value is 90 days.
Status drop-down menu	Filters the list based on the status value.
All Filters	Filters the list based the selected column and the provided values.
Filter (Object Name)	Limits the tasks in the list to those that match the entered string. The search is based on a partial entry. For example, if you enter **vm**, objects such as **vm001** and **acctvm_east** are included.
Task	Name of the task. For example, Set CPU Count for VM.

Table 1-66. Task List (continued)

Option	Description
Status	State of the task. Possible states include the following values: ■ Completed. Task completed successfully on the target objects. ■ In Progress. Task is running on the target objects. ■ Failed. Task failed to run on the target objects. If the task started, the reasons for failure might include a faulty script, a script timed out, or actions are not taken. If the task did not start and immediately reports as failed, the reasons might include that the task was not able to start or the script was not found. If the task was not initiated on the target object, it might have failed because of communication or authentication errors. ■ Maximum Time Reached. Task is running past the amount of time that is the default or configured value. To determine the status, you must troubleshoot the initiated action. ■ Not Dispatched. The action adapter was not found. ■ Started. Task is initiated on the object. ■ Unknown. An error occurred while running the action, but the error was not captured in the task logs. To investigate this status further, check the vRealize Operations Manager support logs for the vCenter Adapter, available in the **Administration** area, and check the target system.
Started Time	Date and time when the task started.
Completed Time	Date and time when the task finished. A completed date does not appear if the task failed or if the maximum timeout is reached.
Automated	Indicates whether the action in the task list is automated, indicated by `Yes` or `No`.
Object Name	Object on which the task was started.
Object Type	Type of object on which the task was started.
Event Source	The UUID or the name of the event that triggered the action automatically. when an event is triggered that is associated to the recommendation, it triggers the action without the user intervention. For example, you can automate Alert recommendations that have an associated action. Automation is disabled by default. You configure automation in the **Override Alert / Symptom Definitions** area of a policy when you create or edit the policy in **Administration > Policies**. An administrator who has the **Automation** role has permission to automate actions in the **Override Alert / Symptom Definitions** area of the policy workspace.

Table 1-66. Task List (continued)

Option	Description
Source Type	Authentication source that the user who started the task used when accessing vRealize Operations Manager .
Submitted By	Name of the user who initiated the task. This column displays the automationAdmin user account for automated actions that are triggered by alerts.
Task ID	ID generated when the task, which included one or more actions, was started. The task ID is unique for the task for each adapter. If a task includes tasks that ran using two adapters, you see two task IDs. If the task is a delete snapshot action, two task IDs are generated. One ID is for the retrieve snapshots based on date task, and the other ID is for the delete selected snapshots task.

The Associated Objects are the objects on which the selected task ran.

Table 1-67. Associated Objects for Selected Task Details

Option	Description
Object Name	Detailed list of objects that are included in the task selected in the task list. If the task ran on only one object, the list includes one object. If the task ran on multiple objects, each object is listed on a separate row.
Object Type	Type of object for each object name.
Status	Current state of the task.

The Messages are the log of the task as it ran. If the task does not finish successfully, use the logs to identify problems.

Table 1-68. Messages for Selected Task Details

Severity drop-down menu	Limits the messages based on the Severity value.
Filter (Message)	Limits the message in the list to those that match the entered string. The search is based on a partial entry. For example, if you enter **`id`**, then messages that contain **`Task ID`** and the phrase **`did not complete`** are included.
Severity	Message level in the logs. The severity includes the following values: ■ Information. Messages added to logs as the task is processed. ■ Error. Messages generated during a task failure.

Table 1-68. Messages for Selected Task Details (continued)

Time	Date and time the entry was added to the log.
Message	Text of the log entry. Use the information in the message to determine why a task failed, and to begin to troubleshoot and resolve the failure. The messages appear with the most recent entry at the top of the list if you do not sort the columns.

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 tasks status of `Failed`. When you evaluate the Messages list for the selected job, you see `VMware Tools: Not running (Not installed)`.

Cause

The Shutdown VM action requires that VMware Tools 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.

Inventory Tab

The tab displays the state of each object in your environment. Objects are members of groups and applications that you define.

Where You Find Inventory

In the menu, click **Environment**, then select the **Inventory** tab.

Use the toolbar options to manage objects.

Table 1-69. Inventory Toolbar Options

Option	Description
Action	An action on the selected object. Depends on the object type. For example, Power on VM applies to the selected virtual machine. See *List of vRealize Operations Manager Actions*.
Open in external application	If an adapter includes the ability to link to another application for information about the object, click the command to access a link to the application. For example, Open Virtual Machine in a vSphere Client or Search for VM logs in vRealize Log Insight.
Filter	Limit the list to objects matching the filter.

Table 1-70. Inventory Data Grid Options

Option	Description
Object Name	Displays a summary of the object.
Summary	Criticality of the health, risk, and efficiency of any object.

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 identity 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 Planning: Traditional
- What-If Analysis - Infrastructure Planning: Traditional
- What-If Analysis - Workload Planning: Hyperconverged and VMC on AWS
- What-If-Analysis - Infrastructure Planning: Hyperconverged
- What-If-Analysis - Migration Planning: VMware Cloud
- What-If-Analysis - Migration Planning: Public Cloud
- What-If Analysis - Data Center Comparison
- Retain Historical Data of VMs Migrated Using VMware Hybrid Cloud Extension
- Custom Profiles in vRealize Operations Manager
- Custom Data Centers in vRealize Operations Manager

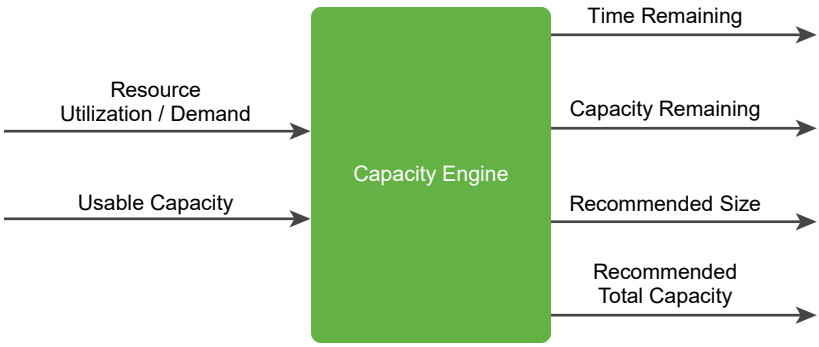
Capacity Analytics

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, *Capacity Details* in the Configuring Policies chapter of the VMware vRealize Operations Manager Configuration Guide.

