VMware vCenter Operations Manager Getting Started Guide

vSphere User Interface

vCenter Operations Manager 5.8.5

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VMware vCenter Operations Manager Getting Started Guide

The *VMware vCenter Operations Manager Getting Started Guide* provides information about using VMware[®] vCenter™ Operations Manager to monitor your virtual environment.

Intended Audience

This guide is intended for administrators of VMware vSphere who want to familiarize themselves with workflow tasks to monitor and manage the performance of the vCenter Operations Manager virtual environment.

Introducing Key Features and Concepts

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vCenter Operations Managerprovides monitoring functionality for your virtual environment. Understanding important features and concepts of vCenter Operations Manager helps you use the product effectively.

This chapter includes the following topics:

vCenter Operations Manager Features

vCenter Operations Manager collects performance data from each object at every level of your virtual environment, from individual virtual machines and disk drives to entire clusters and datacenters. It stores and analyzes the data, and uses that analysis to provide real-time information about problems, or potential problems, anywhere in your virtual environment.

vCenter Operations Manager works with existing VMware products to add the following functions:

- Combines key metrics into single scores for environmental health and efficiency and capacity risk.

- Calculates the range of normal behavior for every metric and highlights abnormalities. Adjusts the dynamic thresholds as incoming data allows it to better define the normal values for a metric.

- Presents graphical representations of current and historical states of your entire virtual environment or selected parts of it.

- Displays information about changes in the hierarchy of your virtual environment. For example, when a virtual machine is moved to a different ESX host, you can see how these changes affect the performance of the objects involved.

- Allows you to define "group" containers to organize monitored objects in accordance with the structure of your environment.

Main Concepts of vCenter Operations Manager

vCenter Operations Manager uses certain concepts that can help you understand the product, its interface, and how to use it.

Attributes and Metrics

vCenter Operations Manager collects several kinds of data for each inventory object. For example, for a virtual machine, vCenter Operations Manager might receive data about free disk space, CPU load, and available memory. Each type of data that vCenter Operations Manager collects is called an attribute. An instance of an attribute for a specific inventory object is called a metric. For example, free memory for a specific virtual machine is a metric.

For each metric, vCenter Operations Manager collects and stores multiple readings over time. For example, the vCenter Operations Manager server polls for information about the CPU load for each virtual machine once every five minutes. Each piece of data that vCenter Operations Manager collects is called a metric value.

Dynamic Thresholds

vCenter Operations Manager defines dynamic thresholds for every metric based on the current and historical values of the metric. The normal range of values for a metric can differ on different days at different times because of regular cycles of use and behavior. vCenter Operations Manager tracks these normal value cycles and sets the dynamic thresholds accordingly. High metric values that are normal at one time might indicate potential problems at other times. For example, high CPU use on Friday afternoons, when weekly reports are generated, is normal. The same value on Sunday morning, when nobody is at the office, might indicate a problem.

vCenter Operations Manager continuously adjusts the dynamic thresholds. The new incoming data allows vCenter Operations Manager to better define what value is normal for a metric. The dynamic thresholds add context to metrics that allows vCenter Operations Manager to distinguish between normal and abnormal behavior.

Dynamic thresholds eliminate the need for the manual effort required to configure hard thresholds for hundreds or thousands of metrics. More importantly, they are more accurate than hard thresholds. Dynamic thresholds allow vCenter Operations Manager to detect deviations based on the actual normal behavior of an object and not on an arbitrary set of limits.

The analytics algorithms take seven days to calculate the initial values for dynamic thresholds. Dynamic thresholds appear as line segments under the bar graphs for use metrics on the Details page and on the Scoreboard page. The length and the position of the dynamic threshold line segment depends on the calculated normal values for the selected use metrics. Dynamic thresholds also appear as shaded gray areas of the use metrics graphs on the All Metrics page.

Hard Thresholds

Unlike dynamic thresholds, hard thresholds are fixed values that you enter to define what is normal behaviour for an object. These arbitrary values do not change over time unless you change them manually. You cannot fix hard thresholds with vCenter Operations Manager.

Key Performance Indicators

vCenter Operations Manager defines attributes that are critical to the performance of an object as key performance indicators (KPI). KPI are weighted more heavily in the calculations that determine the health of an object. Graphs of KPI performance appear before other metrics in several areas of the product.

Alerts and Faults

vCenter Operations Manager generates alerts when events occur on the monitored objects, when data analysis indicates deviations from normal metric values, or when a problem occurs with one of the vCenter Operations Manager components.

Events that the vCenter Serverpublishes are the main source for faults. These events might originate in the vCenter Server itself, or ESX servers might generate them and the vCenter Server publishes them externally. Only a subset of vCenter events are considered as important for fault generation.

Metric Concepts for vCenter Operations Manager

Preparing to monitor your environment with vCenter Operations Manager involves some familiarity with metrics that help you to identify a problem.

vCenter Server presents a use-based model of metrics. vCenter Operations Manager presents a demand-based model of metrics. Some knowledge of the metrics that affect the data and graphs is useful to determine what to do next in a workflow.

Table 1-1. Major Metric Concepts

Metric	Description
Provisioned	Amount of a resource that the user configures.
	The provisioned metric might apply to the amount of physical memory for a host or the number of vCPUs for a virtual machine.
Usable	Actual amount of a resource that the object can use.
	The usable amount is less than or equal to the provisioned amount. The difference between the provisioned amount and usable amount stems from virtualization overhead. This overhead might include the memory that an ESX host uses to run the host, to support reservations for virtual machines, and to add a buffer for high availability.
	The usable metric does not apply to virtual machines.
Usage	Amount of a resource that an object consumes.
	The usage amount is less than or equal to the usable amount.
Demand	Amount of a physical resource that the object might consume without any existing constraints.
	An object becomes constrained because of under-provisioning or contention with other consumers of the resource. A virtual machine might require 10GB of memory but can only get 5GB because the virtual machine must share resources with other virtual machines on the host.
	When the demand amount is less than the usage amount, the environment might have wasted resources. When the demand amount is greater than the usage amount, the environment might incur latency and exhibit decreased performance.
Contention	Difference between the amount of the resource that the object requires and the amount of the resource that the object gets.
	This metric measures the effect of conflict for a resource between consumers. Contention measures latency or the amount of time it takes to gain access to a resource. This measurement accounts for dropped packets for networking.

Table 1-1. Major Metric Concepts (Continued)

Metric	Description
Limit	Maximum amount that an object can obtain from a resource.
	The limit sets the upper bound for CPU, memory, or disk I/O resources that you allocate and configure in vCenter Server.
	The usage amount is less than or equal to the limit amount.
	The demand amount can be greater than the limit amount.
	The limit amount is less than or equal to the provisioned amount.
	The default limit amount is unlimited.
	Rules: **Usage <= Limit**
	Demand can be greater than Limit .
Reservation	Guaranteed amount of resources for an object.
	The object does not start without this reserved amount. The default amount is 0.
Entitlement	Amount of a resource that a virtual machine can use based on the relative priority of that consumer set by the virtualization configuration.
	This metric is a function of provisioned, limit, reservation, shares, and demand. Shares involve proportional weighting that indicates the importance of a virtual machine.
	The entitlement amount is less than or equal to the limit amount.
	The entitlement metric applies only to virtual machines.
	Rules: **Entitlement <= Limit <= Provisioned**
	Entitlement >= Reservations

Beginning to Monitor the Virtual Environment

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To use vCenter Operations Manager to monitor your virtual environment, you must understand the icons, badges, and key metric concepts used in the product.

This chapter includes the following topics:

Object Type Icons in the Inventory Pane

All objects that vCenter Operations Manager monitors are listed in the inventory pane.

vCenter Operations Manager uses specific icons so that you can distinguish between virtual machines, ESX hosts, and other objects in the inventory.

Table 2-1. Object Type Icons

Icon	Description
	World The World object is a logical container for all monitored objects in vCenter Operations Manager.
	vCenter Server system
	Datacenter
	Cluster
	ESX host that is in powered-off state
	ESX host that is in powered-on state
	Datastore
	Virtual machine that is in powered-off state

Table 2-1. Object Type Icons (Continued)

Icon	Description
	Virtual machine that is in powered-on state
	Custom group created by vCenter Operations Manager or by administrators

By default, objects in the inventory pane are grouped by hosts and clusters. You can select **Datastores** from the drop-down menu at the top of the inventory pane to switch the way objects are grouped.

Badge Concepts for vCenter Operations Manager

vCenter Operations Manager uses badges to illustrate derived metrics to provide an overview of the state of the virtual environment or an individual object. These badges serve as focus points to narrow the scope of a potential problem and provide details about the cause of the problem.

vCenter Operations Manager provides major and minor badges that are color coded and range from a healthy green to a potentially problematic yellow, orange, or red. Badges are organized in a simple hierarchy in which the scores of minor badges contribute to the scores of major badges.

Scores might reflect a healthy state or a potential problem depending on the type of badge. For example, low scores for health, time remaining, and capacity remaining might indicate potential problems, while low scores for faults, stress, or anomalies indicate a normal state.

You can use the **Dashboard** tab for an overview of the performance and condition of your virtual infrastructure. The information you see on the **Dashboard** tab depends on the object you select in the navigation tree. See "Object Type Icons in the Inventory Pane," on page 11.

You can expand the panes on the Dashboard to view information about a specific badge. You can also double-click badges to view details about the metrics that affect badge scores.

Major Badges in vCenter Operations Manager

vCenter Operations Manager generates major badges that start a workflow and help you to identify health, capacity risk, and efficiency issues.

Each major badge contains minor badges. vCenter Operations Manager calculates major badges based on the state of the minor badges.

Using Health to Measure the Overall State of the Environment

The vCenter Operations Manager Health badge serves as the first high-level indicator of the state of the virtual environment.

The Health badge indicates immediate problems that might require your attention. It helps you identify the current health of your system. vCenter Operations Manager combines workload, anomalies, and faults to assess the overall health and to determine whether the workload level is expected in that environment. A low health score might indicate a potential problem.

vCenter Operations Manager calculates the Health score by using the scores of the sub-badges that the Health badge contains. Faults are given precedence in the Health score because they describe existing problems, while Workload and Anomalies are combined to identify performance problems. This approach ensures that the score of the Health badge reflects the actual state of the object, without exaggerating or underestimating problems.

The Health score ranges between 0 (bad) and 100 (good). The badge changes its color based on the badge score thresholds that are set by the vCenter Operations Manager administrator.

Table 2-2. Object Health States

Badge Icon	Description	User Action
	The health of the object is normal.	No attention required.
	The object is experiencing some level of problems.	Check the **Details** tab and take appropriate action.
	The object might have serious problems.	Check the **Details** tab and take appropriate action as soon as possible.
	The object is either not functioning properly or will stop functioning soon.	Check the **Details** tab to identify the most probable cause of the problem and act immediately.
	No data is available.	
	The object is offline.	

A vCenter Operations Manager administrator can change the badge score thresholds. For example, a green Health badge can indicate a score above 80 instead of 75, as set by default.

The Health Weather Map

The Health Weather Map displays the health status of all the objects related to the object that you have selected in the inventory pane.

The Health Weather Map is available for all objects in the inventory except virtual machines. For virtual machines, vCenter Operations Manager displays a Health Trend graph.

Each square in the Weather Map represents a related object, directly or indirectly connected to the selected object. For example, if you selected an ESX host in the inventory pane, the number of squares in the Health Weather Map equals the sum of all virtual machines and datastores under this ESX host plus the Datacenter, vCenter Server, and the World object that are above the ESX host in the inventory pane. The squares in the Health Weather Map are not sized, so there is no visible correspondence between object types in the inventory and the squares in the map. You can use the Health Weather Map for a quick overview of the current condition and how it has changed during the past 6 hours. If you notice a red or yellow square, you can click it to navigate to the **Details** tab of the object that corresponds to this square, and view more information about its health.

By default, the Health Weather Map displays the current badge values. You can click the time line in the bottom of the map to switch to earlier periods.

Note   Selecting an earlier time period that is one or more hours away from the current moment displays the condition of the monitored system as it was on the hour. For example, if the current time is 3:15 p.m. and you click **-1**, vCenter Operations Manager displays the Health Weather Map for 3:00 p.m. If you click **-2**, vCenter Operations Manager displays the Health Weather Map for 2:00 p.m.

Using the Workload Badge Under the Health Badge

The vCenter Operations Manager Workload badge measures how hard an object must work for resources. A workload score of 0 indicates that a resource is not being used and a score that approaches or exceeds 100 might cause performance problems.

Workload is an absolute measurement that calculates the demand for a resource divided by the capacity of an object. Resources might include CPU, memory, disk I/O, or network I/O.

The Workload score ranges from 0 (good) to over 100 (bad). The badge changes its color based on the badge score thresholds that are set by the vCenter Operations Manager administrator.

Table 2-3. Object Workload States

Badge Icon	Description	User Action
	Workload on the object is not excessive.	No attention required.
	The object is experiencing some high resource workloads.	1 At the upper right of the **Health** tab, click the **View details** icon to open the VMware vCenter Operations Manager user interface. 2 Check the **Details** tab to identify which resources experience abnormal workload.
	Workload on the object is approaching its capacity in at least one area.	1 At the upper right of the **Health** tab, click the **View details** icon to open the VMware vCenter Operations Manager user interface. 2 Check the **Details** tab to identify which resources are limited, and take appropriate action as soon as possible.
	Workload on the object is at or over its capacity in one or more areas.	1 At the upper right of the **Health** tab, click the **View details** icon to open the VMware vCenter Operations Manager user interface. 2 Check the **Details** tab to identify which resources are exhausted. Act immediately to avoid or correct problems.
	No data is available.	
	The object is offline.	

A vCenter Operations Manager administrator can change the badge score thresholds. For example, a green Workload badge can indicate a score below 80 instead of 85, as set by default.

Using the Anomalies Badge Under the Health Badge

The vCenter Operations Manager Anomalies badge measures the extent of abnormal behavior for an object based on historical metrics data. A high number of anomalies might indicate a potential issue.

A low Anomalies score indicates that an object is behaving in accordance with its established historical parameters. Most or all of the object metrics, especially its KPIs, are within their thresholds. Because changes in behavior often indicate developing problems, if the metrics of an object go outside the calculated thresholds, the anomalies score for the object grows. As more metrics breach the thresholds, anomalies continue to increase. Violations by KPI metrics increase the Anomalies score more than violations by non-KPI metrics. A high number of anomalies usually indicates a problem or at least a situation that requires your attention.

Anomalies involves the number of statistics that fall outside of the expected behavior trends while Workload involves an absolute measurement of how hard an object works for resources. Both Anomalies and Workload are useful when attempting to find a probable cause and troubleshooting performance problems.

The Anomalies score ranges between 0 (good) and 100 (bad). The badge changes its color based on the badge score thresholds that are set by the vCenter Operations Manager administrator.

Table 2-4. Object Anomalies States

Badge Icon	Description	User Action
	The Anomalies score is normal.	No attention required.
	The Anomalies score exceeds the normal range.	Check the **Details** tab to identify what causes the abnormal number of anomalies, and take appropriate action.
	The Anomalies score is very high.	Check the **Details** tab to identify the cause of the abnormal behaviour, and take appropriate action as soon as possible.
	Most of the metrics are beyond their thresholds. This object might not be working properly or might stop working soon.	Check the **Details** tab, and act immediately to avoid or correct problems.
	No data is available.	
	The object is offline.	

A vCenter Operations Manager administrator can change the badge score thresholds. For example, a green Anomalies badge can indicate a score below 60 instead of 50, as set be default.

Using the Faults Badge Under the Health Badge

The Faults badge measures the degree of problems that the object might experience based on events retrieved from the vCenter Server.

The events that might generate faults include the loss of redundancy in NICs or HBAs, memory checksum errors, high availability failover, or Common Information Model (CIM) events, which require your immediate attention.

NOTE   vCenter Operations Manager calculates the Faults score for the World object by using the Faults scores of the vCenter Server systems, the ESX hosts and clusters, and the datastores that belong to the World inventory.

Therefore, if you have one vCenter Server with a Faults score of 100 and another vCenter Server with a Faults score of 0, this might not necessarily result in a Faults score of 50 for the World object. The final Faults score for the World object also depends on the number of datastores, ESX hosts and clusters in the environment, and the Fault scores of these objects.

Fault scores of virtual machines are not taken into account when calculating the Faults score for the World object.

While the Faults score ranges between 0 to 100, the badge changes color based on the badge score thresholds that are set by the vCenter Operations Manager administrator. For example, a green Faults badge can indicate a score below 40 instead of a score below 25 (the system default).

Table 2-5. Object Faults States

Badge Icon	Description	User Action
	No faults are registered on the selected object.	No attention required.
	Faults of low importance are registered on the selected object.	Check the **Details** tab to find more information and take appropriate action.
	Faults of high importance are registered on the selected object.	Check the **Details** tab to find more information about the reported faults, and take appropriate action as soon as possible.
	Faults of critical importance are registered on the selected object.	Check the **Details** tab to find more information about the reported faults, and act immediately to avoid or correct problems.
	No data is available.	
	The object is offline.	

While the Faults score ranges between 0 to 100, the badge changes color based on the badge score thresholds that are set by the vCenter Operations Manager administrator. For example, a green Faults badge can indicate a score below 40 instead of a score below 25 (the system default).

Defining Risk to Assess Future Problems in vCenter Operations Manager

The vCenter Operations Manager Risk badge indicates a potential performance problem in the near future that might affect the virtual environment.

Risk involves the time remaining, capacity remaining, and stress factors that account for the time buffer, remaining virtual machines, and degree of habitual high workload.

vCenter Operations Manager calculates the risk score using the scores of the sub-badges that the Risk badge contains. The formula that is applied to calculate the risk score is inverse geometric weighted mean.

The overall risk score for an object ranges between 0 (no risk) to 100 (serious risk). The badge changes its color based on the badge score thresholds that are set by the vCenter Operations Manager administrator.

Table 2-6. Object Risk States

Badge Icon	Description	User Action
	The selected object has no current problems. No problems are expected in the future.	No attention required.
	A low chance of future problems exists or a potential problem might occur in the far future.	Navigate to the **Scoreboard** tab to check which resources are likely to exhaust and plan for appropriate actions.
	A chance of a more serious problem exists or a problem might occur in the medium-term future.	Navigate to the **Scoreboard** tab to check which resources are close to exhausting and take appropriate actions as soon as possible.
	The chances of a serious future problem are high or a problem might occur in the near future.	Navigate to the **Scoreboard** tab in to check which resources are exhausted and act immediately to resolve or prevent problems.
	No data is available.	
	The object is offline.	

Using the Time Remaining Badge Under the Risk Badge

The vCenter Operations Manager Time Remaining badge measures the time before a resource associated with an object reaches capacity. This badge indicates the available timeframe to provision or load balance the physical or virtual resources for a selected object.

vCenter Operations Manager calculates the Time Remaining score as a percentage of time that is remaining for each compute resource compared to the provisioning buffer you set in the Configuration dialog box. By default, the Time Remaining score provisioning buffer is 30 days. If even one of the compute resources has less capacity than the provisioned buffer, the Time Remaining score is 0.

For example, if the provisioning buffer is set to 30 days, and the object that you selected has CPU resources for 81 days, memory resources for 5 days, disk I/O resources for 200 days, and network I/O resources for more than one year, the Time Remaining score is 0, because one of the resources has capacity for less than 30 days.

The Time Remaining score ranges between 0 (bad) and 100 (good). The badge changes its color based on the badge score thresholds that are set by the vCenter Operations Manager administrator.

Table 2-7. Time Remaining States

Badge Icon	Description	User Action
	The number of days that remain is much higher than the score provisioning buffer you specified.	No attention required.
	The number of days that remain is higher than the score provisioning buffer, but is less than two times the buffer you specified.	Check and take appropriate action.
	The number of days that remain is higher than the score provisioning buffer, but approaches the buffer you specified.	Check and take appropriate action as soon as possible.
	The number of days that remain is lower than the score provisioning buffer you specified. The selected object might have exhausted some of its resources or will exhaust them soon.	Act immediately.
	No data is available for the Time Remaining score.	
	The object is offline.	

Using the Capacity Remaining Badge Under the Risk Badge

The vCenter Operations Manager Capacity Remaining badge measures the number of additional virtual machines that the object can handle before reaching capacity.

The remaining virtual machines count represents the number of virtual machines that can be deployed on the selected object, based on the current amount of unused resources and the average virtual machine profile for the last "n" weeks. The remaining virtual machines count is a function of the same compute resources of CPU, Mem, Disk I/O, Net I/O, and Disk Space that are used to calculate the Time Remaining score.

vCenter Operations Manager calculates the Capacity Remaining score as a percentage of the remaining virtual machines count compared to the total number of virtual machines that can be deployed on the selected object.

The Capacity Remaining score ranges between 0 (bad) and 100 (good). The badge changes its color based on the badge score thresholds that are set by the vCenter Operations Manager administrator.

Table 2-8. Object Capacity States

Icon	Description	User Action
	The capacity remaining for the object is at normal level.	No attention required.
	The capacity remaining for the object is less than the normal level.	Check and take appropriate action.

Table 2-8. Object Capacity States (Continued)

Icon	Description	User Action
	The capacity remaining for the object is at seriously low level.	Check and take appropriate action as soon as possible.
	The object is expected to run out of capacity soon or has already run out of capacity.	Act immediately.
	No data is available for any of the metrics for the time period.	
	The object is offline.	

Using the Stress Badge Under the Risk Badge

The vCenter Operations Manager Stress badge measures a long-term workload that might involve undersized virtual machines or ESX hosts or an excessive number of virtual machines. These conditions might generate performance problems over time.

While workload is based on an instantaneous value, stress measures statistics over a longer period of time.

The Stress score helps you identify hosts and virtual machines that do not have enough resources allocated, or hosts that are running too many virtual machines. A high Stress score does not imply a current performance problem, but highlights potential for future performance problems.

The Stress score ranges between 0 (good) and 100 (bad). The badge changes its color based on the badge score thresholds that are set by the vCenter Operations Manager administrator.

Table 2-9. Stress States

Badge Icon	Description	User Action
	The Stress score is normal.	No attention required.
	Some of the object resources are not enough to meet the demands.	Check and take appropriate action.
	The object is experiencing regular resource shortage.	Check and take appropriate action as soon as possible.
	Most of the resources on the object are constantly insufficient. The object might stop functioning properly.	Act immediately.
	No data is available for the Stress score.	
	The object is offline.	

The Compliance Badge

The Compliance badge value is based on the results of compliance templates that are run in vCenter Configuration Manager and are pulled into vCenter Operations Manager to contribute to the Risk badge calculation.

The Compliance badge value is a score based on one or more compliance templates that you run in VCM against the data collected from vCenter Server, datacenter, cluster, host system, virtual machine objects that are managed by vCenter Operations Manager and by VCM. The scores are calculated based on configured VCM settings.

A VCM compliance template comprises one or more rules that define the configuration standards for different object groups or all your objects. A rule is defined with one or more conditions that are run against objects to determine if the configuration meets the required standards. The success or failure of the conditions determines whether the rule is successful or unsuccessful. The compliance templates are not run against each object, but are run against the collected configuration data for each object.

