VMware vCenter Operations Manager Administration Guide

Custom User Interface

vCenter Operations Manager 5.8.5

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VMware vCenter Operations Manager Administration Guide

The *VMware vCenter Operations Manager Administration Guide (Custom User Interface)* describes how to configure and manage the VMware® vCenter™ Operations Manager Custom user interface.

Intended Audience

The information in this document is intended for anyone who must configure or manage vCenter Operations Manager by using the Custom user interface.

Configuring and Managing vCenter Operations Manager 1

Before vCenter Operations Manager can begin collecting and analyzing your data, you must configure it. After it is configured, you can manage vCenter Operations Manager by performing basic system administration tasks.

This chapter includes the following topics:

- "Configuring vCenter Operations Manager," on page 9
- "Managing vCenter Operations Manager," on page 9
- "Log In as the admin User," on page 10
- "Using the Custom User Interface," on page 11

Configuring vCenter Operations Manager

The key to getting the greatest benefit from vCenter Operations Manager is to configure it properly. vCenter Operations Manager can perform some configuration tasks for you, such as discovering resources, but you must perform most configuration tasks manually.

The configuration tasks must be performed in a particular order.

1. Define the adapter instances that vCenter Operations Manager uses to collect data. See Chapter 2, "Configuring Adapters," on page 13.
2. Define the resources for which vCenter Operations Manager collects data. See Chapter 3, "Configuring Resources," on page 19.
3. Specify the information that vCenter Operations Manager stores for each resource, and identify which types of information are key performance indicators (KPIs). See Chapter 4, "Configuring Attribute Packages," on page 39.
4. Define how related resources fit together into groups and how those groups relate to each other. See Chapter 5, "Configuring Applications," on page 59.
5. Configure vCenter Operations Manager for your users. See Chapter 6, "Configuring and Managing Users," on page 67.
6. (Optional) Set up the alert notification feature to notify users of alerts when they are not using vCenter Operations Manager. See Chapter 7, "Configuring Alert Notifications," on page 79.

Managing vCenter Operations Manager

You manage vCenter Operations Manager by performing typical system administration tasks.

- Manage your vCenter Operations Manager users. See Chapter 6, "Configuring and Managing Users," on page 67.

- View system performance and status information and examine log messages. See Chapter 8, "Performing Basic System Administration Tasks," on page 105.
- View, respond to, and resolve administrative system alerts. See Chapter 9, "Resolving Administrative System Alerts," on page 119.
- Back up vCenter Operations Manager data and processing components. See Chapter 10, "Backing Up and Recovering Data," on page 127.
- Troubleshoot database and connection issues. See Chapter 12, "Using System Tools," on page 149.

Log In as the admin User

When vCenter Operations Manager is initially installed, you must log in as the admin user to perform administrative tasks. During the configuration process, you can create additional administrators by assigning users to the Administrators group.

NOTE Some vCenter Operations Manager features, such as querying the vCenter Operations Manager database directly, require you to log in as the admin user.

Procedure

1 In a Web browser, type the URL for the Custom user interface.

Option	Description
Standalone version	`https://ip_address`
vApp version	`https://ip_address/vcops-custom`

ip_address is the IP address or fully qualified host name of the vCenter Operations Manager server or vApp.

2 Type **admin** in the **User name** and **Password** text boxes.

The default admin account password is admin.

3 Click **Login**.

After you are logged in, your Home page appears in the browser window.

NOTE If your session is inactive for 30 minutes, it times out and you must log in again.

What to do next

If you are using the standalone version of vCenter Operations Manager, change the default admin account password as soon as possible. To change your password, select **User Preferences** at the top of your Home page.

Using the Custom User Interface

When you log in to the Custom user interface, your Home page appears in the browser window. The Home page contains the following components.

Dashboards The tabs near the top of the Home page are your dashboards. The user groups to which your account belongs determine which dashboards are available to you. You can switch to a different dashboard by clicking its tab or selecting it from the **Dashboards** menu. You can click **Home** at any time to return to your Home page.

Widgets The panes on a dashboard are called widgets. A widget is a collection of related information about attributes, resources, applications, or the overall processes in your environment. Each dashboard contains one or more widgets. For information about configuring and using widgets, see the *VMware vCenter Operations Manager Getting Started Guide (Custom User Interface)*.

Menus You use the menus at the top of your Home page to select and use Custom user interface features.

Icons You click icons on pages and widgets to perform tasks in the Custom user interface. When you point to an icon, a tooltip appears that describes the function of the icon.

Configuring Adapters 2

vCenter Operations Manager uses adapters to exchange information with the data collection landscape. Configuring adapters involves defining and maintaining adapter instances and credentials.

This chapter includes the following topics:

- "How Adapters Collect and Process Data," on page 13
- "Defining Adapter Instances," on page 14
- "Modifying Adapter Instances," on page 16
- "Customize an Adapter Kind Icon," on page 17
- "Suppress No Data Receiving Alerts," on page 17

How Adapters Collect and Process Data

Adapters work with the vCenter Operations Manager Collector to collect and process data.

The Collector acts as a gateway between vCenter Operations Manager and its adapters. The adapters connect to and collect data from data sources, transform the data into a format that vCenter Operations Manager can consume, and pass the data to the Collector for final processing.

Depending on the data source and the adapter implementation, an adapter might collect data by making API calls, using a command-line interface, or sending database queries. Some adapters collect data for each resource independently and other adapters extract data for all resources based on a specified time range.

vCenter Operations Manager uses embedded adapters and external adapters. Embedded adapters are the most common type of adapter implementation.

Embedded Adapters

An embedded adapter is a Java component that runs as a plug-in in the Collector. Embedded adapters actively connect to a data source and pull values from it.

Advantages of embedded adapters include better maintainability, control, and visibility into the management of the adapter and the data that it collects. Embedded adapters also use common functions, such as job scheduling, that are already part of the Collector.

Embedded adapters create resources through manual or auto-discovery. A particular embedded adapter might support one or both resource creation methods.

Manual discovery	You send a request to the data source to return all available resources and select the resources to add. This method is often referred to as discovering resources or the discovery process.
Auto-discovery	The data collection process discovers new resources and creates the resources for you. You do not need to manually add new resources.

You configure and manage embedded adapters in the user interface.

External Adapters

External adapters push data from outside sources. The key advantage of an external adapter is flexibility in how the adapter is created and deployed.

External adapters use vCenter Operations Manager OpenAPI to send information. OpenAPI has a simple form, which accepts data through an HTTP request, and an advanced form, which uses Java RMI.

External adapters use auto-discovery to create resources. With auto-discovery, the data collection process discovers new resources and creates the resources for you. You do not need to manually add new resources.

You configure and manage external adapters outside of the user interface.

Defining Adapter Instances

An adapter instance defines the type of adapter to use to connect to a particular data source. It also defines the information that is required to identify and access that data source. A vCenter Operations Manager administrator must define an adapter instance for each data source that uses an embedded adapter.

NOTE You do not define adapter instances for external adapters. External adapters push data from outside sources to vCenter Operations Manager. You manage external adapters outside of the core vCenter Operations Manager domain.

An adapter instance definition typically includes the data access method and a host, port, and credential. The exact information in a particular adapter instance definition depends on the type of adapter.

An adapter instance can have one or more credentials. You can add credentials before you create an adapter instance and select the correct credential when you define the adapter instance, or you can add credentials when you define the adapter instance.

After you define an adapter instance, you can discover and define resources for it.

View the List of Defined Credentials

Before you add, edit, or modify credentials for an adapter instance, you must list the defined credentials for the specific adapter kind and credential kind combination.

Procedure

1 Select **Environment > Configuration > Credentials**.

2 Select the adapter kind to list credentials for from the **Adapter kind** drop-down menu.

3 Select the kind of credentials to list from the **Credential kind** drop-down menu.

The available credential kinds depend on the adapter kind. For example, if you select **Hyperic Adapter**, the credential kind that you select might be **Hyperic database credentials**.

Existing instances appear for the credential kind that you select.

Add a Credential

You must define a credential for each adapter instance that provides data to vCenter Operations Manager. Adapter instances use credentials to sign on to data sources. The information that you provide depends on the adapter kind and credential kind combination.

Prerequisites

View the list of defined credentials for the adapter kind and credential kind combination. See "View the List of Defined Credentials," on page 14.

Procedure

1 At the top of the list of credentials, next to **Action**, click **Add**.

2 Type a unique name for the credential instance in the **Instance name** text box.

3 Type or select additional information for the credentials.

4 Click **OK** to add the credential for the adapter kind.

The credential appears in the list in the Manage Credentials window.

Add an Adapter Instance

You must add an adapter instance in vCenter Operations Manager for each embedded adapter. The information that you provide depends on the type of adapter.

Prerequisites

- Install the adapter. For information about installing a particular adapter, see the installation and configuration guide for that adapter.
- Create a credential or, if you plan to create a credential when you add the adapter instance, become familiar with creating credentials. See "Add a Credential," on page 15.

Procedure

1 Select **Environment > Configuration > Adapter Instances**.

2 Select the collector to use from the **Collector** drop-down menu.

Unless you added additional collectors, the only available collector is **vCenter Operations Server**. You can change the name of this collector when you install the standalone version.

3 Select the adapter kind to add from the **Adapter kind** drop-down menu.

4 Click the **Add New Adapter Instance** icon.

5 Type a name for the adapter in the **Adapter Instance Name** text box.

6 Type or select additional information for the adapter instance.

7 Select the credential to use to sign on to the data source from the **Credential** drop-down menu, or click **Add** to add a new credential.

8 (Optional) Click **Test** to test the adapter instance.

9 Click **OK** to save your configuration.

Modifying Adapter Instances

To maintain adapter instances, you might need to edit or delete credentials or adapter instances.

Edit a Credential

When you edit a credential, you can change its user name or password.

The information that you can modify depends on the adapter kind and credential kind combination.

Prerequisites

View the list of defined credentials for the adapter kind and credential kind combination. See "View the List of Defined Credentials," on page 14.

Procedure

1 In the list of credentials, click **Edit** next to the credential.

2 Edit the credential information.

3 Click **OK** to save your changes.

Delete a Credential

If you do not need a credential, you can delete it. You cannot delete a credential if a resource is using it.

Prerequisites

View the list of defined credentials for the adapter kind and credential kind combination. See "View the List of Defined Credentials," on page 14.

Procedure

1 In the list of credentials, click **Delete** next to the credential.

2 Click **Yes** to confirm the deletion.

Edit an Adapter Instance

When you edit an adapter instance, you can change any of its attributes. The information that you can modify depends on the adapter kind.

Procedure

1 Select **Environment > Configuration > Adapter Instances**.

2 (Optional) Filter the list of adapter instances.

   a Select the collector to use from the **Collector** drop-down menu.

   Unless you added additional collectors, the only available collector is **vCenter Operations Server**. You can change the name of this collector when you install vCenter Operations Manager Standalone.

   b Select the adapter kind of the adapter instance to edit from the **Adapter kind** drop-down menu.

3 Select the adapter instance to edit and click the **Edit Selected Adapter Instance** icon.

4 Edit the adapter instance information.

5 Click **Test** to test the adapter instance.

6 Click **OK** to save your changes.

Delete an Adapter Instance

If an adapter instance is no longer needed, you can delete it.

Procedure

1 Select **Environment > Configuration > Adapter Instances**.

2 (Optional) Filter the list of adapter instances.

   a Select the collector to use from the **Collector** drop-down menu.

   Unless you added additional collectors, the only available collector is **vCenter Operations Server**. You can change the name of this collector when you install vCenter Operations Manager Standalone.

   b Select the kind of the adapter instance to delete from the **Adapter kind** drop-down menu.

3 Select the adapter instance and click the **Remove Selected Adapter Instance** icon.

4 Click **Yes** to confirm the deletion.

Customize an Adapter Kind Icon

vCenter Operations Manager uses icons to represent the kind of adapter through which you access each resource. For example, icons appear in the Data Source column of widgets that list resources. You can customize icons to represent any kind of adapter.

Procedure

1 Select **Enviroment > Advanced > Adapter Kind Icons**.

2 (Optional) To upload your own icon to use, click the **Upload Icon** icon, browse to and select the file to use, and click **Open**.

   The icon appears in the icon list.

3 Assign the adapter kind icon.

Option	Description
Assign an icon or change an assigned icon	Select the adapter kind in the list, click the icon to assign, and click the **Assign Icon** icon.
Return to the default icon	Select the adapter kind in the list and click the **Assign Default Icons** icon.

4 Click **OK**.

5 (Optional) If you returned to the default icon and you want to delete your icon from the icon list, delete the icon file in the *vcenter-ops*`\tomcat\webapps\ROOT\images\adpknd` directory.

   You cannot remove an icon file from within vCenter Operations Manager.

Suppress No Data Receiving Alerts

You can configure an adapter instance to stop generating alerts when it is not receiving data.

Prerequisites

Become familiar with how to start and stop the Analytics service. See "Start or Stop vCenter Operations Manager Services," on page 108.

Procedure

1 Open the `advanced.properties` file in the *`vcenter-ops`*`\user\conf\analytics` directory.

2 Add the property `disabledNoDataReceivingAlertIds = `*`resourceID`*.

`resourceID` is the resource ID of the adapter instance.

3 Save your changes and close the `advanced.properties` file.

4 Restart the Analytics service.

Configuring Resources 3

A resource is any entity in your environment for which vCenter Operations Manager can collect data, such as a router, switch, firewall, database, application server, or TCP/IP-based application.

This chapter includes the following topics:

- "Defining Resources," on page 19
- "Creating and Assigning Resource Tags," on page 23
- "Grouping Resources by Physical Location," on page 27
- "Configure Parent-Child Resource Relationships," on page 29
- "Starting and Stopping Metric Collection," on page 30
- "Using Maintenance Mode," on page 31
- "Modifying Resources," on page 33
- "Modifying Resource Tags," on page 35
- "Customize a Resource Kind Icon," on page 36

Defining Resources

Before vCenter Operations Manager can collect data for resources in your environment, a vCenter Operations Manager administrator must define each resource to vCenter Operations Manager. You define only resources that use embedded adapters. Resources that use external adapters are already defined in vCenter Operations Manager.

vCenter Operations Manager requires specific information about each resource. You typically obtain this information by performing resource discovery in vCenter Operations Manager for each adapter instance. During the resource discovery process, vCenter Operations Manager lists all of the resources for the adapter instance and you select which resources to track. For adapters that do not support resource discovery, you must define resources individually.

A resource can be a single entity, such as a database, or a container that holds other resources. For example, if you have multiple Web servers, you can define a single resource for each Web server and define a separate container resource to hold all of the Web server resources. Applications and tiers are types of container resources. See Chapter 5, "Configuring Applications," on page 59.

If you do not want vCenter Operations Manager to collect all of the available attributes for a resource, you can define a specific set of attributes to collect, called an attribute package, and assign it to the resource. See "Creating Attribute Packages," on page 42.

Discover Resources

You typically define resources to vCenter Operations Manager through the manual discovery process. Discovering resources is usually more efficient than adding resources individually.

NOTE You use discovery to define resources for embedded adapters. Resources that use external adapters are already added to vCenter Operations Manager and do not need to be discovered.

If the adapter type does not support discovery, you must add resources individually. See "Add an Individual Resource," on page 21.

Prerequisites

- Add adapter instances for the resources that you plan to define or, if you plan to add adapter instances during the discovery process, become familiar with defining adapter instances. See "Add an Adapter Instance," on page 15.
- If you plan to add an attribute package during the discovery process, become familiar with creating attribute packages. See "Creating Attribute Packages," on page 42.

Procedure

1. Select **Environment > Environment Overview**.
2. On the **List** tab, click the **Discover Resources** icon.
3. Select the collector to use from the **Collector** drop-down menu.

   Unless you added additional collectors, the only available collector is **vCenter Operations Server**. You can change the name of this collector when you install the standalone version.
4. Select the adapter kind from the **Adapter kind** drop-down menu.
5. Select an adapter instance from the **Adapter instance** drop-down menu, or click **Add** to create a new adapter instance.
6. Make any additional selections for the adapter kind.

   Depending on the adapter kind that you select, additional menus might appear.
7. (Optional) To omit resources that have already been added from the discovery results, select the **Only New Resources** check box.
8. Click **OK** to start the discovery process.

   The discovery process can take several seconds to several minutes.

   When the discovery process is finished, the Discovery Results window lists your resource kinds.
9. Double-click each resource kind that contains resources to add.

   The resource list shows all of the resources of the specified resource kind. You can sort the resource list by clicking any column header. To find a specific resource in the list, type all or part of the resource name in the **Search** text box and click **Search**.

10 Select options for each resource kind.

Option	Description
Import	Import the resources but do not start collecting data. Resources appear in the resource list as **Not Collecting** and data is not stored and analysis is not performed.
Collect	Import the resources and start collecting data. When you select the **Collect** check box, the **Import** check box is also selected.
Attribute Package	To use a nondefault attribute package for the resource kind, select an attribute package from the drop-down menu or click **Add** to define a new attribute package.

11 Click **OK**.

The Discovery Results window closes and the new resources appear on the **List** tab.

What to do next

If you did not select the option to start metric collection when you defined a resource, you can start metric collection after the resource is defined. See "Starting and Stopping Metric Collection," on page 30.

Add an Individual Resource

In some cases, you might want to add an individual resource by providing its information to vCenter Operations Manager. If an adapter instance does not support resource discovery, you must add each resource individually.

When you add an individual resource, you must provide specific information about it, including the kind of adapter to use to make the connection and the connection method. If you do not know this information, use the discovery process to define the resource. See "Discover Resources," on page 20.

You can add resources for most devices and application servers that use embedded adapters. You do not add resources that use external adapters. Resources that use external adapters are already added to vCenter Operations Manager.

Prerequisites

- Add an adapter instance for the resource or, if you plan to add an adapter instance when you add the resource, become familiar with defining adapter instances. See "Add an Adapter Instance," on page 15.
- If you plan to add an attribute package for the resource, become familiar with creating attribute packages. See "Creating Attribute Packages," on page 42.
- If you plan to add a super metric package for the resource, become familiar with creating super metric packages. See "Creating Super Metric Packages," on page 45.
- For Hyperic or IM portal server resource kinds, obtain the attribute files from the software supplier and install them on the vCenter Operations Manager collector.

Procedure

1 Select **Environment > Environment Overview**.

2 On the **List** tab, click the **Add Resource** icon.

3 Type a name for the resource in the **Resource name** text box.

Use only letters and numbers in the resource name. Do not use nonalphanumeric characters or spaces. The resource description is for informational purposes only.

4 (Optional) Type a description of the resource in the **Resource description** text box.

5 Select an adapter kind from the **Adapter kind** drop-down menu.

6 Select an adapter instance from the **Adapter instance** drop-down menu, or click **Add** to add a new adapter instance.

7 Select a resource kind from the **Resource kind** drop-down menu.

Additional configuration options might appear, depending on your selection.

8 Type the name of the resource that the adapter monitors in the **Target to collect from** text box.

The name must be the name of the resource as it appears in the adapter's operating environment. For example, if the adapter kind is **Hyperic** and you select **MS SQL 2005 Database** as the resource kind, type the name that Hyperic assigns, such as `MSSQL 2005 MSSQL.4`.

NOTE Depending on the resource kind that you selected, the **Target to collect from** text box might not be available and additional text boxes might appear.

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9 Accept the default attribute package in the **Attribute package** drop-down menu, select a different package, or click **Add** to define a new package for the resource.

The default attribute package depends on the resource kind.

10 Accept the default super metric package, if any, in the **Super metric package** drop-down menu, select a different package, or click **Add** to define a new package for the resource.

A default super metric package is not available unless you previously defined a default super metric package for the selected resource kind.

11 Type the collection interval, in minutes, in the **Collection Interval (Minutes)** text box.

For example, if you expect the resource to generate performance data every 30 minutes, set the collection interval to 30 minutes.

The collection interval for a resource influences the collection status for that resource. The collection interval for the adapter instance resource determines how often to collect data. For example, if the collection interval for the adapter instance resource is set to five minutes, setting the collection interval for a resource to 30 minutes prevents the resource from having the No Data Receiving collection status after five collection cycles (25 minutes).

12 Select the **Enabled** or **Disabled** check box to enable or disable dynamic thresholding and early warning smart alerts.

Dynamic thresholding is enabled by default, which is the recommended value. Early warning smart alerts are enabled by default only for applications. Early warning smart alerts work best for applications and application-like container resources. Container resources have at least two levels of resources beneath them, such as an application that contains tiers, which each contain resources.

Early warning smart alerts are generated for a resource only if the resource and its children have at least the required number of metrics defined. By default, the minimum number of metrics is 40, not including vCenter Operations Manager generated metrics.

13 (Optional) If you plan to take the resource offline for maintenance at regular intervals, select the maintenance schedule for it to use from the **Maintenance Schedule** drop-down menu, or click **Add** to define a new maintenance schedule.

14 Click **OK** to add the resource.

What to do next

When you add an individual resource, vCenter Operations Manager does not begin collecting metrics for the resource until you start metric collection. See "Starting and Stopping Metric Collection," on page 30.

For each new resource, vCenter Operations Manager assigns tag values for its collector and its resource kind. In some cases, you might want to assign other tags. See "Creating and Assigning Resource Tags," on page 23.

Creating and Assigning Resource Tags

A large enterprise can have thousands of resources defined in vCenter Operations Manager. Creating resource tags and tag values makes it easier to find resources and metrics in vCenter Operations Manager. With resource tags, you select the tag value assigned to a resource and view the list of resources that are associated with that tag value.

A tag is a type of information, such as Application or GEO Location. Application and GEO Location are predefined tags in vCenter Operations Manager. Tag values are individual instances of that type of information. For example, if your offices are located in New York, London, and Mumbai, you define GEO Location tag values for those locations.

You can assign any number of resources to each tag value, and you can assign a single resource to tag values under any number of tags. You typically look for a resource by looking under its application, its location, its tier, and possibly other tags.

- Predefined Resource Tags on page 23

  vCenter Operations Manager includes several predefined resource tags. It creates values for most of these tags and assigns resources to the values.

- Add a Resource Tag on page 24

  If the predefined resource tags do not meet your needs, you can create your own resource tags to categorize and manage resources in your environment.

- Add a Value to a Resource Tag on page 25

  A resource tag is a type of information, and a tag value is an individual instance of that type of information. You can add multiple values to a resource tag. If a resource tag is locked, you cannot add values to it. vCenter Operations Manager maintains locked resource tags.

- Create a Resource Kind Tag on page 25

  You can create a tag for any resource kind that has existing resources. The tag has a value for each resource of that kind.

- Associate a Resource with a Tag Value on page 26

  You can assign any number of resources to each tag value, and you can assign a single resource to tag values under any number of tags.

- Use a Tag to Find a Resource on page 26

  The quickest way to find a resource in vCenter Operations Manager is to use tags. Using tags is more efficient than searching through the entire resource list.

Predefined Resource Tags

vCenter Operations Manager includes several predefined resource tags. It creates values for most of these tags and assigns resources to the values.

For example, when you add a resource, vCenter Operations Manager assigns it to the tag value for the collector it uses and the kind of resource that it is. It creates tag values if they do not already exist.