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.

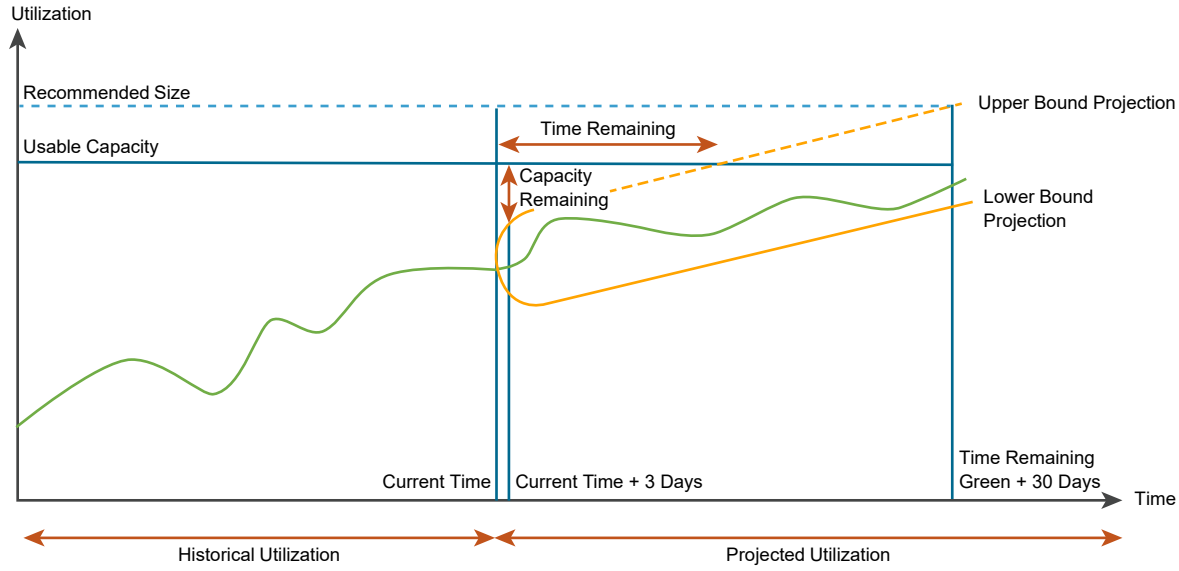
Recommended Total Capacity

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.

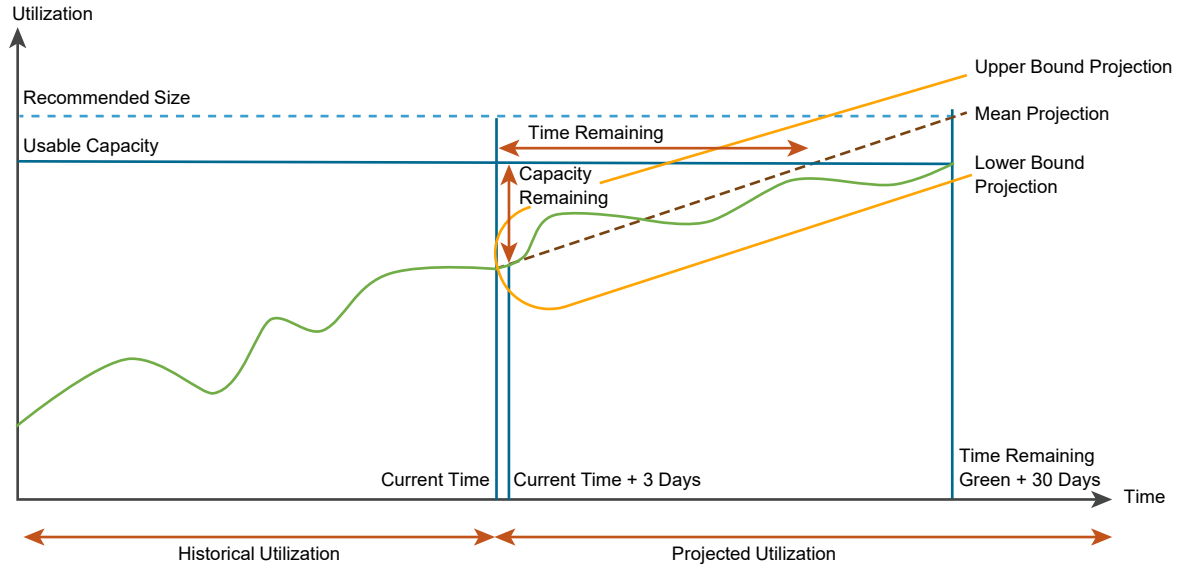
For example, if the warning threshold value for time remaining is 120 days, which is the default value, the recommended size is the maximum projected utilization including HA values, 150 days into the future.

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.

Forecast In Trend Views

Forecasts are generated based on the time range specified in the view settings and are forecasted for the number of days specified in the forecast setting. The forecast is generated based on 3 main algorithms. Change-point detection to find sections of the history with significant changes, linear regression to find linear trends, and cyclical analysis to identify periodic patterns.

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. 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: Traditional pane.

  The Workload Planning: Traditional 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: Traditional pane.

The Workload Planning: Traditional 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.

VMware Cloud on AWS	Hybrid Cloud
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.	
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 in *vRealize Operations Manager Configuration Guide.* .

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.