The Compliance score ranges from 0 (completely non-compliant) to 100 (completely compliant). The color of the badge changes based on the badge score thresholds that are set by the vCenter Operations Manager administrator.

Table 2-10. Object Compliance States

Badge Icon	Description	User Action
	The object is in compliance with the defined standards.	No attention required.
	The object is not as compliant as you would like based on the default values you defined.	1 Click the Compliance badge. 2 Check the template scores and take appropriate action.
	The object is seriously out of compliance.	1 Click the Compliance badge. 2 Check the template scores and take appropriate action as soon as possible.
	The object is non-compliant.	1 Click the Compliance badge. 2 Act immediately to correct non-compliant states based on template results.
	No data is available for any of the templates.	
	The object is offline.	

Defining Efficiency to Optimize the Environment

The vCenter Operations Manager Efficiency badge identifies the potential opportunities to improve the performance or cost of your virtual environment.

Efficiency accounts for the waste and infrastructure density in your environment. A large amount of wasted resources combined with a low density ratio generates a poor efficiency score.

The Efficiency score ranges between 0 (bad) and 100 (good). The badge changes its color based on the badge score thresholds that are set by the vCenter Operations Manager administrator.

Table 2-11. Object Efficiency States

Badge Icon	Description	User Action
	The resource use on the selected object is optimal.	No attention required.
	The efficiency is good, but can be improved. Some resources are not fully used.	1 On the **Planning** tab, click **Views**. 2 Use the views that are available for the selected object to identify underused resources.
	The resources on the selected object are not used in the most optimal way.	1 On the **Planning** tab, click **Views**. 2 Use the views that are available for the selected object to identify underused resources.
	The efficiency is bad. Many resources are wasted.	1 On the **Planning** tab, click **Views**. 2 Try optimizing the resource use to avoid resource waste.
	No data is available.	
	The object is offline.	

Using the Reclaimable Waste Badge Under the Efficiency Badge

The vCenter Operations Manager Reclaimable Waste badge accounts for resource types such as CPU, memory, or disk, and measures the extent of excessive provisioning for an object. It also identifies the amount of resources that you can reclaim and provision to other objects in your virtual environment.

The Reclaimable Waste score ranges between 0 (good) and 100 (bad). The badge changes its color based on the badge score thresholds that are set by the vCenter Operations Manager administrator.

Table 2-12. Reclaimable Waste States

Badge Icon	Description	User Action
	No resources are wasted on the selected object.	No attention required.
	Some resource can be used better.	Select **Planning > Views** to identify underused resources.
	Many resources are underused.	Select **Planning > Views** to identify underused resources.
	Most of the resources on the selected object are wasted.	Select **Planning > Views** to identify underused resources.
	No data is available for any of the metrics for the time period.	
	The object is offline.	

A vCenter Operations Manager administrator can change the badge score thresholds. For example, a green badge can indicate a score below 50 instead of 75, as set by default.

Using the Density Badge Under the Efficiency Badge

The vCenter Operations Manager Density badge measures consolidation ratios to assess cost savings. You can assess the behavior and performance of a virtual machine and related applications to maximize the consolidation ratio without affecting the performance or service level agreements.

The density score is the ratio of the actual density to an ideal density based on the demand, the amount of virtual capacity, and the amount of physical usable capacity. Density calculates the amount of resources that you can provision before contention or conflict for a resource occurs between objects. The ratios account for the number of virtual machines to host, the number of virtual CPUs to physical CPU, and the amount of virtual memory to physical memory.

The Density score ranges between 0 (bad) and 100 (good). The badge changes its color based on the badge score thresholds that are set by the vCenter Operations Manager administrator.

Table 2-13. Object Density States

Badge Icon	Description	User Action
	The resource consolidation is good.	No attention required.
	Some resources are not fully consolidated.	Select **Planning > Views** to identify resource consolidation opportunities.
	The consolidation for many resources is low.	Select **Planning > Views** to identify resource consolidation opportunities.
	The resource consolidation is extremely low.	Select **Planning > Views** to identify resource consolidation opportunities.
	No data is available for any of the metrics for the time period.	
	The object is offline.	

A vCenter Operations Manager administrator can change the badge score thresholds. For example, a green Density badge can indicate a score above 40 instead of 25, as set by default.

Working with Metrics and Charts on the All Metrics Tab

You can check the location of an object in the hierarchy and select metrics to view graphs of their historic values for a period you define.

You can use the panes on the **All Metrics** tab under the **Operations** tab to search metrics and view metric graphs.

The Health Tree Pane

The Health Tree pane displays the location of the currently selected object in the hierarchy of your virtual infrastructure. You can check all parent and child objects related to the currently selected object.

For example, the sample hierarchy shows the parent and child objects in the virtual infrastructure. The red icon indicates a presence of a potential problem in the **vCenter Server** object. You can investigate the probable cause of the problem from the **Dashboard** tab.

The Metric Selector Pane

The Metric Selector pane contains a list of all metric groups that are applicable to the currently selected object. Metric groups contain all the metrics that are applicable to the currently selected object. The list of available metrics is updated depending on the object you selected in the Health Tree pane.

The Search text box allows you find metrics using part of their names and filter the search results by metric groups, instances or metric types.

For example, if you type **%** in the **Search** text box and select **Metric** from the drop-down menu, the search result contains only metrics that are calculated as percentage.

The Metric Chart Pane

The Metric Chart pane displays the graphs of the metrics you select from the Metric Selector pane. You can view as many graphs as you want. You can control the appearance of metric graphs and create screenshots by using the buttons in the Metric Chart pane.

Health Tree Pane Buttons

In the **All Metrics** tab under the **Operations** tab, you can use the buttons of the Health Tree pane to control the appearance of monitored objects in the health tree.

Button Tooltip	Icon	Description
Zoom to fit		Resizes the view so all related objects fit in the health tree area. All previous zoom operations are discarded.
Enter pan mode		Allows you to pan the health tree.
Show values on point		Enables metric value tooltips so that they appear when you point the graph with the mouse pointer.
Enter zoom mode		Allows you to enlarge sections of the health tree by drawing rectangles to enclose the area to enlarge.
Zoom in		Enlarges the middle of the health tree by one level.
Zoom out		Reduces the middle of the health tree by one level.
Reset to initial object		Reset the Health Tree pane to the original view for the selected object..

Metric Chart Pane Buttons

On the All Metrics page, you can use the buttons of the Metric Chart pane to customize the appearance of charts, and add or delete charts.

Global Control Buttons

These buttons control the appearance of all graphs that you open in the Metric Chart pane.

Button Tooltip	Icon	Description
Separate graphs by period		Splits the current metrics graph in separate graphs by periods based on your selection in the time and date widget.
Show/hide Y-axis		Displays or hides the Y axis of the graph to display metric values.
Show/hide metric line		Displays or hides the line that connects the data points in the metric graph.
Show/hide trend line		Displays or hides the line that represents the trend of the currently selected metric in the graph.
Show 24-hour dynamic thresholds		Displays or hides the calculated dynamic threshold values for a 24-hour period in the graph.
Show entire period dynamic thresholds		Displays or hides the calculated dynamic threshold values for the entire monitoring period in the graph.
Show/hide anomalies		Displays or hides the anomalies that occurred during the selected period in the graph.
Retrieve complete metric values		In zoom mode, displays the values of the selected metric when you move the mouse pointer over the graph.
Enable X-axis zoom		Allows you to enlarge the selected area of the graph only on the X axis while the Y axis remains static.
Enable Y-axis zoom		Allows you to enlarge the selected area of the graph only on the Y axis while the X axis remains static.
Zoom to fit		Resizes the charts so the entire graphs for all selected periods fit in the chart area. All previous zooms are discarded.
Zoom Y-axis to dynamic thresholds		Resizes the Y axis of the metric chart so that the highest and the lowest values on the axis are the highest and the lowest values of the dynamic threshold calculated for this metric.
Compress Y-axis		Shortens the graph.
Zoom all graphs together		Resizes all metric graphs that are open in the Metric Chart pane.
Enter zoom mode		Enables resizing of the metric graphs on both axis Y and axis X.
Enter pan mode		When in zoom mode, allows you to drag the enlarged section of the graph around to view higher, lower, earlier, or later values of the metric.
Show value on point		Enables metric value tooltips so that they appear when you point the graph with the mouse pointer.
Refresh		Reloads all graphs in the Metric Chart.
Turn auto refresh on/off		Activates or deactivates the auto refresh option for metric charts.

Button Tooltip	Icon	Description
Open date/time controls		Opens the date and time widget for you to select the period to display on the metric graph.
Remove all graphs		Deletes all graphs from the Metric Chart pane.

Chart-Specific Buttons

These buttons control the specific chart to which they are attached. Some chart-specific buttons are available only when you view graphs split by period.

Button Tooltip	Icon	Description
Move up		When multiple graphs are open in the Metric Chart pane, this button moves the selected graph one place up. Available only for split graphs view.
Move down		When multiple graphs are open in the Metric Chart pane, this button moves the selected graph one place down. Available only for split graphs view.
Save a snapshot		Creates a real-size snapshot of the selected graph and opens a File Download window for you to open or save the PNG file.
Save a full screen snapshot		Creates an enlarged snapshot of the selected graph and opens a File Download window for you to open or save the PNG file.
Download comma separated data		Creates a comma separated values file with the metric data for the selected graph and opens a File Download window for you to open or save the CSV file. Available only for split graphs view.
Close		Deletes the selected graph from the Metric Chart pane. Available only for split graphs view.

Viewing Members and Relationships in the Monitored Environment

<div align="right">

3

</div>

The **Environment** tab allows you to look at the objects in your virtual environment from different perspectives.

The Overview Tab

The **Overview** tab provides a visual representation of the population of your virtual environment by object types. You can click objects to highlight their related parent and child objects. You can compare the scores of related objects to narrow down the possible causes for a bad badge score.

For example, if the Health badge of an ESX host is red, but the health badge of its parent cluster is green, the problem is either with the host itself, or with the virtual machines that run on that host. If the Health badges of one or two virtual machines are red, these virtual machines might be causing the problem on the ESX host. Therefore, you must check these virtual machines first. If the Health badges of all virtual machines are red, the host system is experiencing hardware problems or cannot meet the demands of the virtual machines that run on it.

The Scoreboard Tab

On the **Scoreboard** tab, you can view a population of data across multiple metrics dimensions to get a quick glance overview of where and why problems exist. Scoreboards are useful for any object that has a population, including group objects.

On the **Scoreboard** tab, you can compare the badge values of child objects of the currently selected object. For example, you can use the **Scoreboard** tab to compare objects and analyze the current distribution and availability of resources in your virtual environment.

The Members Tab

On the **Members** tab, you can vew a list of all objects under the currently selected object or group. In addition to the names of objects and their parents, the list displays information about the policy that is assigned to each object.

The Relationships Tab

The **Relationships** tab displays application related information provided by VMware vCenter Infrastructure Navigator. You can view the relationship graph and object properties of the selected object and its related objects.

This chapter includes the following topics:

Check the Performance of Your Virtual Environment

On the **Overview** tab under the **Environment** tab, you can check the performance of your virtual infrastructure to identify objects with potential performance problems.

You can check the performance of all objects on the vCenter Server that you added for monitoring in vCenter Operations Manager.

Prerequisites

Verify that you are logged in to a vSphere Client, and that vCenter Operations Manager is open.

Procedure

1   On the **Environment** tab, click **Overview**, and click the badge that you want to inspect.

Option	Description
Health (default)	Click to check the Health scores of all monitored objects.
Workload	Click to check the Workload scores of all monitored objects.
Anomalies	Click to check the Anomalies scores for all monitored objects.
Faults	Click to check the Faults scores for all monitored objects.

The states of all objects for the metric you selected appear in the **Environment** tab as colored badges.

2   (Optional) To filter objects by state, use the **Status Filter** buttons in the upper right of the **Overview** tab.

What to do next

How you proceed depends on your findings of the performance in your virtual environment.

Balancing the Resources in Your Virtual Environment

You can get an overview of where and why problems exist in your virtual environment, and how the resources are distributed among objects.

On the **Scoreboard** tab under the **Environment** tab, you can compare the performance and available resources of all child objects of the currently selected object, and look for answers to the following questions.

■   What is the current distribution and availability of resources in my virtual environment?

■   Which hosts have the resources to accommodate new virtual machines?

■   Which hosts require load balancing? Can I move virtual machines from an overloaded host to a less loaded host?

■   Which child objects have the highest and the lowest scores for health, workload, anomalies, and faults?

The Custom Overview Chart

The Custom Overview chart is a bubble chart that allows you to compare objects by their badge values. By using the Custom Overview chart, you can draw better inferences from the data that vCenter Operations Manager collects.

The chart presents data by four dimensions, using the following variables: color, size, x-axis, and y-axis. The value that is represented by each variable depends on the selection in the **View** drop-down menu. When **Health**, **Risk**, or **Efficiency** is selected in the **View** drop-down menu, the values for color, size, x-axis, and y-axis are populated automatically and cannot be modified. You can specify your own values only when **Custom** is selected in the **View** drop-down menu.

You can use the buttons above the Custom Overview chart to filter objects by type and badge status. Filtering allows you to slice the problem and narrow down the objects that are experiencing the problem to a certain degree.

The Members List

The Members list displays details for all objects that are visualized in the Custom Overview chart. This list is filtered based on the criteria that you specify for the Custom Overview chart. The columns contain object name, type, and spark lines for all badges related to the object. At the end of each spark line, the latest known value for the badge is displayed as a numeric label.

You can click objects in the Members list to highlight them in the Custom Overview chart, and you can click objects in the Custom Overview chart to highlight them in the Members list.

The procedure that you must follow when searching for a host that can accommodate a new virtual machine depends on the use of Distributed Resource Scheduler (DRS) on the vCenter Server.

Find an ESX Host that Has Resources for More Virtual Machines

If a vCenter Server host does not use Distributed Resource Scheduler (DRS), you can use the **Scoreboard** tab to check the available resources on the ESX hosts in a cluster and make decisions on moving virtual machines in your virtual infrastructure.

Prerequisites

Verify that you are logged in to a vSphere Client, and that vCenter Operations Manager is open.

Procedure

1   In the inventory view, click the datacenter or cluster that contains the ESX host that you want to assess.

2   On the **Scoreboard** tab, select **Health** from the **View** drop-down menu.

    The colored bubbles in the Custom Overview chart represent the health scores for all object in the datacenter that are online. The workload is represented by the X-axis.

    The objects with highest workload appear to the right on the X-axis.

3   (Optional) To filter object types out of the Custom Overview chart, click their icons.

4   In the Custom Overview chart, click the bubble for a host that you think might accommodate more virtual machines.

    Usually, this should be the ESX host that is situated closer to the Y-axis.

    The name of the host becomes highlighted in the Members List pane.

5   In the Members List pane, click the host name to open its **Details** tab.

6   On the **Details** tab, review the Resources pane and the Workload graphs to assess the potential capacity for new virtual machines.

If one or more resources of the host are approaching their limits, you might not want to add a virtual machine to this ESX host.

What to do next

If the selected ESX host has enough resources, you can add the new virtual machines.

Find a Cluster that Has Resources Available for More Virtual Machines

If the vCenter Server host uses Distributed Resource Scheduler (DRS), you can use the **Scoreboard** tab to check the available resources in each cluster and make decisions on moving virtual machines in your virtual infrastructure.

Prerequisites

Verify that you are logged in to a vSphere Client, and that vCenter Operations Manager is open.

Procedure

1   In the inventory view, click the datacenter that contains the cluster that you want to assess, and click the **Environment** tab.

2   On the **Scoreboard** tab, select **Health** from the **View** drop-down menu.

The colored bubbles in the Custom Overview chart represent the health scores for all objects in the datacenter that are online. The workload is represented by the X-axis.

The objects with highest workload appear to the right on the X-axis.

3   (Optional) To filter object types out of the Custom Overview chart, click their icons.

4   In the Custom Overview chart, click the bubble of a cluster that you think might accommodate more virtual machines.

Usually, this is a cluster that is situated closer to the Y-axis.

The name of the cluster becomes highlighted in the Members List pane.

5   In the Members List pane, click the object name to open its **Details** tab.

6   On the **Details** tab, review the Resources pane and the Workload graphs to assess the potential capacity for new virtual machines.

If one or more resources are approaching their limits, you might not want to add a virtual machine to this cluster.

What to do next

If the selected cluster has enough resources, you can add the new virtual machines.

Ranking the Health, Risk, and Efficiency Scores

On the **Scoreboard** tab, you can compare the scores of the Health, Risk, and Efficiency badges and their sub-badges for child objects that are directly related to the object selected in the inventory pane.

Each child object is displayed as a circle in the Custom Overview chart. Larger circle size means higher score for the badge that is selected in the **Size** drop-down menu.

When you compare the Health scores, you can find health problems and see why the health has degraded. You can also identify groups of objects that might have similar problems, check whether the workload is high in the selected population, and whether the population has a lot of faults or anomalies.

When you compare the Efficiency scores, you can analyse visually the distribution of resources among child objects of the selected object.

When you compare the Risk scores, you can prioritize objects that need your attention sooner than others.

You can click the names of objects in the Members List to navigate to their **Details** tabs. Viewing details about the workload and resources that are available to the selected object can help you identify the possible reasons for poor badge scores.

View the Compliance Details

The Compliance score is a value that is based on results that are generated in vCenter Configuration Manager when the compliance templates that are mapped to the Compliance badge are run. You can review the number of failed conditions that contribute to the score and access the template in VCM to evaluate the results. Based on your evaluation, you can make changes to improve the score.

Prerequisites

■ Verify that the vCenter Configuration Manager adapter is installed. See https://www.vmware.com/support/pubs/vcops-pubs.html.

■ Verity that you have access to a supported version of Internet Explorer on the physical or virtual machine on which you are running vCenter Configuration Manager so that you can open the templates in VCM. See the https://www.vmware.com/support/pubs/vcm_pubs.html for supported versions of Internet Explorer.

■ Verify that the VCM mappings are created, tested, and scoring as expected. See the VCM online Help and the https://www.vmware.com/support/pubs/vcm_pubs.html.

Procedure

1 In the inventory panel, select a vCenter Server, datacenter, cluster, host, or virtual machine object.

2 Click the **Dashboard** tab and expand **Why is Risk {score}?**.

3 To see the details of the compliance score, click the **Compliance** badge.

4 On the **Views** tab, click **Compliance**.

   The templates from which the badge score was calculated appear in the Details pane. The templates with the worst noncompliant scores are at the top of the list.

5 To view the non-compliant results so that you can determine what needs to be resolved, click **View details in VCM**.

   The Info window that appears provides the full URL for the template results.

6 If necessary, copy and paste the URL into the Internet Explorer address bar and go to the address.

7 On the VMware vCenter Configuration Manager page, click **Login**.

   The selected template results appear in the VCM console.

What to do next

Review and resolve noncompliance results in vCenter Configuration Manager. See "Resolve Non-Compliant Rules for Compliance Templates," on page 32.

Resolve Non-Compliant Rules for Compliance Templates

The Compliance score is is a value based on template rules that are run in VCM. To improve score, view the template results and determine how to resolve non-compliant rules for the target objects.

When you are working in VCM, click the Help icon to access information about the page on which you are working and for more information about the available actions.

Prerequisites

■ Select the template for which you are evaluating results. See "View the Compliance Details," on page 31.

■ If you do not see the name of the object for which you are resolving non-compliant results, correlate the name that appears in VCM with the name used in vCenter Operations Manager. See "Correlate Compliance Object Names," on page 33.

Procedure

1 On the VMware vCenter Configuration Manager page, click **Login**.

The selected template results appear in the VCM console.

2 Review the status column to identify the non-compliant rules that require your attention.

3 Resolve non-compliance results.

Click Help on the template results data grid for more information about the following options for resolving non-compliant results.

■ Use enforceable compliance to enforce results.

■ Use VCM to enforce non-enforceable compliance results.

■ Manually change the settings or configurations.

■ Add exceptions when you expect the object to not meet the rule and you do not want to see it again as a non-compliant object.

4 Collect data from the machine groups and virtual object groups for which resolved non-compliant results.

5 Run the mappings in VCM.

When you run the mappings, the templates are run for the objects.

6 To review the badge scores in VCM, click **Console** and select **Dashboard > Virtual Environments > vCenter Operations Manager Compliance Rollup**.

Verify the scores to ensure that you resolved all the necessary non-compliant results.

What to do next

In vCenter Operations Manager, review the Compliance badge scores to ensure that your scores are now at acceptable levels. You must allow approximately five minutes for vCenter Operations Manager to pull the new scores from VCM.

Differing Object Names for Compliance Objects

The virtual machine object name in vCenter Operations Manager might be different from the object name in the VCM compliance templates. This difference is a result of how vCenter Operations Manager and VCM retrieve and collect data from vCenter Server.

Some virtual objects in the templates might be managed in VCM as both a virtual machine on which the VCM Agent is installed and as a virtual object that is managed through a vCenter Server instance using the Managing Agent. When the object is managed as a virtual machine and as a virtual object, the name that appears in the template detail results might be different from the name that appears in vCenter Operations Manager.

The name in the VCM template results is the object name that you assigned when the object was created, usually similar to the DNS name. The name in vCenter Operations Manager is based on the vCenter Server object name unless you renamed the object in vCenter Server. If you renamed the object, vCenter Operations Manager displays the user-assigned name. If the name is different from the originally assigned name, you see one name in vCenter Operations Manager and the DNS-derived name in VCM.

To verify that you are working with the same object, use the data in VCM to correlate the object name, the guest object name, and the DNS name.

Correlate Compliance Object Names

If the object name in the VCM template results does not match the name of the object in vCenter Operations Manager, use VCM to correlate the object names and ensure that you are evaluating and remediating the same object.

To verify that you are working with the same object, use the data in VCM to correlate the object name, the guest object name, and the DNS name.

Procedure

1   In VCM, click **Console** and select **Virtual Environments > vCenter > Guests > Summary**.

2   In the Guest column, locate the name used in vCenter Operations Manager and identify the Guest Machine Name and the DNS Name that is used by VCM.

   The Guest Machine name and the DNS name are commonly the names used in the template results.

View a List of Members

You can view the objects that belong to the currently selected object or group.

The list of objects contains columns that show the object name, object type, parent object, parent type, and the policy that is assigned to the object. By default, all columns appear. You can sort the list by one column in ascending or descending order. You can also hide or show columns.

Procedure

1   Click the **Environment** tab, and click **Members**.

2 To sort the list by a specific column: with the mouse, point to the column header and click the triangle to display the menu of sort options.

Option	Action
Sort the Members list by the selected column.	Click **Sort Ascending** or **Sort Descending**.
Display the drop-down list of columns, and select or deselect the checked columns to hide or show them.	With the mouse, point to **Columns**.

Overview of Relationships

VMware vCenter Infrastructure Navigator is an application awareness plug-in to the vCenter Server. Infrastructure Navigator probes the virtual machine entities inside the vCenter Server and provides application related information.

After Infrastructure Navigator integration with vCenter Operations Manager, the application related information is displayed in the **Relationships** tab under the **Environment** tab of the vCenter Operations Manager.