Table 3-1. Predefined Tags

Tag	Description
Collectors (Full Set)	Each defined collector is a tag value. Each resource is assigned to the tag value for the collector that it uses when you add the resource to vCenter Operations Manager. The default collector is vCenter Operations Server.
Application	Each defined application is a tag value. When you add a tier to an application, the tier is assigned to that tag value. Resources that belong to the tiers are not given the tag value.
Applications (Full Set)	Each defined application is a tag value. When you add a tier to an application, or a resource to a tier in an application, the tier is assigned to that tag value.
Maintenance Schedules (Full Set)	Each defined maintenance schedule is a tag value, and resources are assigned to the value when you give them a schedule by adding or editing them.
Adapter Kinds	Each adapter kind is a tag value, and each resource that uses that adapter kind is given the tag value.
Adapter Instances	Each adapter instance is a tag value, each resource is assigned the tag value for the adapter instance or instances through which its metrics are collected.
Resource Kinds	Each kind of resource is a tag value, and each resource is assigned to the tag value for its kind when you add the resource.
Recently Added Resources	The last day, seven days, 10 days, and 30 days have tag values. Resources have this tag value as long as the tag value applies to them.
Health Ranges	Good (green), Abnormal (yellow), Degraded (orange), Bad (red), and Unknown (blue) health statuses have tag values. Each resource is assigned the value for its current health status.
Entire Enterprise	The only tag value is Entire Enterprise Applications. This tag value is assigned to each application.
GEO Location	This tag always exists, but it has no default values. You must create values and assign resources to them manually.
Tier	Each defined tier is a tag value. When you add a resource to a tier, the resource is assigned to that tag value.

Add a Resource Tag

If the predefined resource tags do not meet your needs, you can create your own resource tags to categorize and manage resources in your environment.

Prerequisites

Become familiar with the predefined resource tags. See "Predefined Resource Tags," on page 23.

Procedure

1 Select **Environment > Environment Overview**.

2 Click the **Manage Tags** icon on the left side of the Environment Overview page.

3 Click the **Add Tag** icon to add a new row and type the name of the tag in the row.

4 Click **OK** to add the tag.

The new tag appears in the tags list.

What to do next

Add a value to the resource tag. See "Add a Value to a Resource Tag," on page 25.

Add a Value to a Resource Tag

A resource tag is a type of information, and a tag value is an individual instance of that type of information. You can add multiple values to a resource tag. If a resource tag is locked, you cannot add values to it. vCenter Operations Manager maintains locked resource tags.

Prerequisites

Add a resource tag. See "Add a Resource Tag," on page 24.

Procedure

1 Select **Environment > Environment Overview**.

2 Click the **Manage Tags** icon on the left side of the Environment Overview page.

3 Select the tag to add values to and click the **Add Tag Value** icon.

4 Type the name of the tag value in the new row.

For example, if the resource group is composed of JBoss servers and you assigned the name JBoss to the tag, type a name to associate with one of the JBoss servers, such as JBoss1.

5 Click **OK** to add the tag value.

The tag value appears in the tag list.

Because vCenter Operations Manager considers each tag value to be a resource, it starts collecting metrics that vCenter Operations Manager generates when you create a tag value. You can view the health score for any tag value. See "Metrics that vCenter Operations Manager Generates," on page 40.

What to do next

Associate a resource with the tag value. See "Associate a Resource with a Tag Value," on page 26.

Create a Resource Kind Tag

You can create a tag for any resource kind that has existing resources. The tag has a value for each resource of that kind.

For example, if you have a resource kind of AppServers, and resources of that kind named AppServer1, AppServer2, and so on, you can create a resource kind tag named AppServers and it will have tag values of AppServer1, AppServer2, and so on.

Procedure

1 Select **Environment > Environment Overview**.

2 Click the **Manage Resource Kind Tags** icon on the left side of the Environment Overview page.

The Manage Resource Kind Tags window opens.

3 To create a resource kind tag for a resource kind, select the check box in the Show Tag column of its row.

4 Click **OK**.

If resources of the kind that you selected are present, a tag for that kind appears in the tag list on the Environment Overview page. If you expand the tag, a tag value appears for each resource of that type.

What to do next

Associate resources with the tag values. See "Associate a Resource with a Tag Value," on page 26.

Associate a Resource with a Tag Value

You can assign any number of resources to each tag value, and you can assign a single resource to tag values under any number of tags.

Prerequisites

- Create a resource tag. See "Add a Resource Tag," on page 24.
- Add a value to the resource tag. See "Add a Value to a Resource Tag," on page 25.

Procedure

1 Select **Environment > Environment Overview**.

2 Drag the resource from the list in the right pane of the Environment Overview page onto the tag value name.

You can press Ctrl+click to select multiple individual resources or Shift+click to select a range of resources.

The resources that you selected are now associated with the tag value.

Use a Tag to Find a Resource

The quickest way to find a resource in vCenter Operations Manager is to use tags. Using tags is more efficient than searching through the entire resource list.

Tag values that can also be tags are Applications and Resource Kinds. For example, the Applications tag has values for each application that is defined in vCenter Operations Manager, such as Online Banking. Each of these applications is also a tag that has values equal to the tiers that it contains. The Online Banking application might have tag values for Web Servers, DB Servers, and so on. These tiers might also contain subvalues. You can expand the tag value list to select the value for which you want to see resources.

Procedure

1 Select **Environment > Environment Overview**.

2 In the tag list on the left side of the page, click a tag for a resource with an assigned value.

When you click a tag, the list of values expands under the tag. The number of resources that is associated with each value appears next to the tag value.

A plus sign next to a tag value indicates that the value is also a tag and that it contains other tag values. You can click the plus sign to see the subvalues.

3 Select the tag value.

The resources that have that tag value appear in the pane on the right. If you click the **Invert Results** icon, the list includes resources that do not match the tag values that you select. For example, if you select New York and London, all of the resources that are not in either of those cities appear in the list. If you select multiple tag values, the resources in the list depend on the values that you select.

Option	Action
Select more than one value for the same tag	The list includes resources that have either value. For example, if you select two values of the GEO Location tag, such as New York and London, the list shows resources that have either value.
Select values for two or more different tags	The list includes only resources that have all of the selected values. For example, if you select two values of the GEO Location tag, such as New York and London, and you also select the Tier value of the Resource kind tag, only tiers that are in New York or London appear in the list. Tiers in other locations do not appear in the list, nor do resources in those cities that are not tiers.

4 Select the resource from the list.

Grouping Resources by Physical Location

Depending on your environment, you might want to group some or all of your resources according to their physical location. When resources are grouped according to their physical location, you can see the health of all of the resources in a particular place.

To group resources by their physical location, you must activate the geographical location feature, create values for the GEO Location tag, and assign the resources that you want to track to GEO Location tag values.

- Activate the Geographical Location Feature on page 27

  To group resources by location, you must activate the geographical location feature in vCenter Operations Manager.

- Create a GEO Location Tag Value on page 28

  Before you can assign resources to a location, you must create that location as a value of the GEO Location tag and define its position on the map. Create tag values for each of your office locations.

- Assign a Resource to a GEO Location Tag Value on page 28

  You define a resource's location by assigning it to a value of the GEO Location tag.

- View the Resource Map on page 29

  You can use the world map on the **Geographical** tab on the Environment Overview page to see the health of the resources at some or all of your defined locations.

Activate the Geographical Location Feature

To group resources by location, you must activate the geographical location feature in vCenter Operations Manager.

The **Geographical** tab on the Environment Overview page and the GEO widget show a world map that includes the locations of resources that have GEO Location tag values. Because these maps use the Google Maps API, you must license the Google Maps API to use the geographical location feature.

Prerequisites

Go to the Google support Web site at http://support.google.com, read the license agreement for the Google Maps API, and follow the procedure to license the API for your use.

Procedure

1 Select **Admin > Global Settings**.

2 Select **Google** from the **Geo Panel Provider** drop-down menu.

3 In the **Google Map Key** text box, type the key that you received from Google.

4 Click **OK** to save your settings.

After you activate the geographical location feature, any user who connects to vCenter Operations Manager can use the **Geographical** tab or GEO widget.

What to do next

Create GEO Location tag values. See "Create a GEO Location Tag Value," on page 28.

Create a GEO Location Tag Value

Before you can assign resources to a location, you must create that location as a value of the GEO Location tag and define its position on the map. Create tag values for each of your office locations.

Prerequisites

Activate the geographical location feature in vCenter Operations Manager. See "Activate the Geographical Location Feature," on page 27.

Procedure

1 Select **Environment > Environment Overview**.

2 Click the **Manage Tags** icon on the left side of the page.

3 In the tag list, select **GEO Location**.

4 In the Tag Value pane, click the **Add Tag Value** icon.

5 Type the name for the location and press ENTER.

6 Select the new tag and click the **Manage Location** icon.

7 Type the location in the **Search** text box and click **Search**.

Your entry does not have to match the tag value exactly. For example, you can create a tag value called Los Angeles and search for Los Angeles, CA.

8 In the list of search results, click the location.

You must click the location even if it is the only search result.

9 Click **Save** to save the tag value.

What to do next

Assign resources to the tag value. See "Assign a Resource to a GEO Location Tag Value," on page 28.

Assign a Resource to a GEO Location Tag Value

You define a resource's location by assigning it to a value of the GEO Location tag.

Prerequisites

- Activate the geographical location feature in vCenter Operations Manager. See "Activate the Geographical Location Feature," on page 27.
- Create GEO Location Tag values for your office locations. See "Create a GEO Location Tag Value," on page 28.

Procedure

1 Select **Environment > Environment Overview**.

2 Drag the resource from the list in the right pane of the Environment Overview page to the GEO Location tag value name.

You can press Ctrl+click to select multiple individual resources or Shift+click to select a range of resources.

The resources that you selected are now associated with the GEO Location tag value.

View the Resource Map

You can use the world map on the **Geographical** tab on the Environment Overview page to see the health of the resources at some or all of your defined locations.

The GEO widget shows a map similar to the map on the Geographical tab. You can add the GEO widget to any dashboard.

Prerequisites

- Activate the geographical location feature in vCenter Operations Manager. See "Activate the Geographical Location Feature," on page 27.
- Create GEO Location tag values for your office locations. See "Create a GEO Location Tag Value," on page 28.
- Assign resources to the GEO Location tag values. See "Assign a Resource to a GEO Location Tag Value," on page 28.

Procedure

- To show the world map, select **Environment > Environment Overview** and select the **Geographical** tab in the right pane.
- To show specific locations on the map, select one or more tag values under the GEO Location tag in the left pane.

  By default, the **Geographical** tab shows all resources for all locations.
- To move the map, drag the map or use the direction arrows in the top left corner of the map.
- To zoom the map, click the plus and minus buttons under the direction arrows.

Configure Parent-Child Resource Relationships

When resources are related, the health score of one resource is based on the metrics of its child resources and its own metrics. You can define resource relationships so that vCenter Operations Manager analytics can consider these relationships when it calculates health scores.

Most, if not all, resources in an enterprise environment are related to other resources in that environment. Resources are either part of a larger resource, or they contain smaller component resources, or both.

The most common resource relationships gather similar resources into tiers and related tiers into applications. You define those relationships by defining applications. In addition, frequently other relationships exist between resources. For example, for each application that runs on an application server, you might define a child resource. You define these types of relationships by configuring resource relationships.

You must define applications and tiers to add resources to tiers or tiers to applications. See Chapter 5, "Configuring Applications," on page 59.

Procedure

1 Select **Environment > Advanced > Resource Relationship**.

2 In the Parent Selection column, expand the resource tag and select a tag value that contains the resource to act as the parent resource.

The resources for the tag value appear in the top pane of the second column.

3 (Optional) If the list of resources is long, filter the list to find the child resource or resources.

Option	Description
Navigate the resource tag list for a resource	Expand the resource tag and select a tag value that contains the resource. The resources for the tag value appear in the top pane of the List column. If you select more than one value for the same tag, the list contains resources that have either value. If you select values for two or more different tags, the list includes only resources that have all of the selected values. You can click the **Invert Result** icon to show the resources that do not match the tag values that you selected.
Search for a resource by name	If you know all or part of the resource name, type it in the **Search** text box and press Enter.

4 To make a resource a child resource of the parent resource, select the resource from the list and drag it to the parent resource in the top pane of the second column, or click the **Add All Resources To Parent** icon to make all of the listed resources children of the parent resource.

You can use Ctrl+click to select multiple resources or Shift+click to select a range of resources.

Starting and Stopping Metric Collection

When you add an individual resource to vCenter Operations Manager, vCenter Operations Manager does not start collecting metrics for the resource until you start metric collection. When you discover a resource, you can select an option to start metric collection on the discovery results page. If you did not select this option, you must start metric collection for the resource.

You can start and stop metric collection for specific resources, including tag values, and for adapter instances.

Start or Stop Metric Collection for a Resource

You can start and stop metric collection for specific resources. When you add an individual resource to vCenter Operations Manager, vCenter Operations Manager does not begin collecting metrics for the resource until you start metric collection. When you stop metric collection for a resource, vCenter Operations Manager retains its metric data in case you restart metric collection at a later time.

Because tag values are stored in vCenter Operations Manager as resources, you can also start and stop metric collection for tag values. When you start metric collection for a tag value, vCenter Operations Manager generated metrics are collected for it. With these metrics, you can see the health score that reflects all of the resources that have that tag value.

Procedure

1 Select **Environment > Environment Overview**.

2 (Optional) On the **List** tab, select the resource or resources to affect.

You can press Ctrl+click to select multiple individual resources or Shift+click to select a range of resources. If you do not select any resources, all of the resources in the system are affected.

3 Click the **Start Collecting** or **Stop Collecting** icon to start or stop metric collection for the selected resources.

Start or Stop Metric Collection for an Adapter Instance

When you start or stop metric collection for an adapter instance, metric collection starts or stops by using specific adapter instances for the resources that you want to affect. Resources that do not use the adapter instance are not affected.

If a resource collects metrics through more than one adapter instance, only the metrics that are collected through the selected instance are stopped are started. Other metrics remain in the same collection state.

Procedure

1 Select **Environment > Environment Overview**.

2 On the **List** tab, select the resource or resources to affect.

You can press Ctrl+click to select multiple individual resources or Shift+click to select a range of resources.

3 Click the **Perform Multi-Collecting** icon.

The Adapter Instance Resources window opens. The window lists all of the adapter instances that the selected resources use.

4 Click the adapter instance to start or stop metric collection.

You can press Ctrl+click to select multiple individual adapter instances or Shift+click to select a range of adapter instances. To select all of the listed adapter instances, click the heading row.

5 Click the **Start Collecting** or **Stop Collecting** icon to start or stop metric collection.

Using Maintenance Mode

Many resources in the enterprise might be intentionally taken offline. For example, a server might be deactivated to update software. If vCenter Operations Manager collects metrics when a resource is offline, it might generate incorrect anomalies and alerts that affect the data for setting dynamic thresholds for the resource's attributes. When a resource is in maintenance mode, vCenter Operations Manager does not collect metrics from the resource or generate anomalies or alerts for it.

If a resource undergoes maintenance at fixed intervals, you can create a maintenance schedule and assign it to the resource. For example, you can put a resource in maintenance mode from midnight until 3 a.m. each Tuesday night. You can also manually put a resource in maintenance mode, either indefinitely or for a specified period of time. These methods are not mutually exclusive. You can manually put a resource in maintenance mode, or take it out of maintenance mode, even it if has an assigned maintenance schedule.

Add a Maintenance Schedule

You can use maintenance schedules to put certain resources into maintenance mode at specified times. The scheduled maintenance time can be daily, weekly, monthly, or yearly.

To set up a maintenance schedule for a resource, you define the schedule, then you assign the schedule to the resource, either by adding the resource or by editing it. You can create multiple maintenance schedules, and you can assign each schedule to multiple resources.

Procedure

1 Select **Environment > Maintenance Schedules**.

2 Click the **Add Schedule** icon at the top of the list of maintenance schedules.

3 Type a name for the maintenance schedule in the **Schedule Name** text box.

4 Select the start and end times that resources assigned to the schedule will be in maintenance mode from the **Start Time** and **End Time** drop-down menus.

5 Configure the recurrence pattern.

Option	Description
Daily	Set the number of days between maintenance periods or set to every weekday.
Weekly	Set the number of weeks between maintenance periods and the day of the week.
Monthly	Set the number of months between maintenance periods and either the day of the month or the week and day.
Yearly	Set to a specific date or a specific month, day, and week.

6 Click **OK** to save the maintenance schedule.

The new maintenance schedule appears in the list in the Manage Maintenance Schedules window and is available when you add or edit resources.

Start Maintenance Mode on a Resource

You can place one or more resources in maintenance mode.

Procedure

1 Select **Environment > Environment Overview**.

2 On the **List** tab, select the resource or resources to place in maintenance mode.

You can press Ctrl+click to select multiple individual resources or Shift+click to select a range of resources.

3 Click the **Start Maintenance** icon.

4 Select how long to keep the resource in maintenance mode.

Option	Action
I will come back and end maintenance myself	Maintenance mode starts for the selected resource when you click **OK**. You must manually end maintenance mode for the resource.
End Maintenance in	Type the number of minutes that the resource is in maintenance mode.
End Maintenance on	■ Type the date that maintenance mode stops in the text box, or click the calendar icon and select a date. ■ Select the time that maintenance mode stops from the drop-down menu.

5 Click **OK** to save your changes.

The resource is now in maintenance mode. The Collection Status column shows either **In Maintenance (Manual)** or **In Maintenance till**, depending on your selection.

Stop Maintenance Mode on a Resource

If a resource was in maintenance mode for an unspecified period of time, the only way to remove it and restart metric collection is to manually stop maintenance mode. You can also stop maintenance mode for a resource that was in maintenance mode for a specified period of time or that is in maintenance mode because of its assigned maintenance schedule.

Procedure

1 Select **Environment > Environment Overview**.

2 On the **List** tab, select the resource or resources on which to stop maintenance.

You can press Ctrl+click to select multiple individual resources or Shift+click to select range of resources.

3 Click the **End Maintenance** icon.

Delete a Maintenance Schedule

When you do not need a maintenance schedule, you can delete it.

Procedure

1 Select **Environment > Maintenance Schedules**.

2 Select the maintenance schedule to delete and cilck the **Delete Schedule** icon.

3 Click **Yes** on the confirmation window to delete the schedule.

Edit a Maintenance Schedule

When you edit a maintenance schedule, you can change the schedule name, start time and end times, and recurrence pattern.

Procedure

1 Select **Environment > Maintenance Schedules**.

2 Select the maintenance schedule to edit and click the **Edit Schedule** icon.

3 Edit the maintenance schedule.

4 Click **OK** to save your changes.

Modifying Resources

You might need to edit or delete resources to maintain your resources in vCenter Operations Manager. You can also change the default settings for a resource kind.

Edit a Resource

When you edit a resource, you can modify one or more of its permanent characteristics, such as its collector or attribute package.

To temporarily change the state of a resource, start or stop collection or place the resource in maintenance mode. See "Starting and Stopping Metric Collection," on page 30 or "Using Maintenance Mode," on page 31.

Procedure

1 Select **Environment > Environment Overview**.

2 On the **List** tab, select the resource to edit.

3 Click the **Edit Resource** icon on the top of the list.

The Resource Management window opens. The items that appear in the window depend on the type of resource that you are editing.

4 Edit the resource.

IMPORTANT Modifing some characteristics can have unintended consequences.

5 Click **OK** to save your changes.

Edit Multiple Resources

You can change the same property for multiple resources at the same time. For example, you can assign a new attribute package to several resources, or to all resources of a given resource kind, at the same time. You can change one or more properties and leave other properties unchanged.

Procedure

1 Select **Environment > Environment Overview**.

2 On the **List** tab, select the resources to edit.

You can press Ctrl+click to select multiple individual resources or Shift+click to select a range of resources.

3 Click the **Edit Resource** icon on the top of the list.

The Resource Management window opens. The window contains only the values that you can change for the selected combination of resources.

NOTE If you select resources of different kinds, the window might include only the **Super Metric package** drop-down menu.

4 To change a value, select the check box next to the menu or text box and type or select the new value.

5 Click **OK** to save your changes.

Only the selected values are changed. If you did not select the check box next to a text box or menu, its value is not changed.

Delete a Resource

If you do not need a resource, you can delete it.

Procedure

1 Select **Environment > Environment Overview**.

2 On the **List** tab, select one or more resources to delete.

You can press Ctrl+click to select multiple individual resources or Shift+click to select a range of resources.

3 Click the **Delete Resource** icon on the top of the list.

4 Click **Yes** on the confirmation window to delete the resource.

Each resource that you selected is marked for deletion and locked. Resource deletion occurs in the background and might take a few seconds or longer, depending on the number of resources that you are deleting.

Change the Default Settings for a Resource Kind

Most or all resources of a particular resource kind typically use the same attribute package and super metric package. You can set the default packages to use for a resource kind and specify whether resources generate early warning smart alerts and use dynamic thresholds by default.

vCenter Operations Manager uses the default values that you specify when you add a new resource of that kind, either manually or through resource discovery. In most cases, you can change the default values when you add or edit a resource. You cannot change the default super metric package for a resource during resource discovery, but you can edit the resource after it is added.

Procedure

1 Select **Environment > Configuration > Resource Kind Defaults**.

2 Select the adapter kind that contains the resource kind for which you want to set defaults from the **Adapter kind** drop-down menu.

3 In the list on the left, select the resource kind.

4 Select the default attribute package from the **Attribute package** drop-down menu.

5 Select the default super metric package from the **Super Metric package** drop-down menu.

6 Select the **Enable** or **Disable** check box to specify whether resources generate early warning smart alerts and use dynamic thresholds by default.

7 Click **OK** to save your changes.

Skip Health Rollup for a Resource

You can configure vCenter Operations Manager to skip the health rollup of a particular resource to the parent resource.

Procedure

1 Open the `analytics.properties` file in the *`vcenter-ops`*`\user\conf\analytics` directory.

NOTE The vCenter Operations Manager vApp uses the `analytics.properties` file on the Analytics virtual machine.

2 List the resource kinds that you do not want to be dependent on their children's health in the `skipHealthRollupRKList` property.

For example: **`skipHealthRollupRKList = HostSystem`**

3 Save your changes and close the `analytics.properties` file.

4 Restart the Analytics service to make your changes take effect.

Modifying Resource Tags

To maintain resource tags, you might need to remove a resource from a tag value, edit or delete a resource tag, or edit or delete a tag value.

Edit a Resource Tag

When you edit a resource tag, you can change the tag name and the names of its tag values.

Procedure

1 Select **Environment > Environment Overview**.

2 Click the **Manage Tags** icon on the left side of the page.

3 Edit the resource tag.

Option	Action
Change the resource tag name	Double-click the tag name and type a new name.
Change a tag value name	Expand the tag to show its values and double-click the value to type a new name.

4 Click **OK** to save your changes.

Your changes appear in the tag list on the Environment Overview page.

Delete a Resource Tag or Tag Value

If you do not need a resource tag or tag value, you can delete it.

Procedure

1 Select **Environment > Environment Overview**.

2 Click the **Manage Tags** icon on the left side of the page.

3 Delete the tag or tag value.

Option	Action
Delete a tag	Click the tag name and click the **Remove Tag** icon.
Delete a tag value	Expand the tag, select the value, and click the **Remove Tag Value** icon.

4 Click **OK**.

The tag or tag value does not appear in the tag list on the Environment Overview page.

Remove a Resource from a Tag Value

If you need to recategorize a resource, you can remove the resource from its current tag value.

If a tag is locked, you cannot add resources to or remove resources from any of its values. vCenter Operations Manager maintains locked tags.

Procedure

1 Select **Enviroment > Environment Overview**.

2 Select the tag value from the tag list on the left side of the Environment Overview page.

The assigned resources for the tag value appear on the right side of the Environment Overview page.

3 Drag the resource from the right side of the Environment Overview page to the **UnTag** line at the end of the tag list.