Click the **Edit** icon to modify the criticality threshold, risk level, and allocation model. These changes affect the selected cluster's policy. Hence, any change that you make here, affects all the clusters under the same 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
Select a datacenter	Select a data center from the carousel across the top of the page. Information about the datacenter is displayed below.
ALL DATACENTERS | **X**	Toggle: click **ALL DATACENTERS** on the upper right when you want to switch the view to a filtered list of all data centers. Click **X** 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 **ALL DATACENTERS** 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 **ALL DATACENTERS** on the upper right.
Sort by:	Options (Options appear if you select **ALL DATACENTERS** on the upper right): ■ Alarm clock graphic - lists data centers/custom data centers by time remaining. ■ Dollar sign - lists data centers/custom data centers by potential cost savings. ■ Scales graphic - lists data centers/custom data centers by level of optimization.
Select datacenter or ADD NEW CUSTOM DATACENTER	Options (options appear if you select **ALL DATACENTERS** on the upper right): ■ Select a data center from the carousel across the top of the page. All data following refreshes with information for the selected object. ■ Select **ADD NEW CUSTOM DATACENTER** to display a dialog box that enables you to define a custom data center.

Table 2-1. Capacity Optimization Options (continued)

Option	Description
Time Remaining	Appears when you select a data center or custom data center from the top of the screen. Gives overview of cluster status, including how many are at: ■ Critical ■ Medium ■ Normal ■ Unknown "Critical" can indicate a resource contention, imbalance, or other stress condition. Thresholds you set in the policies define what is critical.
Optimization Recommendations	Lists potential cost savings by reclaiming unused resources. Indicates if workloads can be optimized across clusters. **VIEW RECLAIMABLE VMS** - displays the **Reclaim** screen, where you can research and run potential VM reclamation actions. **VIEW OPTIMIZATION** - displays the **Workload Optimization** screen, where you can optimize workloads based on your policy settings.
Cluster Utilization and Time Remaining	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 select dictate the data displayed in the graph. Sort by: ■ Most Constrained: most constrained element ■ CPU (allocation or demand) ■ Memory (allocation or demand) ■ Disk Space (allocation or demand) **Note** Demand model is always on and is the default. **Filter**: search field. **Show History for**: The period before forecasting begins (does not impact the forecast calculation). **Show Forecast For**: The forecast period. **How is the criticality determined?** Displays the criticality threshold you set for this type of object in the Policies Library. **Cluster Time Remaining Settings**: Click the **Edit** icon to edit the default policy for the selected cluster. Change the criticality threshold, risk level, allocation model and capacity buffer. Applying these changes affects all objects in the policy. For more information, see Configuring Policies in the *VMware vRealize Operations Manager Configuration Guide*

Table 2-1. Capacity Optimization Options (continued)

Option	Description
Time Remaining graph	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).
Recommendations	Option 1: Reclaim Resources. Shows resources that can be reclaimed to increase time remaining for the selected cluster. **RECLAIM RESOURCES** - displays the **Reclaim** screen, where you can research and run potential VM reclamation actions. Option 2: Add Capacity. Shows resources that can be added to increase time remaining.

Note You might 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.

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.

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

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 select 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 check box. Similarly, you can include or exclude powered-off VMs, idle VMs, and orphaned disks. For more information, see Reclamation Settings.

Note To provide read-only access to the Reclamation Settings page for a user, configure the user role in the Access Control page (Roles tab) under **Administration > Access > Access Control**. Select the **Manage Global Settings** permissions under **Administration > Management** in the **Permissions** pane to grant access to modify the Reclamation Settings page. Unselect the **Manage Global Settings** permissions to grant read-only access.

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.
ALL DATACENTERS | **X**	Toggle: click **ALL DATACENTERS** on the upper right when you want to switch the view to a filtered list of all data centers. Click **X** to return to a carousel view of data centers.

Table 2-2. Reclaim Options (continued)

Option	Description
View:	Filter results to include data centers, custom data centers, or both. Option appears when you select **ALL DATACENTERS** 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 **ALL DATACENTERS** on the upper right.
Sort by:	Options (Options appear when you select **ALL DATACENTERS** on the upper right): ■ Alarm clock graphic - list data centers/custom data centers by time remaining. ■ Dollar sign - list data centers/custom data centers by potential cost savings. ■ Scales graphic - list data centers/custom data centers by level of optimization.
Select data center or ADD NEW CUSTOM DATACENTER.	Options (Options appear when you select **ALL DATACENTERS** on the upper right): ■ Select a data center from the carousel across the top of the page. All data refreshes with information for the selected object. ■ Select **ADD NEW CUSTOM DATACENTER** to display a dialog box that enables you to define a custom data center.
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.
Total Reclaimable Capacity	Lists potential cost savings for the selected data center when you reclaim unused resources. Resource: CPU, memory, or disk space Reclaimable Capacity: how much capacity is available to reclaim from idle resources % Reclaimable: percentage of total CPU, memory, or storage you can reclaim.