The **Relationships** tab displays the relationship graph and object properties of the selected object. The object that you select is highlighted and displayed in the middle of the graph. For all the objects that are running in your environment, the **Relationships** tab displays the various types of relationships with respect to the highlighted object.

Relationship Graph Pane Buttons

You can use the relationship graph pane buttons to control the appearance of objects in the relationship graph.

Table 3-1. Relationship Graph Pane Buttons

Button Tooltip	Button Icon	Description
Zoom to fit		Resizes the view so that all related objects fit in the relationship graph.
Enter pan mode		Allows you to pan the relationship graph.
Show values on point		Enables metric value tooltips so that they appear when you point the graph with the mouse pointer.
Enter zoom mode		Allows you to enlarge sections of the relationship graph by drawing rectangles to enclose the area to enlarge.
Zoom in		Enlarges the middle of the relationship graph by one level.
Zoom out		Reduces the middle of the relationship graph by one level.
Reset to initial object		Reset the relationship graph and the properties table pane to the object selected from the inventory tree.
Resource details		Opens the Details page under the **Operations** tab.

Select a Relationship

The **Relationships** tab displays different types of relationships of a selected object. Depending on your choice you can select the type of relationship that you want to view.

Procedure

1 Click the **Relationships** tab under the **Environment** tab.

2 From the **Show** drop-down menu, select the relationships that you want to view.

Relationships	Description
All Relationships	Displays the sum of all the three relationships. This relationship is selected by default.
vSphere Relationships	Displays relationships between the vSphere objects.
Group Relationships	Displays the group relationships with respect to the selected object.
Application Relationships	You can view this relationship only at the virtual machine level. Displays the following relationships between the virtual machines and application objects: ■ Set of applications that run on the selected virtual machine. ■ Set of applications that the selected virtual machine depends on.

Viewing the Properties of an Object

You can see a graphical view of an object's child relationships on the **Relationships** tab. You can use the Relationship graph pane buttons to manipulate the graph, and select the type of relationships to view.

For the selected object in the left-hand inventory pane, the **Relationships** tab displays a graph of the object's relationships and a list of its properties. The list displays the number of objects that have each property. Properties vary according to the type of object.

Procedure

1 In the inventory pane, click the object for which you want to view relationships.

2 Click the **Relationships** tab under the **Environment** tab.

   The relationship graph and properties of the object are displayed. (You can also directly select the object and see its object properties by double-clicking the object from the relationship graph.)

3 Use the Relationships graph pane buttons to examine objects in the graph.

4 Use the Show drop-down list to select the type of relationships to view.

5 (Optional) To view the properties of any object in the relationship graph, click the object.

View the Properties of the Application Object

The vCenter Operations Manager user interface displays the relationships graph and object properties of an application object. The properties of an application object include Process, Listening Port, Category, Runs on, and Dependent of Service.

At the virtual machine level, the relationship graph also displays the application that are running on this virtual machine and applications that this selected virtual machine depends on. If you select any application from the relationship graph, the application object properties of that application is displayed. The virtual machines that are above the application node are a set of virtual machines that depend on the selected application. The virtual machines that are below the application node are the virtual machines that the application runs on.

Procedure

1   In the inventory pane, click the virtual machine object.

2   Click the **Relationships** tab under the **Environment** tab.

The relationship graph and properties of the virtual machine object are displayed. The relationship graph also displays the applications that run on the virtual machine and the applications that the virtual machine depends on.

3   Click the application object for which you want to see the object properties.

The application object properties are displayed. You can also directly select the application object and see its relationship graph and application object properties by double-clicking the application object from the relationship graph.

Table 3-2. Properties of the Application Object

Application	Description
Title	Displays the name of the selected application.
Process	Displays the process name of the selected application.
Listening Port	Displays a list of listening port numbers of the selected application.
Category	Displays the name of the category the selected application belong to.
Runs on	Displays the name of the entity on which the selected application is running. If it is an external entity, IP address is displayed. If it is a virtual machine that is managed by vCenter Operations Manager, you can click on the link to navigate to that virtual machine.
Dependent of Service	Displays a set of virtual machines that depend on the selected application. You can click the link to navigate to the dependent virtual machine.

4   (Optional) To view the properties of any object other than the application object in the relationship graph, click the object

Troubleshooting with vCenter Operations Manager

4

You can use the monitoring features of vCenter Operations Manager to troubleshoot performance and capacity problems in the virtual environment.

This chapter includes the following topics:

Troubleshooting Overview

vCenter Operations Manager provides visual and metric indicators that enable you to research performance and capacity problems in the virtual environment.

The troubleshooting process consists of these main steps:

1   Find an object that has a problem.

2   Identify the cause of the problem.

3   Fix the cause of the problem.

For example, a user might call the help desk and report a performance problem. You can use the **Health** major badge and **Workload**, **Anomalies**, and **Faults** minor badges to identify the object that is experiencing performance degradation. After you identify the problem area, you can relocate the object or transfer resources to it.

Finding an Object with a Problem

A troubleshooting process is often initiated in one of these ways:

- An end user reports a problem with their system.

- One or more alert notifications are received, reporting problems with the environment.

- A vCenter Operations Manager user, such as a system administrator, identifies an immediate or near-term problem.

Identifying the Cause

Consider these items to help find and isolate the cause of a problem:

- The symptoms that appear in vCenter Operations Manager. For example, what are the Workload, Faults, and Anomalies scores?

- The population affected. Which objects are experiencing the symptoms?

- The time frame of the problem. Is it temporary or long-term?

Addressing the Cause

After you understand the cause, you can take appropriate action in the virtual environment to fix the problem. Typically, remediation involves shifting or adding resources in the environment.

Troubleshooting a Help Desk Problem

Use the vCenter Operations Manager Search feature to find an object that a user is having problems with.

If you receive a notice that a user is experiencing a problem with their environment, you can use the vCenter Operations Manager Search feature to find the object that is causing the problem. For example, a user might be experiencing performance problems with a virtual machine.

You can search for any object in the virtual environment, including groups of objects created in vCenter Operations Manager.

Procedure

1   In the **Search** text box in the upper right of the page, type all or part of the object name.

    You can search using any fragment of the object's name, for example, Storage. The resulting list might display **Storage3-ESX41**, **Storage5-ESX41U1**, and the like.

    A list of objects that match your search criteria appears as you type. The list is limited to the first 10 matching items.

2   In the list of matching objects, find the object you are searching for and click it.

    The object is highlighted in the Inventory pane and the **Dashboard** tab is updated.

3   On the **Dashboard** tab, check the badge scores and colors, especially the **Health** badge for the object and the **Alert Volume** chart for the object.

4   Navigate to the **Workload**, **Anomalies**, and Faults badges under the object's **Health** badge, and examine alert notifications, to determine the cause of the user's problem.

Troubleshooting an Alert

Use the Alert Volume graph or the alert icons to begin investigating one or more alerts.

The vCenter Operations Manager **Dashboard** displays alert information in the **Alert Volume** chart under the **Health** badge, and in the alert icons on the far right. The chart shows the number and type of alerts that occurred over the past week, and the icons show the type and number of alerts that are currently active.

Procedure

1   Examine the Alert Volume chart to see if a pattern exists over the past seven days.

    A pattern can indicate an ongoing problem.

2   Navigate to the **Alerts** tab by clicking the Alert Volume chart or clicking an alert icon.

3   On the **Alerts** tab, review the list and the information given for each alert.

       You can use the columns and filters to sort the alert list.

The alert information provides actionable data for identifying and resolving a problem. For example, it shows whether a resource is unavailable or running out of capacity. You can address the problem in the vSphere Client.

Finding Problems in the Virtual Environment

When you log in to vCenter Operations Manager, examine the badges and graphs on the **Dashboard** tab to determine if problems exist.

The **Dashboard** tab provides an overview of your virtual environment. The **Health** badge indicates immediate issues.

In addition, the **Stress** badge, which is a component of the **Risk** badge, shows the objects in the virtual inventory that have habitual high workloads that you might need to adjust.

- Identify an Overall Health Issue on page 39

    The Health badge is the indicator of a potential problem in the virtual environment that vCenter Operations Manager monitors.

- Identify Objects with Stressed Capacity on page 40

    Identify the stressed virtual machines, hosts, and clusters that might require more capacity.

- Identify Stressed Hosted or Clusters for Load Balancing on page 40

    Identify the stressed or undersized hosts and clusters to assign more capacity to those objects and optimize the load.

Identify an Overall Health Issue

The Health badge is the indicator of a potential problem in the virtual environment that vCenter Operations Manager monitors.

By default, the **Dashboard** tab displays information about the World object. You can select another object in the inventory pane to check for immediate health problems on the object. (You can also use the Search text box at the upper right, entering part or all of the object's name, to locate an object.)

Prerequisites

In the vCenter Operations Manager interface, verify that the **Dashboard** tab is open.

Procedure

1   On the **Dashboard** tab, check the color of the Health badge.

2   If the color of the Health badge is other than green, click the arrow under the badge to expand the detailed view.

       The Health pane displays the sub-badges for Workload, Anomalies, and Faults. Badge colors help you identify the possible cause of the problem.

3   Identify the cause of the health problem depending on the object that you selected in the inventory pane.

Selected Object	Action	
■ **World** ■ **vCenter Server** ■ **Datacenter** ■ **Cluster**	a	In the Health pane, identify the sub-badge that indicates poor score.
	b	Click the **Environment** tab under the **Operations** tab.
	c	Select the sub-badge that indicated poor score on the Dashboard page.
	d	Check the **Environment** tab for badges of related objects that are indicating problems.
	e	Double-click an object that indicates poor score.
	f	On the **Details** tab under the **Operations** tab, navigate to the object that the badge represents and review the resource data, key metrics, and badge-specific information.
■ **ESX host** ■ **Virtual machine** ■ **Datastore**	a	In the Health pane, identify the sub-badge that indicates poor score and click it.
	b	On the **Details** tab under the **Operations** tab, review the resource data, key metrics, and badge-specific information.

What to do next

How you proceed depends on your findings on the Details page.

Identify Objects with Stressed Capacity

Identify the stressed virtual machines, hosts, and clusters that might require more capacity.

Prerequisites

In the vCenter Operations Manager interface, verify that the **Dashboard** tab is open.

Procedure

1   Click the **Risk** tab under the **Dashboard** tab, and click the arrow under the badge to expand the detailed view.

2   To view the number of any stressed objects, select an object other than a datastore from the inventory pane.

3   To investigate the details of stressed objects, click the **Stress** badge.

The **Views** tab opens.

4   Select the **Stress** badge and access the view that corresponds to the object.

What to do next

Assign less work to the virtual machines or reconfigure the capacity appropriate to the virtual machine load.

Identify Stressed Hosted or Clusters for Load Balancing

Identify the stressed or undersized hosts and clusters to assign more capacity to those objects and optimize the load.

Prerequisites

Verify that you are logged in to a vSphere Client and that vCenter Operations Manager is open.

Procedure

1   In the inventory pane, select the object that you want to inspect.

2   Click the **View** tab under the **Planning** tab and select the **Stressed Hosts and Clusters - List** view.

The objects that appear in this view are overused and have fewer resources than the virtual machines demand.

What to do next

Assign less work to these hosts and clusters or reconfigure the capacity appropriate to the workload.

Finding the Cause of the Problem

To find the cause of a problem, examine its symptoms, the objects affected, and the time frame.

Perform these main steps to research the cause of a problem.

1   Examine the symptoms on the **Workload**, **Anomalies**, and **Faults** badges and scores.

If workload is high, review performance degradation. In particular, examine memory resource problems and the top consumers of resources.

If anomalies are high or the workload is abnormal, look for events that occurred when the objects experienced the problem.

2   Determine the affected population.

Determine whether one object is affected, or whether peers or families are affected.

3   Determine the time frame of the problem.

Use the **Health** weather map and **Stress** charts to determine if the problem is recent and isolated or chronic in nature.

■   Determine Whether the Environment Operates as Expected on page 42

Anomalies in vCenter Operations Manager provide insight into the behavior of your environment and help you to determine whether a high workload might still reflect a normal or expected load.

■   Identify the Source of Performance Degradation on page 42

Identifying the probable source of performance degradation in vCenter Operations Manager involves investigating the percentage of CPU, memory, disks, and network resources usage in the virtual environment.

■   Identify the Underlying Memory Resource Problem for a Virtual Machine on page 43

When you navigate through a vCenter Operations Manager workflow and identify a virtual machine with a potential problem, you can resolve the underlying problem by using the memory metric data.

■   Identify the Underlying Memory Resource Problem for Clusters and Hosts on page 44

When you navigate through a vCenter Operations Manager workflow and identify a cluster or a host with a potential problem, check the CPU metric graphs to identify a possible resolution.

■   Identify the Top Resource Consumers on page 44

To address high use levels in your virtual environment, identify the top resource consumers.

■   Identify Events that Occurred when an Object Experienced Performance Degradation on page 45

Identifying when the abnormal events started to cause performance degradation and the trend of the problem in vCenter Operations Manager involves examining the Health scores of the object and its related objects.

■   Determine the Extent of a Performance Degradation on page 45

After you identify the performance problem, determine the effect on the rest of the object population and the consistency of the issue.

- Determine the Timeframe and Nature of a Health Issue on page 45

  The Dashboard provides information to help you determine the nature and timeframe of a health issue, including whether it is a transient or chronic problem.

- Determine the Cause of a Problem with a Specific Object on page 46

  Determining a cause of a problem with a specific object involves identifying whether the problem is transient or chronic in the virtual environment.

Determine Whether the Environment Operates as Expected

Anomalies in vCenter Operations Manager provide insight into the behavior of your environment and help you to determine whether a high workload might still reflect a normal or expected load.

By default, the **Dashboard** tab displays information about the World object. You can select another object in the inventory pane to check for immediate health problems on the object. (You can also use the Search text box at the upper right, entering part or all of the object's name, to locate an object.)

In the Anomalies pane, the blue line represents the actual level of anomalies for the selected object. The gray line represents the noise threshold line that shows the normal level of anomalies for the selected object.

Prerequisites

In the vCenter Operations Manager interface, verify that the **Dashboard** tab is open.

Procedure

1. In the inventory pane, select the object that you want to inspect.

2. Click the arrow under the **Health** badge to expand the detailed view.

3. In the Anomalies pane, check the badge score and the noise threshold line.

   If the blue line of the abnormal metric count is far below the noise line, the level of anomalies is normal. If the blue line of abnormal metric count approaches or surpasses the noise line, the object might be experiencing health degradation.

4. If you see an abnormal level of anomalies, click the **Anomalies** badge.

   The **Details** tab opens and you can continue investigating the problem.

What to do next

On the **Details** tab under the **Operations** tab, you can check metric values to identify the resource that might be causing the high Anomalies score. Depending on which resource indicates abnormal operation, check the Key Metrics pane for further information.

Identify the Source of Performance Degradation

Identifying the probable source of performance degradation in vCenter Operations Manager involves investigating the percentage of CPU, memory, disks, and network resources usage in the virtual environment.

Prerequisites

Verify that you are logged in to a vSphere Client and that vCenter Operations Manager is open.

Procedure

1. In the inventory pane, select the object that you want to inspect.

2. Click the **Environment** tab under the **Operations** tab, and select the **Workload** badge.

3   To filter the objects and related objects by state, click the **Status Filter** buttons to view only the red, orange, and yellow states.

4   Point to the object state other than green to view the workload details.

5   Double-click a related object to investigate why it is experiencing heavy resource demands.

6   On the **Details** tab under the **Operations** tab, you can check the percentage of resource use that might be causing the high Workload score.

7   To locate the available resources of the object and related objects, click the **Scoreboard** tab under the **Operations** tab, and select the **Workload** badge.

The **Scoreboard** tab displays the workload scores for all ESX hosts in the cluster. By default, ESX hosts with a high workload are presented as large badges.

8   To filter the objects and related objects by state, click the **Status Filter** buttons to view only the red, orange, and yellow states.

9   Click the object that indicates a poor score.

10   On the **Details** tab under the **Operations** tab, review the Resources pane and the Workload graphs to assess the potential capacity to move virtual machines to balance the workload.

What to do next

Click the **Analysis** tab to compare the performance of selected objects across the virtual infrastructure. You can use this information to balance the load across ESX hosts and virtual machines.

Identify the Underlying Memory Resource Problem for a Virtual Machine

When you navigate through a vCenter Operations Manager workflow and identify a virtual machine with a potential problem, you can resolve the underlying problem by using the memory metric data.

The CPU graphs for clusters and hosts show the Provisioned metric. The CPU graphs for virtual machines show the Entitlement metric. See "Metric Concepts for vCenter Operations Manager," on page 9.

Prerequisites

In the vCenter Operations Manager interface, verify that the **Dashboard** tab is open.

Procedure

1   In the inventory pane, select the object that you want to inspect.

2   Click the **Environment** tab under the **Operations** tab.

3   If the color of the badge is other than green, double-click it.

4   On the **Details** tab, select the **Workload** badge to analyze the memory metrics graphs.

Metric Relationship	Meaning
Demand is equal to Usage	Object has enough resources.
Demand is greater than Usage	Virtual machine might be in the process of waiting for CPU cycles.
Demand is greater than Usage and less than Provisioned	This metric relationship indicates the following implications: ■ Limits set on a virtual machine might cause the virtual machine to use less CPU resources than the demand. vCenter Operations Manager aggregates CPU metrics for virtual machines into the host CPU graph. ■ The CPU Dynamic Power Management in the BIOS might cause a CPU issue. Verify that the setting is in operating system control mode or disable the setting. ■ Virtual machines that are usually idle but happen to become busy at the same time might cause contention.

Understand the metric relationships in the memory graphs and solve the underlying resource problem for the virtual machine.

Identify the Underlying Memory Resource Problem for Clusters and Hosts

When you navigate through a vCenter Operations Manager workflow and identify a cluster or a host with a potential problem, check the CPU metric graphs to identify a possible resolution.

vCenter Operations Manager presents memory information that shows the metric relationships and the breakdown of the way the virtual machines use the memory resource.

Prerequisites

In the vCenter Operations Manager interface, verify that the **Dashboard** tab is open.

Procedure

1 In the inventory pane, select the object that you want to inspect.

2 Click the **Environment** tab under the **Operations** tab.

3 Click the **Workload** badge.

4 On the **Details** tab, analyze the memory metrics graphs for the virtual machine's workload.

Metric Relationship	Meaning
Demand is less than Usage	Virtual machines that receive memory relinquish that memory only when other virtual machines require it. The host does not reclaim memory from a virtual machine just because that memory is not in demand.
Memory Reserved is less than Memory Usable	It is acceptable for memory reservation to be less than usable memory. However, you might want to increase the reservation to guarantee resources in the range of normal demand.

What to do next

Understand the metric relationships in the CPU graphs and solve the underlying resource problem.

Identify the Top Resource Consumers

To address high use levels in your virtual environment, identify the top resource consumers.

Prerequisites

Verify that you are logged in to a vSphere Client and that vCenter Operations Manager is open.

Procedure

1 Click the **Analysis** tab to view the heat map gallery.

2 Depending on the resource, select a CPU, memory, network, or storage focus area.

3 To view a heat map that shows contention by use, select the host, virtual machine, or cluster object.

The larger the size of the heat map tile, the higher the use.

Click the **Analysis** tab to view the heat map gallery.

4 If a color other than green indicates a potential problem, click **Details** for the object in the pop-up window to investigate the resources for that object.

What to do next

Identify the top consumers of resources such as CPU or memory.

Identify Events that Occurred when an Object Experienced Performance Degradation

Identifying when the abnormal events started to cause performance degradation and the trend of the problem in vCenter Operations Manager involves examining the Health scores of the object and its related objects.

In the **Events** tab under the **Operations** tab, you can view graphs of health-related badge scores and events that occurred on the selected object and its related objects. When you notice that the score of a badge changed after an event occurred, you can click that event to view more details.

Prerequisites

Verify that you are logged in to a vSphere Client and that vCenter Operations Manager is open.

Procedure

1   In the inventory pane, select the object that you want to inspect.

2   If the color of the Health badge is other than green, click the **Events** tab under the **Operations** tab to see events that occurred as far back as a month.

    Use the buttons above the badge score graph to control what you see on the **Events** tab.

3   Point to the abnormal event in the Events graph to view the time range when the problem started to decrease the possible causes that contributed to the poor badge score.

What to do next

Depending on the details of the event, investigate the problem in vCenter Server.

Determine the Extent of a Performance Degradation

After you identify the performance problem, determine the effect on the rest of the object population and the consistency of the issue.

Prerequisites

Verify that you are logged in to a vSphere Client and that vCenter Operations Manager is open.

Procedure

1   In the inventory pane, select the object that you want to inspect.

2   Click the Health badge if it is other than green.

3   In the **Related Objects** pane of the **Details** tab, verify the color of the **Parent Objects** and **Peer Objects** icons.

    ■   If the selected object is the only object with a high score, no effect exists on the **Peer Objects** or **Child Objects**.

    ■   If the Parent Object is in a red, yellow, or orange state, click the Parent Object to investigate the details.

Determine the Timeframe and Nature of a Health Issue

The Dashboard provides information to help you determine the nature and timeframe of a health issue, including whether it is a transient or chronic problem.

By default, the **Dashboard** tab displays information about the World object. You can select another object in the inventory pane to check for immediate health problems on the object. (You can also use the Search text box at the upper right, entering part or all of the object's name, to locate an object.)

Prerequisites

In the vCenter Operations Manager interface, verify that the **Dashboard** tab is open.

Procedure

1   In the Health pane, check whether the Weather Map of Health displays colors other than green. (The weather map is most appropriate for grouped objects such as the World, vCenters, and Datacenters.)

    Colors that dominate the map over the past six hours indicate a larger trend.

2   If a trend exists, click the **Health** badge.

    The **Details** tab under the **Operations** tab appears.

3   To identify the type of problem an object has, click the **Workload**, **Anomalies**, or **Faults** badge and point to the metric values for more information.

4   Click the **Dashboard** tab and expand the Risk pane to check the Stress graph.

    The graph in the Stress pane displays the resource demand over the past week and helps you determine when the peak demand occurred.

5   If a particular peak, such as a 6 p.m. peak, exists that might require investigation, click the **Stress** badge.

    The **Views** tab under the **Planning** page appears.

What to do next

Click the **Views** tab under the **Planning** tab to investigate possible causes of the problem and assess resources allocation.

Determine the Cause of a Problem with a Specific Object

Determining a cause of a problem with a specific object involves identifying whether the problem is transient or chronic in the virtual environment.

Prerequisites

Verify that you are logged in to a vSphere Client and that vCenter Operations Manager is open.

Procedure

1   In the inventory pane, select the object that you want to inspect.

2   Check the **Health**, **Risk** and **Efficiency** scores for the object.

    ■   If any of the scores are in the yellow, orange or red state, click the badge and investigate the sub-badges.

    ■   If the problem is because of Health, click the **Anomalies** badge to check for changes in expected behavior and the **Workload** badge to assess whether heavy resource demand exists.

3   Determine whether the demand experienced is for a specific time or whether it indicates a longer trend.

    ■   If the demand is transient, in the Health pane check the **Workload** badge.