Customize a Resource Kind Icon

You can customize the icon to show for any resource kind. In most locations where it shows metric data for resources, vCenter Operations Manager includes an icon to show the kind of each resource.

You can select from the default icons that vCenter Operations Manager provides, or you can upload your own graphics files. When you change a resource kind icon, your changes take effect for all users.

Prerequisites

If you plan to use your own icon files, verify that each image is in PNG format and has the same height and width. The best image size is 256x256 pixels.

Procedure

1 Select **Environment > Advanced > Resource Kind Icons**.

2 To list resource kinds for only one adapter, select the adapter kind from the **Adapter kind** drop-down menu.

By default, the list contains all resource kinds appear and their icons.

3 (Optional) To upload your own icon to use, click the **Upload Icon** icon, browse to and select the file to use, and click **Open**.

The icon appears in the icon list.

4 Assign the resource kind icon.

Option	Action
Assign an icon or change an assigned icon	Select the resource kind in the list, click the icon to assign, and click the **Assign Icon** icon.
Return to the default icon	Select the resource kind and click the **Assign Default Icons** icon.

5 Click **OK** to save your changes.

6 If you removed an icon from a resource kind and you want to delete the icon from the icon list, delete the icon file in the *vcenter-ops*`\tomcat\webapps\ROOT\images\resknd` directory.

You cannot remove an icon file from within vCenter Operations Manager.

Configuring Attribute Packages 4

vCenter Operations Manager can collect several types of data for a single resource. For example, for a database server, it might receive data on free disk space, CPU use, and the average response time for a database request. Each type of data is called an attribute in vCenter Operations Manager. A vCenter Operations Manager administrator creates attribute packages to tell vCenter Operations Manager which attributes to track for your resources.

This chapter includes the following topics:

- "Understanding Data Collection," on page 39
- "Creating Attribute Packages," on page 42
- "Creating Super Metric Packages," on page 45
- "Modifying Attribute Packages," on page 53
- "Modifying Super Metric Packages," on page 54
- "Super Metric Use Case," on page 56
- "Configure Weighted Metric Groups," on page 57
- "Prioritize Threshold Checking," on page 57
- "Enable the Combined Dynamic Threshold Plug-in," on page 57

Understanding Data Collection

Before you begin creating and modifying attribute packages in vCenter Operations Manager, become familiar with how vCenter Operations Manager collects data. The key concepts to understand include attributes, metrics, super metrics, thresholds, and Key Performance Indicators (KPIs).

Attributes and Metrics

Each type of data that vCenter Operations Manager collects is called an attribute. An attribute package contains a combination of those attributes. You assign attribute packages to resources to specify the attributes to collect for the resource.

A metric is an instance of an attribute for a particular resource. For each metric, vCenter Operations Manager collects and stores multiple instances over time. Each piece of data that vCenter Operations Manager collects is called a metric observation or value.

If a single metric cannot tell you what you need to know about the behavior of your enterprise, you can define a super metric. A super metric is a formula that contains a combination of one or more metrics for one or more resources. Like attributes, super metrics are combined in packages, called super metric packages. You can assign super metric packages to resources.

Dynamic and Hard Threshold Calculations

A threshold is a value that marks the boundary between normal and abnormal behavior for a metric. When a metric crosses one of its thresholds, vCenter Operations Manager generates an anomaly.

vCenter Operations Manager can use dynamic and hard thresholds. It defines dynamic thresholds for a metric based on historical and incoming data. A dynamic threshold changes, and a hard threshold is static. A hard threshold changes only when you change it.

With dynamic thresholds, vCenter Operations Manager uses historical data to evaluate the performance of IT components in the context of previous conditions, and it uses incoming data to adjust dynamic thresholds to better define what is normal and abnormal for a metric. By determining what is normal in your environment, vCenter Operations Manager can filter out alerts that are associated with normal behavior, including alerts that might be triggered by hard thresholds, and instead generate alerts only for abnormal behaviors that are precursors to real problems.

vCenter Operations Manager uses dynamic thresholds by default for all metrics except system attributes. You can specify hard thresholds for specific attributes when you create an attribute package. In most environments, you should use dynamic thresholds.

Configuring Dynamic Threshold Properties

The `analytics.properties` and `advanced.properties` files in the *`vcenter-ops`*`\user\conf\analytics` directory define important configuration settings, including dynamic threshold properties.

For example, one of the properties in the `analytics.properties` file controls when vCenter Operations Manager recalculates dynamic thresholds. Its default is 1:00 a.m. Another property controls whether vCenter Operations Manager checks the integrity of each metrics file in the vCenter Operations Manager file system database (FSDB) once a week during the recalculation. If it finds a problem, vCenter Operations Manager can either generate a system alert for that resource, or try to repair the file and generate the system alert only if it cannot repair the file.

Edit the `analytics.properties` and `advanced.properties` files only if you are an advanced user.

Key Performance Indicators

You identify the attributes that are most important in your environment as KPIs. vCenter Operations Manager treats KPIs differently from other attributes. Threshold violations by a KPI generate different types of alerts from non-KPI attributes.

When a KPI for an application or a tier violates a threshold, vCenter Operations Manager examines the events that preceded the violation. If it finds enough related information, vCenter Operations Manager captures the set of events that preceded the violation as a fingerprint. If it finds a similar series of events in the future, it can issue a predictive alert warning that the KPI violation is likely to occur.

Metrics that vCenter Operations Manager Generates

For every resource that you define, vCenter Operations Manager generates and stores metrics in an attribute package metric group called vCenter Operations Generated. vCenter Operations Manager uses these metrics when it calculates the health of a resource. The vCenter Operations Generated package appears when you list the metrics for a resource.

The vCenter Operations Generated metric group is included as part of every attribute package. Because these metrics are similar to other metrics that you define, you can mark them as KPIs or include them in other attribute packages, but this is typically not necessary. You cannot remove metrics from the vCenter Operations Generated attribute package metric group.

Except for **Self - Total**, any metric that vCenter Operations Manager generates that begins with **Self** includes data only for the resource. Metrics that begin with **Full Set** include data for all of the resource's children, but do not include the resource itself.

Table 4-1. vCenter Operations Generated Attribute Package Metrics

Name	Description
Self - Health Score	Health score of the resource.
Self - Metric Count	Number of metrics defined for the resource.
Self - KPI Count	Number of KPI defined for the resource.
Self - Active Anomaly Count	Number of currently active anomalies for the resource.
Self - New Anomaly Count	Number of new anomalies for the resource. An anomaly is new if it occurred for the first time in the most recent collection cycle.
Self - Active KPI Breach Count	Number of KPIs for the resource which are currently violating their thresholds.
Self - New KPI Breach Count	Number of KPIs for the resource with new threshold violations. A breach is new if it occurred for the first time in the most recent collection cycle.
Full Set - Metric Count	Number of metrics defined for the resource’s children.
Full Set - KPI Count	Number of KPI defined for the resource’s children.
Full Set - Anomaly Count	Number of currently active anomalies for the resource’s children.
Full Set - New Anomaly Count	Number of new anomalies for the resource’s children. An anomaly is new if it occurred for the first time in the most recent collection cycle.
Full Set - Active KPI Breach Count	Number of KPIs for the resource’s children which are currently violating their thresholds.
Full Set - New KPI Breach Count	Number of KPIs for the resource’s children with new threshold violations. A breach is new if it occurred for the first time in the most recent collection cycle.
Self - Total Anomalies	Total number of active anomalies for the resource and all its children. This is the only vCenter Operations Manager generated metric that includes the resource itself and its children. If you display the metric graph for this attribute, it includes the calculated noise line for the resource, which is the number of anomalies that triggers an early warning alert.
Availability	Can be one of the following values. ■ 1 (data is being received properly) ■ 0 (resource is unavailable) ■ -1 (adapter resource is not receiving data for this resource)

Creating Attribute Packages

An attribute package is a group of attributes that are related to a specific resource. When you assign an attribute package to a resource, vCenter Operations Manager collects metrics for the attributes in the attribute package.

- Add an Attribute Package on page 42

  When you add an attribute package, you set a collection interval, specify the attributes to collect for a resource, configure the type of threshold to use for each attribute, and indicate which attributes are KPIs.

- Set Hard Thresholds for an Attribute on page 43

  By default, vCenter Operations Manager uses dynamic thresholding for attributes. You can override this behavior by setting hard thresholds for an attribute in an attribute package.

- Metric Data Types on page 44

  Most of the data that vCenter Operations Manager stores and analyzes is numeric, but it can also track other types of data and alert you if the values are unexpected.

- Set the Data Type for an Attribute on page 44

  By default, vCenter Operations Manager recognizes the type of data that it receives for each attribute. You can override this behavior by explicitly setting the data type for an attribute in an attribute package.

Add an Attribute Package

When you add an attribute package, you set a collection interval, specify the attributes to collect for a resource, configure the type of threshold to use for each attribute, and indicate which attributes are KPIs.

To set hard thresholds for an attribute in a package, see "Set Hard Thresholds for an Attribute," on page 43. To set the metric data type for an attribute in a package, see "Set the Data Type for an Attribute," on page 44.

Procedure

1 Select **Environment > Configuration > Attribute Packages**.

2 Select the adapter kind for the attribute package from the **Adapter kind** drop-down menu.

3 Select the resource kind for the attribute package from the **Resource kind** drop-down menu.

  The list shows attribute packages for your selections.

4 Click the **Add New Attribute Package** icon.

5 Type a name for the attribute package in the **Package name** text box.

6 Type a collection interval value, in minutes, in the **Collection Interval (mins)** text box.

  For example, if you expect the resource to generate performance data every 30 minutes, set the collection interval to 30 minutes.

  The collection interval for a resource influences the collection status for that resource. The collection interval for the adapter instance resource determines how often to collect data. For example, if the collection interval for the adapter instance resource is set to five minutes, setting the collection interval for a resource to 30 minutes prevents the resource from having the No Data Receiving collection status after five collection cycles (25 minutes).

  NOTE The collection interval that you set for a resource overrides the collection interval in the attribute package that you assign to the resource.

7 Select the check box next to each attribute to include in the package.

8 For each attribute, select whether a violation of the upper or lower dynamic threshold is a KPI.

9 Click **OK** to return to the Manage Attribute Packages window.

10 Click **OK** to save the attribute package.

What to do next

After you create an attribute package, you can assign it to a resource. You can assign an attribute package when you add a resource, either through discovery or individually, and when you edit a resource. See "Defining Resources," on page 19.

To make the attribute package the default package for resources of its resource kind, see "Change the Default Settings for a Resource Kind," on page 35.

Set Hard Thresholds for an Attribute

By default, vCenter Operations Manager uses dynamic thresholding for attributes. You can override this behavior by setting hard thresholds for an attribute in an attribute package.

A hard threshold is static. A hard threshold changes only when you change it. In most environments, you should use dynamic thresholding instead of hard thresholding.

You can set multiple thresholds, each with a different criticality level, for the same attribute. You can also define the criticality level that a metric must violate for it to be considered a KPI breach. Hard thresholds that are not set as KPIs generate notification alerts if they are violated.

Procedure

1 Select **Environment > Configuration > Attribute Packages**.

2 Select the adapter kind of the attribute package from the **Adapter kind** drop-down menu.

3 Select the resource kind of the attribute package from the **Resource kind** drop-down menu.

The Manage Attribute Package window lists the attribute packages for the resource kind that you selected.

4 Select the attribute package and click the **Edit Selected Attribute Package** icon.

The Manage Attribute Package window displays the attribute details for the package.

5 In the directory tree in the left pane, select the check box for the attribute.

Information about the attribute appears in the right pane.

6 Click the arrow on the right side of the Advanced Configuration bar to view additional configuration options.

7 Configure the hard thresholds options for the attribute.

Option	Action
Critical Level	Select the criticality level of the threshold.
Threshold Operator	Select the threshold operator.
Compare Value	Type the value to compare to the threshold.

Option	Action
Wait Cycle	Type a value for the wait cycle. vCenter Operations Manager multiplies the wait cycle value by the collection interval to calculate the number of minutes that a threshold must be out of bounds before generating an anomaly.
Cancel Cycle	Type a value for the cancel cycle. vCenter Operations Manager multiplies the cancel cycle value by the collection interval to calculate the number of minutes the metric must be in bounds before canceling an anomaly.

8 To make a violation of the hard threshold a KPI, select the **Violation of the Hard threshold is a Key Indicator** check box and select the criticality level from the **Select Criticality Level at which a Hard Threshold becomes Key Indicator** drop-down menu.

The criticality level indicates the level that must be reached for a violation to be considered a KPI breach.

9 Click **OK** to save your settings.

10 Click **OK** to return to the Manage Attribute Packages window.

Metric Data Types

Most of the data that vCenter Operations Manager stores and analyzes is numeric, but it can also track other types of data and alert you if the values are unexpected.

For example, if a resource sends the string Good when operation is normal and Bad when a problem occurs, vCenter Operations Manager analytics can learn this information and generate an anomaly when it receives Bad.

Table 4-2. Metric Types

Data Type	Description
common	The attribute data is numeric. This is the most common type of attribute.
multinomial	The attribute data is one of a limited set of possible values, either string or numeric.
sparse	If you know that vCenter Operations Manager will not receive data for an attribute on a regular basis, use the sparse data type. Using the sparse data type prevents vCenter Operations Manager from generating anomalies when it does not receive the metric as expected.

Set the Data Type for an Attribute

By default, vCenter Operations Manager recognizes the type of data that it receives for each attribute. You can override this behavior by explicitly setting the data type for an attribute in an attribute package.

IMPORTANT If you do not set the correct the data type, vCenter Operations Manager does not use the proper analytic algorithms when it evaluates the metric.

Prerequisites

Become familiar with the metric data types. See "Metric Data Types," on page 44.

Procedure

1 Select **Environment > Configuration > Attribute Packages**.

2 Select the adapter kind of the attribute package from the **Adapter kind** drop-down menu.

3 Select the resource kind of the attribute package from the **Resource kind** drop-down menu.

The Manage Attribute Packages window lists the attribute packages for the resource kind that you selected.

4 Select the attribute package and click the **Edit Selected Attribute Package** icon.

The Manage Attribute Packages window displays the attribute details for the package.

5 In the directory tree in the left pane, select the attribute.

Information about the attribute appears in the right pane.

6 Click the arrow on the right side of the Advanced Configuration bar to show additional configuration options.

7 Select the data type for the attribute from the **DT Type** drop-down menu.

If you do not make a selection, vCenter Operations Manager detects the metric type. If the metric type is sparse, you must set it. vCenter Operations Manager cannot detect a sparse data metric.

8 Click **OK** to save your settings.

9 Click **OK** to return to the Manage Attribute Packages window.

Creating Super Metric Packages

You can combine different metrics by using mathematical formulas to define a super metric. Super metrics are useful when you need to track combinations of metrics, either from a single resource or, more commonly, from multiple resources. A super metric is a formula that contains a combination of one or more metrics for one or more resources. A super metric package contains one or more super metrics.

For example, consider the transfer of packets along a network. The ratio of packets out should stay approximately equal to 1, and a slight deviation can indicate an abnormality. This abnormality cannot be detected if packets in and packets out are studied separately. You must be able to track the ratio of these two metrics.

You cannot assign a super metric directly to a resource. Instead, you create a super metric package that contains the super metric and assign the package to the resource. The same super metric can be part of more than one package. For example, if you create one super metric package that contains the super metrics for WebServer1 and another package that contains all of the super metrics for all Web servers, the super metrics for WebServer1 can be in both packages.

- Design a Super Metric on page 46

  Because super metric formulas can be complex, design a super metric before you use the vCenter Operations Manager user interface to create it. The key to creating a super metric that alerts you to the right situations is knowing your own enterprise and your data.

- Super Metric Specifications on page 47

  A super metric formula can consist of one or more metric specifications. You can specify a particular resource and metric, such as CPU use for Database Server 2, or you can specify a metric and use **This Resource**, which indicates the resource to which the super metric is assigned.

- Super Metric Functions on page 47

  vCenter Operations Manager includes functions that you can use in super metric formulas. The functions are either looping functions or single functions.

- Build a Super Metric Formula on page 49

  A super metric formula can include one or more metric specifications, super metric functions, arithmetic operators (such as the plus or minus sign), and constants. You can enter any number of constants as part of the formula.

- Add a Super Metric on page 50

  You create a super metric when only a combination of metrics can let you know if your systems are behaving normally.

- Add a Super Metric Package on page 51

  When you create a super metric package, you specify the metrics that it contains, configure threshold characteristics for each super metric, and indicate which threshold violations should be considered KPIs. If you include the same super metric in more than one package, you can set different characteristics for it in each package.

- Assigning Super Metric Packages on page 52

  You can assign a super metric package to any resource, regardless of whether any metrics from the resource are used in the super metric package. In most cases, you assign each super metric package to a related resource.

- Export a Super Metric on page 52

  You can export a super metric from one vCenter Operations Manager instance and import it to another vCenter Operations Manager instance.

- Import a Super Metric on page 53

  You can import a super metric that was exported from another instance of vCenter Operations Manager.

Design a Super Metric

Because super metric formulas can be complex, design a super metric before you use the vCenter Operations Manager user interface to create it. The key to creating a super metric that alerts you to the right situations is knowing your own enterprise and your data.

Procedure

1 Determine the resources that are involved in the behavior to track.

  When you define the metrics to use, you can select either specific resources or resource kinds. For example, you can select the specific resources Database Server 2 and Database Server 4, or you can select the resource kind Database Servers. When you select a resource kind, the super metric uses all of the resources of that kind that are children of the resource to which you assign the super metric.

2 Determine the metrics to include in the super metric.

  If you are tracking the transfer of packets along a network, the metrics are packets in and packets out because you are interested in the ratio of those metrics. In another common use of super metrics, the metrics might be the average CPU use or average memory use of the resource kind that you select

3 Decide how to combine or compare the metrics.

  For example, to find the ratio of packets in to packets out, you must divide the two metrics. If you are tracking CPU use for a resource kind, you might want to determine the average use, or you might want to determine what the highest or lowest use is for any any resource of that kind. In more complex scenarios, you might need a formula that uses constants or trigonometric functions.

4 Decide where to assign the super metric.

  You place super metrics in a package and assign the package to a resource. For many super metrics, you assign the super metric package to an application to have it monitor all of the resources of the specified kind in that application. In other cases, you define the resources to track in the super metric, but the resource that you assign the super metric to determines where alerts occur if the super metric shows abnormal behavior. You typically assign super metrics to a tier or application.

Super Metric Specifications

A super metric formula can consist of one or more metric specifications. You can specify a particular resource and metric, such as CPU use for Database Server 2, or you can specify a metric and use **This Resource**, which indicates the resource to which the super metric is assigned.

For example, if you select the transaction time metric and instruct vCenter Operations Manager to use this resource, when the super metric is in a package assigned to Web Server 1, it uses the transaction time for Web Server 1. If you assign the package to Web Server 2, it uses the transaction time for Web Server 2.

Assign any package that contains the super metric only to resources for which the metric is collected. You can combine specific resource metrics and **This Resource** metrics in the same formula.

Super Metric Functions

vCenter Operations Manager includes functions that you can use in super metric formulas. The functions are either looping functions or single functions.

Looping Functions

Looping functions work on more than one value.

Table 4-3. Looping Functions

Function	Description
avg	Average of the collected values.
combine	Combines all of the values of the metrics of the included resources into a single metric timeline.
count	Number of values collected.
max	Maximum of the collected values.
min	Minimum of the collected values.
sum	Total of the collected values.

Looping Function Formats

All looping functions have four possible formats.

Table 4-4. Looping Function Formats

Format	Description
funct(*res*:*met*)	Checks one level below the indicated resource and acts on the values of the metric for all of the resource's children. For example, `avg(Tier1;CPUuse)` returns the average of the CPUuse metric for all of the children of the Tier1 resource.
funct(*reskind*:*met*)	Checks down the resource tree and acts on the values of the metric for all of the resources of the indicated resource kind that are below the resource to which the super metric is assigned. The metric might be a specific metric or an attribute kind. For example, `sum(DomCont:BytesReadSec)` totals the value of all instances of the BytesReadSec attributes for all resources of DomCont kind below the resource to which you assign the super metric.

Table 4-4. Looping Function Formats (Continued)

Format	Description
functN(*res*:*met*,*n*)	Similar to *funct*(*res*:*met*), except that it checks down or up the number of levels indicated by *n* instead of working on only the immediate children. This behavior is inclusive. For example, `avgN(App1:CPUuse,3)` averages the CPUuse metric for the children, grandchildren, and great-grandchildren of the App1 resource. If *n* is negative, the function checks the resource's parents instead of its children. If *n* is 1, this format is the same as *funct*(*res*:*met*).
funct([*val1*,*val2*,*val3*...])	Array format of a looping function. It can include any number of of the following values, separated by commas. ■ A resource:metric or resource kind:metric pair. The function takes the value of the specified resource, not its children, unless you include a resource kind. If you use a resource kind, you must specify a single metric for it, not a metric kind. The function checks all resources of that type below the resource to which it is assigned and acts on the value of the specified metric for those resources. ■ A constant. ■ A function or expression that returns a single value, such as `floor($This:AvgTransTime)` or `100–(DBServer3:MemoryUsed)`.

For example, `max([$This:CPUavg,Host3:CPUavg,VM:CPUavg])` finds the value of the CPUavg metric for the resource to which the super metric is assigned, for the resource called Host3, and for all resources of type VM that are below the resource to which the super metric is assigned in the resource tree.

Although this example uses the same metric in all three res:met pairs, you do not need to use the same metric. For example, you can have one function take the average of the physical memory used for one attribute, and the virtual memory used for a second attribute for one or more defined resources.

Single Functions

Single functions work on only a single value or a single pair of values.

Table 4-5. Single Functions

Function	Format	Description
abs	abs(x)	Absolute value of x. x can be any floating point number.
acos	acos(x)	Arccosine of x.
asin	asin(x)	Arcsine of x.
atan	atan(x)	Arctangent of x.
ceil	ceil(x)	The smallest integer that is greater than or equal to x.
cos	cos(x)	Cosine of x.
cosh	cosh(x)	Hyperbolic cosine of x.
exp	exp(x)	e raised to the power of x.
floor	floor(x)	The largest integer that is less than or equal to x.
log	log(x)	Natural logarithm (base *x*) of x.
log10	log10(x)	Common logarithm (base 10) of x.
pow	pow(x,y)	Raises x to the y power.
rand	rand(x:y)	Generates a random number between x and y.
sin	sin(x)	Sine of x.
sinh	sinh(x)	Hyperbolic sine of x.
sqrt	sqrt(x)	Square root of x.

Table 4-5. Single Functions (Continued)

Function	Format	Description
tan	tan(x)	Tangent of x.
tanh	tanh(x)	Hyperbolic tangent of x.

Build a Super Metric Formula

A super metric formula can include one or more metric specifications, super metric functions, arithmetic operators (such as the plus or minus sign), and constants. You can enter any number of constants as part of the formula.

You must follow certain procedures and rules when you build a super metric formula in the vCenter Operations Manager user interface.

Prerequisites

- Become familiar with how to construct super metric specifications. See "Super Metric Specifications," on page 47.
- Become familiar with the super metric functions that vCenter Operations Manager provides. See "Super Metric Functions," on page 47.

Procedure

- To use a function, select it in from the **Function** drop-down menu and select the resource or resource kind and metric or attribute kind to use in its argument.
- For looping functions that are in functN format, type the comma and value of *n* in the function argument.
- To select a resource and metric, click the resource in the Resource pane and double-click the metric in the Metrics pane.