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	Tabular representation of the VMs, Idle VMs, Snapshots, and Orphaned disks in the selected data center from which resources can be reclaimed. 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. 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. Once you select a VM or VMs, the dimmed options above the table become visible, as follows. **Exclude VM(s)**: The selected VMs are excluded from your subsequent action. Excluding VMs from a reclamation action can reduce the potential cost savings. For powered Off VMs: ■ **SCHEDULE ACTION**: Displays a dialog box enabling you to schedule one or more reclaim action for powered off VMs. Expand the cluster name displayed in the table and select one or more VMs. Then, from the SCHEDULE ACTION drop down menu, select an action to be performed later. In the dialog box, you configure the schedule for the job. Scheduled jobs can be managed in Automation Central. ■ **DELETE VM(s)**: Deletes the selected VMs. ■ **EXCLUDE VM(s)**: Excludes the selected VMs. ■ **EXPORT ALL**: Exports the list of powered off VMs into a CSV file. For idle VMs: ■ **SCHEDULE ACTION**: Displays a dialog box enabling you to schedule one or more reclaim action for idle VMs. Expand the cluster name displayed in the table and select one or more VMs. Then, from the SCHEDULE ACTION drop down menu, select an action to be performed later. In the dialog box, you configure the schedule for the job. Scheduled jobs can be managed in Automation Central. ■ **DELETE VM(s)**: Deletes the selected VMs. ■ **POWER OFF**: Powers off the selected VMs. ■ **EXCLUDE VM(s)**: Excludes the selected VMs. ■ **EXPORT ALL**: Exports the list of idle VMs into a CSV file. For Snapshots: ■ **SCHEDULE ACTION**: Displays a dialog box enabling you to schedule one or more reclaim action for snapshots. Expand the cluster name displayed in the table and select one or more VMs. Then, from the SCHEDULE ACTION drop down menu, select an action to be performed later. In the dialog box, you configure the schedule for the job. Scheduled jobs can be managed in Automation Central. ■ **DELETE SNAPSHOT(s)**: Deletes the selected snapshots. ■ **EXCLUDE VM(s)**: Excludes the selected snapshot. ■ **EXPORT ALL**: Exports the list of snapshots into a CSV file.

Table 2-2. Reclaim Options (continued)

Option	Description
	SHOW|HIDE EXCLUDED VMS: Toggle displays or hides the list of VMs you previously excluded. **Note** 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. For Orphaned Disks: ■ **EXCLUDE DISK(S)**: Exclude the selected disks in the actionable list. ■ **EXPORT ALL**: 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. **Note** 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 . Check the accuracy of the VMDK reported as an orphaned disk, and then perform a reclamation. **SHOW|HIDE EXCLUDED DISKS**: Toggle displays or hides the list of disks you previously excluded. Excluded disks are not listed in the exported CSV file.

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	VMs that have been continuously powered off during the defined period of time. 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	VMs that have used no more than 100MHz CPU during the defined period of time. 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. Direct cost of VM is also attributed.
Snapshots	VM snapshots that have existed for the entire defined period of time. 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	VMDKs on datastores that are not connected to any registered VMs and have not been modified during the defined period of time. 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. **Note** You can navigate to **Global Settings** under **Administration > Management** and change the value of the **Orphaned Disks Collection** time. At this time that you set, vRealize Operations Manager checks for orphaned VMDKs in vSphere Client instances. The settings for **Cost Calculation** and **Orphaned Disks Collection** are interrelated. The default value for **Cost Calculation** is 9:00 PM, and the default for **Orphaned Disks Collection** is 8:00 PM. It is recommended to schedule **Cost Calculation** after **Orphaned Disks Collection**.

Note If you are unable to make changes in the Reclamation Settings page, your user role in the Access Control page (Roles tab) under **Administration > Access > Access Control** must be modified by an administrator. The **Manage Global Settings** permissions under **Administration > Management** in the **Permissions** pane controls access to the Reclamation Settings page.

What-If Analysis - Workload Planning: Traditional

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 Planning: Traditional

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: Traditional.

How What-If Analysis - Workload Planning: Traditional Works

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. When you add VMs in the Workload Planning: Traditional pane, you can select 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 selecting 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 select 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 **Add VMs** or **Remove VMs** 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 **Delete** 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 **Run Scenario**,**Edit**, and **Delete** 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 VMs

As part of the What-If workload planning for traditional infrastructure, Workload Planning: Traditional is the pane you use to fill in the details of your virtual machines. You select 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 Can Add or Remove VMS

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

Table 2-5. Workload Planning: Traditional Add VMs Options

Option	Description
Scenario Name	Name of your scenario
Location	Where do you want to add the workload? Select from the list of existing data centers. You can optionally select the exact cluster where you want the workload to reside.
Application Profile/Configure	Allows you to configure the virtual compute resource, including vCPU, memory, and storage.
Application Profile/Import Import from existing VM	Displays the Select VMs dialog box where you can select 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.

Table 2-5. Workload Planning: Traditional Add VMs Options (continued)

Option	Description
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.
Expected Utilization	Set the projected percentage of total workload capacity you expect to average. Click **Advanced Configuration** to set the percentage of expected utilization for CPU, Memory, and Disk individually and to select thin or thick provisioning.
Annual Projected Growth	Set the percentage by which you expect your capacity go grow, annually. Click **Advanced Configuration** to set the percentage growth of CPU, Memory, and Disk individually. For example, if the utilization is 100 at the start date, and you set the annual growth % to 10%, then at the end of the year the utilization will grow to 110. The Annual Projected Growth can be set to 0% if no growth is expected.
Number of VMs (optional)/**Quantity**	You can optionally select how many VMs to spread the workload across.
Start Date/End Date	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.
Run Scenario	Click to run the scenario. The system calculates whether it fits into the location you selected.
Save	**Save** the scenario.
Cancel	**Cancel** the scenario.

Table 2-6. Workload Planning: Traditional Remove VMs Options

Option	Description
Scenario Name	Name of your scenario.
Location	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.
Application Profile/Configure	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.
Application Profile/Import Existing VMs	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. **Note** The recommended limit is 100 VMs as a maximum for workload removal.

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

Option	Description
Application Profile / Custom: 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.
Start Date/End Date	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.
Run Scenario	Click to run the scenario. The system calculates the impact on the cluster (time remaining and capacity remaining) when removing the workload.
Save	**Save** the scenario.
Cancel	**Cancel** the scenario.

Select VMs

Use the **Select VMs** dialog box to choose the VMs whose attributes you want to copy or remove for your Workload Planning: Traditional or Workload Planning: Hyperconverged what-if scenarios.

Where You Find Select VMs

From the What-If Analysis screen, click **Add VMS** or **Remove VMS** in the Workload Planning: Traditional or Workload Planning: Hyperconverged pane. 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 (**nn**).	Select the VMs listed on the current page, from which to import, or remove characteristics.
Select all (**nn**) VMS	Click to select all the VMs across all the pages, based on the filters you have set. The number of VMs that you can select by clicking this option is limited to 500 VMs.
Selected	List of VMs you selected from RESULTS.
OK	When you have selected the VMs you want, click **OK** to return to the Add Workload or Remove Workload screen, where your selected VMs are listed.