    ■   If the problem results from chronic stress, in the Risk pane, check the **Stress** badge and click the object in the yellow, orange, or red state.

4   Click the **Summary** tab under the **Planning** tab to check the trend and forecast of CPU and memory demand for that object.

    If the object is approaching capacity, consider moving some virtual machines to a less resource-constrained object.

5   Identify the top transient resource consumers, click the **Scoreboard** tab under the **Operations** tab, and select the **Workload** badge.

6   To filter the objects and related objects by Workload, click the **Status Filter** buttons to view only the red, orange, and yellow states.

You can prioritize the virtual machines with high Workload scores and move them to a less resource-constrained object.

7   Identify the resource consumers causing chronic stress, click the **Scoreboard** tab under the **Planning** tab, and select the **Stress** badge.

8   To filter the objects and related objects by Stress, click the **Status Filter** buttons to view only the red, orange, and yellow states.

You can prioritize the virtual machines with high Stress scores and move them to a less resource-constrained object.

What to do next

Identify a candidate object to which to move the problem virtual machines, click the **Analysis** tab, and select the **CPU** or **Memory** focus area depending on the constrained resource for the virtual machine object.

The heat map gallery helps identify candidate objects to which to move the virtual machines.

Fix the Cause of the Problem

After you know the cause of a problem, you can take steps to resolve it, such as shifting or adding resources.

You can use the views in vCenter Operations Manager to diagnose a problem and decide how to solve it. You can investigate and navigate to these views using the Capacity Remaining badge, which is a component of the Risk badge.

You use the vSphere Client to make changes, such as adding a virtual machine or transferring a virtual machine to another host.

Determine the Percentage of Used and Remaining Capacity to Assess Current Needs

The Capacity Remaining pane under the **Risk** badge provides an overview of the used and remaining capacity for all objects in the inventory except for virtual machine objects.

You can use the bar chart under the Capacity Remaining badge to determine how many new virtual machines you can add to your environment.

Prerequisites

In the vCenter Operations Manager interface, verify that the **Dashboard** tab is open.

Procedure

1   In the inventory pane, select the object that you want to inspect.

2   Click the arrow under the **Risk** badge to expand the detailed view.

3   Under the **Capacity Remaining** badge, review the bar chart of used and remaining capacity.

4   To view more details about capacity-related metrics, click the **Capacity Remaining** badge.

5   On the **Views** tab, you can switch views to find aggregate information for used and total capacity, and capacity trends.

Assessing Risk and Efficiency in vCenter Operations Manager 5

vCenter Operations Manager provides workflows for assessing efficient use of the infrastructure as well as risks to future capacity.

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

This chapter includes the following topics:

- "Analyzing Data for Capacity Risk," on page 49
- "Optimizing Data for Capacity," on page 54
- "Forecasting Data for Capacity Risk," on page 58

Analyzing Data for Capacity Risk

vCenter Operations Manager provides using more than 20 predefined heat maps on the **Analysis** 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.

Determine When an Object Might Run Out of Resources

The Time Remaining pane under the **Risks** badge provides a summary of when an object in the virtual environment might run out of resources such as disk space, memory, CPU, or network.

Prerequisites

Verify that you are logged in to a vSphere Client and that vCenter Operations Manager is open.

Procedure

1 In the inventory pane, select the object that you want to inspect.

2 Click the **Risk** tab under the **Dashboard** tab, and click the arrow under the badge to expand the detailed view.

3 In the Time Remaining pane, identify the resource that is approaching capacity.

4 Click the **Summary** tab under the **Planning** tab.

5 In the Objects and Resources pane, view a breakdown of the remaining capacity and trend information for each resource.

   The Time Remaining value represents an aggregated forecast based on the number of virtual machines and indicates when capacity might equal resource use.

What to do next

To further investigate which resources constrain the virtual machine count, click the **Views** tab and select the **Virtual Machine Capacity - Summary** view.

Identify Clusters with the Space for Virtual Machines

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

Prerequisites

Verify that you are logged in to a vSphere Client and that vCenter Operations Manager is open.

Procedure

1   Click the **Analysis** tab.

2   In the heat map gallery, narrow the scope from the drop-down menu to display the remaining capacity for clusters.

Option	Action
Focus Area	Select **Capacity**.
Smallest Box Shows	Select **Cluster**.
Description	Select **Which clusters have the most free capacity and least stress?** .

3   Click the **Which clusters have the most free capacity and least stress?** view.

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

5   If a color other than green indicates a potential problem, click **Details** in the pop-up window to investigate the resources for the cluster or datacenter.

What to do next

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

Investigating Abnormal Host Health

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

Prerequisites

Verify that you are logged in to a vSphere Client and that vCenter Operations Manager is open.

Procedure

1   In the inventory pane, select the object that you want to inspect.

2   Click the **Analysis** tab.

3   In the heat map, narrow the scope from the drop-down menu to display the cluster and host health sized according to workload.

Option	Action
Focus Area	Section **Health**.
Smallest Box Shows	Section **Host**.
Description	Section **Which hosts currently have the most abnormal Workload?** .

4   Click the **Which hosts currently have the most abnormal Workload?** view.

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 investigate the resources for that host.

What to do next

Adjust workloads to balance resources as necessary.

Identify Datastores with Space for Virtual Machines

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

Prerequisites

Verify that you are logged in to a vSphere Client and that vCenter Operations Manager is open.

Procedure

1   Click the **Analysis** tab.

2   In the heat map gallery, narrow the scope from the drop-down menu to display the datastore space.

Option	Action
Focus Area	Select **Storage**.
Smallest Box Shows	Select **Datastore**.
Description	Select **Which datastores have the highest disk space overcommitment and lowest time remaining?**

3   Click **Which datastores have the highest disk space overcommitment and lowest time remaining?**

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

5   If a color other than green indicates a potential problem, click **Details** for the datastore 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

Identify datastores with the highest amount of wasted space that you can reclaim to improve the efficiency of your virtual infrastructure.

Prerequisites

Verify that you are logged in to a vSphere Client and that vCenter Operations Manager is open.

Procedure

1   Click the **Analysis** tab.

2   In the heat map gallery, narrow the scope from the drop-down menu to display the datastore waste.

Option	Action
Focus Area	Select **Storage**.
Smallest Box Shows	Select **Datastore**.
Description	Select **Which datastores have the most wasted space and total space usage?**

3   Click the **Which datastores have the most wasted space and total space usage?** view.

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

5   If a color other than green indicates a potential problem, click **Details** for the datastore 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.

Address a Problem with a Specific Virtual Machine

Identifying the cause of a problem with a specific virtual machine involves investigating whether the problem is because of a constraining environment or because of changes in the guest operating system configuration.

Prerequisites

Verify that you are logged in to a vSphere Client and that vCenter Operations Manager is open.

Procedure

1   Search for the problematic virtual machine name in the vCenter Operations Manager search box.

2   Check the **Health**, **Risk** and **Efficiency** scores for the virtual machine.

   ■   If any of the badges are in the yellow, orange or red state, click the badge and investigate the subbadges.

   ■   If the problem is because of Health, check the **Anomalies** badge for changes in expected behavior and the **Workload** badge to assess whether heavy resource demand exists.

   ■   If the problem results from chronic stress, identify the constraining resource, such as CPU or memory, and click the **Stress** badge under the **Risk** pane for more information.

3   Click the **Summary** tab under the **Planning** tab to check the trend and forecast of CPU and memory demand for that virtual machine and the host that stores it.

   If the forecast indicates a virtual machine resource demand problem, increase the resources allocated to the virtual machine.

4   Identify an object candidate to which to move the virtual machines, click the **Analysis** tab, and select the CPU or memory focus areas depending on the constrained resource for the virtual machine.

   The heat map gallery helps identify cluster or host candidates to which to move the virtual machines.

5   If the problem results from changes to the guest operating system configuration, click the **Events** tab under the **Operations** tab for that virtual machine.

6   Examine the Events graph to see if the guest operating system change events or vSphere events caused the problem.

   The guest change events will have a different icon shape.

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.

Prerequisites

Verify that you are logged in to a vSphere Client and that vCenter Operations Manager is open.

Procedure

1   Click the **Analysis** tab.

2   In the heat map gallery, narrow the scope from the drop-down menu to display the virtual machines with waste across datastores.

Option	Action
Focus Area	Select **Storage**.
Smallest Box Shows	Select **VM**.
Description	Select **For each datastore, which VMs have the most wasted disk space?**

3   Click the **For each datastore, which VMs have the most wasted disk space?** view.

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

5   If a color other than green indicates a potential problem, click **Details** for the virtual machine 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 virtual machines with the highest amount of wasted space.

Address a Problem with a Specific Datastore

Identifying the cause of a problem with a specific datastore involves investigating the I/O intensive virtual machines that adversely affect the disk space.

Prerequisites

Verify that you are logged in to a vSphere Client and that vCenter Operations Manager is open.

Procedure

1   Search for the problematic datastore name in the vCenter Operations Manager search box.

2   Check the **Health**, **Risk** and **Efficiency** scores for the datastore.

3   If the **Risk** badge shows that disk I/O is approaching capacity, click the **Summary** tab under the **Planning** tab to view the forecast of resources and constrained resources.

   a   On the **Analysis** tab, select the **Storage** focus area and the **Datastore** object to view **Datastore I/O Contention Sized by I/O Usage Grouped by Datastore** candidates that can accommodate the large disk I/O virtual machines.

   b   Move the disk I/O intensive virtual machines to another datastore.

4   If the datastore shows that disk space is approaching capacity, click the **Summary** tab under the **Planning** tab to view the breakdown of the resource capacity usage.

   If snapshots occupy a significant amount of disk space, remove snapshots from some of the virtual machines on the datastore.

5   On the **Analysis** tab, select the **Storage** focus area and click **Which datastores have the most wasted space and total space usage?** to list the virtual machines in the datastore.

What to do next

Filter the virtual machines in the red, orange, and yellow states to identify the virtual machines that waste the most disk space.

Identify the Host and Datastore with the Highest Latency

Identify the host and datastore pair with the highest latency to prevent a potential performance problem.

The heat map statistics for host I/O contention measure the latency or the time it takes to gain access to a resource.

Prerequisites

Verify that you are logged in to a vSphere Client and that vCenter Operations Manager is open.

Procedure

1   Click the **Analysis** tab.

2   In the heat map gallery, narrow the scope from the drop-down menu to display the datastore waste.

Option	Action
Focus Area	Select **Storage**.
Smallest Box Shows	Select **Host**.
Description	Select **For each datastore, which hosts currently have the highest I/O usage and latency?**

3   Click the**For each datastore, which hosts currently have the highest I/O usage and latency?** view.

4   In the heat map, point to each datacenter area to view the latency statistics.

What to do next

Identify the host and datastore pair with the highest latency. Then determine how many hosts are using the datastore. If only one VM is using the datastore, or if more than one is but none of the others have high latency, there might be a problem with the host. Find out which VMs are on the host and what their storage usage is. If there are multiple hosts and they all are red, there might be a population pressure problem on the datastore. If this is the case, you should consider relocating some VMs.

Optimizing Data for Capacity

Optimizing data for capacity in vCenter Operations Manager involves finding opportunities for resource optimization and cost savings.

Determine How Efficiently You Use the Virtual Infrastructure

Determining the efficiency of the vCenter Operations Manager virtual infrastructure involves investigating the optimal, waste, and stressed virtual machines.

Prerequisites

In the vCenter Operations Manager interface, verify that the **Dashboard** tab is open.

Procedure

1   In the inventory pane, select the object that you want to inspect.

2   Click the arrow under the **Efficiency** badge to expand the detailed view.

   The Efficiency pane displays the subbadges for **Reclaimable Waste** and **Density**.

What to do next

Examine the **Reclaimable Waste** and **Density** subbadge colors to identify whether resources are underused or partially consolidated.

Depending on your findings, you can investigate possible opportunities to improve efficiency.

Identify the Consolidation Ratio Trend for a Datacenter or Cluster

The consolidation ratio trend of a datacenter or cluster helps you understand the behavior and performance of your virtual machines and applications.

Prerequisites

Verify that you are logged in to a vSphere Client and that vCenter Operations Manager is open.

Procedure

1   In the inventory pane, select the object that you want to inspect.

2   Click the arrow under the **Efficiency** badge to expand the detailed view.

3   In the Density pane, compare the consolidation ratio trend in the VM : Host Ratio and the vCPU : CPU Ratio graphs.

   If the ratios are below the optimal rate, the resource consolidation is low.

What to do next

To further investigate opportunities to optimize resource consolidation, click the **Views** tab under the **Planning** tab.

Determine Reclaimable Resources from Underused Objects

Determining reclaimable resources in vCenter Operations Manager involves identifying the objects that are underused.

Reclaimable waste is calculated for each resource type like CPU, memory, and disk, for each object in the virtual environment.

Prerequisites

Verify that you are logged in to a vSphere Client and that vCenter Operations Manager is open.

Procedure

1   In the inventory pane, select the object that you want to inspect.

2   Click the arrow under the **Efficiency** badge to expand the detailed view.

3   In the Reclaimable Waste pane, identify the CPU, memory, and disk resources that are underused and click the **Reclaimable Waste** badge.

4   In the **Views** tab, select the **Undersized Virtual Machines - List** view.

What to do next

Identify the virtual machines that are underused and provision fewer resources for them (or delete them).

Assess Virtual Machine Capacity Use

Identify optimization opportunities for a single virtual machine with vCenter Operations Manager.

Prerequisites

Verify that you are logged in to a vSphere Client and that vCenter Operations Manager is open.

Procedure

1   In the inventory pane, select the object that you want to inspect.

2   Click the **Views** tab under the **Planning** tab and select **Virtual Machine Capacity Usage - Summary**.

     If the Host CPU and Memory use is high, the virtual machine does not have enough capacity to perform assigned work.

What to do next

Determine whether you can optimize performance for this virtual machine by assigning capacity to match typical load demand. If the virtual machine is powered off or idle, you can decommission the virtual machine to reclaim unused capacity.

Implement a strategy for optimizing use of this virtual machine based on the information you obtain from the view. Save your results by exporting the information to an export file.

Assess Virtual Machine Optimization Data

To optimize data with vCenter Operations Manager, identify overused and underused virtual machines for a selected object.

A virtual machine can be oversized in memory and undersized in CPU or the reverse. vCenter Operations Manager counts the virtual machine in both the oversized virtual machine count and in the undersized virtual machine count.

This double counting can be misleading because you might expect the values for powered-off, undersized, oversized, and idle virtual machines to add up to the total virtual machine value.

Prerequisites

Verify that you are logged in to a vSphere Client and that vCenter Operations Manager is open.

Procedure

1   In the inventory pane, select the object that you want to inspect.

2   Click the **Views** tab under the **Planning** tab and select **Virtual Machine Optimization - Summary**.

3   Examine the Total Virtual Machines, Powered-Off Virtual Machines, Undersized Virtual Machines, Oversized Virtual Machines, and Idle Virtual Machines values to determine how many machines assigned to this object can be optimized.

Table 5-1. Example of Virtual Machine Optimization - Summary

Virtual Machine Type	Number
Total Virtual Machines	12
Powered-Off Virtual Machines	0
Undersized Virtual Machines	6
Oversized Virtual Machines	6
Idle Virtual Machines	1

Identify Powered-Off Virtual Machines to Optimize Data

Powered-off virtual machines in your infrastructure are resources with capacity that you can reclaim.

Prerequisites

Verify that you are logged in to a vSphere Client and that vCenter Operations Manager is open.

Procedure

1   In the inventory pane, select the object that you want to inspect.

2   Click the arrow under the **Efficiency** badge to expand the detailed view.

3   In the Reclaimable Waste pane, identify the powered off virtual machines and delete the virtual click the **Reclaimable Waste** badge.

4   In the **Views** tab, select the **Powered-Off Virtual Machines** view.

The virtual machines that appear in this view are powered off and you can restart the machines in the vSphere Client.

What to do next

In the vSphere Client, determine why the virtual machine is powered off. If the virtual machine is obsolete, you can remove it from the inventory.

Identify Idle Virtual Machines to Optimize Capacity

Optimizing the capacity in the virtual environment involves identifying idle virtual machines that are powered on but not in use.

Prerequisites

Verify that you are logged in to a vSphere Client and that vCenter Operations Manager is open.

Procedure

1   In the inventory pane, select the object that you want to inspect.

2   Click the arrow under the **Efficiency** badge to expand the detailed view.

3   In the Reclaimable Waste pane, identify the powered off virtual machines and click the **Reclaimable Waste** badge.

4   In the **Views** tab, select the **Idle Virtual Machines - List** view.

The idle virtual machines in this view either do not perform any work or perform below a specified threshold.

5   Select the **Oversized Virtual Machines - List** view to evaluate candidate objects that can receive more work.

Identify Oversized Virtual Machines to Optimize Data

To optimize and right-size the capacity for your virtual environment, identify the oversized virtual machines and assign less capacity to those virtual machines.

Prerequisites

Verify that you are logged in to a vSphere Client and that vCenter Operations Manager is open.

Procedure

1   In the inventory pane, select the object that you want to inspect.

2   Click the arrow under the **Efficiency** badge to expand the detailed view.

3   In the **Views** tab, select the **Oversized Virtual Machines - List** view.

     The virtual machines that appear in this view are underused and have more capacity than is required for the workload.

4   To determine how to update the CPU, check the value in the Recommended vCPU column.

5   (Optional) To examine a datacenter, run a **Capacity Overview Report** from the **Reports** tab.

What to do next

Assign more work to the underused virtual machines or reconfigure the capacity appropriate to the virtual machine load.

Determine the Trend of Waste for a Virtual Machine

To optimize the capacity for your virtual environment, determine the trend of powered off, idle, undersized, and oversized virtual machines over a period of time to help you identify wasted resources.

Prerequisites

Verify that you are logged in to a vSphere Client and that vCenter Operations Manager is open.

Procedure

1   In the inventory pane, select the object that you want to inspect.

2   Click the **Views** tab under the **Planning** tab and select the **Virtual Machine Waste and Stress -Trend** view.

     The CPU, memory, disk I/O, and network resources trend charts appear in this view.

3   (Optional) To view the object resource data in a list, click the **Table** link.

4   To view the object resource data interval, select the timeframe from the **Interval** drop-down menu and click **Update**.

What to do next

Depending on the trend of wasted resources, reconfigure the capacity to be appropriate for the virtual machine load.

Forecasting Data for Capacity Risk

Forecasting data for capacity risk in vCenter Operations Manager involves creating capacity scenarios to examine the demand and supply of resources in the virtual infrastructure.

A what-if scenario is a supposition about how capacity and load change if certain conditions are changed, without making actual changes to your virtual infrastructure. If you implement the scenario, you know in advance what your capacity requirements are.

NOTE   The What-if Scenario wizard is accessible only if you select a host or a cluster in the inventory pane.

vCenter Operations Manager assigns names, such as Add 1 New VM, to scenarios. The What-if Scenarios pane refreshes as each new scenario is applied in the view results. Scenarios persist until you delete them or until you refresh vCenter Operations Manager.

Create Capacity Scenarios for Virtual Machines With New Profiles

Virtual machine scenarios assess the consequences of adding a new virtual machine to a cluster or host without applying actual changes to your virtual environment.

To help you make configuration selections for virtual machines, the right pane of the What-If Scenario wizard contains population information that shows the total virtual machine use of the selected object and representative virtual machine data. vCenter Operations Manager calculates virtual machine data by partitioning the range of capacity for CPU, memory, and disk dimensions into thirds, assigning the virtual machines to bins based on configuration, and creating a profile for each bin where the capacity of the profile is the maximum configuration of the virtual machines in the bin and the use of the profile is the average usage of the virtual machines in the bin. The value of the virtual machines assigned to the profile and the use is the average of the virtual machines assigned to the profile. The right pane includes information on the smallest and largest hosts.

For information about relevant CPU and memory maximums, see the VMware vSphere documentation.

NOTE The What-if Scenario wizard is accessible only if you select a host or a cluster in the inventory pane.

Prerequisites

In vCenter Operations Manager, verify that the **Summary** tab under the **Planning** tab is open.

Procedure

1   Select the destination object in the inventory pane.

    The destination object is a cluster or host where you locate the new virtual machines if you implement your scenario.

2   Click the **New what-if scenario** link.

    The What-If Scenario wizard opens.

3   Select a view for the scenario and click **Next**.

    This step is not available if you opened the What-if Scenario wizard from the **Views** tab.

4   On the Change Type page, select **Virtual machines** and click **Next**.

5   Select **Add virtual machines by specifying profile of new virtual machines** and click **Next**.

6   Set the virtual machine count and the configuration for the virtual machine.

Option	Description
vCPU Configuration	Number of virtual CPU cores that a target virtual machine will have, followed by the target processor core speed, in GHz or MHz.
vCPU Utilization	Expected average CPU use for this virtual machine.
vCPU Reservation	Required minimum of CPU resources that the virtual machine must have.
vCPU Limit	Amount of maximum CPU resources that the virtual machine can use.
Memory Reservation	Required minimum of memory for this virtual machine.
Memory Limit	Amount of maximum memory that the destination virtual machine can have.
Virtual Disk Type	**Thin** or **Thick** disk configuration. You might apply thin disk provisioning when you start with only the necessary partition and plan to grow it over time.

Option	Description
Virtual Disk Linked Clone	Shared space that uses linked clones.
	Linked clones involve delta disks that reference a master disk rather than a full copy of the entire virtual hard disk. For thick disks with linked clones, vCenter Operations Manager calculates linked clone capacity as one master copy that uses 100 percent of the specified disk size and the remaining copies use 10 percent delta disks. For thin disks with linked clones, vCenter Operations Manager uses the same calculation but the disk size multiplied by the use percentage defines the master copy size.
Virtual Disk Configuration	Disk size.
Virtual Disk Utilization	Expected average disk use for the virtual machine.
	The use percentage applies only to thin disks.

vCenter Operations Manager does not require you to specify the disk I/O and network I/O use of the new virtual machines, and instead uses the average disk I/O and network I/O use across virtual machines in the host or cluster as an estimation of the new virtual machine use.

7   Click **Next** when your configuration selections are complete.

8   On the Ready to Complete page, check the parameters of your what-if scenario and click **Finish** to view the outcomes.

vCenter Operations Manager applies the scenario to the view you selected and shows current capacity compared to the expected capacity if you add the virtual machines to the target object.

Create Capacity Scenarios for Virtual Machines With Existing Profiles

You can create a scenario that uses profiles of existing virtual machines as models to simulate adding one or more new virtual machines to a host or a cluster.

To help you make configuration selections for virtual machines, the right pane of the What-If Scenario wizard contains population information that shows the total virtual machine use of the selected object and representative virtual machine data. vCenter Operations Manager calculates virtual machine data by partitioning the range of capacity for CPU, memory, and disk dimensions into thirds, assigning the virtual machines to bins based on configuration, and creating a profile for each bin where the capacity of the profile is the maximum configuration of the virtual machines in the bin and the use of the profile is the average usage of the virtual machines in the bin. The value of the virtual machines assigned to the profile and the use is the average of the virtual machines assigned to the profile. The right pane includes information on the smallest and largest hosts.