  The database IDs of the resource and metric appear in the formula line at the top of the window.
- Define a metric for the resource to which the super metric is assigned.

  a In the Resources pane, click any resource that contains the metric to use.

  b Click the **This Resource** icon or type `$This` on the formula line.

  If the **This Resource** icon is already selected, do not click it again. After you click the **This Resource** icon, you must click it again to turn it off before you can add a specific resource to the formula.

  c In the Metrics pane, double-click the metric.
- To select a resource kind and attribute kind as an argument for a looping function, click the kind in the Resource Kinds pane and double-click the kind in the Attribute Kinds list.

  The database IDs of the resource kind and attribute kind appear in the formula line.
- To shorten the resource kinds list, type all or part of the resource kind in the **Search** text box and click the arrow next to the text box.
- To use looping functions in array mode, type brackets to enclose the array and type commas between each value.
- Use values that are the same type, either single values or arrays.

  Arrays are defined when you select a resource kind and attribute kind instead of a particular metric.

- Select a resource kind and single metric only as part of the argument for a looping function.

  If you select a resource kind, you must select an attribute kind.
- To see the formula with resource and metric names instead of IDs, click the **Show Formula Description** icon in the area beneath the formula line.
- To select function names and formats and arithemetic operators, either type them directly on the formula line or select them from the drop-down menus.
- To use parentheses to specify the order of operations in the formula, either type them directly on the formula line or select them from the **Operators** drop-down menu.
- To clear the metrics or attribute kinds lists, click the **Clear Selection** icon in the Resources or Resources kind pane at any time.

Add a Super Metric

You create a super metric when only a combination of metrics can let you know if your systems are behaving normally.

When you add a super metric, you might find it helpful to open two vCenter Operations Manager browser tabs. For example, you can create the super metric in one tab and view a dashboard that shows the Resource Selector, Metric Selector, and Metric Graph widgets in the other tab. When you use two tabs, you can also see the metric graph of a metric and verify that it is correct before you use it in a super metric.

Prerequisites

- Design your super metric formula. See "Design a Super Metric," on page 46.
- Become familiar with the user interface for building super metric formulas. See "Build a Super Metric Formula," on page 49.

Procedure

1. Select **Environment > Super Metrics** and click the **Super Metric Editor** tab.
2. Click the **Add New Super Metric** icon.
3. Type a name for the super metric in the **Super Metric Name** text box.
4. Define the formula for the super metric.

   Select, in order, each function or operator to use and the metrics or attribute kinds to use in each function or with each operator.
5. To verify the formula, display a metric graph that shows what its value was during a past time period.
   a. Click the **Visualize Supermetric** icon.

      The metric graph pane replaces the Metrics and Attribute Kinds panes.
   b. If you are prompted to select a resource, select the resource to which to assign the super metric in the Resources pane.
   c. Click the **Data Controls** icon and select the date range for the data.
   d. If the formula uses resource kinds, and you want the graph to use only resources that are current being collected, select the **Only Monitoring Resources** check box.
   e. Click the **Show Graph** icon.

6 Click **OK**.

vCenter Operations Manager checks the syntax of your formula. For example, it verifies that the number of opening and closing parentheses are the same and that single values and arrays are not mixed. If your formula is not valid, an error message appears that describes the cause of the problem. You must correct the formula before you can save the super metric.

What to do next

Add the super metric to an existing super metric package, or create a new super metric package. See "Edit a Super Metric Package," on page 55 or "Add a Super Metric Package," on page 51.

Add a Super Metric Package

When you create a super metric package, you specify the metrics that it contains, configure threshold characteristics for each super metric, and indicate which threshold violations should be considered KPIs. If you include the same super metric in more than one package, you can set different characteristics for it in each package.

You can also add a super metric package when you add an individual resource or edit a resource. See "Add an Individual Resource," on page 21 or "Edit a Resource," on page 33.

Prerequisites

Create one or more super metrics. See "Add a Super Metric," on page 50.

Procedure

1 Select **Environment > Super Metrics** and click the **Package Editor** tab.

2 Click the **Add New Attribute Package** icon.

3 Type a name for the super metric package in the **Package name** text box.

4 Select a super metric to add to the package from the list on the left side of the window.

The characteristics that you can set for the super metric appear in the right pane.

5 (Optional) To set the upper dynamic threshold violation for a super metric as a KPI, select the **Violation of the Upper Dynamic threshold is a Key Indicator** check box.

6 (Optional) To set the lower dynamic threshold violation for a super metric as a KPI, select the **Violation of the Lower Dynamic threshold is a Key Indicator** check box.

7 (Optional) To set and use hard thresholds for a super metric, click the down arrow to the right of Advanced Configuration and configure the hard threshold options.

Option	Action
Critical Level	Select the criticality level of the hard threshold.
Threshold Operator	Select the threshold operator.
Compare Value	Type the value to compare to the hard threshold.
Wait Cycle	Type a value for the wait cycle. vCenter Operations Manager multiples the wait cycle value by the collection interval to calculate the number of minutes that the hard threshold must be out of bounds before generating an anomaly.
Cancel Cycle	Type a value for the cancel cycle. vCenter Operations Manager multiplies the cancel cycle value by the collection interval to calculate the number of minutes that the hard threshold must be in bounds before canceling an anomaly.

8 To make a violation of a hard threshold a KPI, select the **Violation of the Hard threshold is a Key Indicator** check box and select the criticality level from the **Select Criticality Level at which a Hard Threshold becomes Key Indicator** drop-down menu.

The criticality level indicates the level that must be reached for a violation to be considered a KPI breach.

9 Click **OK** to save the super metric package.

What to do next

After you create the super metric package, you can assign it to a resource. See "Assigning Super Metric Packages," on page 52.

To make the super metric package the default package for a resource kind, see "Change the Default Settings for a Resource Kind," on page 35.

Assigning Super Metric Packages

You can assign a super metric package to any resource, regardless of whether any metrics from the resource are used in the super metric package. In most cases, you assign each super metric package to a related resource.

For example, if a super metric package includes the average free space for all database servers, you assign the package to the database server tier. If another super metric package includes all of the super metrics that are defined for a particular application, you assign it to the application. Super metrics are the only attributes that you can assign directly to a tier or an application.

To make vCenter Operations Manager generate problem fingerprints for your applications, you must assign super metrics to an application or its tiers and designate the super metrics as KPI. Fingerprints can help you predict problems with applications.

If you use looping functions that have resource kinds or **This Resource** metrics in a super metric, the resource to which you assign the super metric determines which of the resource's metrics are included in the super metric.

When you use resource discovery to define a resource, vCenter Operations Manager assigns the default super metric package, if any, for its resource kind. When you add a resource individually, you can accept the default super metric package or assign a different package. A default super metric package is not available unless you previously defined a default super metric package for the selected resource kind. To change the super metric package for one or more resources, see "Modifying Resources," on page 33.

Export a Super Metric

You can export a super metric from one vCenter Operations Manager instance and import it to another vCenter Operations Manager instance.

Procedure

1 Select **Environment > Super Metrics** and click the **Super Metric Editor** tab.

2 Select the super metric to export and click the **Export** icon.

vCenter Operations Manager creates a super metric file, for example, `SuperMetric.bin`.

3 Select **Save File** and click **OK** to download the super metric file to your computer.

What to do next

Import the super metric file to another instance of vCenter Operations Manager. See "Import a Super Metric," on page 53.

Import a Super Metric

You can import a super metric that was exported from another instance of vCenter Operations Manager.

If the super metric to import contains a reference to an object that does not exist in the target instance, the import fails. vCenter Operations Manager returns a brief error message and writes detailed information to the log file.

Prerequisites

Export a super metric from another vCenter Operations Manager instance. See "Export a Super Metric," on page 52.

Procedure

1 Select **Environment > Super Metrics** and click the **Super Metric Editor** tab.

2 Click the **Import** icon.

3 Click **Browse**, select the super metric file to import, and click **Open**.

4 Click **Import** to import the super metric file.

If the target instance has a super metric with the same name as the super metric you are importing, you can click **Yes** to create a super metric with the same name or **No** to cancel the import.

After the import is finished, the super metric appears in the Manage Super Metric window.

Modifying Attribute Packages

To maintain your attribute packages in vCenter Operations Manager, you might need to edit, clone, or delete an attribute package.

Edit an Attribute Package

When you edit an attribute package, you can change the package name, change the collection interval, and add or remove attributes from the package.

To change hard threshold settings for an attribute in a package, see "Set Hard Thresholds for an Attribute," on page 43. To change the metric data type for an attribute in a package, see "Set the Data Type for an Attribute," on page 44.

Procedure

1 Select **Environment > Configuration > Attribute Packages**.

2 (Optional) Select the adapter kind of the attribute package to edit from the **Adapter kind** drop-down menu.

3 (Optional) Select the resource kind of the attribute package to edit from the **Resource kind** drop-down menu.

4 Select the attribute package to edit and click the **Edit Selected Attribute Package** icon.

5 Edit the attribute package.

Option	Action
Change the package name	Type a new name in the **Package name** text box.
Change the collection interval	Type a new value in the **Collection interval (mins)** text box.
Add or remove an attribute from the package	Select or deselect the check box next to the attribute name.

6 Click **OK** to save your changes.

Clone an Attribute Package

You can make a copy of an attribute package by cloning it.

Procedure

1 Select **Environment > Configuration > Attribute Packages**.

2 (Optional) Select the adapter kind and resource kind of the attribute package to clone.

3 Select the attribute package to clone and click the **Clone Selected Attribute Package** icon.

4 Type a name for the cloned attribute package.

5 Click **OK** to create the attribute package.

Delete an Attribute Package

If you do not need an attribute package, you can delete it.

Procedure

1 Select **Environment > Configuration > Attribute Packages**.

2 (Optional) Select the adapter kind and resource kind of the attribute package to delete.

3 Select the attribute package to delete and click the **Remove Selected Attribute Package** icon.

4 Click **Yes** on the confirmation window to delete the package.

Modifying Super Metric Packages

To maintain your super metric packages in vCenter Operations Manager, you might need to edit or remove a super metric package.

Edit a Super Metric

When you edit a super metric, you can change its name and edit the super metric formula.

Prerequisites

If you plan to change the super metric formula, see "Design a Super Metric," on page 46 and "Build a Super Metric Formula," on page 49 for information on designing your formula and using the vCenter Operations Manager user interface to build it.

Procedure

1 Select **Environment > Super Metrics** and click the **Super Metric Editor** tab.

2 Select the super metric to edit.

You can use the **Search** box to search for the super metric.

The packages to which the super metric belongs appear in the Packages pane.

3 Click the **Edit Selected Super Metric** icon.

4 To change the super metric name, type a new name in the **Super Metric Name** text box.

5 To change the formula for the super metric, select, in the order in which they will be used, each function or operator to use and the metrics or attributes kinds to use in each function or with each operator.

6 To save your changes, click **OK**.

vCenter Operations Manager checks the syntax of your formula. For example, it verifies that the number of opening and closing parentheses are the same and that single values and arrays are not mixed. If your formula is not valid, an error message appears that describes the cause of the problem. You must correct the formula before you can save your changes.

Edit a Super Metric Package

When you edit a super metric package, you can change the name of the package, add or remove super metrics from the package, and change threshold settings for super metrics in the package.

You can also edit a super metric package when you add an individual resource or edit a resource. See "Add an Individual Resource," on page 21 or "Edit a Resource," on page 33.

Procedure

1 Select **Environment > Super Metrics** and click the **Package Editor** tab.

2 Select the super metric package to modify.

You can use the **Search** box to search for the super metric package.

The resources to which the super metric package is applied appear in the Resources pane.

3 Click the **Edit Selected Attribute Package** icon.

4 To change the package name, type a new name in the **Package name** text box.

5 To add or remove a super metric from the package, select or deselect the check box next to the super metric name.

6 (Optional) To set the upper dynamic threshold violation for a super metric as a KPI, select the **Violation of the Upper Dynamic threshold is a Key Indicator** check box.

7 (Optional) To set the lower dynamic threshold violation for a super metric as a KPI, select the **Violation of the Lower Dynamic threshold is a Key Indicator** check box.

8 (Optional) To set and use hard thresholds for a super metric, click the down arrow to the right of Advanced Configuration and configure the hard threshold options.

Option	Action
Critical Level	Select the criticality level of the hard threshold.
Threshold Operator	Select the threshold operator.
Compare Value	Type the value to compare to the hard threshold.
Wait Cycle	Type a value for the wait cycle. vCenter Operations Manager multiples the wait cycle value by the collection interval to calculate the number of minutes that the hard threshold must be out of bounds before generating an anomaly.
Cancel Cycle	Type a value for the cancel cycle. vCenter Operations Manager multiplies the cancel cycle value by the collection interval to calculate the number of minutes that the hard threshold must be in bounds before canceling an anomaly.

9 To make a violation of a hard threshold a KPI, select the **Violation of the Hard threshold is a Key Indicator** check box and select the criticality level from the **Select Criticality Level at which a Hard Threshold becomes Key Indicator** drop-down menu.

The criticality level indicates the level that must be reached for a violation to be considered a KPI breach.

10 Click **OK** to save your changes.

Delete a Super Metric

If you do not need a super metric, you can delete it.

Procedure

1 Select **Environment > Super Metrics** and click the **Super Metric Editor** tab.

2 Select the super metric to delete.

You can use the **Search** box to search for the super metric.

The packages to which the super metric belongs appear in the Packages pane.

3 Click the **Remove Selected Super Metric** icon.

Delete a Super Metric Package

If you do not need a super metric package, you can delete it.

Procedure

1 Select **Environment > Super Metrics** and click the **Package Editor** tab.

2 Select the super metric package to delete.

You can use the **Search** box to search for the super metric package.

The resources to which the super metric package is applied appear in the Resources pane.

3 Click the **Remove Selected Attribute Package** icon.

Super Metric Use Case

Consider an application, such as a Web-based business, where all of the servers in a tier perform a similar activity, such as processing transactions. In this use case, it might be useful to know the average of a metric, such as CPU usage, for all of the servers. You can define a super metric to track this number and assign it to the tier.

Prerequisites

- Become familiar with creating or editing super metric packages. See "Add a Super Metric Package," on page 51 or "Edit a Super Metric Package," on page 55.
- Become familiar with assigning super metric packages. See "Assigning Super Metric Packages," on page 52.

Procedure

1 Select **Environment > Super Metrics** and click the **Super Metric Editor** tab.

2 Click the **Add New Super Metric** icon.

3 Type a name for the super metric in the **Super Metric Name** text box.

For example, `Average CPU Use`.

4 Select **avg** from the **Functions** drop-down menu.

5 In the Resource Kinds pane, select the resource kind, or type all or part of the name of the resource type for the transaction servers in the **Search** text box, for example, `AppServ`, and click the arrow next to the text box.

The attributes for the resource kind appear in the Attribute Kinds pane.

6 Double-click the **AvgCPUtil** attribute.

The database ID of the resource and metric appear in the formula line at the top of the window.

7 (Optional) To see the resource name and metric name, click below the formula line.

8 Click **OK** to save the super metric.

9 Add the super metric to an existing super metric package, or create a new super metric package.

10 Assign the super metric package to the tier.

Configure Weighted Metric Groups

With the weighted metric groups feature, vCenter Operations Manager calculates the weight of individual metrics based on the number of metrics in the group so that every top-level group has equal weight in the health calculation.

When the weighted metric groups feature is enabled, the total anomalies metric shows the weighted total anomalies that are related to the total number of metrics. When the weighted metric group feature is disabled, each metric has equal weight when vCenter Operations Manager calculates health, for example, two CPU metrics have the same effect on health as two memory metrics.

Procedure

1 Open the `analytics.properties` file in the *`vcenter-ops`*`\user\conf\analytics` directory.

The vCenter Operations Manager vApp uses the `analytics.properties` file on the Analytics virtual machine.

2 To enable or disable weighted metric groups, set the `useMetricGroupWeightingForHealth` property to `true` or `false`.

3 Save your changes and close the `analytics.properties` file.

4 Restart the Analytics service to make your changes take effect.

Prioritize Threshold Checking

You can pause dynamic threshold calculation when the data queue size exceeds a certain value. This feature enables you to prioritize threshold checking over the dynamic threshold calculation.

Procedure

1 Open the `advanced.properties` file in the *`vcenter-ops`*`\user\conf\analytics` directory.

2 Set the `dtBlockIfDataQueueSizeOver` property to the data queue size.

For example: **`dtBlockIfDataQueueSizeOver = 200`**

NOTE Setting the `dtBlockIfDataQueueSizeOver` property to 0 disables the feature.

3 Save your changes and close the `advanced.properties` file.

4 Restart the Analytics service.

Enable the Combined Dynamic Threshold Plug-in

The combined dynamic threshold plug-in provides faster and more accurate dynamic threshold calculations by combining the information learned from all previous dynamic threshold algorithms.

Procedure

1 Open the `advanced.properties` file in the *`vcenter-ops`*`\user\conf\analytics` directory.

2 Set the `useCombinedDTPlugin` property to true.

   For example: `useCombinedDTPlugin = true`

3 Save your changes and close the *`advanced.properties`* file.

4 Restart the Analytics service.

Configuring Applications 5

An application is a type of container resource that defines an interdependent set of hardware and software components that delivers a specific capability that supports your business. A vCenter Operations Manager administrator builds application topologies to determine how applications are affected when one or more of the resources that they contain experience problems.

After you configure an application, you can view real-time analysis for any or all of the affected resources in the application, understand where in the application problems arise, and determine how problems spread to other resources.

This chapter includes the following topics:

- "Understanding Applications," on page 59
- "Add an Application," on page 60
- "Creating and Assigning Application Tags," on page 61
- "Use a Tag to Find an Application," on page 62
- "Modifying Applications," on page 63
- "Modifying Application Tags," on page 64

Understanding Applications

In vCenter Operations Manager, applications are three-level hierarchies. Each application contains one or more tiers, and each tier contains one or more resources.

A tier is a group of resources that performs a specific task in an application. For example, you can group all of your database servers together in a tier. The resources that make up a tier can also contain other resources, but they do not have to.

When you define application hierarchies for your resources, vCenter Operations Manager can calculate and store fingerprints for your applications. When a KPI for an application or tier violates a threshold, vCenter Operations Manager examines the events that preceded the violation. If it finds enough related information, such as other anomalies, it captures the set of events that preceded the violation. This captured series of events is called a fingerprint.

With fingerprints, vCenter Operations Manager can monitor events in the future and, if it finds a similar series of events, issue a predictive alert to warn you that a KPI violation is likely to occur. The information that vCenter Operations Manager obtains after it generates the fingerprint assists you in correcting the problem.

vCenter Operations Manager generates fingerprints only for applications. Because the only type of attribute that you can assign directly to an application or tier is a super metric, vCenter Operations Manager generates fingerprints only if you assign super metrics to a tier or application and mark them as KPIs. See "Creating Super Metric Packages," on page 45.

To maintain the highest possible server performance, vCenter Operations Manager tracks each captured fingerprint to determine if the set of conditions it represents recurs and if those conditions help to predict future problems. If a fingerprint is not useful in predicting problems, vCenter Operations Manager deactivates it and stops checking for its recurrence.

Add an Application

You build an application topology by adding an application. When you add an application, you can select from a list of predefined templates, or create your own custom template, to define the tiers in the application.

Configured application tags appear in the left pane of the Application Overview page and the list of configured applications appears in the right pane. For each application, a graph shows the application health over the last 24 hours, the current health score, icons that indicate the health of each tier, and the number of Smart Alerts and Classic Alerts.

Procedure

1 Select **Environment > Applications Overview**.

2 Click the **Add New Application** icon.

3 Select a template, or select **Custom** to define your own application from a blank template, and click **Go**.

The default tiers for each template appear next to the template name. The tiers for the selected template also appear at the bottom of the window.

4 Type a name for the application in the **Application** text box.

5 (Optional) To add a tier to the application, click the **Add New Tier** icon and type the tier name in the row that appears.

For example, if you are configuring a tier of Web servers, you might type **`Web Servers`**.

6 Select a tier in the Tiers pane.

7 Filter the resources to add to the tier.

You can select a resource tag and tag value in the Resource-Tags list to show only the resources that have that tag value. If you click the **Invert Result** icon, the list includes resources that do not match the tag values that you selected. For example, if you select New York and London, all of the resources that are not in either of the cities appear in the list. If you select multiple tags, the resources in the list depend on the values that you select.

Option	Description
Select more than one value for the same tag	The list includes resources that have either value.
Select values for two or more different tags	The list includes only resources that have all of the selected values.

8 Select the resources to add to the tier from the **List** tab and drag them to the tier Resources pane.

You can select one resource, press Shift+click to select a range of resources, press Ctrl+click to select multiple individual resources, or click the **Select All** to icon to select all of the listed resources.

You can also add all listed resources to a tier by clicking the **Add All Resources To Tier** icon.

NOTE You can add the same resource to more than one tier.

9 Continue to select tiers, filter resources, and add resources to tiers until the application topology is finished.

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

The new application appears in the list of applications in the Application Overview page.

Creating and Assigning Application Tags

You can use application tags to categorize and manage applications in your environment. Creating application tags and tag values makes it easier to find applications in vCenter Operations Manager. Rather than searching through thousands of applications in a long list, you can easily use tags to find the applications you want.

- Add an Application Tag on page 61

  With application tags, you can index applications for ease of manageability. Defining tags appropriate to your environment makes it easier to find applications in vCenter Operations Manager.

- Add a Value to an Application Tag on page 62

  You can assign any number of applications to each tag value, and you can assign a single application to tag values under any number of application tags.

- Associate an Application with a Tag Value on page 62

  When an application is associated with a tag value, you can use the application tag hierarchy to select it in vCenter Operations Manager.

Add an Application Tag

With application tags, you can index applications for ease of manageability. Defining tags appropriate to your environment makes it easier to find applications in vCenter Operations Manager.

Procedure

1 Select **Environment > Applications Overview**.

2 Click the **Manage Tags** icon.

3 Click the **Add Tag** icon to add a new row and enter the name of the tag in the row.

4 Click **OK** to save the tag.

The new tag appears in the tags list on the Application Overview page.

What to do next

Add a value to the application tag. See "Add a Value to an Application Tag," on page 62.

Add a Value to an Application Tag

You can assign any number of applications to each tag value, and you can assign a single application to tag values under any number of application tags.

Prerequisites

Add an application tag. See "Add an Application Tag," on page 61.

Procedure

1 Select **Environment > Applications Overview**.

2 Click the **Manage Tags** icon on the left side of the Application Overview page.

3 Select the tag to which to add values and click the **Add Tag Value** icon.

4 Type a name for the tag value in the new row.

5 Click **OK** to add the tag value.

The tag value appears in the tag list.

What to do next

Associate an application with the tag value. See "Associate an Application with a Tag Value," on page 62.

Associate an Application with a Tag Value

When an application is associated with a tag value, you can use the application tag hierarchy to select it in vCenter Operations Manager.

Prerequisites

- Create an application tag. See "Add an Application Tag," on page 61.
- Add a value to the application tag. See "Add a Value to an Application Tag," on page 62.

Procedure

1 Select **Environment > Applications Overview**.

2 Drag the application from the list in the right pane of the Application Overview page onto the tag value name.

You can select one application, press Ctrl+click to select multiple individual applications, or press Shift +click to select a range of applications.

The applications that you selected are now associated with the tag value.

Use a Tag to Find an Application

Rather than searching through the entire application list, you can use tags to find the applications you want more easily.