Under Application Profile, in the Selected VMs table, enter the number of copies of each VM you selected to add or remove in the Quantity column.

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 - Infrastructure Planning: Traditional

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 Infrastructure Planning: Traditional

From the Home screen, select **What-If Analysis** under Optimize Capacity in the left pane. Click **Add Hosts** or **Remove Hosts** in the pane titled Infrastructure Planning: Traditional.

How the What-If Analysis for Infrastructure Planning: Traditional Works

Infrastructure Planning for traditional environments 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 Infrastructure Planning: Traditional pane, you can choose where you want to locate the additional capacity or from where you can remove the existing capacity.

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

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

- Select a server type from a list of commercially available servers. You can select 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.

Add or Remove Hosts

As part of the What-If analysis for physical infrastructure planning for traditional environments, Infrastructure Planning: Traditional pane is what you use to fill in the details of your What-If scenario. You select where to add or remove hosts, 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 Infrastructure Planning: Traditional pane.

Table 2-7. Add Hosts Options

Option	Description
Scenario Name	Name of your scenario
Location	Where do you want to add capacity? Select from the list of existing data centers, then select the cluster where you want one or more servers to reside.
Server Details	Clicking **Select Server** displays the Select Server Type dialog box, where you can select 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.
Start Date/End Date	Select from pop-up calendars the start and end date for the What-If scenario.
Run Scenario	Click to run the scenario. The system calculates the cost of the scenario and determines any new time remaining number.

Table 2-7. Add Hosts Options (continued)

Option	Description
Save	**Save** the scenario.
Cancel	**Cancel** 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 2-8. Remove Hosts Options

Option	Description
Scenario Name	Name of your scenario
Location	From where do you want to remove capacity? Select from the list of existing data centers, then select the cluster from where you want to remove one or more servers.
Server Details	Clicking **Select Server** displays the Select Server Type dialog box, where you can select 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.
Start Date/End Date	Select from pop-up calendars the start and end date for the What-If scenario. You can select to keep the end date blank.
Run Scenario	Click to run the scenario. The system determines any new time remaining number.
Save	**Save** the scenario.
Cancel	**Cancel** 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 - Workload Planning: Hyperconverged and VMC on AWS

You can perform Hyperconverged Infrastructure workload planning by adding or removing VMs to VMware vSAN enabled clusters and running What-If scenarios. vRealize Operations Manager shows you 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. .

Where You Find What-If Analysis - Workload Planning: Hyperconverged

From the menu, select **Home** and **Optimize Capacity > What-If Analysis** in the left pane. From the **What-If Analysis** page, select **Workload Planning: Hyperconverged**. To run a What-If scenario click **Add VMS** or **Remove VMS**.

How What-If Analysis - Workload Planning: Hyperconverged Works

You define scenarios that can potentially add or remove workloads to VMware vSANenvironment. The workload scenarios are based on VMs associated with specific storage policy related factors (such as FTT, RAID).

Note When a workload is added based on imported VMs, and the VM is currently in a VMware vSAN-enabled cluster, the VMware vSAN policy settings are not applied and the current VM disk space is taken as is.

Capacity and Cost Planning Support for Virtual Machines - VMC Datacenter

You can now perform capacity planning and cost calculations for a virtual machine (VM) in hyper-converged environment where the VM is part of the Vmware Cloud on Amazon Web Services (VMC) cluster. vRealize Operations Manager provides accurate capacity recommendations and cost calculations when you add or remove VMs in hyper-converged environment from VMC data centers.

The cost calculation is based either on bills collected by VMC adapter or based on reference. To know more about VMC costing, see VMware Cloud on AWS Cost Management in vRealize Operations Cloud section in *vRealize Operations Manager Help* .

Add or Remove VMS

As part of the What-If workload planning for hyperconverged infrastructure, Workload Planning: Hyperconverged is the pane you use to fill in the details of your virtual machines. You select where to add or remove the workload, configure it yourself or use an existing VM as a template, and establish a time frame. The advanced configuration option lets you define your configuration more precisely.

Where You Find Workload Planning

From the menu, select **Home** and **Optimize Capacity > What-If Analysis** in the left pane. Click **Add VMS** or **Remove VMS** in the **Workload Planning: Hyperconverged** pane.

Table 2-9. Workload Planning: Hyperconverged Add Options

Option	Description
Scenario Name	Name of your scenario
Location	Where do you want to add the virtual machines? Select from the list of existing data centers. You can optionally select the exact cluster where you want the virtual machine to reside.
Application Profile/Configure	Allows you to configure the virtual compute resource, including vCPU, Memory, and Disk Space.
Application Profile/Import Import from existing VM	Displays the Select VMs dialog box where you can select 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 selected VM you want to incorporate as templates into your workload.
Select 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.
Expected Utilization	Set the projected percentage of total workload capacity you expect to average. Click **Advanced Configuration** to set the percentage of expected utilization for CPU, Memory, and Disk individually and to select thin or thick provisioning.
Annual Projected Growth	Set the percentage by which you expect your capacity to grow, annually. Click **Advanced Configuration** to set the percentage growth of CPU, Memory, and Disk individually. For example, if the utilization is 100 at the start date, and you set the annual growth % to 10%, then at the end of the year the utilization will grow to 110. The Annual Projected Growth can be set to 0% if no growth is expected.
Number of VMs (optional)/**Quantity**	You can optionally select how many VMs to spread the workload across.
Additional vSAN configuration	Configure additional VMware vSAN details such as swap space, host failures to tolerate, fault tolerance method, and Dedup.
Start Date/End Date	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.
Run Scenario	Click to run the scenario. The system calculates whether it fits into the location you selected.
Save	**Save** the scenario.
Cancel	**Cancel** the scenario.