For information about relevant CPU and memory maximums, see the VMware vSphere documentation.

NOTE   The What-if Scenario wizard is accessible only if you select a host or a cluster in the inventory pane.

Prerequisites

In vCenter Operations Manager, verify that the **Summary** tab under the **Planning** tab is open.

Procedure

1   Select the destination object in the inventory pane.

The destination object is a cluster or host where you locate the new virtual machines if you implement your scenario.

2   Click the **New what-if scenario** link.

The What-If Scenario wizard opens.

3   Select a view for the scenario and click **Next**.

This step is not available if you opened the What-if Scenario wizard from the **Views** tab.

4   On the Change Type page, select **Virtual machines** and click **Next**.

5   Select **Add virtual machines using profiles of existing virtual machines as models** and click **Next**.

6   Select existing virtual machines from the list to use as profiles for the new virtual machines.

The list of the existing virtual machines applies to the datacenter of the selected object. The **Datacenter** and the **Cluster or Host** drop-down menus narrow the scope of the virtual machine list. The list provides CPU, memory, and disk information such as the used space and the use of thin disks or linked clones.

7   Click **Next**.

8   To duplicate any virtual machines, increase the virtual machine count and click **Next**.

9   On the Ready to Complete page, check the parameters of your what-if scenario and click **Finish** to view the outcomes.

vCenter Operations Manager applies the scenario to the view you selected and shows current capacity compared to the expected capacity if you add the virtual machines to the target object.

What to do next

If you have more than one scenario for a view, you can combine and compare the outcomes. To save the information, export the scenario results.

Create a Hardware Change Scenario

Before you purchase new hardware, you can create hardware change scenarios to determine if the purchase is necessary. To determine the effect of adding, removing, or updating the hardware capacity in a cluster, create a scenario that models changes to hosts and datastores.

Prerequisites

In vCenter Operations Manager, verify that the **Summary** tab under the **Planning** tab is open.

Procedure

1   Select the target host in the inventory panel.

The target host is where you simulate changes to the environment to examine possible outcomes.

2   Click the **New what-if scenario** link.

3   Select a view for the scenario and click **Next**.

This step is not available if you opened the What-if Scenario wizard from the **Views** tab.

4   On the Change Type page, select **Hosts & Datastores** and click **Next**.

5   Use the buttons to add, remove, or restore hosts in the host list.

Actions are applied only to hosts that you selected using the check boxes in the hosts list.

6   Click host rows to change the physical resources and click **Save**.

You can use the text boxes and drop-down menus to modify the CPU capacity and the memory size of the selected host.

Option	Description
CPU Total	Number of CPU cores that a target single host will have, followed by the target processor core speed.
Memory Total	Amount of memory that the target host profile will have.

7   Click **Next**.

8　　Use the buttons to add, remove, or restore datastores in the datastores list.

Actions are applied only to datastores that you selected using the check boxes in the datastores list.

9　　Click datastore rows to modify the disk size and click **Save**.

The Population Details pane to the right contains information about the actual datastore capacity, the disk I/O use, and the number of hosts that link the datastore. The sharing status indicates whether different hosts share the datastore.

10　Click **Next**.

11　On the Ready to Complete page, check the parameters of your what-if scenario and click **Finish** to view the outcomes.

vCenter Operations Manager applies the scenario to the view that you selected. The scenario forecast appears in the chart as a gray dotted line. You can compare the actual current capacity to the expected capacity if you apply the changes you specified in the hardware change scenario.

What to do next

If you have more than one scenario, you can combine or compare the scenario outcomes. You can export the scenario results to an Adobe PDF or CSV file to save the information.

Create a What-If Scenario to Remove Virtual Machines

You can create a scenario that simulates removing a virtual machine or group of virtual machines from a host or a cluster.

Prerequisites

In vCenter Operations Manager, verify that the **Summary** tab under the **Planning** tab is open.

Procedure

1　　Select the target object in the inventory panel.

The target object identifies the host or the cluster from which the virtual machines are removed if you implement your scenario.

2　　Click the **New what-if scenario** link.

3　　Select a view for the scenario and click **Next**.

This step is not available if you opened the What-if Scenario wizard from the **Views** tab.

4　　On the Change Type page, select **Virtual machines** and click **Next**.

5　　Select **Remove virtual machines** and click **Next**.

6　　On the Configuration page, select the virtual machines to remove from the selected host or cluster and click **Next**.

7　　On the Ready to Complete page, check the parameters of your what-if scenario and click **Finish** to view the outcomes.

vCenter Operations Manager applies the scenario to the view that you selected. The forecasted capacity appears in the chart as a gray dotted line. You can compare the current capacity to the expected capacity if you remove the virtual machines from the target object.

What to do next

If you have more than one scenario, you can combine or compare the scenario outcomes. You can export the scenario results to an Adobe PDF or CSV file to save the information.

Combine the Results of What-If Scenarios

You can combine the results of all what-if scenarios to assess their cumulate effect on your environment.

The list of scenarios that you created appears in the What-If Scenarios pane under the Legend pane.

Prerequisites

In vCenter Operations Manager, verify that the **Views** tab under the **Planning** tab is open.

Verify that you have created at least two what-if scenarios.

Procedure

1   In the What-If Scenarios pane, select **Combine** from the drop-down menu.

    The combined values for all what-if scenarios appear as dotted lines in the **Forecasted** area of the view.

2   To view aggregate scenario values in tabular form, click the **Table** link.

What to do next

You can compare the results of different what-if scenarios to determine the best course of action.

Compare the Results of What-If Scenarios

You can compare a scenario result to the actual capacity of your environment and to other scenario results and determine the best course of action.

The list of scenarios that you created appears in the What-If Scenarios pane under the Legend pane.

Prerequisites

In vCenter Operations Manager, verify that the **Views** tab under the **Planning** tab is open.

Procedure

1   In the What-If Scenarios pane, select **Compare** from the drop-down menu.

    Existing data and scenario data appear in different line styles in the **Forecasted** area of the view.

2   (Optional) To view scenario results in tabular form, click the **Table** link.

    The table view contains separate columns to show the effect of the simulated change.

What to do next

You can combine scenario results to assess the cumulative effect of all scenarios.

Delete a Scenario from the What-If Scenarios List

You can remove scenarios in the What-If Scenarios pane if you do not need them.

The list of scenarios that you created appears in the What-If Scenarios pane under the Legend pane.

When you finish examining a what-if scenario, you can delete it.

Prerequisites

In vCenter Operations Manager, verify that the **Views** tab under the **Planning** tab is open.

Procedure

1   To delete a what-if scenario, click the **X** icon to the right of the scenario name.

    A confirmation dialog box opens.

2   Click **Yes** to confirm the deletion and return to the **Views** tab.

vCenter Operations Manager refreshes the view in the Details pane to remove the data from the scenario.

Working with Faults and Alerts 6

vCenter Operations Manager generates alerts when events occur on the monitored objects, when data analysis indicates deviations from normal metric values, or when a problem occurs with one of the vCenter Operations Manager components. Events that the vCenter Server publishes are the main source for faults.

This chapter includes the following topics:

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Events that Generate Faults

Problem events and problem remediation events generate faults.

Events that the vCenter Server publishes are the main source for faults. These events might originate in the vCenter Server itself, or ESX servers might generate them and the vCenter Server publishes them externally. Only a subset of vCenter events are considered as important for fault generation.

Faults are collected by the vCenter adapter for vCenter Operations Manager. During normal operation, fault events are collected every 5 minutes by the vCenter adapter.

If the Faults badge of an object has a high score, you can use the information from the **Details** tab to troubleshoot and resolve the faults. For information about a particular fault for an object, see the help topic for the fault event on that type of object.

Problem Events

Problem events indicate the occurrence of a fault scenario. vCenter Operations Manager computes a fault badge score and creates an alert for the problem event. The greater the severity of the problem, the higher the fault badge score that is computed. An example of this type of event is Host Connectivity Lost, which occurs on a host object. This event indicates that the vCenter Server cannot communicate to the host. More than one event might result from the same problem or type of fault.

Remediation or Clear Events

Remediation, or clear, events communicate resolution of a problem. Upon receiving a remediation or clear event, vCenter Operations Manager resets the fault score and clears or cancels the associated alert. An example of this type of event is Connected to Host, `Connected to Host`, which indicates that communication between the vCenter Server and the host is active again.

Device-Specific Faults

Faults occur on a resource, but at times can represent a problem that is more specific. For example, a vSphere host can lose network connectivity, but the problem is also specific to a NIC within the host. Another example is when a vSphere host loses connectivity to a storage device. The fault manifests itself on the host, but it is also specific to the storage device to which the connectivity was lost.

These types of device-specific faults are a subcategory of problem events. Device-specific faults exhibit a unique behavior. A fault alert of this type consists of all devices exhibiting the problem. This list of devices changes dynamically, based on devices entering and leaving the problem state. The fault state is restored when no devices exhibit a problem. This behavior ensures that the fault on a resource is cleared only if all traces of the problem are resolved completely.

For example, consider a host with two physical NICs, A and B. Network connectivity on NIC A is lost. vCenter Operations Manager creates a fault with NIC A listed as an affected device. If NIC B encounters the same problem, it is added to the device list on the already created fault. Whenever NIC A or NIC B have a restored connection, they are removed from the fault, and the fault is cleared after both NICs are connected.

The behavior of device-specific faults is completely different from that of alarms in vCenter Server. vCenter alarms are agnostic to devices and are generic. They are created and cleared regardless of which devices have a problem. This vCenter Server alarm behavior can lead to discrepancies between vCenter alarms and vCenter Operations Manager faults.

Monitoring Alerts in vCenter Operations Manager

The alerts workflow in a vCenter Operations Manager virtual environment involves identifying alerts to respond to, maintaining alerts, and identifying alert trends.

Alerts in vCenter Operations Manager are available for all of the minor badges. Alert messages provide an alternate path to identify and resolve issues.

What Is an Alert in vCenter Operations Manager

vCenter Operations Manager generates alerts when events occur on the monitored objects, when data analysis indicates deviations from normal metric values, or when a problem occurs with one of the vCenter Operations Manager components.

The Alert Volume Chart

The Alert Volume chart is a graphical representation of the number of alerts that were activated during the last 7 days. The color coding in the graph represents the level of criticality of alerts.

Alert Icon	Description
	Critical alert. You must act immediately.
	Immediate alert. Act as soon as possible.
	Warning alert. Check the condition of the selected object.
	Information alert.

The Alert Volume chart helps you visually assess what is the overall volume of alerts triggered in your environment, what is the ratio between alerts of different criticality, and what criticality level prevails in your environment.

Types of Alerts

vCenter Operations Manager generates several types of alerts. Double-click alerts in the list to view the alert details.

Badge Score Alerts	Badge score alerts are triggered when a badge changes its color. Badge colors change based on the hard thresholds that you set in the Configuration dialog box. Alerts can be triggered for the Workflow, Anomalies, Time Remaining, Capacity Remaining, Stress, Waste, and Density badges. You can select which badges activate alerts in the Configuration dialog box. **NOTE** You cannot cancel badge score alerts.
Fault Alerts	The color of the Faults badge changes based on the number of events that occurred in the virtual infrastructure that you monitor. vCenter Operations Manager does not weigh the importance of events, and the Faults badge color might remain unchanged if a single event occurs. As a result, you might miss an isolated, but critical fault event that occurred on the vCenter Server. Therefore, fault alerts are triggered when an individual event occurs and are not related to the color of the Faults badge. You can enable and disable fault alerts in the Configuration dialog box. **NOTE** Only fault alerts can be cancelled in vCenter Operations Manager.
Administrative Alerts	Administrative alerts are displayed only when the World object is selected in the navigation tree. Administrative alerts are related to problems on the vCenter Operations Manager system and virtual environment and do not affect monitored objects, but affect the proper operation and data collection of the application. Administrative alerts can be two types: system and environment. If any administrative alerts are present, a purple notification icon appears in the vertical alert pane on the far right. If the number of administrative alerts is zero, the icon is not present. The following table lists the alert icons.

Alert Icon	Administrative Alert Type	Description
	Notification	One or more administrative alerts has occurred.
	System alert	A component of the vCenter Operations Manager application has failed.
	Environment alert	vCenter Operations Manager has stopped receiving data from one or more resources. This might indicate a problem with the resource or the network infrastructure.

NOTE You cannot cancel administrative alerts.

External Alert Notifications

An administrator can configure vCenter Operations Manager to send email and SNMP notifications when an alert triggers. SMTP and SNMP notifications are set on the vCenter Operations Manager Administration Web page. The URL format is https://*VM-IP*/admin/, where *VM-IP* is the IP address or fully qualified host name of the *UI VM* virtual machine that is part of the vCenter Operations Manager virtual appliance.

Filter Alerts to Identify Notifications

Filter the alerts in your virtual environment to easily identify notifications by time, severity, and duration.

Prerequisites

Verify that you are logged in to a vSphere Client and that vCenter Operations Manager is open.

Procedure

1   In the inventory pane, select the object that you want to inspect.

2   Click the **Alerts** tab to view a list of active alerts.

3   In the Alerts list, filter the alerts by columns or select an alert icon.

Option	Action
To view the most critical alerts that need immediate attention.	Select the **Criticality** column.
To filter badge alerts in the object.	Select the **Type** column.
To filter sub-badge alerts in the object.	Select the **Sub-Type** column.
To view the most recent alerts in the object.	Select the **Start Time** column.
To filter the duration of the alert to identify the alerts that the administrator has not attended to.	Select the **Duration** column.
To view the Administrative alerts in the object.	Select the **Administrative Alert** icon.
To view the System alerts in the object.	Select the **System** icon.
To view the Environment alerts in the object.	Select the **Environment** icon.

What to do next

To investigate the possible causes of an alert, double-click the alert for details.

Identify Capacity-Related Alerts

Capacity-related alerts might be triggered because of resources running out of capacity, stressed virtual machines, or resources wasting memory.

Prerequisites

Verify that you are logged in to a vSphere Client and that vCenter Operations Manager is open.

Procedure

1   In the inventory pane, select the object that you want to inspect.

2   Click the **Alerts** tab to view a list of active alerts.

3   In the Alerts list, filter the list by the **Capacity Remaining** badge to view alerts that address capacity.

When you double-click an alert, vCenter Operations Manager opens a pop-up window displaying the alert details.

What to do next

To find aggregate information for used and total capacity and capacity trends, click the **Views** tab under the **Planning** tab and select the **Capacity** badge.

Identify the Overall Trend of Alert Types

You can use the overall trend of alert types to identify the number of critical alerts over a period of time.

Prerequisites

Verify that you are logged in to a vSphere Client and that vCenter Operations Manager is open.

Procedure

1   In the inventory pane, select the object that you want to inspect.

2   Click the **Alerts** tab to view a list of active alerts.

3   To view the alert distribution across the last seven days, check the **Alert Volume** graph.

A trend in alerts typically indicates a problem to investigate. Over time, you might also want to customize alert settings, which will be reflected in the trend display.

Maintaining vCenter Operations Manager Alerts

Maintaining alerts in the vCenter Operations Manager environment requires administrative privileges.

After identifying an alert from the Alerts list, administrators can take and release ownership of the alert, suspend, suppress, or cancel an alert.

- Take Ownership of an Alert on page 70

  Users can take ownership of alerts in the Alerts list.

- Release Ownership of an Alert on page 70

  If you are no longer responsible for an alert or want to let other users take ownership of that alert, you must release the ownership.

- Suppress an Alert on page 70

  You can hide an alert from the Alerts list for a specific number of days.

- Suspend an Alert on page 71

  You can hide an alert from the Alerts list for a specific number of minutes.

- Cancel a Fault Alert on page 72

  You can deactivate fault alerts if they are no longer valid.

- Cancel a Compliance Alert on page 72

  You can cancel compliance alerts if you want to acknowledge or ignore a compliance score until the issue is resolved and you run the mappings in vCenter Configuration Manager.

Take Ownership of an Alert

Users can take ownership of alerts in the Alerts list.

Owning an alert means that you are responsible for taking the necessary remediation actions, and prevents other users from suspending or suppressing the alert. This can reduce overlapping efforts when multiple operators manage alerts. The user names of alert owners appear in the User Name column of the Alerts list.

IMPORTANT   Only owners can suspend or suppress the alerts they own.

Prerequisites

Verify that you are logged in to a vSphere Client, and vCenter Operations Manager is open.

Procedure

1   Click the **Alerts** tab.

2   In the Alerts list, click the alert you want to own.

3   (Optional) To select multiple alerts in the list, press the Shift or Control key and click to select the alerts.

4
     Click the **Take Ownership** button .

5   Click **Yes** to confirm.

The alert appears as Assigned in the Control State column of the alert list.

Release Ownership of an Alert

If you are no longer responsible for an alert or want to let other users take ownership of that alert, you must release the ownership.

Prerequisites

Verify that you are logged in to a vSphere Client, and vCenter Operations Manager is open.

Procedure

1   Click the **Alerts** tab.

2   In the Alerts list, click one of the alerts that you own.

3   (Optional) To select multiple alerts in the list, press the Shift or Control key and click to select the alerts.

4
     Click the **Release Ownership** button .

5   Click **Yes** to confirm.

Your user name is removed from the User Name column of the Alerts list.

Suppress an Alert

You can hide an alert from the Alerts list for a specific number of days.

When you suppress an alert, you take ownership of this alert.

NOTE   You cannot suppress an alert owned by another user.

Prerequisites

Verify that you are logged in to a vSphere Client, and vCenter Operations Manager is open.

NOTE   You do not need administrative privileges to suppress or suspend alerts.

Procedure

1   Click the **Alerts** tab.

2   In the Alerts list, click the alert you want to suppress.

3   (Optional) To select multiple alerts in the list, press the Shift or Control key and click to select the alerts.

4
    Click the **Suppress** button .

5   In the Confirm dialog box, type the number of days to suppress the alert for, and click **OK**.

By default, vCenter Operations Manager hides suppressed and suspended alerts from the Alerts list for the period you specified. You can use the filters in the Control State column header to show or hide suppressed and suspended alerts.

If the problem still exists when the period you specified expires, vCenter Operations Manager reactivates the alert and the alert appears in the Alerts list. Your user name remains assigned as the alert owner.

Suspend an Alert

You can hide an alert from the Alerts list for a specific number of minutes.

When you suspend an alert, you take ownership of the alert.

NOTE   You can suspend only alerts that are not owned by another user.

Prerequisites

Verify that you are logged in to a vSphere Client, and vCenter Operations Manager is open.

NOTE   You do not need administrative privileges to suppress or suspend alerts.

Procedure

1   Click the **Alerts** tab.

2   In the Alerts list, click the alert you want to suspend.

3   (Optional) To select multiple alerts in the list, press the Shift or Control key and click to select the alerts.

4
    Click the **Suspend** button .

5   In the Confirm dialog box, type the number of minutes to suspend the alert for, and click **OK**.

By default, vCenter Operations Manager hides suppressed and suspended alerts from the Alerts list for the period you specified. You can use the filters in the Control State column header to show or hide suppressed and suspended alerts.

If the problem still exists when the period you specified expires, vCenter Operations Manager reactivates the alert and the alert appears in the Alerts list. Your user name remains assigned as the alert owner.

Cancel a Fault Alert

You can deactivate fault alerts if they are no longer valid.

Fault alerts are triggered by events that are retrieved from the vCenter Server. All the fault events that appear in vCenter Operations Manager have associated remediation events that will clear the fault badge score and the associated alert. To deactivate a fault alert, vCenter Operations Manager must receive a remediation notification when the problem on the vCenter Server is resolved. If vCenter Operations Manager does not receive such an event, the fault alert remains active.

Because faults contribute to the Health badge score, active fault alerts degrade the health score even if the problems that triggered them are solved. Although relatively rare, there can be scenarios where the ESXi host or vCenter Server fails to generate or publish the remediation event, causing the fault score to remain high and the alert to remain active after the problem causing the fault has been resolved. Therefore, you might need to deactivate outdated fault alerts manually.

NOTE Only fault alerts can be cancelled in vCenter Operations Manager. You cannot cancel badge score alerts nor administrative alerts.

Fault alerts cannot be cancelled on custom groups. Instead, you must correct any problems causing the fault on each individual group member. Cancelling alerts on group members will also clear the group-level alert.

Prerequisites

Verify that you are logged in to a vSphere Client, and vCenter Operations Manager is open.

NOTE You do not need administrative privileges to cancel fault alerts.

Procedure

1   Click the **Alerts** tab.

2   In the Alerts list, click the fault alert that you want to deactivate.

You can press the Shift or Control key while you click to select multiple fault alerts in the list.

3   Click the **Cancel Fault Alert** button ⊝.

4   Click **Yes** to confirm.

Canceling a fault manually has the same effect as a remediation event.The canceled fault alert is removed from the Alerts list and vCenter Operations Manager updates the Fault badge score and the Health Score.

NOTE Badge scores are not refreshed in real time. These values are refreshed on each data collection cycle. The data collection interval is five minutes by default.

Cancel a Compliance Alert

You can cancel compliance alerts if you want to acknowledge or ignore a compliance score until the issue is resolved and you run the mappings in vCenter Configuration Manager.

Canceling a compliance alert sets the Compliance badge score to 100. The score remains 100 until new scores are pulled from VCM.

Compliance alerts cannot be cancelled on custom groups. Instead, you must act on any problem causing the alert for each affected group member. Canceling alerts on group members will also clear the group-level alert.

Procedure

1   In the inventory panel, select a vCenter Server, datacenter, cluster, host, or virtual machine object.

2   Click the **Alerts** tab.

3   In the Alerts list, click the compliance alert you are canceling.

     You can press the Shift or Control key while you click to select multiple compliance alerts in the list.

4   Click the **Cancel Fault or Compliance Alert** button.

5   Click **Yes** to confirm.

The canceled compliance alert is removed from the Alerts list and vCenter Operations Manager updates the Compliance badge score and the Risk score.

What to do next

Resolve the noncompliant rules for the virtual object. See "Resolve Non-Compliant Rules for Compliance Templates," on page 32.

Working with Groups

7

Groups allow you to create your own containers for objects in your environment.

vCenter Operations Manager has several fixed container objects that are defined mainly by the adapters used. These containers include the World group, vCenter Server objects, Datacenter objects, ESX and Cluster objects, and Datastore objects that appear in the inventory view. Fixed containers follow the structure of your virtual environment. You cannot control the objects that are included in these containers.

To define your own containers to group monitored objects depending on the logical organization of your environment, you can use groups.

Metrics and Badges for Groups

The approach that vCenter Operations Manager applies for calculating metrics and badge values for groups differs from the approach that is applied for calculating metrics for fixed container objects. The metrics on a fixed container object use data about the object itself and are computed using prescriptive formulas that can be arbitrarily complex. Metrics on a group are about the child objects that the group contains, and are simply rolled up from them.

Types of Groups

Adapter-Managed Groups

In these groups, group membership is managed by the adapters that are installed on the vCenter Operations Manager system. For example, the vCenter Server adapter creates groups like datastore, host, network, and so on, which correspond to container objects in the vSphere inventory. Some folder groups created by the vCenter Server adapter might appear empty if the objects that they contain are not supported as first class objects in vCenter Operations Manager.