Procedure

1 Select **Environment > Applications Overview**.

2 In the tag list on the left side of the page, click the tag for which the application was assigned a value.

When you click a tag, the list of values expands below the tag. The number of applications associated with each value appears next to the tag value. You can collapse and expand a tag by clicking it again. You can also use the toolbar buttons above the tag list to collapse and expand application tag branches, clear all selected application tags, and manage tags.

3 Click the tag value.

The applications with that tag value appear in the right pane.

4 Select the application from the list.

Modifying Applications

To maintain your applications in vCenter Operations Manager, you might need to add or delete tiers, add or delete resources from tiers, change the names of tiers, or delete applications.

Edit an Application

When you edit an application, you can add and delete tiers, add and delete resources from tiers, and change the names of tiers.

IMPORTANT Do not delete a tier that contains resources for which metrics are being collected. If metrics are being collected when you delete a tier, vCenter Operations Manager generates alerts regarding the negative performance of the individual resources that correspond with their respective applications. In addition, metric collection might malfunction.

Procedure

1 Select **Environment > Applications Overview**.

2 Select the application to edit.

3 Click the **Edit Selected Application** icon.

4 Edit the application.

Option	Action
Add a tier to the application	Click the **Add New Tier** icon and type the tier name in the row that appears. For example, if you are configuring a tier of Web servers, you might type **`Web Servers`**.
Remove a tier from the application	Select the tier in the list and click the **Remote Selected Tier** icon.
Change the name of a tier	Double-click the existing name and type a new name.
Add a resource to a tier	a Select the tier in the Tiers pane. b Select the resources to add to the tier from the resource list. c Drag the selected resources from the tier Resources pane.
Delete a resource from a tier	a Select the tier in the Tiers pane. b Select the resources to remove from the tier in the resource list. c Click the **Remote Selected Resources From Tier** icon.

5 Click **Save** to save your changes.

Delete an Application

If you do not need an application, you can delete it. When you delete an application, the fingerprints, alerts, and anomalies associated with the application are also deleted.

Procedure

1 Select **Environment > Applications Overview**.

2 Select the application to delete.

3 Click the **Remove Selected Application** icon.

4 Click **Yes** on the confirmation window to delete the application.

Modifying Application Tags

To maintain application tags, you might need to remove an application from a tag value, edit or delete an application tag, or edit or delete a tag value.

Edit an Application Tag

When you edit an application tag, you can change the tag name and the names of its tag values.

Procedure

1 Select **Environment > Applications Overview**.

2 Click the **Manage Tags** icon on the left side of the page.

3 Edit the application tag.

Option	Description
Change the tag name	Double-click the tag name and type a new name.
Change a tag value name	Expand the tag to show its values and double-click the value to type a new name.

4 Click **OK** to save your changes.

Your changes appear in the tag list in the Application Overview page.

Delete an Application Tag or Tag Value

If you do not need an application tag or tag value, you can delete it.

Procedure

1 Select **Environment > Applications Overview**.

2 Click the **Manage Tags** icon on the left side of the page.

3 Delete the tag or tag value.

Option	Description
Delete a tag	Click the tag name and click **Remove Tag**.
Delete a tag value	Expand the tag, select the value, and click **Remove Tag Value**.

4 Click **Close**.

The tag or tag value does not appear in the tag list in the Application Overview page.

Remove an Application from a Tag Value

If you need to recategorize an application, you can remove it from its current tag value.

Procedure

1 Select **Environment > Applications Overview**.

2 Select the tag value from the list on the left side of the Application Overview page.

The assigned applications for the tag value appear in the tag list.

3 Drag the application from the list on the right to the **UnTag** line at the end of the tag list on the left.

Configuring and Managing Users 6

To use vCenter Operations Manager, a user must have a user account. If your organization uses an LDAP user database, a vCenter Operations Manager administrator can import some or all of the LDAP users to vCenter Operations Manager.

vCenter Operations Manager provides user group-based security. You can place each user in one or more user groups, and you can assign access rights to user groups. For example, one user group might be able to view only the resource integrity levels, another user group might be able to configure resources, and a third user group might have root permissions to administer other users.

This chapter includes the following topics:

- "Create a User Account," on page 67
- "Importing LDAP Users," on page 68
- "Configuring User Groups and Access Rights," on page 72
- "Set Password Policies," on page 75
- "Maintaining Users and User Groups," on page 75
- "Run the User Audit Report," on page 77

Create a User Account

You must create a user account for each person who uses vCenter Operations Manager. You can create users from the vCenter Operations Manager user interface.

If you use an LDAP user database, you can also import some or all of your LDAP users into vCenter Operations Manager. See "Importing LDAP Users," on page 68.

NOTE In a vApp installation, users that you create from the Custom user interface do not have access to the vSphere user interface.

Procedure

1 Select **Admin > Security**.

2 Click the **User Management** tab and click the **Add New User Account** icon in the User Accounts pane.

3 Type the user's first and last names, the user name and password for the user account, and the user's email address.

4 (Optional) Type information about the user in the **Description** text box, such as the purpose of the user's interaction with vCenter Operations Manager.

5 Select the **Is Enabled** check box to activate the user profile.

If you do not select this check box, the user account is inactive and the user cannot log in to vCenter Operations Manager.

6 Deselect the **Is Locked** check box.

If you select this check box, the user account is locked and the user cannot use vCenter Operations Manager.

7 Select **Change Pswd At Next Login** to force the user to change his or her password at the next login.

8 Click **OK** to save your configuration.

After vCenter Operations Manager creates the user account, the account appears in the User Accounts pane. By default, new users are set to use the light color scheme, the local browser time, and to have no administrative privileges.

What to do next

Assign the user to a user group. See "Assign a User to a User Group," on page 74.

Importing LDAP Users

If you use an LDAP database to manage users and groups, you can import users from one or more groups to vCenter Operations Manager. When you import LDAP users, you can create user records and assign them to vCenter Operations Manager groups in one operation.

When you import LDAP users to vCenter Operations Manager, only the user name is imported. The user password is not imported. When an LDAP user logs in, vCenter Operations Manager queries the LDAP database to validate the password. LDAP users cannot change their passwords in vCenter Operations Manager.

You can import LDAP users manually or with autosynchronization. When you import LDAP users manually, vCenter Operations Manager retrieves the users that match your criteria. With autosynchronization, you map LDAP groups to vCenter Operations Manager groups. Autosynchronization runs at specified intervals. You can import LDAP users manually at any time.

Before you can import LDAP users, you must define the LDAP host in vCenter Operations Manager. To use SSL to communicate securely with the LDAP server, you must import a security certificate on the vCenter Operations Manager server.

- Add or Modify an LDAP Host Definition on page 69

  To import LDAP users, you must define the LDAP host in vCenter Operations Manager. You can also modify existing LDAP host definitions.

- Configure Secure Communication for LDAP Import on page 70

  You can import a security certificate to the vCenter Operations Manager server truststore file to communicate securely with an LDAP host.

- Import LDAP Users Manually on page 70

  When you import LDAP users manually, vCenter Operations Manager retrieves the LDAP users that match your criteria. You can import all users, or select specific users, and assign users to vCenter Operations Manager groups. You can manually import users at any time.

- Import LDAP Users with Autosynchronization on page 71

  With autosynchronization, you map LDAP groups to vCenter Operations Manager groups. The import retrieves all members of the LDAP groups and adds them to the mapped vCenter Operations Manager groups.

- Stop Importing LDAP Users on page 72

  You can configure the autosynchronization feature to stop importing LDAP users to a vCenter Operations Manager group.

Add or Modify an LDAP Host Definition

To import LDAP users, you must define the LDAP host in vCenter Operations Manager. You can also modify existing LDAP host definitions.

Procedure

1 Select **Admin > Security**.

2 In the User Accounts pane, click the **Import From LDAP** icon.

3 Add, edit, or delete an LDAP host.

Option	Action
Add a new LDAP host	Click **Add**.
Modify an LDAP host definition	Select an LDAP host definition and click **Edit**.
Remove an LDAP host definition	Click **Delete**

4 Define or modify the LDAP host settings.

Option	Action
LDAP Description	Type a unique description for the LDAP host.
LDAP Host Name	Type the LDAP host name or IP address.
Port	Type the port number to connect to the LDAP host.
SSL	Select if you imported an SSL certificate for LDAP import. You can use SSL only if you imported a security certificate in the vCenter Operations Manager server trust store.
Username Field	Select or type the LDAP field to use as the user name in vCenter Operations Manager.
Base DN	Type the base distinguished name for the user search. Only users under this base will be found.
Username	Type the user name to connect to the LDAP database.
Password	Type the password to connect to the LDAP database.

5 (Optional) To limit the users that vCenter Operations Manager finds on the LDAP host when you import LDAP users, type values in the search criteria and attribute text boxes.

All of the text boxes are optional.

Option	Description
Group Search Criteria	The LDAP search criteria for finding groups. If you do not specify group search criteria, vCenter Operations Manager uses the default search parameters `(|(objectClass=group)(objectClass=groupOfNames))`.
Member Attribute	The name of the attribute of a group object that contains the list of members. If you do not specify a member attribute, vCenter Operations Manager uses `member` by default.
User Search Criteria	The LDAP search criteria for finding and caching specific users that the member field looks up. Type sets of key=value pairs, for example, `(|(key1=value1)(key2=value2))`. If you do not specify search criteria, vCenter Operations Manager searches for each user separately and the search operation might be time consuming.

Option	Description
Member Match Field	The attribute name of a User object to be matched with the Member entry from the Group object. If you do not specify an attribute name, vCenter Operations Manager treats the Member entry as a DN.
LDAP Context Attributes	Additional attributes to apply to the LDAP context environment. Type sets of key=value pairs separated by commas, for example, `java.naming.referral=ignore,java.naming.ldap.deleteRDN=false`.

6 Click **OK** to save the LDAP host definition.

What to do next

If you configured SSL for the LDAP host, import a security certificate. See "Configure Secure Communication for LDAP Import," on page 70.

Configure Secure Communication for LDAP Import

You can import a security certificate to the vCenter Operations Manager server truststore file to communicate securely with an LDAP host.

Prerequisites

- Obtain a security certificate.
- Become familiar with how to start and stop the vCenter Operations Manager Web service. See "Start or Stop vCenter Operations Manager Services," on page 108.

Procedure

1 Open a command prompt on the vCenter Operations Manager server.

2 Use the `keytool` utility to import the security certificate to the server truststore file.

For example:

```
"vcenter-ops\jre\bin\keytool.exe" -import -alias NDSCERT -file certificate.cer -keystore
"vcenter-ops\user\conf\truststore" -storepass oxygen
```

certificate.cer is the name of the security certificate.

3 Restart the vCenter Operations Manager Web service.

Import LDAP Users Manually

When you import LDAP users manually, vCenter Operations Manager retrieves the LDAP users that match your criteria. You can import all users, or select specific users, and assign users to vCenter Operations Manager groups. You can manually import users at any time.

Prerequisites

- Define the LDAP host in vCenter Operations Manager. See "Add or Modify an LDAP Host Definition," on page 69.
- Verify that you have the Import From LDAP access right.

Procedure

1 Select **Admin > Security**.

2 In the User Accounts pane, click the **Import from LDAP** icon.

3 Select the LDAP host from the **Ldap Host** drop-down menu.

vCenter Operations Manager populates the user name and password text boxes by using values from the LDAP host definition.

4 Click **Lookup**.

vCenter Operations Manager searches the LDAP data and lists all of the users that it finds. If the search returns a user who is already imported to vCenter Operations Manager, that row is dimmed and locked. You cannot reimport users.

5 Select the users to import.

Option	Description
Import all of the users in an LDAP group	Check **Import All** for that group.
Import an individual user in an LDAP group	Click in the Import column and select **true**.

6 For each user that you selected to import, select the vCenter Operations Manager group to which to add the user in the Groups column.

7 Click **Import**.

If you try to import a user who has the same name as a user in vCenter Operations Manager, a message states that one or more users could not be imported and the row for the user is yellow.

After the LDAP users are imported, their user accounts appear in the User Accounts pane.

Import LDAP Users with Autosynchronization

With autosynchronization, you map LDAP groups to vCenter Operations Manager groups. The import retrieves all members of the LDAP groups and adds them to the mapped vCenter Operations Manager groups.

By default, autosynchronization runs at one hour intervals. If you are an advanced user, you can change the autosynchronization interval by editing the `ldapSyncInterval` property in the *`vcenter-ops`*`\user\conf\web\web.properties` file.

Prerequisites

- Define the LDAP host in vCenter Operations Manager. See "Add or Modify an LDAP Host Definition," on page 69.
- Verify that you have the Import From LDAP access right.

Procedure

1 Select **Admin > Security**.

2 In the User Accounts pane, click the **Import from LDAP** icon.

3 Select the LDAP host from the **Ldap Host** drop-down menu and click **Edit**.

4 Select the **Auto Sync** check box to enable autosynchronization.

The Account Groups and LDAP Groups lists appear at the bottom of the window.

5 Click **Load LDAP Groups**.

vCenter Operations Manager populates the LDAP Groups list.

6 In the Account Groups pane, select a vCenter Operations Manager group.

7 Click the **Add Group** icon.

8 Select the LDAP group to import to the vCenter Operations Manager group that you selected.

9 Repeat Step 6 through Step 8 for each LDAP group to import.

10 Click **OK** to save your configuration.

The next time that autosynchronization runs, vCenter Operations Manager retrieves the members of the LDAP groups that you selected and adds them to the mapped vCenter Operations Manager groups.

Stop Importing LDAP Users

You can configure the autosynchronization feature to stop importing LDAP users to a vCenter Operations Manager group.

Prerequisites

Verify that you have the Import From LDAP access right.

Procedure

1 Select **Admin > Security**.

2 In the User Accounts pane, click the **Import from LDAP** icon.

3 Select the LDAP host and click **Edit**.

4 Select the **Auto Sync** check box to enable autosynchronization.

The Account Groups and LDAP Groups lists appear at the bottom of the window.

5 Click **Load LDAP Groups**.

vCenter Operations Manager populates the LDAP Groups list.

6 In the Account Groups pane, select the vCenter Operations Manager group.

7 Click the **Remove Groups** icon.

The LDAP Groups list shows all of the LDAP groups that were imported to the selected vCenter Operations Manager group.

8 Select the LDAP group to stop importing to the selected vCenter Operations Manager group.

9 Click **OK** to save your configuration.

vCenter Operations Manager stops importing LDAP users to the vCenter Operations Manager group that you selected. The next autosynchronization also removes any existing users from the selected vCenter Operations Manager group.

Configuring User Groups and Access Rights

You can place each user in one or more user groups, and you can assign access rights to user groups. The access rights that you assign to a user group determine the vCenter Operations Manager features that members of the user group can use. vCenter Operations Manager provides several predefined user groups. You can also create your own custom user groups.

Perform access rights-related tasks only when you are logged in as a user who has administrative privileges.

- Predefined User Groups on page 73

  vCenter Operations Manager includes several predefined user groups.

- Add a User Group on page 73

  If the predefined user groups do not meet your needs, you can create your own user groups.

- Configure Access Rights for a User Group on page 74

  To enable users to perform certain actions in vCenter Operations Manager, you must assign access rights to each user group. You define which menus users within a user group can access and the actions that the users can perform.

- Assign a User to a User Group on page 74

  You can assign any number of users to a user group, and each user can belong to any number of groups. You can create administrators in addition to the default admin user by assigning users to the Administrators group.

Predefined User Groups

vCenter Operations Manager includes several predefined user groups.

Table 6-1. Predefined User Groups

Group	Description
Administrators	Have full access to the system.
Operators	Can manage the environment, but cannot manage users and user groups or edit the password policy.
Users	Can view the environment, including the Environment Overview, Applications Overview, Alerts Overview, Cross-Silo Analysis, and Problem Fingerprint Library pages. Members of this group can also view the support **Status** tab and run performance, behavior, and anomaly correlation reports.

Add a User Group

If the predefined user groups do not meet your needs, you can create your own user groups.

Prerequisites

Become familiar with the predefined user groups. See "Predefined User Groups," on page 73.

Procedure

1 Select **Admin > Security**.

2 On the **User Management** tab, click the **Add New Group** icon in the Account Groups pane.

3 Type a name for the user group in the **Group name** text box.

4 (Optional) Type a description for the user group in the **Description** text box.

  The description can include information about the group, such as the purpose of the group's interaction with vCenter Operations Manager.

5 Click **OK** to save your configuration.

  The new user group appears in the Account Groups pane.

What to do next

Assign access rights to the user group. See "Configure Access Rights for a User Group," on page 74.

Configure Access Rights for a User Group

To enable users to perform certain actions in vCenter Operations Manager, you must assign access rights to each user group. You define which menus users within a user group can access and the actions that the users can perform.

Prerequisites

Add user groups to vCenter Operations Manager. See "Add a User Group," on page 73.

Procedure

1 Select **Admin > Security**.

2 On the **Access Rights** tab, select the user group under Account Groups.

3 In the Access Rights pane on the right, select the check box for each menu and menu option that group members can access.

The Access Rights pane contains an expandable list of access rights for actions that you can perform in the vCenter Operations Manager menus. The Administrative Access right provides access to the **Admin** menu. If the check box for an access right is deselected, group members cannot perform the associated action.

4 Click the **Save Changes** icon to save the access rights for the user group.

What to do next

Add users to the user group. See "Assign a User to a User Group," on page 74.

Assign a User to a User Group

You can assign any number of users to a user group, and each user can belong to any number of groups. You can create administrators in addition to the default admin user by assigning users to the Administrators group.

NOTE Only by the admin user can perform some vCenter Operations Manager features, such as querying the vCenter Operations Manager database.

Prerequisites

- Become familiar with the predefined user groups. See "Predefined User Groups," on page 73.
- If the predefined user groups do not meet your needs, create new user groups. See "Add a User Group," on page 73.

Procedure

1 Select **Admin > Security**.

2 On the **User Management** tab, select a user in the User Accounts pane.

You can press Ctrl+click to select multiple individual users or Shift+click to select a range of users.

3 Drag the user to the Account Groups pane and drop it into the user group.

Set Password Policies

You can configure the account lockout, password strength, and password change policy settings for vCenter Operations Manager user passwords.

NOTE vCenter Operations Manager sessions time out after 30 minutes of inactivity and require users to log in again. You cannot change this timeout value.

Procedure

1 Select **Admin > Security**.

2 Select the **Password Policy** tab.

3 In the Account Lockout Policy group, configure the account lockout settings.

Option	Description
Active	Locks users out of vCenter Operations Manager after the number of failed login attempts specified in **Allowed Login Attempts**.
Allowed Login Attempts	The number of login attempts that a user can attempt before being locked out of vCenter Operations Manager.

4 In the Password Strength Policy group, configure the password strength policy settings.

Option	Description
Active	Select this check box to set password strength requirements.
Password Min Length	The minimum number of characters that a password can contain.
Password Must Have Letters and Numbers	Select this check box to require passwords to contain at least one letter and at least one number.
Password Must Not Equal To User	Select this check box to prevent users from using their user name as their password.

5 In the Password Change Policy group, configure the password change policy settings.

Option	Description
Active	Forces users to change their passwords after the number of days specified in **Password Expiration Period**.
Password Expiration Period (days)	Number of days before users are forced to change their passwords.
Password Prior Expiration Warn Period (days)	Number of days before a password expires that users are warned that their passwords are about to expire.

6 Click the **Save Policy** icon to save your configuration.

Maintaining Users and User Groups

To maintain users and user groups in vCenter Operations Manager, you might need to add, remove, or edit user accounts and user groups.

Edit a User Account

When you edit a user account, you can change user and password information. You can also activate, deactivate, lock out, or unlock a user account.

If you imported a user from LDAP, you cannot change user name or password-related information, but you can edit other user information.

Procedure

1 Select **Admin > Security**.

2 On the **User Management** tab, select the user and click the **Edit Selected User Account** icon.

3 Type different values in the appropriate text boxes to modify the user's first and last name, user name, password, email address, or description.

4 Change the user account options to modify the behavior of the user account.

Option	Action
Enable or disable the user account	Select or deselect the **Is Enabled** check box. When a user account is disabled, it becomes inactive and the user cannot log in to vCenter Operations Manager.
Lock or unlock the user account	Select or deselect the **Is Locked** check box. When a user account is locked, the user cannot use vCenter Operations Manager.
Change the password change policy	Select or deselect the **Change Pswd At Next Login** check box.

5 Click **OK** to save your changes.

Remove a User Account

You can remove a user account from vCenter Operations Manager.

Procedure

1 Select **Admin > Security**.

2 On the **User Management** tab, select the user account in the User Accounts pane and click the **Remove Selected User Account** icon.

3 Click **Yes** in the confirmation window to delete the user account.

Edit a User Group

When you edit a user group, you can change its name and description.

Procedure

1 Select **Admin > Security**.

2 On the **User Management** tab, select the user group in the Account Groups pane and click the **Edit Selected Group** icon.

3 Modify the user group information.

You can change the user group name and description.

4 Click **OK** to save your changes.

Remove a User Group

If you do not need a user group, you can remove it.

Procedure

1 Select **Admin > Security**.

2 On the **User Management** tab, select the user group in the Account Groups pane and click the **Remove Selected Group** icon.

3 Click **Yes** in the confirmation window to remove the user group.

Run the User Audit Report

The User Audit report shows information about the users, groups, and access rights configuration of a vCenter Operations Manager system. For each user, it shows the groups that the user belongs to and the access rights that are granted to each group. The access rights are arranged by group.

Procedure

1 Select **Admin > User Audit Report**.

2 Select the report format from the **Report type** drop-down menu.

3 Click **Submit**.

The User Audit Report window appears.

Configuring Alert Notifications 7

vCenter Operations Manager generates an anomaly when a metric violates its threshold. If vCenter Operations Manager determines that the current combination of anomalies indicates a real problem, it generates an alert. An alert is a notification to inform you of an abnormal condition that might require attention.

Alerts appear in the vCenter Operations Manager user interface on the Alerts Overview page, in the alert watch list, and in the Alerts widget. If a vCenter Operations Manager administrator sets up the alert notification feature, users can find out about alerts even when they are not using vCenter Operations Manager.

This chapter includes the following topics:

- "Configuring and Modifying Alert Handler Instances," on page 79
- "Configuring Email Alert Notifications," on page 83
- "Modifying Email Alert Notifications," on page 93
- "Configuring Mulitilevel Alert Rules," on page 97
- "Configuring Hint Text for Alerts," on page 99
- "Configure Alerts for vCenter Server Events," on page 103
- "Retrieve Keys from the vCenter Operations Manager Database," on page 103

Configuring and Modifying Alert Handler Instances

An alert handler sends alert notifications. You can configure alert handler instances to send alert notifications as email messages or SNMP traps, or to save alert notifications in a log file. If you use EMC Smarts, you can configure an alert handler instance to send notifications to the SAMS Global Console. You can create an unlimited number of alert handler instances.

An alert handler instance sends alert notifications for all new, updated, and canceled alerts. If an attempt to send an alert notification fails, the handler continually retries the notification. After five minutes, if all alert notification attempts fail, the handler generates an administrative system alert and continues to retry the notification until it succeeds.

- Add or Edit an Email Alert Handler Instance on page 80

  To send alert notifications to users in email messages, you must create an alert handler that sends alert notifications to an email filter.

- Add or Edit an SNMP Trap Alert Handler Instance on page 81

  An SNMP trap alert handler instance sends all alerts, of all types, as SNMP traps to a destination host that you specify. Any filtering, by alert type or any other critieria, must be done on the destination host.