Table 2-10. Workload Planning: Hyperconverged Remove Options

Option	Description
Scenario Name	Name of your scenario.
Location	From where do you want to remove the VMs? Select from the list of existing data centers. You can optionally select the exact cluster from where you want to remove the workload.

Table 2-10. Workload Planning: Hyperconverged Remove Options (continued)

Option	Description
Application Profile/Configure	Allows you to configure the virtual compute resource, including vCPU, Memory, and Disk Space. After you have configured the scenario, enter the quantity of custom VMs that you want to remove.
Application Profile/Import Existing VMs	Displays the **Select VMs** dialog box where you can select one or more existing VMs. Once you have made your selections, you return to this screen to enter the quantity of each selected VM you want to remove from your workload. **Note** The recommended limit is 100 VMs as a maximum for workload removal.
Application Profile / Custom: 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.
Expected Utilization	Set the projected percentage of total workload capacity you expect to average. Click **Advanced Configuration** to set the percentage of expected utilization for CPU, Memory, and Disk individually and to select thin or thick provisioning.
Number of VMs (optional)/ **Quantity**	You can optionally select how many VMs to spread the workload across.
Additional vSAN configuration	Configure additional VMware vSAN details such as swap space, host failures to tolerate, fault tolerance method, and Dedup.
Start Date/End Date	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.
Run Scenario	Click to run the scenario. The system calculates the impact on the cluster (time remaining and capacity remaining) when removing the workload.
Save	**Save** the scenario.
Cancel	**Cancel** the scenario.

Results: Add or Delete VMs to Hyperconverged Infrastructure

The scenario results are displayed when you run the scenario. In Private Cloud Data Center you can view the recommendation which provides details about the number of VMs to be added or removed from the VMware Cloud. You can also view whether the workload fits in your cloud environment and the cost increase or cost saving depending on whether you are adding or removing a VM from the VMware cloud. The Public Cloud tile displays the cost increase or savings across public clouds like Google Cloud, VMware Cloud on AWS, Amazon Web Services, IBM Cloud and others.

What-If-Analysis - Infrastructure Planning: Hyperconverged

You can perform infrastructure planning by adding or removing Hyperconverged Infrastructure (HCI) nodes in vSAN enabled clusters and running What-If scenarios. vRealize Operations Manager displays the cost, 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 What-If Analysis screen, select **Infrastructure Planning: Hyperconverged**. To run a What-If scenario click **Add HCI Nodes** or **Remove HCI Nodes**.

How What-If Analysis - Hyperconverged Infrastructure Works

You can add hyperconverged infrastructure to your VMware vSAN enabled environment evaluate the increase in HCI capacity and cost. You can add up to 64 hosts per vSAN cluster. This number accounts for 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 or Remove HCI Nodes

As part of the what-if analysis for physical infrastructure planning for hyperconverged environments, the Infrastructure Planning: Hyperconverged pane is what 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 enabled data center and change the number of instances of this server to calculate storage, compute capacity, time remaining, and cost. You can run the Remove HCI Nodes scenario to see the capacity changes after you remove HCI nodes from your data center.

Where You Find Workload Planning

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

Table 2-11. Add HCI Nodes Options

Option	Description
Scenario Name	Name of your scenario.
Location	Where do you want to add the HCI node? Select from the list of existing data centers. You must also choose the exact cluster where you want the HCI node to reside.
Server Details	Allows you to select an existing server type to calculate capacity, time, and storage remaining based on the number of instances of the server.
Number of servers to add	How many instances of the server do you want to add? **Note** Only 60 new hosts can be added to the specified vSAN cluster as the maximum allowed is 64 hosts.

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

Option	Description
Start Date/End Date	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.
Run Scenario	Click to run the scenario. The system calculates whether it fits into the location you selected.
Save	**Save** the scenario.
Cancel	**Cancel** the scenario.

Table 2-12. Remove HCI Nodes Options

Option	Description
Scenario Name	Name of your scenario.
Location	From where do you want to remove capacity? Select from the list of existing data centers, then select the cluster from where you want to remove the server(s).
Server Details	Clicking **Select Server** 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.
Start Date/End Date	Select from pop-up calendars the start and end date for the what-if scenario. You can choose to keep the end date blank.
Run Scenario	Click to run the scenario. The system determines any new time remaining number.
Save	**Save** the scenario.
Cancel	**Cancel** the scenario.

What-If-Analysis - Migration Planning: VMware Cloud

What-If-Analysis - Migration Planning, allows you to evaluate your plan for migrating or moving workloads across different VMware clouds. You can compare capacity and cost of workload across Vmware Cloud for Amazon Web Services (AWS), Azure Vmware Solution (AVS), and Google Cloud Vmware Engine (GCVE). vRealize Operations Manager evalautes the migration plan, calculates the cost and capacity requirements, and provides cost estimate for the selected VMC workload.

Where You Find What-If Analysis - Migration Planning

From the **Home** screen, select **What-If Analysis** under **Optimize Capacity** in the left pane. In the **Migration Planning: VMware Cloud** click **Plan Migration**.

How What-If Analysis - Migration Planning Works

The What-If-Analysis feature of Capacity Optimization enables you to forecast successfully the impact of migrating a workload to the VMware Cloud instance such as Vmware Cloud on AWS, Azure Vmware Solution, Google Cloud Vmware Engine. Once you select the Migration Planning screen, choose whether you want to run the scenario against a VMware Cloud on AWS or other type of cloud accounts. For the Vmware Cloud, select the region where you want to migrate the workload.

When you have set the profile for the migrating workload, run the scenario to get the analysis and assessment of your plan. You can select one VMware cloud at a time and get the estimate for migration planning cost. 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.

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 result also displays the resource-use-level cost and the monthly purchase cost for an on-demand subscription. In addition, the result displays the resource-use-level cost and monthly purchase cost for one-year and three-year subscriptions.