NOTE   You cannot modify adapter-based groups from the user interface.

Rule-Managed Groups

In these groups, group membership is based on the rules that you define while you create or update a group. You create these groups by selecting **Dynamic** membership type in the New Group wizard, and can update them in the Edit Group dialog box.

Manually Managed Groups

In these groups, you select group members one by one from the inventory. You create these groups by selecting **Manual** membership type in the New Group wizard, and can edit them in the Edit Group wizard.

Each group must be assigned a group type. Group types are categories that you define to help organize the groups that you create. You use the Configuration dialog box to create group types.

NOTE   All operations on a group are based on the current members of the group. You cannot go back in time and run operations based on the group members at that point in the past.

This chapter includes the following topics:

Create a Group Type

As part of the groups creation process, you must select a group type from a list of predefined types.

By creating a group type, you create a new category in the groups inventory. Group types help you organize the groups that you create.

vCenter Operations Manager provides a set of pre-defined group types for you to use. The available types are: **Location**, **Environment**, **Department**, **Function**, **Service Level Objective**, and **Security Zone**.

Procedure

1   Click the **Configuration** link at the upper right of the vCenter Operations Manager interface.

2   In the Configuration dialog box, click **Manage Group Types**.

3   Click the **Add Group Type** icon .

4   Enter a name for the group type and click **OK**.

The new group type appears in the list.

5   Click **Done** to close the Configuration dialog box.

A new object named after the group type appears in the groups inventory tree.

Edit a Group Type

Edit a group type to change its name.

A group type is a named category used to help organize custom groups of objects that you create. You can edit group types that you or other users create, and you can edit group types that are currently assigned to groups.

You cannot edit group types created by vCenter Operations Manager adapters. These group types are: VCM Machine Groups (created by the VCM adapter), Application (created by the Infrastructure Navigator adapter, and Folder (created by the vCenter adapter).

Procedure

1   Click the **Configuration** link at the upper right of the window.

2   In the Configuration dialog box, click **Manage Group Types**.

3   Select the group type you want to edit.

The group type must be managed by a user.

4   Click the **Edit** icon ✏ at the top of the dialog box.

5   In the text box that displays the Group Type name, make changes.

6   Click **OK** to confirm the editing change.

Delete a Group Type

Delete a group type when you decide to no longer use it to organize groups in your inventory.

A group type is a named category used to help organize custom groups of objects that you create. You can delete group types that you or other users create.

NOTE   If you delete a group type that is assigned to a custom group, that group will be deleted as well.

You cannot edit group types created by vCenter Operations Manager adapters. These group types are: VCM Machine Groups (created by the VCM adapter), Application (created by the Infrastructure Navigator adapter, and Folder (created by the vCenter adapter).

Procedure

1   Click the **Configuration** link at the upper right of the window.

2   In the Configuration dialog box, click **Manage Group Types**.

3   Select the group type you want to delete.

The group type must be managed by a user.

4   Click the **Delete** icon ✖ at the top of the dialog box.

A warning dialog box appears, asking you to confirm the permanent deletion. If the group type is assigned to any custom groups, you are warned that the group type and its custom groups will be deleted.

5   Click **OK** to confirm the deletion.

Create a Group

You create groups to monitor batches of objects that belong to different generic containers.

Grouping objects in custom containers allows you to view aggregated data for these objects, regardless of their location in the inventory.

You must have a vCenter Operations Manager admin or vCenter Server Administrator role, or **vCenter Operations Manager Admin** permission assigned to your user name on the vCenter Server level in order to create or edit groups.

Procedure

1   Specify the Basic Parameters of the New Group on page 78

When you create a new group, you must specify the basic details of the group.

2   Define Group Members on page 79

You can populate groups either automatically based on rules or manually.

3   Review Your Settings and Create the Group on page 81

Before you add a group to the groups list, you must verify that all group members appear as expected, and that the group settings are correct.

Specify the Basic Parameters of the New Group

When you create a new group, you must specify the basic details of the group.

Prerequisites

If not group types exist, you must define at least one group type before you can create a group. See "Create a Group Type," on page 76.

Procedure

1 From the **Actions** drop-down menu, select **Create new group**.

2 On the Edit group details page of the New Group wizard, fill in the basic parameters of the group.

Option	Description
Name	Type a name for the new group.
Description	Optionally, type a description for the group.
Type	Select the group type from the drop-down menu. You create group types before you create groups.
Policy	Select the policy to apply to group members. ■ **Inherit policy from parent** - if the group that you create is nested under another group, you can select this option to propagate the policy assigned to the parent group to the nested group. ■ **Default policy** - You can select this option to use the default policy that is set in the Configuration dialog box. NOTE Default policy is the policy that you have decided to apply to monitored objects by default. ■ All custom policies that you created appear as separate entries in the **Policy** drop-down menu. You can select the one to apply to the new group. NOTE If an object belongs to several groups that have different policies assigned, the policy with the highest priority applies to this object. The priority of policies is determined by their position in the list of policies. You can find the list of policies on the **Manage Policies** page of the Configuration dialog box.
Membership Type	Select the way group members are added to the group. ■ **Dynamic** - members are added to the group based on the rules that you specify on the following pages of the New Group wizard. Select this option to create a rule-based group. NOTE This option must be selected if you want to create lists of objects to exclude from the group. ■ **Manual** - you select group members manually, from the inventory tree. No rules are applied to the group, and you update group members manually. Select this option to create a manually managed group.
Automatically keep the membership up to date	This option is available only for rule-based groups, if you selected **Dynamic** membership type. ■ Select the option if you want vCenter Operations Manager to run periodically a search query to find objects that match the group membership rules, and update the list of group members according to search results. ■ Do not select this option if, after the initial creation and population of the group, you want group members to be added or deleted only when you select the **Update members** option from the **Actions** drop-down menu.

3 Click **Next**.

What to do next

Set the rules that determine which objects belong to the group or select these objects manually.

Define Group Members

You can populate groups either automatically based on rules or manually.

The mechanism for adding group members depends on the option that you select from the **Membership Type** drop-down menu on the Edit group details page.

Table 7-1. Defining Group Members Depending on the Membership Type

Membership Type	Procedure to Follow
Dynamic	Define Group Membership Criteria
Manual	Select Group Members Manually

Define the Rules for Group Membership

You create rules to define which objects belong to a group. Based on these rules, vCenter Operations Manager adds or removes group members.

You define the rules for group membership in the New Group wizard. You can modify the rules that you created for a group in the Edit Group dialog box.

Each criterion defines a set of objects that needs to be considered for group membership. The format of all criteria is `Scope:Property:Condition:Value`.

A group of criteria is called a rule set. You add new criteria to the rule set by using the **Add a new criteria** button. The logical operator between criteria in a rule set is AND.

A rule group contains two or more rule sets. You add rule sets by using the **Add a new rule set** button. The logical operator between rule groups is OR.

Prerequisites

Verify that **Dynamic** membership type is selected on the Edit group details page of the New Group wizard.

Procedure

1 On the Define membership page, use the drop-down menus to create the rules that determine which objects belong to the group.

The logical operation between criteria in a rule is AND. The logical operation between rule sets is OR.

Note   The custom group criteria use the last stored value from the vCenter Operations Manager database. For example, the last recorded state of virtual machines from a host is powered-on. The host is disconnected from the vCenter Server and all virtual machines on the host were powered off. If you create a group that must contain only powered-on virtual machines, the powered-off machines from the disconnected host are added as group members because their last known state is powered-on.

2 (Optional) Create lists of exceptions to the rules.

You can select the objects to include and objects to exclude from the group despite the rules that you defined.

3 (Optional) To view the list of objects that match the membership rules that you defined, click **Preview**.

4 Click **Next**.

What to do next

You can review the settings for the new group.

Create Whitelists and Blacklists for Group Members

Optionally, you can control whether specific objects are included in or excluded from your group, irrespective of the membership rules that you set.

You list the objects that are exceptions to the rules that you specified while you create a rule-based group on the Define membership page of the New Group wizard.

You can modify these lists later, by using the Edit Group dialog box.

NOTE   These settings override the membership criteria and rules that you have defined.

Prerequisites

Verify that **Dynamic** membership type is selected on the Edit group details page of the New Group wizard. You can create lists of object to include or exclude only for groups with dynamic membership type enabled.

Procedure

1   To permanently include objects in the group, select the check boxes of the objects in the navigation tree, and click **Add** on the left of the Objects to Include list.

 You can use the search text box to locate objects in the inventory.

 You can use the drop-down options of the **Add** button to add only the selected object, or the selected object and its child objects.

2   To permanently exclude specific objects from the group, select the check boxes of the objects in the navigation tree, and click **Add** on the left of the Objects to Exclude list.

 You can use the search text box to locate objects in the inventory.

 You can use the drop-down options of the **Add** button to add only the selected object, or the selected object and its child objects.

3   Click **Next**.

What to do next

You can review the settings for the new group.

Select Group Members Manually

You can add objects objects from the inventory to a group.

You select the group members in the New Group wizard. You can add or delete group members in the Edit Group dialog box.

Prerequisites

Manual membership type must be selected on the Edit group details page of the New Group wizard.

Procedure

1   On the Define membership page, select the view for inventory objects.

Option	Description
Hosts and Clusters	Click to view the entire inventory tree and select from vCenter Server objects to individual virtual machines.
Groups	Click to nest groups within the group that you create. NOTE You cannot nest adapter-managed groups.
Datastores	Click to limit the view to vCenter Server objects, Datacenters, and Datastores.

2   Select the check boxes in front of the objects that you want to add to the group, and click **Add**.

     If you select groups, these groups will be nested in the new group that you create.

3   Click **Next**.

Example: Nesting Groups in groups

Assume that you have created a group that is called `group1`, and you want to nest `group1` in a new group,
called `new group`.

1   From the **Actions** drop-down menu, select **Create new group**.

2   On the Edit group detail page of the New Group wizard, type `new group` in the **Name** text box.

3   From the **Membership Type** drop-down menu, select **Manual**, and click **Next**.

4   On the Define Membership page, click the **Groups** icon.

5   In the inventory, select **group1**, and click **Add**.

6   Click **Next** and **Finish** to close the New Group wizard.

What to do next

You can review the settings for the new group.

Review Your Settings and Create the Group

Before you add a group to the groups list, you must verify that all group members appear as expected, and
that the group settings are correct.

Procedure

◆   On the Review settings page of the New Group wizard, verify that all group members are displayed
     correctly and click **Finish**.

The group that you created appears in the groups navigation tree, under the group type that you selected
during the configuration.

What to do next

You can view aggregated metrics for the objects that belong to the group.

Managing Groups

You can add groups, modify their settings, apply policies, and delete groups from the groups inventory
view.

The options for managing a group appear in the **Actions** drop-down menu on the upper right when a group
is selected in the groups inventory view.

■   Modify a Group on page 82

     You can change the settings that you applied to a group to add or remove members that are included
     in the group, or to change how vCenter Operations Manager updates group members.

■   Clone an Existing Group on page 83

     To save time for creating groups with similar settings, you can clone existing groups, and modify part
     of their parameters to create new groups.

■   Delete a Group on page 84

     If you no longer need a group that you created, you can remove it from the list of groups.

Modify a Group

You can change the settings that you applied to a group to add or remove members that are included in the group, or to change how vCenter Operations Manager updates group members.

Prerequisites

You must have a vCenter Operations Manager admin or vCenter Server Administrator role, or **vCenter Operations Manager Admin** permission assigned to your user name on the vCenter Server level in order to create or edit groups.

Procedure

1   In the groups inventory view, select the group that you want to edit.

2   From the **Actions** drop-down menu, select **Edit group**.

3   From the navigation pane on the left, select the set of options that you want to modify.

Option	Description
Edit group details	On this page of the Edit Group dialog box, you can change the following parameters. ■ Group name ■ Group description ■ Policy that is applied to group members NOTE You cannot change the group type.
Define membership	On this page of the Edit Group dialog box, you can change the following parameters. ■ Group membership type ■ Membership criteria and rules for rule-based groups ■ Automatic updates of group members for rule-based groups ■ Group members for manually managed groups ■ Objects to include in the group. Applies to manually defined groups

4   To apply the changes, click **OK** or select another page from the navigation pane of the Edit Group dialog box.

Change the Group Membership Type of an Existing Group

The group membership type determines how a group is populated. You can select a different membership type if you want to change how group is populated.

Prerequisites

Verify that you understand the difference between dynamic, or rule-based, and manual group membership type. See Chapter 7, "Working with Groups," on page 75.

Procedure

1   Click the **groups** icon to navigate to the groups view.

2   In the groups inventory view, click the group that you want to modify.

3   From the **Actions** drop-down menu, select **Edit group**.

4   Change the group membership type.

Option	Description
Make a manual group dynamic	a On the **Define membership** page of the Edit Group dialog box, select the **Advanced settings** check box. b Click **OK** to confirm. All group members are added to the Objects to always include list. You can create the rules for dynamic addition of group members.
Make a dynamic group manual	a On the **Define membership** page of the Edit Group dialog box, deselect the **Advanced settings** check box. b Click **OK** to confirm. All current group members and objects from the whitelist are moved to the group members list. The objects from the blacklist are not saved.

5   To apply the changes, click **OK** or select another page from the navigation pane of the Edit Group dialog box.

Change How vCenter Operations Manager Updates Group Members

For rule-based groups, you can switch between manual or automatic updating of group members.

Prerequisites

Verify that the group that you want to modify is rule-based. See Chapter 7, "Working with Groups," on page 75.

Procedure

1   Click the **groups** icon to navigate to the groups view.

2   In the groups inventory view, click the group that you want to modify.

3   From the **Actions** drop-down menu, select **Edit group**.

4   In the navigation pane of the Edit Group dialog box, select **Define Membership**.

5   Select or deselect the **Automatically keep the membership up to date** option.

Option	Description
Option selected	vCenter Operations Manager periodically runs a search query to find objects that match the group membership rules, and updates the list of group members according to search results.
Option not selected	vCenter Operations Manager adds or deletes group members only when you select the **Update members** option from the **Actions** drop-down menu.

6   To apply the changes, click **OK** or select another page from the navigation pane of the Edit Group dialog box.

Clone an Existing Group

To save time for creating groups with similar settings, you can clone existing groups, and modify part of their parameters to create new groups.

NOTE   You cannot clone adapter-managed groups.

Prerequisites

You must have a vCenter Operations Manager admin or vCenter Server Administrator role, or **vCenter Operations Manager Admin** permission assigned to your user name on the vCenter Server level in order to create or edit groups.

Verify that you have created at least one group.

Procedure

1   In the groups inventory view, select the group that you want to clone.

2   From the **Actions** drop-down menu, select **Clone group**.

3   Type a new name for the cloned group.

> NOTE   The names of cloned groups cannot duplicate the names of other groups in your environment.

4   Use the **Next** button to navigate to the set of options that you want to modify.

Option	Description
Edit group details	On this page of the Clone Group dialog box, you can change the following parameters. ■ Group type ■ Group description ■ Group membership type ■ Automatic updates of group members for rule-based groups ■ Policy that is applied to group members
Define membership	On this page of the Clone Group dialog box, you can change the following parameters. ■ Membership criteria and rules for rule-based groups ■ Group members for manually managed groups ■ Objects to include in the group. Applies to manually defined groups

5   To apply the changes, click **Next** or **Finish**.

Delete a Group

If you no longer need a group that you created, you can remove it from the list of groups.

Procedure

1   In the groups inventory view, click the group that you want to delete.

2   From the **Actions** drop-down menu, select **Delete group**, and click **Yes** to confirm the deletion.

Application Custom Group

vCenter Infrastructure Navigator discovers a set of virtual machines that are correlated as a platform for a multi-tier application by using a user configured application template or static applications, and publishes this information.

If you integrate Infrastructure Navigator 2.0 with vCenter Operations Manager, vCenter Operations Manager queries and processes this application related information and reports this application correlated group of virtual machines as an adapter-defined application custom group. You can monitor the discovered application custom group as a vCenter Operations Manager object.

Two types of Infrastructure Navigator data are published.

Type	Description
Application Definition	Describes an application definition. For example, name and description.
Application	Describes an application instance and its member entities.

You can also manually create a custom group based on a selected application. For example, you can specify an application, Tomcat, and then create a custom group with a group of virtual machines all running Tomcat. For more information, see "Create a Group," on page 77.

View Entities of an Application Custom Group

After the integration of Infrastructure Navigator 2.0, application custom group related information is queried, processed, and displayed in the vCenter Operations Manager user interface.

Procedure

1   Click the **Groups** tab.

     The discovered application custom group is listed under the `Application` folder.

2   Select the application custom group for which you want to view the entity information.

3   Click the **Members** tab under the **Environment** tab.

     The **Members** tab displays the member entities of the discovered application custom group.

Set How Data Appears in vCenter Operations Manager

8

An administrator can modify the way vCenter Operations Manager analyzes and presents data in the dashboard, in different views, and reports.

All settings in the Configuration window are optional, and allow you to adapt the appearance and operation of vCenter Operations Manager to your environment and preferences.

NOTE   The settings that are available to you depend on the license that you have.

Initial Setup

After you install and configure vCenter Operations Manager and before you work with the application, review the default policy settings with other users. Decide whether to begin work using the default policy settings or to modify them. The default policy is applied to all objects and newly created groups by default. You can change the policy associated with a certain group by using the Configurations dialog box. Most changes are noticeable immediately.

Applying Custom Settings

An administrator can modify any policy in vCenter Operations Manager at any time. The changes that the administrator applies affect all users. Therefore, the administrator must notify the users who are working with vCenter Operations Manager about any new settings that are applied to the policies.

> ⚠️ CAUTION   Be sure you understand how data is affected before you modify the default policy settings.

Always change the settings at the end of a performance period. For example, if you change the settings for calculating average usage in the middle of the collection period, partial data for that period is based on the old settings and the remainder of the data is based on the new settings. The discrepancy might be difficult to reconcile.

You can view a summary of settings that affect calculations for the currently selected view in the View Information pane of the **Views** tab under **Planning**. You can change the settings as you work with a selected view. For example, if you know that your disk I/O will behave differently from its usual pattern for a week and this might affect the views, you can change the settings in the Configuration dialog box to turn off the resource.

Ordering Policies in the Configuration Dialog Box

The order in which policies appear in the **Manage Policies** pane of the Configuration dialog box determines their priority. The higher a policy is in the list, the higher its priority.

The priority of policies is important for objects that belong to more that one group. If an object belongs to two or more groups and different policies are assigned to each group, the object is associated with the policy that has the highest priority.

This chapter includes the following topics:

- "Create a New Policy," on page 88
- "Modify an Existing Policy," on page 109
- "Modify Summary, Views, and Reports Settings," on page 110

Create a New Policy

You create policies to define a set of rules for vCenter Operations Manager to apply when analyzing and presenting data in the user interface.

Associating Policies with Groups

You can associate policies to specific groups.

NOTE   You can associate only one policy per group, while one policy can be associated with many groups.

You can associate a policy with a group while you create or edit groups, and while you create or modify policies.

While creating or modifying a group, you can select the policy that you want to associate with the group from a list of already defined policies.

While creating or modifying a policy, you can select the groups that you want to associate with the policy.

The Default Policy

The Default policy is the policy that is associated with all groups for which no other policy is selected.

If you have modified the Default policy, but want to revert to the original policy settings, open the Default policy for editing and go to section **1a General**. From the **Clone from** drop down menu, select **Original Defaults**.

Prerequisites

Verify that you are logged in to a vSphere Client as an administrator, and vCenter Operations Manager is open.

- Set the General Parameters of a Policy on page 89

  To distinguish a policy from other policies in the list, you must specify a name and provide a comprehensive description of the policy.

- Associate a Policy with One or More Groups on page 90

  You can determine what policies are applied to groups in vCenter Operations Manager.

- Customize Badge Thresholds for Infrastructure Objects on page 91

  You can modify the default badge threshold levels for virtual infrastructure objects so that your own ranges appear in the vCenter Operations Manager interface.

- Customize Badge Thresholds for Virtual Machine Objects on page 92

  You can modify the default badge threshold levels for virtual machines so that your own ranges appear in the vCenter Operations Manager interface.

- Customize the Badge Thresholds for Groups on page 95

  You can modify the default badge threshold levels for groups so that your own ranges appear in the vCenter Operations Manager interface.

- Modify Capacity and Time Remaining Settings on page 96

  Select whether to use stress to account for spikes and peaks, specify the bases for Capacity and Time Remaining, and, select Demand and Allocation models for compute resources.

- Modify Usable Capacity Settings on page 98

  If you activate the use of usable capacity, you can modify usable capacity settings to specify High Availability, calculation, and buffer rules.

- Modify Usage Calculation Settings on page 99

  Specify the number of hours during the work week over which average capacity usage is calculated, and identify peak hours or spikes by excluding data that falls into a regular pattern. If the allocation model is enabled, set the target ratios for CPU, Memory, and Disk Space.

- Modify the Criteria for Powered-Off and Idle Virtual Machine State on page 100

  You can specify the amount of time after which the virtual machine is classified as powered-off or idle, and select the threshold used to detect idle status for virtual machines.

- Modify the Criteria for Oversized and Undersized Virtual Machines on page 102

  You can select the level of activity that constitutes an oversized or undersized virtual machine.

- Modify the Criteria for Underused and Stressed Capacity on page 103

  Underused and stressed capacity settings help you identify the load on clusters and hosts before you deploy virtual machines.

- Select Which Badges Generate Alerts on page 106

  You can select the badges for which you want alerts to appear on the **Alerts** tab in vCenter Operations Manager.

- Modify Trend and Forecast Analysis Settings on page 106

  You can define trend and forecast parameters around data points that include outlier detection or smoothing filters.

Set the General Parameters of a Policy

To distinguish a policy from other policies in the list, you must specify a name and provide a comprehensive description of the policy.

Prerequisites

Verify that you are logged in to a vSphere Client as an administrator, and vCenter Operations Manager is open.

Procedure

1   Click the **Configuration** link on the main vCenter Operations Manager page.

2   Create a new policy or open an existing policy for editing.

Option	Description
To create a new policy	In the **Manage Policies** pane, click the **Create Policy** icon .
To modify an existing policy	In the **Manage Policies** pane, select the policy that you want to associate to groups and click the **Edit Policy** icon .