- Add or Edit a Log File Alert Handler Instance on page 81

  A log file alert handler instance saves alert nominations to a log file on the vCenter Operations Manager server.

- Add or Edit an EMC Smarts Alert Handler Instance on page 82

  If you use vCenter Operations Manager with EMC Smarts, you can configure an alert handler instance to send alerts directly to the EMC Smarts SAM Global Console.

- Start or Stop an Alert Handler Instance on page 83

  You can start and stop alert handler instances from the vCenter Operations Manager user interface.

- Delete an Alert Handler Instance on page 83

  If you do not need an alert handler instance, you can delete it.

Add or Edit an Email Alert Handler Instance

To send alert notifications to users in email messages, you must create an alert handler that sends alert notifications to an email filter.

Prerequisites

Set up filtering rules, define email templates, and configure email alert notification settings. See "Configuring Email Alert Notifications," on page 83.

Procedure

1 Select **Admin > Configure Outbound Alert**.

2 Add or edit an email alert handler instance.

Option	Action
Add an email alert handler instance	a Click the **Add Alert Handler** icon. b Select **Email** from the **Outbound Alert Type** drop-down menu. c Type a name for the alert handler instance in the **Instance Name** text box.
Edit an email alert handler instance	Select the alert handler instance and click the **Edit Alert Handler** icon. You cannot change the outbound alert type.

3 Configure or modify the email alert handler settings.

Option	Description
SMTP_HOST	Type the IP address of the SMTP server. The SMTP server delivers email messages to the recipients of the alert notifications.
SMTP_PORT	Type the SMTP port number. The default value is 25.

4 Click **Test** to test the filter.

vCenter Operations Manager verifies that the SMTP host and port you specified are valid and checks the syntax and data of the `emailFilter.xml` file.

5 Click **OK** to save your configuration.

vCenter Operations Manager starts the alert handler instance.

Add or Edit an SNMP Trap Alert Handler Instance

An SNMP trap alert handler instance sends all alerts, of all types, as SNMP traps to a destination host that you specify. Any filtering, by alert type or any other critieria, must be done on the destination host.

The MIB file *vcenter-ops*`\user\plugins\outbound\snmp_alertplugin\mibs\VMWARE-VCOPS-EVENT-MIB.mib` contains the information that you need to enable the receiving party to interpret the traps.

Procedure

1 Select **Admin > Configure Outbound Alert**.

2 Add or edit an SNMP trap alert handler instance.

Option	Action
Add an SNMP trap alert handler instance	a Click the **Add Alert Handler** icon. b Select **SNMP Trap** from the **Outbound Alert Type** drop-down menu. c Type a name for the alert handler instance in the **Instance Name** text box.
Edit an SNMP trap alert handler instance	Select the alert handler and click the **Edit Alert Handler** icon. You cannot change the outbound alert type.

3 Configure or modify the alert handler settings.

Option	Action
Instance Name	Type a name for the alert handler instance.
destination_host	Type the IP address of the SNMP trap receiving host.
port	Type the port number to use. The default port number for SNMP traps is 162.
community	Type the community name of the SNMP trap receiver. The default is public.

4 Click **Test** to send a test trap with test data to the configured destination.

If the attempt fails, vCenter Operations Manager generates an error message.

5 Click **OK** to save your configuration.

vCenter Operations Manager starts the alert handler instance.

Add or Edit a Log File Alert Handler Instance

A log file alert handler instance saves alert nominations to a log file on the vCenter Operations Manager server.

Procedure

1 Select **Admin > Configure Outbound Alert**.

2 Add or edit a log file alert handler instance.

Option	Action
Add a log file alert handler instance	a Click the **Add Alert Handler** icon. b Select **Log File** from the **Outbound Alert Type** drop-down menu. c Type a name for the alert handler instance in the **Instance Name** text box.
Edit a log file alert handler instance	Select the alert handler instance and click the **Edit Alert Handler** icon. You cannot change the outbound alert type.

3 Configure or modify the alert handler settings.

Option	Action
Instance Name	Type a name for the alert handler instance.
Alert Output Folder	Type the log file path. The path must be on the vCenter Operations Manager Server. The complete path must be no longer than 50 characters. If the path is too long, vCenter Operations Manager cannot update the alert instance.

4 Click **OK** to save your configuration.

NOTE You cannot use the **Test** button to test a log file alert handler instance.

vCenter Operations Manager starts the alert handler instance.

Add or Edit an EMC Smarts Alert Handler Instance

If you use vCenter Operations Manager with EMC Smarts, you can configure an alert handler instance to send alerts directly to the EMC Smarts SAM Global Console.

When you use an EMC Smarts alert handler, EMC Smarts users can see vCenter Operations Manager alert information and can open vCenter Operations Manager to see alert details from their EMC Smarts display.

Prerequisites

Obtain the broker name, SAM server name, and user name and password for your EMC Smarts configuration. See the *Integration Guide for VMware vCenter Operations Manager and EMC Smarts*.

Procedure

1 Select **Admin > Configure Outbound Alert**.

2 Add or edit an EMC Smarts alert handler instance.

Option	Action
Add an EMC Smarts alert handler instance	a Click the **Add Alert Handler** icon. b Select **Email** from the **Outbound Alert Type** drop-down menu. c Type a name for the alert handler instance in the **Instance Name** text box.
Edit an EMC Smarts alert handler instance	Select the alert handler instance and click the **Edit Alert Handler** icon. When you edit an alert handler instance, you cannot change the outbound alert type.

3 Configure the alert handler settings.

Option	Action
Instance Name	Type a name for the alert handler instance.
Broker	Type the broker name, SAM server name, and user credentials for your Smarts configuration.
SAM Server	Type the name of the SAM server.
User Name	Type the user name.
Password	Type the password.

4 Click **Test** to test the alert handler instance.

vCenter Operations Manager verifies that all required fields contain values and tries to connect to EMC Smarts.

5 Click **OK** to save your configuration.

vCenter Operations Manager starts the alert handler instance.

Start or Stop an Alert Handler Instance

You can start and stop alert handler instances from the vCenter Operations Manager user interface.

NOTE When you create an alert handler instance, vCenter Operations Manager starts it for you.

Procedure

1 Select **Admin > Configure Outbound Alert**.

2 Select the alert handler instance.

Option	Action
Start the alert handler instance	Click the **Start** button on the toolbar at the top of the page. The Alert Handler Status column shows **Started** when the instance is activated.
Stop the alert handler instance	Click the **Stop** button on the toolbar at the top of the page. The Alert Handler Status column shows **Stopped** when the instance is deactivated.

Delete an Alert Handler Instance

If you do not need an alert handler instance, you can delete it.

Procedure

1 Select **Admin > Configure Outbound Alert**.

2 Select the alert handler instance and click the **Delete Alert Handler** icon.

3 Click **Yes** to confirm the deletion.

Configuring Email Alert Notifications

Configuring email alert notifications involves adding filtering rules, defining email templates, and configuring email alert notification settings.

A filtering rule is a set of conditions and email addresses. The vCenter Operations Manager email plug-in uses filtering rules to send email alert notifications to the proper users based on the affected application, resource kind, alert level, and other criteria.

An email template definition specifies which email template file to use for a given alert type, subtype, and status. An email template file defines the body text of an email alert notification.

vCenter Operations Manager provides several default email template files. You can also create your own custom email template files. In general, you use the default email template files for most notifications and create custom email template files for users that require different information in their notifications. You can create custom email template files before or after you configure email template definitions.

You typically have more email template file definitions than email template files. Most email template definitions point to the same email template file, even though they are for different combinations of alert types and recipients.

emailFilter.xml File

`emailFilter.xml` is an XML file that defines the filtering rules and template files to use for email alert notifications. The file also contains general settings that apply to all email alert notifications.

IMPORTANT Do not edit `emailFilter.xml` directly unless you are familiar with XML structure and syntax. A formatting mistake might prevent email alert notifications from working. If you edit `emailFilter.xml` directly, make a backup copy of the file before you change it.

After you edit the `emailFilter.xml` file, you must restart the email filter plug-in instance in vCenter Operations Manager to make your changes take effect.

Sample emailFilter.xml File

This sample `emailFilter.xml` file shows the entire content of `emailFilter.xml` contained within the <EmailFilter> and </EmailFilter> tags. None of the entries are case-sensitive.

```
<EmailFilter >
  <Templates>
    <Template alert_type="Administrative" alert_subtype="Environment"
      status="New">New-Administrative-Environment.html</Template>
    <Template alert_type="Administrative" alert_subtype="Environment"
      status="Cancel">Cancel-Administrative-Environment.html</Template>
    <Template alert_type="Administrative" alert_subtype="System"
      status="New">New-Administrative-System.html</Template>
    <Template alert_type="Administrative" alert_subtype="System"
      status="Cancel">Cancel-Administrative-System.html</Template>
...
  </Templates>

<SendFromEmail>name1@example.com</SendFromEmail>

  <FilterRule name="WebTierAlerts">
    <Conditions>
      <condition type="Application">Online Trading</condition>
      <condition type="Tier">Online Trading:Web</condition>
      <condition type="Tier">Online Trading:Web</condition>
      <condition type="Level">Critical</condition>
    </Conditions>
    <Addresses>
      <sendTo type="email">name2@example.com</sendTo>
      <sendTo type="sms">9495554444@vtext.com </sendTo>
    </Addresses>
  </FilterRule>
  <FilterRule name="ResourceKindAlerts">
    <Conditions>
      <condition type="ResourceKind">OPEN_API:DEMO</condition>
      <condition type="Status">New</condition>
      <condition type="Tag">Location:NewYork</condition>
    </Conditions>
    <Addresses>
      <sendTo type="email">name3@example.com</sendTo>
```

```
      <sendTo type="sms">9495551212@vtext.com</sendTo>
    </Addresses>
  </FilterRule>
</EmailFilter>
```

<Templates> Element

The first part of the `emailFilter.xml` file is a <Templates> element, which contains a series of <Template> elements. Each element specifies the template file to use for alert email messages of a particular type, subtype, and status. You can use the following types of template files.

Default templates — Default template files, which are included with vCenter Operations Manager, are designed to use with an alert type, subtype, and status if a custom file is not specified for the recipient. `emailFilter.xml` includes a <template> element for each default template. Do not change these elements. To change the messages sent to all users for a particular alert type, modify the default message template.

Custom templates — Custom template files are unique to your installation and are designed for particular users. The <template> element for a custom template includes a <sendTo> attribute that specifies the recipient.

The following sample element is a default template.

```
<Template alert_type="ADMINISTRATIVE" alert_subtype="ENVIRONMENT" status="NEW">
New-Administrative-Environment.html</Template>
```

The following sample element is a custom template.

```
<Template sendTo="abc@example.com" alert_type="ADMINISTRATIVE" alert_subtype="ENVIRONMENT"
status="NEW">abc-New-Administrative-Environment.html</Template>
```

Table 7-1. <template> Element Attributes

Attribute	Description and Values
alert_type	Alert type. Valid values are as follows: ■ RESOURCE ■ TIER ■ APPLICATION ■ FINGERPRINT_PREDICTION ■ FINGERPRINT_GENERATION ■ SMART ■ CLASSIC ■ ADMINISTRATIVE ■ HEALTH ■ RISK ■ EFFICIENCY
alert_subtype	Alert subtype. Valid values for SMART alerts are as follows: ■ EARLYWARNING ■ KPI_BREACH ■ KPI_PREDICTION Valid values for CLASSIC alerts are as follows: ■ KPI_HT_BREACH ■ NOTIFICATION ■ ABNORMALITY Valid values for ADMINISTRATIVE alerts are as follows: ■ SYSTEM ■ ENVIRONMENT Valid values for HEALTH alerts are as follows: ■ WORKLOAD ■ ANOMALY ■ FAULT Valid values for RISK alerts are as follows: ■ TIME ■ CAPACITY ■ STRESS ■ COMPLIANCE Valid values for EFFICIENCY alerts are as follows: ■ WASTE ■ DENSITY
status	Change in alert condition that generated the notification. Valid values are NEW, UPDATE, and CANCEL.
sendTo	Email address of the intended recipient. This attribute is used only with custom templates.

The content of the <template> element is the file name of the template file.

Elements for General Settings

Email alert notifications use general settings.

Table 7-2. Elements for General Options

Element	Description
<SendFromEmail>	(Optional) Sets the address to use as the from address for all email alert notifications. If you do not include this element, vCenter Operations Manager sends messages from the default email sender address in the *vcenter-ops*\user\conf\email.properties configuration file.

<FilterRule> Element

The rest of the `emailFilter.xml` file contains one or more <FilterRule> elements. Each <FilterRule> element defines a set of conditions for an alert and one or more email addresses to which to send notifications for all alerts that meet those conditions. <FilterRule> should have a name attribute. The name attribute can be any text that describes the filter rule.

Each <FilterRule> has one or more conditions, which are contained in a <Conditions> tag. Each <condition> element includes a type setting and a value to match. In the sample file, the following conditions are used in the first rule:

```
<Conditions>
  <condition type="Application">Online Trading</condition>
  <condition type="Tier">Online Trading:Web</condition>
  <condition type=Level">Critical</condition>
</Conditions>
```

In this example, the rule contains three conditions. The first condition is of type Application and it checks for the value Online Trading. The type setting defines the type of data to check for the matching value to determine if the condition is met.

Table 7-3. Valid Type Settings

Type	Description
AlertType	Type of alert. For a list of alert types, see Table 7-1. For example: `<condition type="AlertType">ADMINISTRATIVE</condition>`
AlertSubType	Subtype of the alert. For the subtypes that you can use with each alert type, see Table 7-1. For example: `<condition type="AlertSubType">ENVIRONMENT</condition>`
Application	Name of a vCenter Operations Manager application. The condition matches if the alert is for any resource in the application. For example: `<condition type="Application">OnlineTrading</condition>`
Collector	Unique name of a vCenter Operations Manager collector. For example: `<condition type="Collector">vCenter Operations Collector</condition>`
Level	Minimum alert criticality level. Alerts of this level or above match this condition. Valid types are NONE, INFO, WARNING, IMMEDIATE, and CRITICAL. For example: `<condition type="Level">immediate</condition>`
ResourceKind	Name of a resource kind in the format AdapterKind:ResourceKind. For example: `<condition type="ResourceKind">OPEN_API:DEMO</condition>`
RootCauseTier	Tier in an application. It is a match if one of the root causes of the alert is on the tier. You must include the application name and the tier name in the format Application:Tier. For example: `<condition type="RootCauseTier">Online Trading:Network</condition>`
State	State of the alert. Valid values are OPEN, ASSIGNED, SUSPENDED, and SUPPRESSED. For example: `<condition type="State">Open</condition>`

Table 7-3. Valid Type Settings (Continued)

Type	Description
Status	Status of the alert. Valid values are ACTIVE, NEW, or CANCEL. For example: `<condition type="Status">Cancel</condition>`
Tag	Tag name and value pair in the format TagName:TagValue. For example: `<condition type="Tag">Geo Location:Chicago</condition>`
Tier	Tier within an application. You must include the application name and the tier name in the format Application:Tier. The condition matches if the alert is for any resource in the tier. For example: `<condition type="Tier">Online Trading:Network</condition>`

If the filter contains multiple conditions, an alert must meet all of the conditions to be considered a match for the filter.

Following the conditions, each rule contains an <Addresses> element that contains one or more <sendto> subelements, each of which specifies a single email address, the type of message to send, and a delay time and resend time. The delay time and resend time are optional.

type Specifies the type of message to send, which is either email or sms. sms sends the full alert message and sms sends only header information. The address is the email address to which to send the notification.

resend Sets the repeat interval for the notification. For example, if the resend interval is set to 60, vCenter Operations Manager sends a notification to the address every hour for as long as the alert condition is met.

delay Interval between when an alert that meets the conditions of the filtering rule occurs and when vCenter Operations Manager sends the first message to the address. For example, you might want to delay the message if the recipient should be notified only if the condition is not corrected within a specified time period.

For example, the following element sends a notification to the email address name3@example.com.

```
<sendTo type="email" delay="120" resend="60">name3@example.com</sendTo>
```

In this example, the first message is sent two hours after the alert condition occurs and the message repeats every hour until the condition is resolved.

You can enter as many <FilterRule> elements as necessary to filter alert notifications and send each notification to the correct members of your organization. If an alert matches the conditions for more than one filter, it is sent to the address for each condition that it matches.

Email Template File Format

An email template file can be in text (`.txt`) or HTML (`.html`) format. The default email template files are HTML files.

Formatting Rules

Email template files must follow specific formatting rules.

- If you create an email template in HTML format, it must contain standard HTML formatting tags.
- An email template file can contain a single line for the message subject and any amount of text for the message body.
- The subject line in an email template file must start with `$$Subject=`. The text that follows the equals sign is the message subject. If you do not include a subject line, the message uses a default subject.

- You must store custom email template files in the *vcenter-ops*\user\plugins\outbound\filter_alertplugin\conf\custom_templates directory.

Placeholders

All email template files can include placeholders, which are replaced with information from the alert. A placeholder can be a replaced by a single value, such as an alert type, or it can represent multiple values, such as the health of the parent or child resources. Placeholders must be enclosed in double braces ({{}}). The subject line can contain only single-value placeholders.

Table 7-4. Placeholders

Single-Value Placeholders	Multiple-Value Placeholders
{{AlertId}}	{{KPIFiring}}
{{AlertStatus}}	{{Anomalies}}
{{AlertType}}	{{ChildrenHealth}}
{{AlertSubType}}	{{ParentsHealth}}
{{AlertCriticality}}	{{AlertRootCause}}
{{AffectedResourceName}}	{{AlertRootCauseDetails}}
{{AffectedResourceKind}}	{{AlertTrigger}}
{{AlertGenerateTime}}	
{{AlertUpdateTime}}	
{{AlertCancelTime}}	
{{AlertMessage}}	
{{AlertOwner}}	
{{AlertSummaryLink}}	
{{AlertDetailLink}}	
{{vcopsServerName}}	
{{FilterRuleName}}	
{{ConsolidatedAffectedResourcesCount}}	
{{ConsolidatedAffectedResourcesAddedCount}}	
{{ConsolidatedAffectedResourcesRemovedCount}}	
{{ConsolidatedAffectedResourcesCountChange}}	
{{ConsolidatedAffectedResourcesList}}	
{{AlertHints}}	

Add a Filtering Rule

A filtering rule is a set of conditions and email addresses. The vCenter Operations Manager email plug-in uses filtering rules to send email alert notifications to the proper users based on the affected application, resource kind, alert level, and other criteria.

You define filtering rules in the `emailFilter.xml` file, which is in the `vcenter-ops\user\plugins\outbound\filter_alertplugin\conf` directory.

If you are using the vCenter Operations Manager vApp, edit the `emailFilter.xml` file on the second virtual machine.

For vCenter Operations Manager Standalone, you can edit `emailFilter.xml` directly or you can use the Configuration File editor. This procedure describes how to use the Configuration File editor.

For the vCenter Operations Manager vApp, you must edit `emailFilter.xml` directly. You cannot use the Configuration File editor with the vCenter Operations Manager vApp. For descriptions of the XML elements in `emailFilter.xml`, see "emailFilter.xml File," on page 84.

Procedure

1 To start the Configuration File editor, use any standard Windows method to run the file `FilterPluginConfEditor.jar`.

`FilterPluginConfEditor.jar` is in the *vcenter-ops*`\user\plugins\outbound\filter_alertplugin\conf` directory.

2 Select **Actions > Open** to open `emailFilter.xml` or another XML file, or select **Actions > New** to create a new XML file.

To review your changes before they take effect, you can create and modify other XML files.

3 Click the **Add** icon near the top right of the window to add a filtering rule.

4 Type a name for the filtering rule in the **Rule name** text box.

5 Click the **Add** icon near the top center of the window.

6 Select the condition type and condition value and click **OK**.

An alert must meet all of the conditions that you enter to be considered a match for the filter. You can add any number of conditions for a filtering rule.

7 Click the **Add** icon near the top right of the window.

You can add any number of addresses for a filtering rule.

a From the **Address type** drop-down menu, select **email** to send the message subject and text, or select **SMS** to send only the message subject to the email address.

b Type the destination email address in the **Address value** text box.

c (Optional) If the email address should receive messages at intervals while the alert condition remains in effect, type a value in the **Resend value** text box.

For example, type 60 to send an alert notification email message every hour as long as the alert condition is met.

d (Optional) To specify a delay between the time an alert meets the conditions of the filtering rule and when vCenter Operations Manager sends the first message to the email address, type a value in the **Delay value** text box.

For example, you might want to delay sending the message if the recipient should be notified only if the condition is not corrected within a specific period of time.

e Click **OK**.

8 Click **OK** to close the Filtering Rule window.

9 Save your changes.

Option	Action
Save your changes to the currently open file	Select **Actions > Save**.
Save your changes to a different file	Select **Actions > Save As**. The plug-in only reads `emailFilter.xml`.

10 Select **Actions > Close** to close the Configuration File editor.

11 To make your changes take effect, restart the email filter plug-in.

a In vCenter Operations Manager, select **Admin > Configure Outbound Alert**.

b Select the email filter plug-in instance and click the **Stop** icon.

c Select the email filter plug-in instance and click the **Start** icon.

Add an Email Template Definition

An email template definition specifies which email template file to use for a given alert type, subtype, and status. An email template file defines the body text of an email alert notification.

You configure email template definitions in the `emailFilter.xml` file, which is located in the *vcenter-ops*`\user\plugins\outbound\filter_alertplugin\conf` directory.

If you are using the vCenter Operations Manager vApp, edit the `emailFilter.xml` file on the second virtual machine.

For vCenter Operations Manager Standalone, you can edit `emailFilter.xml` directly or you can use the Configuration File editor. This procedure describes how to use the Configuration File editor.

For the vCenter Operations Manager vApp, you must edit `emailFilter.xml` directly. You cannot use the Configuration File editor with the vCenter Operations Manager vApp. For descriptions of the XML elements in `emailFilter.xml`, see "emailFilter.xml File," on page 84.

vCenter Operations Manager provides several default email template files in the *vcenter-ops*`\user\plugins\outbound\filter_alertplugin\conf\default_templates` directory. If the default template files do not meet your needs, you can create custom template files. For formatting requirements, see "Email Template File Format," on page 88. You can create custom email template files before or after you configure email template definitions.

Procedure

1 To start the Configuration File editor, use any standard Windows method to run the file `FilterPluginConfEditor.jar`.

`FilterPluginConfEditor.jar` is in the *vcenter-ops*`\user\plugins\outbound\filter_alertplugin\conf` directory.

2 Select **Actions > Open** to open `emailFilter.xml` or another XML file, or select **Actions > New** to create an XML file.

To review your changes before they take effect, you can create or modify other XML files.

3 Click the **Add** icon near the top center of the window.

4 Define the alerts for which the template definition should be used.

Option	Action
Alert Type	Select the alert type.
Alert Sub-type	Select the alert subtype.
Status	Select the change in alert condition that generates the notification. **Active** indicates that the existing alert was updated.

5 (Optional) To use the template definition for email alert notifications sent to a specific email address, type the email address in the **Send to** text box.

This setting is an additional condition for the use of the template.

6 In the **Template** text box, type the name of the email template file to use for the email alert notifications that meet the conditions in the template definition.

The email template file does not have to exist. You can define the template and create the actual email template file later.

7 Click **OK** to close the Email Template window.

8 Save your changes.

Option	Action
Save your changes to the currently open file	Select **Actions > Save**.
Save your changes to a different file	Select **Actions > Save As**. The plug-in only reads the `emailFilter.xml`.