About Clouds

The system might provide a recommendation based on the cost of placing the workload on different VMware clouds. This cost-based recommendation varies for different clouds.

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.

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

Migration Planning: VMware Cloud

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 **Plan Migration** in the **Migration Planning: VMware Cloud** tile.

When you run a scenario for What If: Migration for VMware Cloud, vRealize Operations Manager might suggest the right cloud Instance suitable for the Workload Configuration selected by you. vRealize Operations Manager also calculates the cost for that VMware Cloud's instance and displays the same.

Table 2-13. Migrate Options

Option	Description
SCENARIO NAME	Name of your scenario
SELECT CLOUDS	Where do you want to migrate the workload? Options: ■ **VMware Cloud on AWS** ■ **Azure VMware Solution (AVS)** ■ **Google Cloud VMware Engine (GCVE)** **Note** You can now select regions for VMware Cloud on AWS, AVS, and GCVE .
CLUSTER SETTINGS	Specify the following cluster details: ■ Enter the **Instance Type**. ■ Enter the **Slack Space** in percentage. ■ Enter the **Steady state CPU headroom** in percentage.
APPLICATION PROFILE/Configure	Using the Application Profile you can configure the virtual compute resources, like vCPU, memory, and storage.
Select Your Workload: ■ **CPU** ■ **Memory** ■ **Disk Space**	With the Configure radio button selected, you can size your migrating workload by defining values for vCPU, memory, and storage.
Expected Utilization	Specify the expected utilization or Click **ADVANCED CONFIGURATION** and specify the values for the following: ■ **CPU** ■ **Memory** ■ **Disk Space** ■ **Disk Space Provisioning** - Select either Thin or Thick.
Annual Projected Growth	Specify the annual growth rate so that the system adjust the scenario calculations or click **ADVANCED CONFIGURATION** and specify the values for the following: ■ **CPU** ■ **Memory** ■ **Disk Space**
Number of VMs (OPTIONAL)	You can optionally choose how many VMs to spread the workload across.
Additional vSAN configuration	Select **Account for Swap Space** to reserve swap space for any unreserved virtual machine memory. ■ Select the **Host failures to tolerate value** from the drop-down list. ■ Select the **Fault Tolerance Method**, the options are RAID -1 and RAID-5. ■ Select the **Dedup** value from the drop down list.

Table 2-13. Migrate Options (continued)

Option	Description
APPLICATION PROFILE/Import from existing VM	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. 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.
RUN SCENARIO	Click to run the scenario. The system calculates whether it fits into the location you chose.
SAVE	**SAVE** the scenario.
CANCEL	**CANCEL** the scenario.

VMware Cloud on AWS Assessment - Results

The scenario results are displayed when you run the scenario. You can view the recommendation which provides details about the number of hosts required for the VMware Cloud. You can also view the Total Cost associated with the recommended VMware Cloud for 3 years subscription and the Total Capacity Usage details for CPU, memory and disk space.

For VMware Cloud on AWS Assessment, you can edit the following options.

- **Edit Configuration** - you can edit the change in Reserved Capacity CPU, Reserved Capacity Memory, Fault Tolerance, and RAID Level values and save the values to the original configuration.
- **Change Plan** - you can use the **Choose Plan** option to change your subscription plan, the available options are one-year plan, three-year plan, or Pay-As-You-Go.
- **Edit Discount** - you can use the edit discount option to specify the discount value, the total cost for the subscription is equal to the actual utilization cost minus the discount percentage.

What-If-Analysis - Migration Planning: Public Cloud

You define scenarios that can potentially migrate workloads to a public cloud 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, select 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 might 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 2-14. Migrate Options

Option	Description
SCENARIO NAME	Name of your scenario
SELECT CLOUDS	Where do you want to migrate the workload? Options: ■ AWS ■ VMware Cloud on AWS - You can now select regions for VMware Cloud on AWS. ■ IBM Cloud ■ Microsoft Azure ■ Google Cloud **Note** The cloud providers added in the Add Cloud Provider page are also included in the list. You can select a maximum of three public clouds at a time for comparison. Hold the **Shift** 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.
ADD CLOUD PROVIDERS	You can add or edit the cloud providers and also edit the rate card of each individual cloud provider.
APPLICATION PROFILE/Configure	Using the Application Profile you can configure the virtual compute resources, like vCPU, memory, and storage.
Select Your Workload: ■ **CPU** ■ **Memory** ■ **Disc Space**	With the Configure radio button selected, you can size your migrating workload by defining values for vCPU, memory, and storage.

Table 2-14. Migrate Options (continued)

Option	Description
APPLICATION PROFILE/Import from existing VM	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. 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.
Number of VMs (OPTIONAL)/**Quantity**	You can optionally choose how many VMs to spread the workload across.
RUN SCENARIO	Click to run the scenario. The system calculates whether it fits into the location you chose.
SAVE	**SAVE** the scenario.
CANCEL	**CANCEL** the scenario.

VMware Cloud on AWS Assessment - Results

The scenario results are displayed when you run the scenario. For VMware Cloud on AWS Assessment, you can edit the following options.

- **Edit Configuration** - you can edit the change in Reserved Capacity CPU, Reserved Capacity Memory, Fault Tolerance, and RAID Level values and save the values to the original configuration.
- **Change Plan** - you can use the **Choose Plan** option to change your subscription plan, the available options are one-year plan, three-year plan, or Pay-As-You-Go.
- **Edit Discount** - you can use the edit discount option to specify the discount value, the total cost for the subscription is equal to the actual utilization cost minus the discount percentage.

What-If Analysis - Data Center Comparison

You can select virtual machines to determine which of the preferred data centers (along with a specific choice of cluster or default cheapest cluster) are best fit from both cost effectiveness and capacity requirements perspective. The comparison helps you to find the right data center to place the workload from cost and capacity perspective.

Where You Find What-If Analysis – Data Center Comparison

From the Home screen, select **What-If Analysis** under Optimize Capacity in the left pane. From the Quick Start screen, click **Plan** in the second-from-left column. Click **Compare Datacenters** in the pane titled data center comparison.