3   Type a name and description for the policy.

4   From the **Clone from** drop-down menu, select an existing policy to reuse its settings.

Option	Description
Default Policy	Select to apply the Default policy that is associated with all groups for which no other policy is selected.
Original Default	Select to use the original policy settings of vCenter Operations Manager. For the original default policy, stress is included in capacity and time calculations (see section **3a Capacity and Time Remaining**). However, resource allocation is not included in stress calculations (see section **4c Underuse and Stress**).
Optimized for 15-minute peak period	Select to detect resources using more than 100% of their usable capacity for more than 15 minutes within any given hour.
Optimized for 30- minute peak period	Select to detect resources using more than 100% of their usable capacity for more than 30 minutes within any given hour.
Excludes over-sized analysis	Select if your company policy allows the existence of over-sized virtual machines in your environment. For example, if you provision certain virtual machines with enough resources to cover the highest possible workload, these machines might be considered as over-sized when the workload is normal. You can create a separate group for such highly-provisioned machines and assign the **Excludes over-sized analysis** policy to the group, so that these machines will not be included in calculating the values for capacity-related badges.
Ignore these objects	For testing and development. This policy deactivates all alerts and badge threshold settings.
Production environment	For real-world production. Both demand and allocation models are configured. Uses a 4-hour sliding window for measurement. Container object thresholds for CPU and memory are set to demand above 40% for more than 10% of the configured time period (see section **4c Underuse and Stress**).
Test and development environment	For testing and development. Uses the current defaults, and a demand model, in which requested resources are used to determine capacity remaining (see section **3a Capacity and Time Remaining**).Only fault alerts are enabled (see section **5 Configure alerts**).
Batch workloads	For production. Optimized for throughput. Uses an 8-hour sliding window for measurement.
Interactive workloads	For production. Optimized for response time. Uses a 1-hour sliding window for measurement.

5   Click **OK** or **Finish** to save your settings, or select another option to configure.

6   Click **Done** to close the Configuration dialog box.

Associate a Policy with One or More Groups

You can determine what policies are applied to groups in vCenter Operations Manager.

You can use the Configuration dialog box to associate policies with groups either while you create a new policy or while modifying an existing policy.

NOTE   You can assign only one policy per group.

Prerequisites

Verify that you are logged in to a vSphere Client as an administrator, and vCenter Operations Manager is open.

Procedure

1   Click the **Configuration** link on the main vCenter Operations Manager page.

2   Create a new policy or open an existing policy for editing.

Option	Description
To create a new policy	In the **Manage Policies** pane, click the **Create Policy** icon ➕.
To modify an existing policy	In the **Manage Policies** pane, select the policy that you want to associate to groups and click the **Edit Policy** icon 🖉.

3   Under Policy Details, click **1b Associations**.

4   In the list of groups, select the groups that you want to associate with the current policy and click **Add**.

5   (Optional) To remove groups that are already associated with the policy, select the groups in the list on the right and click **Remove**.

6   Click **OK** or **Finish** to save your settings, or select another option to configure.

7   Click **Done** to close the Configuration dialog box.

The policy is associated with the selected groups.

NOTE   If an object belongs to more than one group and different policies are assigned to each group, the object will be associated with the policy that stands higher in the list of policies in the Configuration dialog box.

Example: Associating policies to objects that belong to numerous groups

Assume that a virtual machine belongs to group A and group B. Policy X is assigned to group A. Policy Y is assigned to group B. In the **Manage Policies** pane of the Configuration dialog box, policies are ordered as follows.

■   Default Policy

■   Policy X

■   Policy C

■   Policy Y

The virtual machine is associated with policy X because this policy appears higher in the list.

Customize Badge Thresholds for Infrastructure Objects

You can modify the default badge threshold levels for virtual infrastructure objects so that your own ranges appear in the vCenter Operations Manager interface.

An administrator can modify any policy in vCenter Operations Manager at any time. The changes that the administrator applies affect all users. Therefore, the administrator must notify the users who are working with vCenter Operations Manager about any new settings that are applied to the policies.

Prerequisites

Verify that you are logged in to a vSphere Client as an administrator, and vCenter Operations Manager is open.

Procedure

1   Click the **Configuration** link on the main vCenter Operations Manager page.

2   Create a new policy or open an existing policy for editing.

Option	Description
To create a new policy	In the **Manage Policies** pane, click the **Create Policy** icon ➕.
To modify an existing policy	In the **Manage Policies** pane, select the policy that you want to associate to groups and click the **Edit Policy** icon ✏️.

3   Under Configure badges, click **2a Infrastructure badge thresholds**.

4   Slide the color icons on the selected axis to modify the default values and set the ranges to show the green, yellow, orange, or red badge.

> NOTE   You cannot revert the changes you apply to badge thresholds. Topic Default Badge Threshold Values lists the default threshold values for your reference.

5   (Optional) To enable or disable a color range for a badge, click the icon of that color.

Only the outlines of the icon that you disabled remain on the axis.

If the badge score crosses the threshold marked by the disabled icon, the badge color does not change.

vCenter Operations Manager does not trigger alerts derived from disabled badge thresholds.

6   Click **OK** or **Finish** to save your settings, or select another option to configure.

7   Click **Done** to close the Configuration dialog box.

Badge thresholds are updated. The badge colors will change when the next collection cycle begins.

> NOTE   Depending on your selection in the **Configure alerts** section of the policy configuration dialog box, new badge thresholds might affect the number of alerts that vCenter Operations Manager generates.

Customize Badge Thresholds for Virtual Machine Objects

You can modify the default badge threshold levels for virtual machines so that your own ranges appear in the vCenter Operations Manager interface.

An administrator can modify any policy in vCenter Operations Manager at any time. The changes that the administrator applies affect all users. Therefore, the administrator must notify the users who are working with vCenter Operations Manager about any new settings that are applied to the policies.

Prerequisites

Verify that you are logged in to a vSphere Client as an administrator, and vCenter Operations Manager is open.

Procedure

1   Click the **Configuration** link on the main vCenter Operations Manager page.

2   Create a new policy or open an existing policy for editing.

Option	Description
To create a new policy	In the **Manage Policies** pane, click the **Create Policy** icon ➕.
To modify an existing policy	In the **Manage Policies** pane, select the policy that you want to associate to groups and click the **Edit Policy** icon ✏️.

3   Under Configure badges, click **2b VM badge thresholds**.

4   Slide the color icons on the selected axis to modify the default values and set the ranges to show the green, yellow, orange, or red badge.

NOTE   You cannot revert the changes you apply to badge thresholds. Topic Default Badge Threshold Values lists the default threshold values for your reference.

5   (Optional) To enable or disable a color range for a badge, click the icon of that color.

Only the outlines of the icon that you disabled remain on the axis.

If the badge score crosses the threshold marked by the disabled icon, the badge color does not change.

vCenter Operations Manager does not trigger alerts derived from disabled badge thresholds.

6   Click **OK** or **Finish** to save your settings, or select another option to configure.

7   Click **Done** to close the Configuration dialog box.

Badge thresholds are updated. The badge colors will change when the next collection cycle begins.

NOTE   Depending on your selection in the **Configure alerts** section of the policy configuration dialog box, new badge thresholds might affect the number of alerts that vCenter Operations Manager generates.

Default Badge Threshold Values

If you modify the badge thresholds in the Configuration window, you cannot reset to the default values.

Because you cannot revert the changes you apply to badge thresholds for infrastructure, virtual machine, and group objects, Table 8-1 lists the default badge threshold values for your reference.

Table 8-1. Default Badge Threshold Values

Badge	Icon	Status	Default Score Range for Infrastructure	Default Score Range for VM	Default Score Range for Groups
Health		Good	100-76	100-76	100-76
		Abnormal	75-51	75-51	75-51
		Degraded	50-26	50-26	50-26
		Bad	25-0	25-0	25-0
Workload		Good	0-79	0-84	0-24
		Abnormal	80-89	85-94	25-49
		Degraded	90-95	95-100	50-74
		Bad	>95	>100	75-100
Anomalies		Good	0-49	0-49	0-24
		Abnormal	50-74	50-74	25-49

Table 8-1. Default Badge Threshold Values (Continued)

Badge	Icon	Status	Default Score Range for Infrastructure	Default Score Range for VM	Default Score Range for Groups
		Degraded	75-89	75-89	50-74
		Bad	90-100	90-100	75-100
Faults		Good	0-24	0-24	0-24
		Abnormal	25-49	25-49	25-49
		Degraded	50-74	50-74	50-74
		Bad	75-100	75-100	75-100
Compliance		Good	100-76	100-76	100-76
		Abnormal	75-51	75-51	75-51
		Degraded	50-26	50-26	50-26
		Bad	25-0	25-0	25-0
Risk		Good	0-49	0-49	0-24
		Abnormal	50-74	50-74	25-49
		Degraded	75-100	75-100	50-74
		Bad	100	100	75-100
Time Remaining		Good	100-51	100-51	100-76
		Abnormal	50-26	50-26	75-51
		Degraded	25-1	25-1	50-26
		Bad	0	0	25-0
Capacity Remaining		Good	100-11	100-11	100-76
		Abnormal	10-6	10-6	75-51
		Degraded	5-1	5-1	50-26
		Bad	0	0	25-0

Table 8-1. Default Badge Threshold Values (Continued)

Badge	Icon	Status	Default Score Range for Infrastructure	Default Score Range for VM	Default Score Range for Groups
Stress		Good	0	0	0-24
		Abnormal	1-4	1-4	25-49
		Degraded	5-29	5-29	50-74
		Bad	30-100	30-100	75-100
Efficiency		Good	100-26	100-26	100-76
		Abnormal	25-11	25-11	75-51
		Degraded	10-1	10-1	50-26
		Bad	0	0	25-0
Reclaimable Waste		Good	0-49	0-49	0-24
		Abnormal	50-89	50-74	25-49
		Degraded	75-99	75-99	50-74
		Bad	100	100	75-100
Density		Good	100-26	100-26	100-76
		Abnormal	25-11	25-11	75-51
		Degraded	10-1	10-1	50-26
		Bad	0	0	25

Customize the Badge Thresholds for Groups

You can modify the default badge threshold levels for groups so that your own ranges appear in the vCenter Operations Manager interface.

An administrator can modify any policy in vCenter Operations Manager at any time. The changes that the administrator applies affect all users. Therefore, the administrator must notify the users who are working with vCenter Operations Manager about any new settings that are applied to the policies.

Prerequisites

Verify that you are logged in to a vSphere Client as an administrator, and vCenter Operations Manager is open.

Procedure

1 Click the **Configuration** link on the main vCenter Operations Manager page.

2 Create a new policy or open an existing policy for editing.

Option	Description
To create a new policy	In the **Manage Policies** pane, click the **Create Policy** icon ➕ .
To modify an existing policy	In the **Manage Policies** pane, select the policy that you want to associate to groups and click the **Edit Policy** icon 🖊 .

3 Under Configure badges, click **2c Groups badge thresholds**.

4 Slide the color icons on the selected axis to modify the default values and set the ranges to show the green, yellow, orange, or red badge.

NOTE   You cannot revert the changes you apply to badge thresholds. Topic Default Badge Threshold Values lists the default threshold values for your reference.

5 (Optional) To enable or disable a color range for a badge, click the icon of that color.

Only the outlines of the icon that you disabled remain on the axis.

If the badge score crosses the threshold marked by the disabled icon, the badge color does not change.

vCenter Operations Manager does not trigger alerts derived from disabled badge thresholds.

6 Click **OK** or **Finish** to save your settings, or select another option to configure.

7 Click **Done** to close the Configuration dialog box.

Badge thresholds are updated. The badge colors will change when the next collection cycle begins.

NOTE   Depending on your selection in the **Configure alerts** section of the policy configuration dialog box, new badge thresholds might affect the number of alerts that vCenter Operations Manager generates.

Modify Capacity and Time Remaining Settings

Select whether to use stress to account for spikes and peaks, specify the bases for Capacity and Time Remaining, and, select Demand and Allocation models for compute resources.

An administrator can modify any policy in vCenter Operations Manager at any time. The changes that the administrator applies affect all users. Therefore, the administrator must notify the users who are working with vCenter Operations Manager about any new settings that are applied to the policies.

Prerequisites

Verify that you are logged in to a vSphere Client as an administrator, and vCenter Operations Manager is open.

Procedure

1 Click the **Configuration** link on the main vCenter Operations Manager page.

2   Create a new policy or open an existing policy for editing.

Option	Description
To create a new policy	In the **Manage Policies** pane, click the **Create Policy** icon ![plus].
To modify an existing policy	In the **Manage Policies** pane, select the policy that you want to associate to groups and click the **Edit Policy** icon ![pencil].

3   Click **3a Capacity and time remaining** and modify the settings.

Option	Description
Spikes and Peaks	Determines whether to take the more conservative approach of using stress in accounting for spikes and peaks in capacity use.
	Select the check box if you want a more conservative approach to account for demand used in capacity and time remaining calculations using the settings for stress calculation in sections 4b and 4c of the policy configuration dialog box. Deselect the check box if you want the demand to be the average demand without accounting for spikes and peaks.
Capacity Remaining is based on:	Choose the model for capacity calculations:
	■ **Physical or Configured Capacity**. Uses physical capacity in metric calculations. vCenter Operations Manager does not calculate VMware HA and buffer percentages.
	■ **Usable Capacity**. Activates support for VMware HA and buffer percentages in metric calculations. You can further specify HA and buffer settings in the Usable Capacity global settings.
Time Remaining is based on:	Contains settings that affect the calculations of Time Remaining badge scores and alerts.
	■ From the drop-down menu, select the algorithm to be used for calculating the Time Remaining badge score.
	■ Select **Planning Cyclical** to use planning data and algorithm. vCenter Operations Manager considers historical data based on the business cycle and data calculation that you define such as specifying usable capacity, stress, and business hours.
	■ Select **Real Time** to use real time data and algorithm. vCenter Operations Manager considers real data and does not consider any other configuration details.
	■ In the **Days of provisioning buffer** text box, type the number of days to be used as score provisioning buffer when calculating the score of the Time Remaining badge. vCenter Operations Manager applies the following formula to calculate the badge score.
	`Time Remaining badge score = Log10(Time Remaining — Provisioning Buffer` `Threshold + 1) / Log10(Time Remaining Window — Provisioning Buffer Threshold + 1) * 100`
Demand or Allocation by Compute Resource	For each compute resource (VM, Datastore, or Containers), select whether to use Demand or Allocation (or both) in calculations for CPU, Memory, Disk I/O, Disk Space, and Network I/0. Containers are the World, vCenters, data centers, clusters and hosts, but not groups.
	A Demand model uses requested resources to calculate remaining resources. A Demand model considers the actual usage of a resource. An Allocation model considers allocated resources to be used and unallocated resources as capacity remaining. An Allocation model is used in calculations for CPU, memory, and disk space. A Demand model is more aggressive, while an Allocation model is more conservative. When you select the check box for disk space (container), it is the sum of all the allocated resources like virtual machine disk and so on.
	Reservations for CPU and Memory are always included in Capacity and Time remaining calculations.

4   Click **OK** or **Finish** to save your settings, or select another option to configure.

5   Click **Done** to close the Configuration dialog box.

The capacity and time remaining settings are reconfigured.

Example: Examples of Capacity and Time Remaining Settings

These examples show how some of the settings are used.

Compute Resources to Analyze	If you have a mixed host environment or your ESX or vSphere version limits the ability to view disk I/O metrics, you can turn off that resource type.
Usable Capacity	If you stress the load on your systems and want extra headroom for error, activate buffer support with this setting.

What to do next

If you selected **Usable Capacity**, configure the high availability and buffer settings in section **3b Usable capacity** of the policy configuration dialog box.

Modify Usable Capacity Settings

If you activate the use of usable capacity, you can modify usable capacity settings to specify High Availability, calculation, and buffer rules.

An administrator can modify any policy in vCenter Operations Manager at any time. The changes that the administrator applies affect all users. Therefore, the administrator must notify the users who are working with vCenter Operations Manager about any new settings that are applied to the policies.

The capacity buffer is a percentage of virtual machine capacity that is held in reserve to prevent the virtual machine from consuming 100 percent of its resources.. Buffer limits apply to hosts and virtual machines. For example, if a virtual machine is used at 50 percent capacity, adding a scenario that would simulate using another 50 percent of capacity onto that virtual machine puts the virtual machine at its capacity limit. A peak load might demand more performance from the virtual machine than it can deliver. The buffer limits help prevent this event by forecasting the remaining capacity. This information appears in the following places:

■   In the Time Remaining and Trend Information table on the **Summary** tab under the **Planning** tab.

■   In the Total Remaining column of some views on the **Views** tab under the **Planning** tab.

NOTE   For the following settings to apply, you must have set the basis for Capacity Remaining to **Usable Capacity** on the **Capacity and Time Remaining** tab.

Prerequisites

Verify that you are logged in to a vSphere Client as an administrator, and vCenter Operations Manager is open.

Procedure

1   Click the **Configuration** link on the main vCenter Operations Manager page.

2   Create a new policy or open an existing policy for editing.

Option	Description
To create a new policy	In the **Manage Policies** pane, click the **Create Policy** icon ✚.
To modify an existing policy	In the **Manage Policies** pane, select the policy that you want to associate to groups and click the **Edit Policy** icon 🖊.

3   Click **3b Usable Capacity** and change the settings for usable capacity.

Option	Description
Use High Availability (HA) Configuration, and reduce capacity	If HA is configured on the clusters in your virtual environment, selecting this option excludes the CPU and memory reserved per the HA settings when calculating capacity scores in vCenter Operations Manager.
% of *resource* capacity to reserve as buffer:	Sets the percent of reserve capacity for CPU, memory, disk I/O, disk space, or Network I/O.
Capacity Calculation Rules	Select how to calculate capacity. ■ **Use last known capacity**. Bases capacity calculations on the last known capacity for the selected data interval. This setting affects the remaining capacity. Although you expect a proportional relationship between utilization and capacity, the average utilization might exceed the last known capacity when the capacity drops. ■ **Use actual capacity**. Bases capacity calculations on the average known capacity for the selected data interval.

If you choose **Use last known capacity** and your capacity has dropped over time, it is likely that your average usage will be larger than your last known capacity. This situation can generate an alert due to negative capacity remaining.

4   Click **OK** or **Finish** to save your settings, or select another option to configure.

5   Click **Done** to close the Configuration dialog box.

The usable capacity settings are reconfigured.

Example: Examples of Usable Capacity Global Settings

These examples show how some of the settings are used.

Use last known capacity	If the interval included in the view is two months, and today is June 30, views of capacity such as Average Virtual Machine Capacity show you the capacity used on June 30.
Use actual capacity	If the interval included in the view is two months, and today is June 30, views of capacity show you the average of capacity used in May and June.

Modify Usage Calculation Settings

Specify the number of hours during the work week over which average capacity usage is calculated, and identify peak hours or spikes by excluding data that falls into a regular pattern. If the allocation model is enabled, set the target ratios for CPU, Memory, and Disk Space.

An administrator can modify any policy in vCenter Operations Manager at any time. The changes that the administrator applies affect all users. Therefore, the administrator must notify the users who are working with vCenter Operations Manager about any new settings that are applied to the policies.

Prerequisites

Verify that you are logged in to a vSphere Client as an administrator, and vCenter Operations Manager is open.

Procedure

1   Click the **Configuration** link on the main vCenter Operations Manager page.

2   Create a new policy or open an existing policy for editing.

Option	Description
To create a new policy	In the **Manage Policies** pane, click the **Create Policy** icon .
To modify an existing policy	In the **Manage Policies** pane, select the policy that you want to associate to groups and click the **Edit Policy** icon .

3   Click **3c Usage calculation** to change the settings for work week calculation and allocation overcommit ratios.

4   Set the **Usage Work Week** to a continual array of sampling or specific times to sample.

Option	Description
All hours on all days	Average capacity use is calculated based on inventory and performance data collected during all 24 hours of each day throughout the business week.
Specific hours and days	Average capacity use is calculated based on inventory and performance data collected during business hours that you define for each day throughout the business week.

5   Enter **Allocation Overcommit Ratios**

An allocation model considers allocated resources as used in resource calculations. Allocation or demand models for compute resources are configured in section **3a Capacity and Time Remaining**.

Option	Description
CPU	Sets a numeric ratio for virtual-to-physical overcommitment.
Memory	Sets a percentage ratio for virtual-to-physical overcommitment.
Disk Space	Sets a percentage ratio for virtual-to-physical overcommitment.

6   Click **OK** or **Finish** to save your settings, or select another option to configure.

7   Click **Done** to close the Configuration dialog box.

The Usage Calculation settings are reconfigured.

Modify the Criteria for Powered-Off and Idle Virtual Machine State

You can specify the amount of time after which the virtual machine is classified as powered-off or idle, and select the threshold used to detect idle status for virtual machines.

An administrator can modify any policy in vCenter Operations Manager at any time. The changes that the administrator applies affect all users. Therefore, the administrator must notify the users who are working with vCenter Operations Manager about any new settings that are applied to the policies.

vCenter Operations Manager uses performance counters to measure the activity for a host or virtual machine. The following counters detect activity thresholds:

■   CPU use in MHz

- Disk I/O in KBps

- Network I/O in KBps

The thresholds are evaluated for the period specified for views. You set this period in the **Number of intervals to use** text box of the **Manage Display Settings** section in the Configuration dialog box. For example, if the default setting for **Number of intervals to use** is four, and the **Interval to use** is weekly, vCenter Operations Manager examines the performance activity for the past month.

Prerequisites

Verify that you are logged in to a vSphere Client as an administrator, and vCenter Operations Manager is open.

Procedure

1   Click the **Configuration** link on the main vCenter Operations Manager page.

2   Create a new policy or open an existing policy for editing.

Option	Description
To create a new policy	In the **Manage Policies** pane, click the **Create Policy** icon .
To modify an existing policy	In the **Manage Policies** pane, select the policy that you want to associate to groups and click the **Edit Policy** icon .

3   Click **4a Powered off and idle VMs** and change the settings for powered-off and idle virtual machines.

Option	Description

% Time Powered-off threshold	Percentage of time during which the virtual machine is powered off. A virtual machine is considered as powered off by using the following calculation.
	
	 `The number of hours that vm is powered off in non-trend`
	`view interval`
	`/ number of hours set in non-trend view >= %time powered`
	`off threshold`

Idle VM Detection Rules	

% Time Idle threshold	Percentage of time during which the virtual machine is powered on but inactive, so that you identify the virtual machine as idle.
	 For a given hour, a virtual machine passes the idle detection criteria for that hour if it satisfies the resource threshold for all/any specified enabled resource.
	 A virtual machine is considered idle by using the followinf calculation.
	
	 `Number of hours that virtual machine passes the idle`
	`detection criteria in non-trend view interval`
	`/ number of hours in non-trend view >= %time idle threshold`

Detection based on any of the thresholds	If any of the selected counters falls below the minimum threshold, the virtual machine is considered to be idle.
Detection based on all of the thresholds	All selected counters must fall below the minimum threshold for the virtual machine to be considered idle.
Average Resource Usage Criteria	You can select the minimum usage of CPU, Disk I/O, and network resources to determine the idle detection criteria. vCenter Operations Manager uses these criteria to determine if the virtual machine is idle, based on the % Time Idle threshold that you set.

4   Click **OK** or **Finish** to save your settings, or select another option to configure.

5   Click **Done** to close the Configuration dialog box.

The settings for powered off and idle virtual machines are reconfigured.

Modify the Criteria for Oversized and Undersized Virtual Machines

You can select the level of activity that constitutes an oversized or undersized virtual machine.

An administrator can modify any policy in vCenter Operations Manager at any time. The changes that the administrator applies affect all users. Therefore, the administrator must notify the users who are working with vCenter Operations Manager about any new settings that are applied to the policies.

IMPORTANT   Oversizing and undersizing refers to the amount of capacity that a virtual machine has available, not the amount of work being performed. An undersized virtual machine has less capacity than is needed to perform work. An oversized virtual machine has more capacity than is needed to perform work.