9 Click **Actions > Close** to close the Configuration File Editor.

10 To make your changes take effect, restart the email filter plug-in.

a In vCenter Operations Manager, select **Admin > Configure Outbound Alert**.

b Select the email filter plug-in instance and click the **Stop** icon.

c Select the email filter plug-in instance and click the **Start** icon.

Configure General Settings for Email Alert Notifications

You can configure the subject for generic email messages, the email address from which alert notification email messages are sent, and the number of minutes that vCenter Operations Manager waits before checking the `emailFilter.xml` file for changes. These settings apply to all email alert notification messages.

You configure general settings for email alert notifications in the `emailFilter.xml` file, which is located in the *`vcenter-ops`*`\user\plugins\outbound\filter_alertplugin\conf` directory.

If you are using the vCenter Operations Manager vApp, edit the `emailFilter.xml` file on the second virtual machine.

For vCenter Operations Manager Standalone, you can edit `emailFilter.xml` directly or you can use the Configuration File editor. This procedure describes how to use the Configuration File editor.

For the vCenter Operations Manager vApp, you must edit `emailFilter.xml` directly. You cannot use the Configuration File editor with the vCenter Operations Manager vApp. For descriptions of the XML elements in `emailFilter.xml`, see "emailFilter.xml File," on page 84.

Procedure

1 To start the Configuration File editor, use any standard Windows method to run the file `FilterPluginConfEditor.jar`.

`FilterPluginConfEditor.jar` is in the *`vcenter-ops`*`\user\plugins\outbound\filter_alertplugin\conf` directory.

2 In the **Subject** text box, type the subject line to use for generic messages.

If vCenter Operations Manager cannot find a valid email template to use to send a particular alert message, it sends a generic message to the defined recipient.

3 In the **Email sender** text box, type the email address from which to send alert notification email messages.

NOTE Do not type a value in the **File reload time (minutes)** text box. The file reload feature is obsolete.

4 Select **Actions > Save** to save your changes to the currently open file, or select **Actions > Save As** to save your changes to a different file.

   The plug-in only reads the `emailFilter.xml` file.

5 Select **Actions > Close** to close the Configuration File editor.

6 To make your changes take effect, restart the email filter plug-in.

   a In vCenter Operations Manager, select **Admin > Configure Outbound Alert**.

   b Select the email filter plug-in instance and click the **Stop** icon.

   c Select the email filter plug-in instance and click the **Start** icon.

Modifying Email Alert Notifications

You can edit and delete filtering rules and email template definitions.

Edit a Filtering Rule

When you edit a filtering rule, you can modify the condition type, condition value, and email address values for specific conditions.

You define filtering rules in the `emailFilter.xml` file, which is in the `vcenter-ops\user\plugins\outbound\filter_alertplugin\conf` directory.

If you are using the vCenter Operations Manager vApp, edit the `emailFilter.xml` file on the second virtual machine.

For vCenter Operations Manager Standalone, you can edit `emailFilter.xml` directly or you can use the Configuration File editor. This procedure describes how to use the Configuration File editor.

For the vCenter Operations Manager vApp, you must edit `emailFilter.xml` directly. You cannot use the Configuration File editor with the vCenter Operations Manager vApp. For descriptions of the XML elements in `emailFilter.xml`, see "emailFilter.xml File," on page 84.

Procedure

1 To start the Configuration File editor, use any standard Windows method to run the file `FilterPluginConfEditor.jar`.

   `FilterPluginConfEditor.jar` is in the *`vcenter-ops`*`\user\plugins\outbound\filter_alertplugin\conf` directory.

2 Select **Actions > Open** to open `emailFilter.xml` or another XML file, or select **Actions > New** to create a new XML file.

   To review your changes before they take effect, you can create and modify other XML files.

3 Select the filtering rule from the list on the right.

4 Click the **Edit** icon near the top right of the window.

   The list on the left shows the existing conditions for the filtering rule. The list on the right shows where to send alert notifications if they meet the conditions for the rule.

5 To edit a condition, select the condition and click the **Edit** icon.

   You can change the condition type or condition value.

6 To edit an email address for a condition, select the address and click the **Edit** icon.

Option	Description
Address type	Select **email** to send both the message subject and text, or **SMS** to send only the message subject to the email address.
Address value	Type the destination email address.
Resend value	(Optional) If the email address should receive messages at intervals while the alert condition remains in effect, type a value in the Resend value text box. For example, type 60 to send an alert notification email message every hour as long as the alert condition is met.
Delay value	(Optional) To specify a delay between the time an alert meets the conditions of the filtering rule and when vCenter Operations Manager sends the first message to the email address, type a value in the Delay value text box. For example, you might want to delay sending the message if the recipient should be notified only if the condition is not corrected within a specific period of time.

7 Save your changes.

Option	Action
Save your changes to the currently open file	Select **Actions > Save**.
Save your changes to a different file	Select **Actions > Save As**. The plug-in only reads `emailFilter.xml`.

8 Select **Actions > Close** to close the Configuration File editor.

9 To make your changes take effect, restart the email filter plug-in.

a In vCenter Operations Manager, select **Admin > Configure Outbound Alert**.

b Select the email filter plug-in instance and click the **Stop** icon.

c Select the email filter plug-in instance and click the **Start** icon.

Delete a Filtering Rule

If you do not need a filtering rule, you can delete it.

You define filtering rules in the `emailFilter.xml` file, which is in the `vcenter-ops\user\plugins\outbound\filter_alertplugin\conf` directory.

If you are using the vCenter Operations Manager vApp, edit the `emailFilter.xml` file on the second virtual machine.

For vCenter Operations Manager Standalone, you can edit `emailFilter.xml` directly or you can use the Configuration File editor. This procedure describes how to use the Configuration File editor.

For the vCenter Operations Manager vApp, you must edit `emailFilter.xml` directly. You cannot use the Configuration File editor with the vCenter Operations Manager vApp. For descriptions of the XML elements in `emailFilter.xml`, see "emailFilter.xml File," on page 84.

Procedure

1 To start the Configuration File editor, use any standard Windows method to run the file `FilterPluginConfEditor.jar`.

`FilterPluginConfEditor.jar` is in the *`vcenter-ops`*`\user\plugins\outbound\filter_alertplugin\conf` directory.

2 Select **Actions > Open** and open `emailFilter.xml`.

3 Select the filtering rule from the list on the right.

4 Click the **Delete** icon.

5 Select **Actions > Save** to save your changes to `emailFilter.xml`.

6 Select **Actions > Close** to close the Configuration File editor.

7 To make your changes take effect, restart the email filter plug-in.

   a In vCenter Operations Manager, select **Admin > Configure Outbound Alert**.

   b Select the email filter plug-in instance and click the **Stop** icon.

   c Select the email filter plug-in instance and click the **Start** icon.

Edit an Email Template Definition

When you edit an email template definition, you can change the alerts and email address for which the template is used and specify a different email template file.

You configure email template definitions in the `emailFilter.xml` file, which is located in the *`vcenter-ops`*`\user\plugins\outbound\filter_alertplugin\conf` directory.

If you are using the vCenter Operations Manager vApp, edit the `emailFilter.xml` file on the second virtual machine.

For vCenter Operations Manager Standalone, you can edit `emailFilter.xml` directly or you can use the Configuration File editor. This procedure describes how to use the Configuration File editor.

For the vCenter Operations Manager vApp, you must edit `emailFilter.xml` directly. You cannot use the Configuration File editor with the vCenter Operations Manager vApp. For descriptions of the XML elements in `emailFilter.xml`, see "emailFilter.xml File," on page 84.

vCenter Operations Manager provides several default email template files in the *`vcenter-ops`*`\user\plugins\outbound\filter_alertplugin\conf\default_templates` directory. If the default template files do not meet your needs, you can create custom template files. For formatting requirements, see "Email Template File Format," on page 88. You can create custom email template files before or after you edit email template definitions.

Procedure

1 To start the Configuration File editor, use any standard Windows method to run the file `FilterPluginConfEditor.jar`.

   `FilterPluginConfEditor.jar` is in the *`vcenter-ops`*`\user\plugins\outbound\filter_alertplugin\conf` directory.

2 Select **Actions > Open** to open `emailFilter.xml` or another XML file, or select **Actions > New** to create an XML file.

   To review your changes before they take effect, you can create or modify other XML files.

3 Select the template definition in the list on the left.

4 Click the **Edit** icon near the top center of the window.

5 To change the alerts for which the template is used, select a different option from the appropriate drop-down menu.

Option	Action
Alert Type	Select the alert type.
Alert Sub-type	Select the alert subtype.
Status	Select the change in alert condition that generates the notification. **Active** indicates that the existing alert was updated.

6 To change the email address for the template definition, type a different email address in the **Send to** text box.

The template definition is used for email alert notifications sent to this email address.

7 To change the email template file to use, type the name of a different template file in the **Template** text box.

The email template file does not have to exist. You can define the template and create the actual email template file later.

8 Click **OK** to close the Email Template window.

9 Save your changes.

Option	Action
Save your changes to the currently open file	Select **Actions > Save**.
Save your changes to a different file	Select **Actions > Save As**. The plug-in only reads the `emailFilter.xml`.

10 Click **Actions > Close** to close the Configuration File Editor.

11 To make your changes take effect, restart the email filter plug-in.

a In vCenter Operations Manager, select **Admin > Configure Outbound Alert**.

b Select the email filter plug-in instance and click the **Stop** icon.

c Select the email filter plug-in instance and click the **Start** icon.

Delete an Email Template Definition

If you do not need an email template definition, you can delete it.

You configure email template definitions in the `emailFilter.xml` file, which is located in the *vcenter-ops*`\user\plugins\outbound\filter_alertplugin\conf` directory.

If you are using the vCenter Operations Manager vApp, edit the `emailFilter.xml` file on the second virtual machine.

For vCenter Operations Manager Standalone, you can edit `emailFilter.xml` directly or you can use the Configuration File editor. This procedure describes how to use the Configuration File editor.

For the vCenter Operations Manager vApp, you must edit `emailFilter.xml` directly. You cannot use the Configuration File editor with the vCenter Operations Manager vApp. For descriptions of the XML elements in `emailFilter.xml`, see "emailFilter.xml File," on page 84 for descriptions of the XML elements in `emailFilter.xml`.

Procedure

1 To start the Configuration File editor, use any standard Windows method to run the file `FilterPluginConfEditor.jar`.

`FilterPluginConfEditor.jar` is in the *vcenter-ops*`\user\plugins\outbound\filter_alertplugin\conf` directory.

2 Select **Actions > Open** and open `emailFilter.xml`.

3 Select the email template definition from the list on the left.

4 Click the **Delete** icon.

5 Select **Actions > Save** to save your changes to `emailFilter.xml`.

6 Click **Actions > Close** to close the Configuration File Editor.

7 To make your changes take effect, restart the email filter plug-in.

   a In vCenter Operations Manager, select **Admin > Configure Outbound Alert**.

   b Select the email filter plug-in instance and click the **Stop** icon.

   c Select the email filter plug-in instance and click the **Start** icon.

Configuring Mulitilevel Alert Rules

You can configure complex alert rules that evaluate multiple conditions on related resources. For example, you can write a multilevel alert rule that generates an alert if the workload on a virtual machine exceeds A for B cycles, health is below C, and the host's CPU use is above the dynamic threshold.

Because the hard threshold conditions in multilevel alert rules do not generate additional alerts, the multilevel alert feature reduces the number of alerts and lets you focus only on important alerts.

Multilevel alert rules do not have a specific alert type in the vCenter Operations Manager user interface. The user interface shows a multilevel alert as KPI HT alerts, but the alert description identifies the alert as Multi Level Rule. Rule details and triggers appear in the Reason pane on the Alert Details page. Multilevel alerts are also visible as KP HT Breach in the mashup chart for the alert and the INFO field shows the rule details.

Multilevel Alert Rules XML File Format

The `multi-level-alert-rules.xml` file contains elements and attributes that define multilevel alert rules.

The following sample `multi-level-alert-rules.xml` file contains a multilevel alert rule that includes nested conditions and dynamic threholds.

```
<rules>
<rule tag="some text here" alert="VirtualMachine" attributeKey="System Attributes|health"
criticality="critical">
<cond operator="and">
<cond type="ht" operator="&lt;=" cancelCycles="5" waitCycles="3">
<token resourceKind="VirtualMachine" attributeKey="System Attributes|health" />
<value>100</value>
</cond>
<cond operator="and">
<cond type="ht" operator="&gt;" cancelCycles="5" waitCycles="3">
<token resourceKind="HostSystem" attributeKey="summary|workload" />
<value>0</value>
</cond>
<cond type="dt" operator="below">
<token resourceKind="VirtualMachine" attributeKey="cpu|usage_average" />
</cond>
</cond>
</cond>
</rule>
</rules>
```

<rule> Element

The <rule> element defines a multilevel alert rule. The <rule> element contains several attributes.

Table 7-5. <rule> Element Attributes

Attribute	Description
tag	Specifies a text string. vCenter Operations Manager adds this text to the information string of alerts that the rule triggers.
alert	Specifies the resource kind on which the alert is defined. vCenter Operations Manager checks all resources of the specified resource kind if the resource or its parents satisfy the rule. For example, the rule `VirtualMachine cpu_usage > 50 AND HostSystem cpu_usage 50` defines an alert on `VirtualMachine`.
attributeKey	The attribute key of an attribute. You can obtain attribute keys from the vCenter Operations Manager database. See "Retrieve Keys from the vCenter Operations Manager Database," on page 103.
criticality	Criticality level of the alert. Valid values are critical, immediate, info, none, and warning.

<cond> Element

The <rule> element can contain one or more <cond> elements. Each <cond> element defines a condition. You can nest <cond> elements.

The <cond> element contains several attributes.

Table 7-6. <cond> Element Attributes

Attribute	Description
operator	Arithmetic operator. Valid values are and and or. You can nest operators.
type	Threshold type. Valid values are ht for hard threshold and dt for dynamic threshold. Operators for ht are >, >=, <=, =, and !=. You must escape operators, for example, < is &lt. Operators for dt are above, below, and abnormal.

Add a Multilevel Alert Rule

To add a multilevel alert rule, you define a rule in the `multi-level-alert-rules.xml` file.

Leaving the `multi-level-alert-rules.xml` file empty disables the multilevel alert rule feature.

Prerequisites

Become familiar with the syntax of the `multi-level-alert-rules.xml` file. See "Multilevel Alert Rules XML File Format," on page 97.

Procedure

1 Open the `multi-level-alert-rules.xml` file in the *`vcenter-ops`*`\user\conf\analytics` directory.

   In a vApp installation, the `multi-level-alert-rules.xml` file is in the Analytics virtual machine.

2 Add the rule to the `multi-level-alert-rules.xml` file.

3 Save your changes and close the `multi-level-alert-rules.xml` file.

Your changes take effect the next time vCenter Operations Manager reads the `multi-level-alert-rules.xml` file. By default, vCenter Operations Manager reads the `multi-level-alert-rules.xml` every 30 minutes. You can change this interval by modifying the `multiLevelAlertRulesUpdateInterval` property in the *`vcenter-ops`*`\user\conf\analytics\advanced.properties` file.

Each time vCenter Operations Manager parses the `multi-level-alert-rules.xml` file, it cancels alerts that do not have corresponding rules.

Configuring Hint Text for Alerts

You can configure hint text for all types of alerts. Alert hint text can appear on the Alert Detail page in the Custom user interface or in email alert notifications.

You configure hint text that appears in the user interface in the `alert-hints.xml` file.

You use the `{{AlertHints}}` placeholder in an email template file to configure alert hint text for email alert notifications. For more information, see "Configuring Email Alert Notifications," on page 83.

Alert Hint Text XML File Format

The `alert-hints.xml` file contains elements and attributes that define alert hint text. An alert hint text definition is composed of a condition and alert hint text. For the hint text to appear in the user interface for an alert, the alert must meet the defined condition.

<condition> Element

The <condition> element defines the conditions that an alert must meet for the hint text to appear in the user interface for the alert. If an alert satisfies more than one condition, all of the associated hint text appears for the alert.

The <condition> element contains several attributes. None of the attributes are required.

Table 7-7. <condition> Element Attributes

Attribute	Description
attributeKey	Matches an attribute key associated with the alert. You can obtain attribute keys from the vCenter Operations Manager database. See "Retrieve Keys from the vCenter Operations Manager Database," on page 103 . NOTE Specify all metrics by attribute key, except for super metrics. Specify super metrics by name.
resourceKind	Matches the resource kind key associated with the alert.
minDuration	Duration of the alert, in minutes, must be greater than or equal to this value.
criticality	Matches the criticality level of the alert. Valid values are critical, immediate, info, none, and warning.
alertType	Matches the type of the alert. Valid values are as follows: ■ Resource Alerts ■ Tier Alerts ■ Business Service Alerts ■ Fingerprint Prediction Alerts ■ Fingerprint Generation Alerts ■ Notification Alerts ■ System Alerts ■ Smart Alerts ■ Classic Alerts ■ Administrative Alerts ■ Health Alerts ■ Risk Alerts ■ Efficiency Alerts ■ Consolidated Alerts

Table 7-7. <condition> Element Attributes (Continued)

Attribute	Description
alertSubtype	Matches the subtype of the alert. Valid values are as follows: ■ Smart Early Warning ■ Smart KPI Breach ■ Smart KPI Prediction ■ Classic KPI HT Breach ■ Classic Notification ■ Administrative System ■ Administrative Environment ■ Abnormality ■ Workload ■ Anomalies ■ Faults ■ Time Remaining ■ Capacity Remaining ■ Stress ■ Waste ■ Density
infoRegEx	Regular expression that matches the info of the alert.

Table 7-7. <condition> Element Attributes (Continued)

Attribute	Description
eventClass	Class of an event that is part of the alert. Valid values are as follows: ■ empty ■ dt ■ ht ■ failure ■ system ■ cusum ■ noise ■ prediction ■ environment ■ change ■ notification ■ fault ■ multilevel ht For this attribute to be evaluated, you must also specify attributeKey. vCenter Operations Manager checks only events that have a matching attributeKey value.
eventSubclass	Subclass of an event that is part of the alert. Valid values are as follows: ■ above ■ below ■ down ■ exception ■ extevent ■ outofrange ■ rateabove ■ ratebelow ■ not collected ■ collector down ■ abnormal dt ■ fingerprint ■ perform degradation ■ change ■ equal ■ not equal ■ corrupt For this attribute to be evaluated, you must also specify attributeKey. vCenter Operations Manager checks only those events that have a matching attributeKey value.

<text> Element

The <text> element defines the hint text that appears in the user interface when the alert meets the condition defined in the associated <condition> element. The following example defines the hint text Some text here.

```
<text>Some text here</text>
```

Alert Hint Text Definition Examples

In the following example, the first alert hint text definition matches alerts that have the attribute key Super Metric|test and are assigned to resources that have the resource kind Tier. The second definition uses the eventClass and eventSubclass attributes to match all HT above alerts.

```
<root>
  <kbItem>
    <condition attributeKey="Super Metric|test" resourceKind="Tier" minDuration=""
criticality="critical" alertType="" alertSubtype="" infoRegEx="" eventClass="" eventSubclass=""/>
    <text>Some text here</text>
  </kbItem>
  <kbItem>
    <condition attributeKey="" resourceKind="" minDuration="" criticality="critical"
alertType="" alertSubtype="" infoRegEx="" eventClass="ht" eventSubclass="above"/>
    <text>Some text here</text>
  </kbItem>
</root>
```

Configure Hint Text for Alerts

You can configure hint text for any type of alert in the `alert-hints.xml` file. The text appears on the HINT field in the Reason pane on the Alert Detail page in the Custom user interface.

NOTE The `alertsKb.xml` file is no longer supported. If you configured alert hint text for KPI alerts in the `alertsKb.xml` file, you can import the definitions into the `alert-hints.xml` file.

Prerequisites

Become familiar with the syntax of the `alert-hints.xml` file. See "Alert Hint Text XML File Format," on page 99.

Procedure

1 Open the `alert-hints.xml` file in the *vcenter-ops*`/user/conf/analytics` directory.

   In a vApp, the `alert-hints.xml` file is in the Analytics virtual machine.

2 Define the condition that the alert must satisfy for the hint to appear.

   For example:

   ```
   <condition attributeKey="Super Metric|test"
   resourceKind="Tier" minDuration="" criticality="critical"
   alertType="" alertSubtype="" infoRegEx="" eventClass=""
   eventSubclass=""/>
   ```

3 Define the alert hint.

   For example: `<text>Some text here</text>`

4 Save your changes and close the `alert-hints.xml` file.

   vCenter Operations Manager reads the `alert-hints.xml` file every 30 minutes by default. You can change this interval by editing the `alertHintsReloadInterval` property in the `advanced.properties` file in the *vcenter-ops*`/user/conf/analytics` directory.

If an alert satisfies the condition that you configured, the hint text appears in the HINT field in the Reason pane on the Alert Detail page.

Configure Alerts for vCenter Server Events

You can configure vCenter Server events to generate alerts.

Procedure

1 Open the `eventlist.txt` file in the *`vcenter-ops`*`\user\plugins\inbound\vmwarevi_adapter3\conf` directory.

The `eventlist.txt` file defines the list of events that the vCenter adapter collects from vCenter Server.

2 Type the event ID of the event to generate an alert and set it to ***`alert`***.

For example: **`vim.event.AlarmActionTriggeredEvent = alert`**

3 Save your changes and close the `eventlist.txt` file.

When the vCenter adapter collects an event that is marked as an alert, it sends a notification message to the vCenter Operations Manager server and the Analytics service generates an alert.

Retrieve Keys from the vCenter Operations Manager Database

You can obtain keys and identifiers for data fields by accessing the vCenter Operations Manager database and running SQL queries.

NOTE If you are using version 1.0.1 or later, you can also use the HTTP Post Adapter interface to retrieve keys and identifiers for data fields.

Procedure

1 In a Web browser, type **`http://`*`ip_address`*`/dbAccessQuery.action`** where ***`ip_address`*** is the IP address of the vCenter Operations Manager server.

2 Type your SQL query in the top right window.

For example:

```
 select a.ADAPTER_KIND_ID, a.ADAPTER_KEY, b.RESKND_ID, b.RESKND_KEY, e.ATTRKEY_ID,
e.ATTR_KEY from AdapterKind a
 inner join ResourceKind b on (b.ADAPTER_KIND_ID = a.ADAPTER_KIND_ID)
 inner join AliveResource c on (c.RESKND_ID = b.RESKND_ID)
 inner join ResourceAttributeKey d on (d.RESOURCE_ID = c.RESOURCE_ID)
 inner join AttributeKey e on (e.ATTRKEY_ID = d.ATTRKEY_ID)
 where a.ADAPTER_KEY = 'something' or b.RESKND_KEY = 'something'
```

3 Click the **Execute SQL** icon.

The results appear in the lower right window.

Performing Basic System Administration Tasks

8

vCenter Operations Manager administrators monitor system operations and perform basic system maintenance tasks, such as starting and stopping vCenter Operations Manager services. If a problem occurs that requires VMware assistance, an administrator can create a support bundle and send it to VMware technical support for analysis.

System administrators are also responsible for monitoring and responding to administrative alerts. See Chapter 9, "Resolving Administrative System Alerts," on page 119.

This chapter includes the following topics:

- "View Performance Information," on page 105
- "View Status Information," on page 106
- "vCenter Operations Manager Service Names," on page 107
- "Start or Stop vCenter Operations Manager Services," on page 108
- "Viewing and Managing System Log Files," on page 109
- "Delete Old Data in the File System Database," on page 113
- "Run the Audit Report," on page 113
- "Modify Global Settings," on page 114
- "Modify Global Settings for Virtual Environments," on page 115
- "Create a Support Bundle," on page 117

View Performance Information

You can view performance information related to vCenter Operations Manager operation.