How What-If Analysis - data center Comparison Works

This feature of Capacity Optimization enables you to compare cost across data centers within the private cloud environment. After you select the Datacenter Comparison screen, choose one or more data centers to compare the cost and run the scenario. vRealize Operations Manager suggests which data center is most cost effective for the selected workload.

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

- Configure the workload manually by specifying CPU, memory, disk space, expected utilization, and annual projected growth.
- 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 comparing the workload, run the scenario to get the vRealize Operations Manager analysis and assessment of your plan. You can select up to three data centers to compare results. Alternatively, you can save the scenario to edit or run later. A list of saved scenarios is available in the Saved Scenarios tab on the What-If analysis page.

Cost varies from one data center to another depending on cost settings, which include cost drivers such as servers, facility, power, labor, license, network, and storage.

The data center comparison feature solves this problem by allowing you to select a data center which suits your requirement, is least expensive, and has adequate capacity.

Datacenter Comparison

As part of the What-If Analysis function, Compare Datacenters is the form you use to fill in the details of your What-If scenario. Use this scenario to compare cost across data centers within the private cloud environment.

Where You Find Compare Datacenters

At the **What-If Analysis** page, click **Compare Datacenters** in the pane titled Datacenter Comparison.

Table 2-15. Compare Datacenter Options

Option	Description
Scenario Name	Name of your scenario.
Select Datacenters	Select the data centers for which you want to compare the costs.
Application Profile/Configure	Using the Application Profile, you can configure the virtual compute resources, like CPU, memory, disk space, expected utilization, and annual projected growth.

Table 2-15. Compare Datacenter Options (continued)

Option	Description
Select Your Workload: ■ **CPU** ■ **Memory** ■ **Disk Space** ■ **Expected Utilization** ■ **Projected Annual Growth**	With the Configure radio button selected, you can size your workload by defining values for CPU, memory, disk space, expected utilization, and annual projected growth.
Application Profile/Import from existing VM	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. 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.
Number of VMs (OPTIONAL)/**Quantity**	You can optionally choose how many VMs to spread the workload across.
Date	You can specify the Start Date and End Date to compute the data center infrastructure cost for a specific time period.
Run Scenario	Click to run the scenario. The system calculates the cost of migration and checks whether the selected workload fits into the location you have chosen.
Save	**Save** the scenario.
Cancel	**Cancel** the scenario.

Retain Historical Data of VMs Migrated Using VMware Hybrid Cloud Extension

In vRealize Operations Manager you can use VMware Hybrid Cloud Extension (HCX) to perform application migration, workload rebalancing, and business continuity across data centers and clouds. You can also migrate workloads from on-premises data centers to VMware Cloud.

Earlier when you performed HCX bulk migration to migrate workloads from one datacenter to another datacenter, or from one datacenter to VMware Cloud. vRealize Operations Manager failed to retain the historic metrics.

Now vRealize Operations Manager has implemented a solution which is triggered during HCX migration. The event helps vRealize Operations Manager to collect details and manage the target vCenter to identify the workload migration.

After mapping the right attributes of VMs in the source datacenter with the VMs in the destination datacenter, you can verify if vRealize Operations Manager is able to retain all the historical metrics. The HCX migration types supported in vRealize Operations Manager are:

- Bulk Migration
- vMotion Based Migration (hot & cold)

- Replication Assisted Migration

HCX vMotion

vRealize Operations Manager performs the following actions during HCX vMotion.

- Get the target `VCI`, `VM-VC-MOID` from event using the resource key.
- Get the source `VCID`, `VM-VC-MOID` from event using the resource key.
- Maps the correct target `VCID`, `VM-VC-MOID` to the source VM in vRealize Operations Manager .

vMotion Generic Scenario

vRealize Operations Manager performs the following actions during vMotion.

- Get the target `VCI`, `VM-VC-MOID` from event using the resource key.
- Detects the discovered target VM in vRealize Operations Manager , based on the `VCID`, `VM-VC-MOID` attribute.
- For the detected target VMs, get VMs with **VM Entity Instance UUID**, and map the `VCID`, `VM-VC-MOID` for these VMs.
- Search `VCID`, `VM-VC-MOID` in the event message to find the actual vMotion VM.
- Set the correct target `VCID`, `VM-VC-MOID` to the right VM in on source vRealize Operations Manager .

Note To know more about HCX Migration, see VMware HCX Product Documentation.

Custom Profiles in 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 2-16. Custom Profiles Options

Option	Description
Toolbar options	In the toolbar click **Add Profile** to add a custom profile for a specific object type. Click the **Vertical Ellipses** against a profile to perform the following actions: ■ **Edit Profile**. Modify the selected profile. ■ **Delete Profile**. Remove the selected profile.
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 **Add** button. To edit the selected profile, click **Vertical Ellipses** next to the profile and perform an action.

Table 2-17. 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 **IMPORT FROM EXISTING VM** button.

Custom Data Centers in 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 2-18. Custom Datacenters Toolbar and Grid Options

Option	Description
Toolbar options	In the toolbar click **Add** to add a new custom data center. Click the **Vertical Ellipses** against a custom data center to perform the following actions: ■ **Edit**. Modify the custom data center. ■ **Delete** . Remove the custom data center. ■ **Clone** . Clone the custom data center.
Filter	Limit the list of custom data centers to those data centers that match the text that you enter in the **Filter** text box.
Data grid	Lists the custom data centers in your environment, and displays the health, risk, and efficiency for each one. To view a summary of the custom data center health, risk, and efficiency on the **Summary** 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.

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 data center 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 **ADD** button.

To edit a selected custom data center, click the **Vertical Ellipses** to edit, remove or clone.

Table 2-19. 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	Lists the objects in your environment. Select the check box for each object to add to the custom data center. You can add vCenter Server instances, vSphere data centers, vSphere clusters, and ESXi hosts. 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.