Prerequisites

Verify that you are logged in to a vSphere Client as an administrator, and vCenter Operations Manager is open.

Procedure

1   Click the **Configuration** link on the main vCenter Operations Manager page.

2   Create a new policy or open an existing policy for editing.

Option	Description
To create a new policy	In the **Manage Policies** pane, click the **Create Policy** icon ✚.
To modify an existing policy	In the **Manage Policies** pane, select the policy that you want to associate to groups and click the **Edit Policy** icon ✎.

3   In the Configure state-related thresholds section, click **4b Oversized and undersized VMs**.

4   Change the settings for oversized and undersized virtual machines.

Option	Description
VMs are oversized when:	
Amount of CPU demand below	Considers the virtual machine oversized when the following conditions are met: ■ CPU use is less than the percentage of its allocated capacity as indicated in this field. ■ Duration of CPU activity under this threshold compared to total time evaluated meets the % oversized threshold.
Amount of memory demand below	Considers the virtual machine oversized when the following conditions are met: ■ Memory use is less than the percentage of its allocated capacity as indicated in this field. ■ Duration of memory activity under this threshold compared to total time evaluated meets the % oversized threshold.
is more than *number*% for the entire range	Sets the amount of nonusage in the the entire environment defined by the % oversized thresholds and the time range to analyze. You define the time range in the **Manage Display Settings** section of the Configuration dialog box.
VMs are undersized when:	

Option	Description
Amount of CPU demand peaks above	Considers the virtual machine undersized when the following conditions are met: ■ CPU demand is more than the percentage of its allocated capacity as indicated in this field. ■ Duration of CPU activity under this threshold compared to total time evaluated meets the % undersized threshold.
Amount of memory demand peaks above	Considers the virtual machine undersized when the following conditions are met: ■ Memory use is more than the percentage of its allocated capacity as indicated in this field. ■ Duration of memory activity under this threshold compared to total time evaluated meets the % undersized threshold.
is more than *number*% for	Sets the amount of use in the entire environment defined by the % undersized threshold and the time range to analyze.
Any *number* hour period	Sets the time range to analyze as a period of hours.
Entire range	Sets the time range to analyze as the range defined in the **Manage Display Settings** section of the Configuration dialog box.

5　Click **OK** or **Finish** to save your settings, or select another option to configure.

6　Click **Done** to close the Configuration dialog box.

The criteria for oversized and undersized virtual machines are reconfigured.

Example: Oversized and Undersized Virtual Machine Settings

The following examples show how some of the settings are used.

% oversized threshold	If the threshold is 70 percent, a virtual machine that has an average capacity use of 60 percent is considered oversized. A virtual machine with an average capacity use of 75 percent is not oversized.
% undersized threshold	If the threshold is 10 percent, a virtual machine that has an average capacity use of 8 percent is considered undersized. A virtual machine with an average capacity use of 45 percent is not undersized.

Modify the Criteria for Underused and Stressed Capacity

Underused and stressed capacity settings help you identify the load on clusters and hosts before you deploy virtual machines.

An administrator can modify any policy in vCenter Operations Manager at any time. The changes that the administrator applies affect all users. Therefore, the administrator must notify the users who are working with vCenter Operations Manager about any new settings that are applied to the policies.

Prerequisites

Verify that you are logged in to a vSphere Client as an administrator, and vCenter Operations Manager is open.

Procedure

1　Click the **Configuration** link on the main vCenter Operations Manager page.

2   Create a new policy or open an existing policy for editing.

Option	Description
To create a new policy	In the **Manage Policies** pane, click the **Create Policy** icon ✚.
To modify an existing policy	In the **Manage Policies** pane, select the policy that you want to associate to groups and click the **Edit Policy** icon ✎.

3   Click **4c Underuse and stress** and change the settings for underused and stressed rules.

Containers include World, vCenters, data centers, clusters, and hosts, but not groups or datastores.

Option	Description
Containers are underused when:	
Amount of CPU demand below	Considers the container underused when either of the following conditions are met: ■ CPU use is less than the percentage of its allocated capacity as indicated in this field. ■ Duration of CPU activity under the threshold compared to total time evaluated meets the percentage Underused threshold.
Amount of memory demand below	Considers the container underused when either of the following conditions are met: ■ Memory use is less than the percentage of its allocated capacity as indicated in this field. ■ Duration of memory activity under the threshold compared to total time evaluated meets the percentage Underused threshold.
is more than *number*% for the entire range	Sets the amount of nonusage in the entire environment defined by the % underuse thresholds, calculated for the time interval over which the nonusage is analyzed. You define the time range in the **Manage Display Settings** section of the Configuration dialog box.
Datastores:	
Snapshots and templates are considered waste after *number*days	Determines the number of days since creation when a snapshot or a template becomes a waste resource. For example, if the waste bin is set to 90 days and a snapshot is 88 days old, the snapshot is not considered as waste. Only snapshots or templates that are older than 90 days are considered as waste.
Containers have stress when:	
Amount of CPU demand above	Considers the host or cluster stressed when either of the following conditions are met: ■ CPU use is more than the percentage of its allocated capacity as indicated in this field. ■ Duration of CPU activity under the threshold compared to total time evaluated meets the % stressed threshold.
Amount of memory demand above	Considers the host or cluster stressed when either of the following conditions are met: ■ Memory use is more than the percentage of its allocated capacity as indicated in this field. ■ Duration of memory activity under the threshold compared to total time evaluated meets the % stressed threshold.
is more than *number*% for	Sets the amount of use in the entire environment defined by the % stressed threshold and the time range to analyze.
Any *number* hour period	Sets the time range to analyze as a period of hours.

Option	Description
Entire range	Sets the time range to analyze as the range defined in the **Manage Display Settings** section of the Configuration dialog box.
Consider allocation in stress calculation	Enables an allocation model in calculating stress. Allocation considers allocated resources as used, and unallocated resources as capacity remaining.

4   Click **OK** or **Finish** to save your settings, or select another option to configure.

5   Click **Done** to close the Configuration dialog box.

The criteria for underused and stressed capacity are reconfigured.

Determining the Underused and Stressed Capacity Thresholds

You determine the thresholds for underused and stressed capacity on ESX hosts and clusters to define what is acceptable in your virtual environment.

You can set the underused and stressed capacity thresholds in the **4 Configure state-related thresholds** section of the Edit Policy dialog box.

You determine the time period for which values are computed by using the Usage Work Week setting in the **3c Usage calculation** section. By default, vCenter Operations Manager uses a 24-hour period, 7 days a week, but you can modify this setting. The following examples use the default usage calculation setting.

Underused and stressed capacity thresholds represent the degree to which you allow the resources to be underused or stressed. Underused and stressed capacity thresholds are computed as an area ratio between the demand area in the stressed zone and the area of the stressed zone.

Example: Calculating the Thresholds for a Stressed or Underused Resources

To set the thresholds for a one-week interval, open the Configuration dialog box and click **Manage Display Settings**. Set the Non-Trend Views Interval to **Weekly** and select **1** as the number of intervals to use.

You set the percentage of affordable stress or underuse in the **4c Underused and stressed** section of the Edit Policy dialog box. Determine the area ratio for which you can afford to have high stress or low use in your environment.

To determine the stress threshold for a day, multiply the stress area ratio by 100.

```
Demand in the stress zone/stressed zone * 100
```

For stress, even an hour or two per week might represent a problem, because during that time the capacity is almost exhausted. Therefore, you can set a peak time period as well as the stress threshold, and specify the maximum number of hours that can have stress levels above the specified threshold.

By setting this peak period, you define a "moving window" of a number of hours, and the stress calculation will be applied to every such window in the Non-Trend Views Interval. The stress calculation is:

```
stressed % = max_(for each moving window)(demand area in the stress zone in the window/area of
stressed zone in the window)
```

Example: Calculating the Thresholds for Underused and Stressed Resources for Four Weekly Intervals

To set the thresholds for four weekly intervals, open the Configuration dialog box and click **Manage Display Settings**. Set the Non-Trend Views Interval to **Weekly** and select **4** as the number of intervals to use.

Example: Limiting the Thresholds for Business Days and Hours

To restrict the stress limit to 8 business hours, Monday to Friday, specify the hours and days in the **3c Usage calculation** section of the policy configuration dialog box.

Select Which Badges Generate Alerts

You can select the badges for which you want alerts to appear on the **Alerts** tab in vCenter Operations Manager.

Alerts are generated when a badge changes its color based on the badge score metrics.

An administrator can modify any policy in vCenter Operations Manager at any time. The changes that the administrator applies affect all users. Therefore, the administrator must notify the users who are working with vCenter Operations Manager about any new settings that are applied to the policies.

Prerequisites

Verify that you are logged in to a vSphere Client as an administrator, and vCenter Operations Manager is open.

Procedure

1   Click the **Configuration** link on the main vCenter Operations Manager page.

2   Create a new policy or open an existing policy for editing.

Option	Description
To create a new policy	In the **Manage Policies** pane, click the **Create Policy** icon ➕.
To modify an existing policy	In the **Manage Policies** pane, select the policy that you want to associate to groups and click the **Edit Policy** icon 🖉.

3   Click **5 Configure Alerts** and select the badges for which you want to generate alerts when their color changes.

You can activate alerts for virtual machines, for other virtual infrastructure objects, and for groups.

4   (Optional) To trigger an alert each time a fault occurs on the vCenter Server, select **Generate alerts on individual faults**.

vCenter Operations Manager calculates fault badge scores based on the number of events retrieved from the vCenter Server and does not weigh the importance of the events. Therefore, if the **Generate alerts on individual faults** option is disabled, the Faults badge color might remain unchanged if a single event occurs, and as a result, you might miss a critical fault event that occurs on the vCenter Server.

5   Click **OK** or **Finish** to save your settings, or select another option to configure.

6   Click **Done** to close the Configuration dialog box.

vCenter Operations Manager generates alerts based on the settings you have applied.

Modify Trend and Forecast Analysis Settings

You can define trend and forecast parameters around data points that include outlier detection or smoothing filters.

An administrator can modify any policy in vCenter Operations Manager at any time. The changes that the administrator applies affect all users. Therefore, the administrator must notify the users who are working with vCenter Operations Manager about any new settings that are applied to the policies.

For information about techniques to address outliers and fluctuations in data points that might mislead the trend and forecast calculations, see “Outlier Detection and Smoothing Filters in vCenter Operations Manager,” on page 108.

Prerequisites

Verify that you are logged in to a vSphere Client as an administrator, and vCenter Operations Manager is open.

Procedure

1 Click the **Configuration** link on the main vCenter Operations Manager page.

2 Create a new policy or open an existing policy for editing.

Option	Description
To create a new policy	In the **Manage Policies** pane, click the **Create Policy** icon ✚.
To modify an existing policy	In the **Manage Policies** pane, select the policy that you want to associate to groups and click the **Edit Policy** icon 🖉.

3 Click **6 Configure forecast and trends**, and change the settings for trend and forecast analysis.

Option	Description
Forecast Functions	
Do not forecast answers beyond *percentage* **% of the time range used for analysis**	Determines how far into the future to forecast data. If this setting is too limited, it can cause Time Remaining data in the dashboard to appear as a dash (-). This occurs because vCenter Operations Manager cannot calculate the remaining values within the forecast period.
Forecast Method	
Select Best Fit from all Forecast Methods	Instructs vCenter Operations Manager to determine the function with the least potential error. vCenter Operations Manager applies all functions before determining the function with the best fit. The best fit function is based only on the current data.
Eliminate functions that have more than *percentage* **% of curvature change beyond fitted data and prior to forecast limit**	Discards functions that cause the trend to increase or decrease at a faster rate than the specified setting.
Eliminate non-linear functions for data sets less than *number of data points* **points**	Specifies that the best fit function use the linear function when the number of data points is less than this setting.
Force Forecast Method	Forces the forecast function for trend analysis. The linear method provides a true representation of the range.
Trend and Forecast Data Filter	
Trend collected data with no filtering	Prevents the use of outlier detection or smoothing.
Apply one or more smoothing filters prior to trending	Activates outlier detection and smoothing options.
Smooth data prior to fit	Activates smoothing. You can select the smoothing method. ■ **EWMA (Exponentially Weighted Moving Average)** calculates each smooth data point as a weighted mean of the preceding data points such that more weight or importance is given to data points closer to it. ■ **GWMA (Geometrically Weighted Moving Average)** applies a weighted geometric mean instead of a weighted arithmetic mean. GWMA is more stable amidst fluctuations than EWMA. ■ **Lifetime Average** calculates each smooth data point as a simple arithmetic mean of the preceding data points.
Detect outliers and plateaus using progressive fit analysis	Activates outlier detection.

Option	Description
Outlier detection variance limit	Sets an error threshold against the progressive fits that are part of the algorithm to detect outliers.
Outlier percentage of data allowed before giving up	Sets the threshold for the percentage of data points marked as outliers. This is useful when vCenter Operations Manager detects too many outliers and the data set becomes too small to continue outlier detection. The calculation for the number of data points is (*outlier percentage limit* x *total number of data points*) rounded up to the next whole number. Outliers that appear in the Average Virtual Machine Capacity view depend on the VM Count Capacity compound metric and outliers might exceed the threshold in this global setting because each outlier indicates at least one outlier in the dependent metrics.

4   Click **OK** or **Finish** to save your settings, or select another option to configure.

5   Click **Done** to close the Configuration dialog box.

The Trend and Forecast Analysis settings are reconfigured.

Example: Examples of Trend and Forecast Analysis Global Settings

These examples show how some of the settings are used.

Forecast Functions - Use up to data point number data points for trend and forecast	You might set the viewing default time window to six but use more data points for this setting to calculate the trend.
Outlier percentage of data allowed before giving up (outlier detection)	If you have eight data points and you set the percentage to 10, vCenter Operations Manager takes the final value of .8 and rounds it up to 1.

Outlier Detection and Smoothing Filters in vCenter Operations Manager

vCenter Operations Manager provides data filtering techniques to address outliers and temporary fluctuations in data points. Outlier detection and smoothing remove anomalies or sudden changes in patterns during maintenance or other cycles that might mislead the trend and forecast calculations.

When you apply smoothing, vCenter Operations Manager applies a smoothing function to data points and calculates the trend using the smooth data set. The value of a data point in a graph is affected by the value of the preceding data points. vCenter Operations Manager assigns a weight or priority to each data point and that weight determines the contribution of the data point to a smoothed value.

Activating different combinations of outlier detection and smoothing generates different results.

Table 8-2. Outlier Detection and Smoothing Results

Data Filter	Result
No data filter	Shows the original data points and trend.
Outlier detection	Shows the original data points, trends, and outliers. In the views, outliers appear as hollow circles.

Table 8-2. Outlier Detection and Smoothing Results (Continued)

Data Filter	Result
Smoothing	Shows the smooth data points and trends. vCenter Operations Manager does not show the original data points. In a table view, vCenter Operations Manager identifies the smooth data points with (S).
Outlier detection and smoothing	Shows the smooth data points, trends, and outlier data. vCenter Operations Manager does not show the original data points. In this case, outlier detection occurs first followed by smoothing. If the data involves 10 data points, outlier detection eliminates two data points as outliers and smoothing occurs on the remaining eight data points.

You can set the trend, outlier detection, and smoothing filters in the global settings.

NOTE   The Average Virtual Machine Capacity view relies on the VM Count Capacity compound metric for data. Because the outliers in this view indicate outliers in at least one of the dependent metrics for the time stamp, the view might exceed the threshold for the percentage of data points marked as outliers in the **Outlier percentage of data allowed before giving up** policy setting. To investigate the resource dimension that might cause the outlier, look at the Cluster or Host Capacity Usage view.

The settings for outlier detection and smoothing are located in the **6 Configure forecast and trends** section of each policy.

Modify an Existing Policy

You can modify a previously configured policy to improve the way vCenter Operations Manager interprets and presents data in your environment.

An administrator can modify any policy in vCenter Operations Manager at any time. The changes that the administrator applies affect all users. Therefore, the administrator must notify the users who are working with vCenter Operations Manager about any new settings that are applied to the policies.

Associating Policies with Groups	You can associate policies to specific groups. NOTE You can associate only one policy per group, while one policy can be associated with many groups. You can associate a policy with a group while you create or edit groups, and while you create or modify policies. While creating or modifying a group, you can select the policy that you want to associate with the group from a list of already defined policies. While creating or modifying a policy, you can select the groups that you want to associate with the policy.
The Default Policy	The Default policy is the policy that is associated with all groups for which no other policy is selected. If you have modified the Default policy, but want to revert to the original policy settings, open the Default policy for editing and go to section **1a General**. From the **Clone from** drop down menu, select **Original Defaults**.

Prerequisites

Verify that you are logged in to a vSphere Client as an administrator, and vCenter Operations Manager is open.

Procedure

1 Click the **Configuration** link on the main vCenter Operations Manager page.

2 Click **Manage Policies**, select the policy that you want to modify, and click the **Edit Policy** icon .

3 In the Edit Policy dialog box, select the option that you want to modify and apply the necessary changes.

The settings in the Edit Policy dialog box are the same as in the New Policy dialog box.

4 Click **OK** to save your settings or select another option to modify.

NOTE   Your settings are saved only when you click **OK** in the Edit Policy dialog box.

Modify Summary, Views, and Reports Settings

You can configure how information appears in the **Planning** tab of vCenter Operations Manager.

An administrator can modify the settings for summary, views, trends, and reports that appear on the **Planning** tab in vCenter Operations Manager. The changes that the administrator applies affect all policies and users. Therefore, the administrator must notify other users who are working with vCenter Operations Manager about the new settings that are applied.

Prerequisites

Verify that you are logged in to a vSphere Client as an administrator, and vCenter Operations Manager is open.

Procedure

1 Click the **Configuration** link on the main vCenter Operations Manager page.

2 Click **Manage Display Settings** and click **Edit**.

3 Change the settings to specify how information appears in the **Planning** tab.

Option	Description
Summary	■ **Summary trend intervals**. Time intervals for which information for objects and resources appears as a bar graph on the planning **Summary** tab.
Trend Views	■ **Default interval**. Time intervals for which information on the Views trend graphs or information tables appear. Trends are based on information retroactively from the present. Data that has a high degree of variability might distort trends. ■ **Default time window**. Number of data points that appear in a view. If you set the window to 6, you can view 6 data points. ■ **Forecast horizon**. Default number of intervals for which a forecast is calculated and shown in views or the dashboard. You can adjust the interval in the view.
Non-Trend Views	■ **Interval to use**. Time interval used to display nontrending data in a view. Nontrend views include list and summary views that combine all values into a single value. ■ **Number of intervals to use**. Number of intervals to include for display of nontrending data.

Option	Description
Distribution Views	■ **Distribution buckets**. Default value that determines the level of detail in which distribution views are presented. Increasing the buckets can provide more insight into the data.
Trend & Forecast	■ **Use up to** *data point number* **data points for trend and forecast**. Indicates the number of data points used to calculate the trend. This setting decouples what you view from the data set used to calculate the trend.
Reports	■ **Report period**. Specifies the scope of the report data. You can create reports for one day at a time, or for greater time periods up to a year. ■ **Interval start**. Specifies the interval start period using either the current interval or an offset number of previous intervals. ■ **Report interval**. Determines the number of intervals in which information is presented.

4   Click **OK** to save your settings.

5   Click **Done** to close the Configuration dialog box.

The Summary, Views, and Reports settings are reconfigured.

Example: Examples of Summary, Views, and Reports Settings

The following examples show how some of the settings are used.

Default time window	If your default interval is months, this field is set to 4, and the current month is May, your view includes activity for February through May. You can adjust the interval in the view.
Distribution buckets	If Distribution buckets is set to 4, the data on the x-axis of the Chart view and in the Table view appears in increments of 25 percent: 10 percent to 25 percent, 25 percent to 50 percent, 50 percent to 75 percent, and 75 percent to 100 percent. If Distribution buckets is set to 10, the data appears in increments of 10 percent: 0 percent to 10 percent, 10 percent to 20 percent, and so on.
Interval start	If you select **Current interval** and the current month is September, the report provides data for September. If you select **Offset** and specify 1 interval ago, the report provides data for August.
Report interval	If you select a monthly report period with weekly report intervals, your monthly report includes a weekly breakdown of the data. Your selection must be smaller than or equal to the entry you select for the Report period setting.

Monitor the Performance of vCenter Operations Manager

9

vCenter Operations Manager collects metrics about its own performance, as it does for other monitored objects. You can view information about the health, alerts, and metrics of the vCenter Operations Manager object.

Prerequisites

You must be logged in to the vSphere UI of vCenter Operations Manager.

- Check the Health State of vCenter Operations Manager on page 113

  You can view a chart of the health status of vCenter Operations Managerand take corrective actions if necessary.

- Monitor Specific Metrics for vCenter Operations Manager on page 114

  You can view the behavior of a specific metric for vCenter Operations Manager such as Alert Count Critical, Availability, and so on or compare the behavior of multiple metrics for the product to perform deeper analysis.

- Monitor Specific Metrics for a vCenter Operations Manager Component on page 114

  You can view the behavior of a specific metric for a vCenter Operations Manager component or compare the behavior of multiple metrics for one or more components.

Procedure

1 Click **About** at the upper right.

   A dialog box appears.

2 Click **Self Info** at the lower right.

Check the Health State of vCenter Operations Manager

You can view a chart of the health status of vCenter Operations Managerand take corrective actions if necessary.

Prerequisites

You must be logged in to the vSphere UI of vCenter Operations Manager.

Procedure

1 Click **About** and click **Self Info** at the lower right.

2 In the Health status pane, see the health graph for vCenter Operations Manager for the past 6 hours.

What to do next

You can see the Root cause ranking pane for more information about problems with any of the nodes analytics, collector, Web, or MQ, and take actions accordingly.

Monitor Specific Metrics for vCenter Operations Manager

You can view the behavior of a specific metric for vCenter Operations Manager such as Alert Count Critical, Availability, and so on or compare the behavior of multiple metrics for the product to perform deeper analysis.

Prerequisites

You must be logged in to the vSphere UI of vCenter Operations Manager.

Procedure

1   Click **About** and click **Self Info** at the lower right.

2   In the Metric Selector pane, expand a metric group to view the individual metrics in it.

Any alarm set on a metric are shown on the metric chart. The alarms are colored according to their criticality level.

3   Double-click a metric to view a graph of its values for the past 6 hours.

You can change the period for the metric graph by using the date and time controls in the Metric Chart pane.

You can add multiple graphs at a time.

Monitor Specific Metrics for a vCenter Operations Manager Component

You can view the behavior of a specific metric for a vCenter Operations Manager component or compare the behavior of multiple metrics for one or more components.

Prerequisites

You must be logged in to the vSphere UI of vCenter Operations Manager.

Procedure

1   Click **About** and click **Self Info** at the lower right.

2   In the Health Tree pane, double click a component.

3   In the Metric Selector pane, expand a metric group to view the individual metrics in it.

Any alarm set on a metric are shown on the metric chart. The alarms are colored according to their criticality level.

4   Double-click a metric to view a graph of its values for the past 6 hours.

You can change the period for the metric graph by using the date and time controls in the Metric Chart pane.

You can add multiple graphs at a time.

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