Procedure

1 Select **Admin > Support**.

2 Click the **Status** tab.

The performance information on the **Status** tab is divided into multiple panes.

What to do next

Interpret the information on the **Status** tab. See "Interpreting Performance Information," on page 106.

Interpreting Performance Information

vCenter Operations Manager provides performance information related to its own operation. Performance information is divided into multiple panes on the **Status** tab.

Health Status

Shows the health graph and the current health score. To see the exact health score from a time on the graph, point to that time. You can point to the **More** icon to see its collector and other information.

Root Cause Ranking

Shows the root causes of any current health degradation. Double-click a symptom group to list specific resources that show that symptom. You can also double-click a specific symptom resource to open a pop-up window that shows details about the specific threshold violations.

Metric Selector

Shows the metric groups that are selected in the Health Tree pane. Expand a metric group to see the individual metrics. To see a graph for a metric in the Metric Graphs pane, double-click it or select it and click the **Move to Graph** icon.

Health Tree

Shows the section of the health tree around vCenter Operations Manager. You can select a resource to list its metrics, select a resource and click the **Show Detail** icon to show the Resource Detail page, or select a resource and click the **Show Alerts** icon to list current alerts.

Metric Graph

Shows graphs for the selected metrics.

View Status Information

You can view status information for vCenter Operations Manager collectors, adapters, and dynamic threshold calculations. Dynamic threshold calculations are part of vCenter Operations Manager analytics.

Procedure

1 Select **Admin > Support**.

2 Click the **Info** tab.

The status information on the **Info** tab is divided into multiple panes.

Interpret the information on the **Info** tab. See "Interpreting Status Information," on page 106.

Interpreting Status Information

vCenter Operations Manager reports status information for collectors, adapters, and dynamic threshold calculations. Status information is divided into multiple panes on the **Info** tab.

Describe Info

Shows the status of the describe process, which sends information about the data that can be collected from each adapter to the vCenter Operations Manager server. The describe status for individual adapters appears in the Adapter Info pane.

Collectors Info

Shows the status of the synchronize process that vCenter Operations Manager runs for each collector. The synchronize process sends any updated configuration information from the controller to each adapter. The describe process sends information about the data that can be collected from each adapter to the vCenter Operations Manager server.

Adapter Info

Shows the status of the describe process, the adapter version, and any messages from the adapter for each installed adapter. The adapter version consists of major and minor versions and the build number.

NOTE The `describe.xml` file contains an additional adapter version number. This version number changes only if you must rerun the describe process because of an adapter change, for example, when the metrics that the adapter collects change, or when the format of the adapter's credentials change.

The synchronize and describe processes usually run only when the vCenter Operations Manager server process starts. If you make changes and want to run these processes without restarting vCenter Operations Manager, click the **Describe** icon in the Adapter Info pane.

Replication Info

If you are using a replication server to back up the primary vCenter Operations Manager server, this pane indicates whether synchronization is on, when it started, and the percentage completed.

DT Calculation Info

Shows statistics for dynamic threshold calculations. You can click the **Generate Dynamic Thresholds** icon in this pane to manually generate dynamic thresholds on all collected metrics.

The regular schedule for calculating dynamic thresholds is set by the `updateTime` property in the `analytics.properties` file. When `updateTime` is set to a positive number, vCenter Operations Manager calculates thresholds once a day, starting at the hour specified, in military time. For example, `updateTime=23` starts threshold calculation at 11:00 p.m. When `updateTime` is set to a negative number, vCenter Operations Manager calculates dynamic thresholds every *x* hours. For example, `updateTime=-6` starts threshold calculation every six hours.

Slowest DT Objects

The five resources for which vCenter Operations Manager spent the most time calculating dynamic thresholds appear on this pane. This information might help VMware technical support diagnose certain types of problems.

vCenter Operations Manager Service Names

The services and service names are different for vCenter Operations Manager Standalone and the vCenter Operations Manager vApp.

vCenter Operations Manager Standalone

For vCenter Operations Manager Standalone, the services are the same on Windows and Linux servers but the service names are different.

Table 8-1. vCenter Operations Manager Standalone Services

Windows Server Name	Linux Server Name	Description
vcopsWebService	vcopsserver	vCenter Operations Manager Web service. Runs on the vCenter Operations Manager server.
AnalyticsService	analytics	Analytics service. Runs on the vCenter Operations Manager server.
ActiveMQ	activemq	ActiveMQ service. Runs on the vCenter Operations Manager server.
CollectorService	collector	Collector service. Runs on the vCenter Operations Manager server.
DTProcessorService	dtprocessor	DT Processor service. Runs on the server where the analytics processor is installed.
ReplicationServerService	replication	Replication Server service. Runs only on a vCenter Operations Manager replication server.

vCenter Operations Manager vApp

The vCenter Operations Manager vApp includes these services.

Table 8-2. vCenter Operations Manager vApp Services

Service	Description
vCenter Operations Service	Meta service that starts and stops the Collector, Analytics, and ActiveMQ services. Runs on the UI virtual machine in the vApp.
vCenter Operations Collector Service	Collector service. Runs on the Analytics virtual machine in the vApp.
vCenter Operations Analytics Service	Analytics Service. Runs on the Analytics virtual machine in the vApp.
vCenter Operations ActiveMQ Broker Service	ActiveMQ service. Runs on the Analytics virtual machine in the vApp.
vCenter Operations Web Service	Server for the Advanced Web application. Runs on the UI virtual machine in the vApp.
vCenter Operations Web Enterprise Service	Server for the Enterprise Web application. Runs on the UI virtual machine in the vApp.
vCenter Operations Admin Service	Server for the Admin Web application. Runs on the UI virtual machine in the vApp.

Start or Stop vCenter Operations Manager Services

You might need to start or stop one or more of the vCenter Operations Manager services.

Prerequisites

For the names of the vCenter Operations Manager services, see "vCenter Operations Manager Service Names," on page 107.

Procedure

- To start or stop all vCenter Operations Manager services on a Windows server, select **Start > All Programs > VMware > vCenter Operations Enterprise** and select **Start all services** or **Stop all services**.

- To start or stop individual vCenter Operations Manager services on a Windows server, use the Windows Services dialog box or open a command prompt and type the `sc` command.

  For example:

  ```
  sc start service_name
  sc stop service_name
  ```

  service_name is the name of the service on Windows.

- To start or stop vCenter Operations Manager services on a Linux server, use the **Background Services** tab of the Service Configuration dialog box or open a terminal window and type the `service vcops` command.

  For example:

  ```
  service vcops start [service_name]
  service vcops stop [service_name]
  ```

  service_name is the name of the service on Linux. If you do not include a service name, the command starts or stops all vCenter Operations Manager services.

  NOTE To use `vcops.sh`, the shell script form of the `service vcops` command, you must be in the `common/bin` directory.

- To list the vCenter Operations Manager environment variables on a Linux server, type the `service vcops env` command.

Viewing and Managing System Log Files

You can view vCenter Operations Manager system log files in the vCenter Operations Manager user interface. System log files are organized in log type folders.

The software component log type folders, which include the `vCenter Operations Web`, `Apache Tomcat`, and `vCenter Operations Analytics` folders, contain log files related to those components. The `Admin Log` folder contains the `Action` log file, which logs user actions.

Each installed collector has a separate log type folder, which contains subfolders for each adapter. Each adapter folder contains a subfolder for each instance. The instance folders contain the instance log files.

- Enable Logging for Widgets on page 110

  You can enable logging for widgets by editing the `log4.properties` file.

- View System Log Files in vCenter Operations Manager on page 110

  Viewing log files in vCenter Operations Manager is similar to opening the log files in an external text viewer.

- Using an External Log Monitoring Tool on page 111

  If you use an external log file monitoring tool to search for significant messages in vCenter Operations Manager log files, you might want to check for specific message strings in specific log files.

- Modify Logging Levels on page 112

  You can modify logging levels for the vCenter Operations Web, vCenter Operations Analytics, and vCenter Operations Collector logs.

Enable Logging for Widgets

You can enable logging for widgets by editing the `log4.properties` file.

Procedure

1 Open the `log4.properties` file.

For vCenter Operations Manager Standalone, `log4.properties` is in the *`vcenter_ops`*`\user\conf` directory. For the vCenter Operations Manager vApp, it is in the *`vcenter-ops`*`\user\conf\web` directory.

2 Add the following line after the line `log4j.rootLogger=ERROR`.

```
log4j.logger.com.integrien.alive.ui=debug
```

3 Save your changes and close the `log4.properties` file.

View System Log Files in vCenter Operations Manager

Viewing log files in vCenter Operations Manager is similar to opening the log files in an external text viewer.

Prerequisites

By default, vCenter Operations Manager does not create log files for widgets. To view log files for widgets in vCenter Operations Manager, enable logging for widgets. See "Enable Logging for Widgets," on page 110.

Procedure

- To list all viewable log files, select **Admin > Support** and click the **Logs** tab.

  The log type folders appear in the Logs pane.
- To view the log files in a folder, double-click the folder.
- To view the contents of a log file, double-click the log file.

  The contents of the log file appear in the Log Content pane.
- To view a specific part of a log file, type line numbers in the **Line Position** and **Row Limit** text boxes.

  The line position value determines the starting line and the row limit value determines the maximum lines to show in the Log Content pane.
- To delete a log file, select the file and click the **Delete Selected File** icon.
- If the data source for any of your resources changes, click the **Recalculate Data Source** icon.

  vCenter Operations Manager recalculates the data sources for all resources.
- To reload the log tree information and collapse all open log type folders, click the **Reload Tree** icon.

What to do next

You can use an external log file monitoring tool to search for significant messages in vCenter Operations Manager log files. See "Using an External Log Monitoring Tool," on page 111.

Using an External Log Monitoring Tool

If you use an external log file monitoring tool to search for significant messages in vCenter Operations Manager log files, you might want to check for specific message strings in specific log files.

Analytics Log File Messages

These messages in the `analytics.log` file might indicate that an Oracle database is down.

```
ERROR [Thread-10]
com.integrien.alive.common.hibernate.util.OracleConnectionProvider.getConnection - Exception
trying to set up connection
java.sql.SQLException: Io exception: Connection reset by peer: socket write error
ERROR [Thread-10] com.integrien.alive.common.hibernate.dao.BaseDAO.executeSingle -
org.hibernate.HibernateException: org.hibernate.exception.GenericJDBCException: Cannot open
connection
ERROR [Thread-10]
com.integrien.alive.common.availability.AvailabilityChecker.isDBConnectionAvailable -
org.hibernate.HibernateException: org.hibernate.exception.GenericJDBCException: Cannot open
connection
```

These messages indicate that the AnalyticsService service started successfully.

```
INFORMATION [WrapperListener_start_runner] com.integrien.analytics.AnalyticsMain.start -
AnalyticsService has been started 10.1.11.40
INFORMATION [Thread-1] com.integrien.analytics.AnalyticsMain.doRun - Ready
```

Controller Log File Messages

These messages in the `controller.log` file might indicate a problem with an SQL Server database.

```
ERROR [Thread-1] com.integrien.alive.ui.util.MainPortalListener.contextInitialized -
org.hibernate.exception.GenericJDBCException: Cannot open connection
ERROR [Thread-5] com.integrien.alive.common.hibernate.dao.BaseDAO.executeInTransaction - Cannot
open connection
org.hibernate.exception.GenericJDBCException: Cannot open connection
```

These messages indicate that the ActiveMQ service is not available.

```
ERROR [http-80-3]
com.integrien.alive.common.rmi.MetricDataDistributorClient.getCurrentHealthsFromMemory -
MetricDataDistributorClient -- Failed to Receive Metric Data. Re-initializing Failed. Null
ERROR [Communicator] com.integrien.alive.controller.collector.CommunicatorThread.connect - Can
not connect to the MQ Broker. The reason is Could not connect to broker URL:
tcp://localhost:61616?wireFormat.maxInactivityDuration=0. Reason: java.net.ConnectException:
Connection refused: connect
```

These messages indicate that the vcopsWebService service started successfully.

```
INFORMATION [Thread-1] com.integrien.alive.ui.util.MainPortalListener.contextInitialized -
AliveService has been started 10.1.11.40
INFORMATION [Describe thread] com.integrien.alive.controller.collector.DescribeThread.describe -
Staring describe
INFORMATION [Describe thread]
com.integrien.alive.controller.collector.DescribeUtils.constructAdapterDescribes - Beginning
Describe on Controller
INFORMATION [Describe thread] com.integrien.alive.controller.collector.DescribeThread.describe -
Finished describe in 2281 ms
```

Collector Log File Messages

These messages in the `collector.log` file indicate that the ActiveMQ service is down.

```
2010-04-12 19:04:10,715 ERROR [ActiveMQ Task]
org.apache.activemq.transport.failover.FailoverTransport.doReconnect - Failed to connect to
transport after: 5 attempt(s)
2010-04-12 19:04:10,715 ERROR [Communicator]
com.integrien.alive.collector.CommunicatorThread.connect - Can not connect to the MQ Broker. The
reason is Connection refused: connect
```

These messages indicate that the CollectorServer service started successfully.

```
INFORMATION [WrapperListener_start_runner] com.integrien.alive.collector.CollectorMain.start -
CollectorService has been started 10.1.11.40
INFORMATION [Communicator] com.integrien.alive.collector.CommunicatorThread.connect - Collector
by id 1 successfully connected to MQ.
INFORMATION [Thread-5] com.integrien.alive.collector.Collector.describe - Beginning Describe on
Collector
INFORMATION [Thread-5] com.integrien.alive.collector.Collector.describe - Describe succeeded
```

Modify Logging Levels

You can modify logging levels for the vCenter Operations Web, vCenter Operations Analytics, and vCenter Operations Collector logs.

The available logging levels are ALL, DEBUG, ERROR, FATAL, INFO, OFF, and WARN. The logging level is set to ERROR by default. To troubleshoot problems, set the logging level to INFO. To view detailed messages, including micro steps, queries, and returned results, set the logging level to DEBUG.

NOTE If you set the logging level to DEBUG, log files can become large very quickly. Set the logging level to DEBUG only for short periods of time.

Procedure

1 Select **Admin > Support**.

2 On the **Logs** tab, select the log type folder and click the **Edit Properties** icon.

You can select `vCenter Operations Web`, `vCenter Operations Analytics`, or any `vCenter Operations Collector` folder.

3 Edit the logging level settings.

Option	Action
To set the root logging level	Select a level from the **Root Logger Level** drop-down menu.
To specify how long to keep log files	Type the number of days in the **Maximum backup days** text box.
To set the logging level for a component group	Click the component group and select a logging level from the **Group Log Level** drop-down menu.
To set the logging level for a specific component	Expand the component group, select the current logging level or **Please Select** for the component, and select a new logging level from the drop-down menu.

4 Click **OK** to save your configuration.

Delete Old Data in the File System Database

You can configure how often vCenter Operations Manager removes old data from the file system database (FSDB) by modifying properties in the `advanced.properties` file.

IMPORTANT Always make a backup copy of the `advanced.properties` file. Changes you make to the file might cause errors that can adversely affect vCenter Operations Manager operations.

Prerequisites

Become familiar with how to start and stop the Analytics service. See "Start or Stop vCenter Operations Manager Services," on page 108.

Procedure

1. Make a backup copy of the `advanced.properties` file in the `vcenter_ops\user\conf\analytics` directory on the vCenter Operations Manager server.
2. Open the original `advanced.properties` file.
3. Change the `oldDataCleanerExecutionFrequency` property to how often, in days, to erase old data.

   For example, to erase old data once a week, set `oldDataCleanerExecutionFrequency` to 7. A value of 0 causes old data not to be erased.
4. Change the `oldDataCleanerDateRange` property to how old, in days, data must be before it is erased.

   For example, to erase data that is 900 or more days old, set `oldDataCleanerDateRange` to 900.
5. Save your changes and close the `advanced.properties` file.
6. Restart the Analytics service.

vCenter Operations Manager deletes old data for the first time when the frequency that you specified elapses. For example, if you set the frequency to 7, the first data purge occurs one week later.

Run the Audit Report

The Audit report shows the number of resources configured, resources that are having data collected, resource kinds, resources for each defined adapter, metrics configured and being collected, super metrics, metrics generated by vCenter Operations Manager, and applications.

You can also run a report to view information about users, groups, and access rights. See "Run the User Audit Report," on page 77.

Procedure

1. Select **Admin > Audit Report**.
2. Select the report type format.
3. Click **Submit**.

The Audit Report window appears.

Modify Global Settings

You can customize certain vCenter Operations Manager user interface behaviors by modifying global settings. Global settings control the ranges for health color indicators, the interaction metrics count, and the number of root cause groups. These settings affect all users.

Modify Health Ranges

One of the ways that vCenter Operations Manager indicates the health of a resource is to show a colored indicator. The color is based on the range of the health score. You can change the range for all colors except for blue.

You can also choose whether the health chart that appears on many vCenter Operations Manager windows is colored according to the health score for each time period.

Table 8-3. Default Health Color Ranges

Color	Range
Green	76 to 100
Yellow	51 to 75
Orange	26 to 50
Red	1 to 25
Blue	0

Procedure

1 Select **Admin > Global Settings**.

2 Modify the health range settings.

Option	Action
Change the range for a color	Type different values in the **From** and **To** text boxes.
Change whether the health chart is colored	Select or deselect the **Health Chart Colored** check box.

3 Click **OK** to save your changes.

Set the Interaction Metrics Count

In several locations in vCenter Operations Manager, you can select an object to see related items of another type. For example, you can click a resource in the Resources widget to see its metrics in the Metric Sparklines widget. You can select how many related items appear when you perform an interaction of this kind.

Procedure

1 Select **Admin > Global Settings**.

2 Select a number from the **Important Metrics Count** drop-down menu.

3 Click **OK** to save your changes.

Set the Number of Root Cause Groups

When vCenter Operations Manager shows root cause information, for example, in the Root Cause widget or on the Alert Summary page, it breaks the causes into groups. You can set the maximum number of first-level root cause groups that vCenter Operations Manager shows for any condition.

The number of first-level groups that vCenter Operations Manager stores when it captures root cause information is set in the `advanced.properties` file. The default is 50. If you set the number of root cause groups to show a higher number than the number of groups captured, the setting has no effect.

Procedure

1 Select **Admin > Global Settings**.

2 Type the maximum number of first-level root cause groups to show in the **Root Cause Groups To Show** text box.

3 Click **OK** to save your changes.

Modify Global Settings for Virtual Environments

You can change the way vCenter Operations Manager displays information for objects that are part of your virtual environment by modifying virtual machine global settings. These settings affect all users.

- Customize the Workload Icon on page 115

  You can specify whether the **Workload** icon spins on the Resource Detail page.

- Customize the Performance Graph on page 116

  You can specify whether change events appear in the performance graph on the Resource Detail page.

- Set the Time Period for History Graphs on page 116

  You can specify the time period to include in the health, workload, and capacity history graphs that appear in the upper-left pane of the Resource Detail page.

- Modify Level Ranges on page 116

  vCenter Operations Manager uses colored indicators for the health, workload, anomalies, faults, risk, time remaining, capacity, stress, efficiency, waste, and density levels that appear in the VC Relationship widget and on the Resource Detail page. You can modify the default values and define your own ranges for these levels.

- Configure the Hierarchy Sort Order on page 116

  You can set the order in which objects appear in the VC Relationship widget.

Customize the Workload Icon

You can specify whether the **Workload** icon spins on the Resource Detail page.

Procedure

1 Select **Admin > VM Global Settings**.

2 To specify whether the **Workload** icon spins, select a **Spin Workload** option.

If you select **Yes**, the icon spins when users view the Resource Detail page.

3 Click **OK** to save your changes.

Customize the Performance Graph

You can specify whether change events appear in the performance graph on the Resource Detail page.

NOTE The performance graph is named Events and Performance or Events and Health, depending on whether Health is selected.

Procedure

1 Select **Admin > VM Global Settings**.

2 To specify whether to show change events, select a **Show Change Events** option.

If you select **Yes**, change events appear as labels in the performance graph.

3 Click **OK** to save your changes.

Set the Time Period for History Graphs

You can specify the time period to include in the health, workload, and capacity history graphs that appear in the upper-left pane of the Resource Detail page.

Procedure

1 Select **Admin > VM Global Settings**.

2 Select a time period from the **History Duration** drop-down menu.

3 Click **OK** to save your changes.

Modify Level Ranges

vCenter Operations Manager uses colored indicators for the health, workload, anomalies, faults, risk, time remaining, capacity, stress, efficiency, waste, and density levels that appear in the VC Relationship widget and on the Resource Detail page. You can modify the default values and define your own ranges for these levels.

Procedure

1 Select **Admin > VM Global Settings**.

2 For each level to modify, slide the triangular icons on the axis to the new values.

3 Click **OK** to save your changes.

The ranges are updated the next time the vCenter Operations Manager client refreshes.

Configure the Hierarchy Sort Order

You can set the order in which objects appear in the VC Relationship widget.

Procedure

1 Select **Admin > VM Global Settings**.

2 Select a **Hierarchy Sort Order** option.

Option	Description
Parent Name/Self Name	Group all child objects of a parent object.
Self Name	Sort objects alphabetically by object name.
Value	Sort object icons according to the currently selected metric, from worst range to best range.

3 Click **OK** to save your changes.

Create a Support Bundle

You can package all log and configuration files into one compressed ZIP file and send it to VMware technical support. You can download the support bundle ZIP file to your local hard drive or upload it to an FTP server location that you configure.

vCenter Operations Manager creates support bundles in the *vcenter-ops*\tomcat\webapps\ROOT\support directory on the vCenter Operations Manager server. It creates the directory the first time you create a support bundle.

Procedure

1 Select **Admin > Support**.

2 Click the **Create Support Bundle** icon.

The name of the ZIP file for the support bundle appears. The file name contains the creation date, for example, VCOpsSupport2008.03.07-16.52.28-0400.zip.

3 Download the support bundle ZIP file to your local hard drive or upload it to an FTP server.

Option	Action
Download the support bundle to your local hard drive	a Select the support bundle and click the **Download Support Bundle** icon. b Attach the support bundle ZIP file to an email message and send it to VMware technical support.
Upload the support bundle to an FTP server	a Select the support bundle and click the **Upload Support Bundle to Ftp server** icon. b Type the host name, user name, and password of the FTP server. c (Optional) Click **Test** to test the connection to the FTP server. d Click **OK** to upload the support bundle ZIP file to the FTP server.

Resolving Administrative System Alerts

9

An administrative system alert indicates a problem with one of the vCenter Operations Manager components. When you resolve an administrative system alert, follow certain recommended procedures.

This chapter includes the following topics:

- "Analytics FSDB Overloaded," on page 119
- "Analytics Threshold Checking Overloaded," on page 120
- "Collector Is Down," on page 120
- "Controller Is Unable to Connect to MQ," on page 121
- "DataQueue Is Filling Up," on page 122
- "Describe Failed," on page 122
- "Failed to Connect to Replication MQ," on page 123
- "Failed to Repair Corrupted FSDB Files," on page 123
- "File Queue Is Full," on page 123
- "FSDB Files Corrupted for Resources," on page 124
- "FSDB Storage Drive Free Space Is Less Than 10%," on page 124
- "No DT Processors Connected," on page 124
- "One or More Resources Were Not Started," on page 125
- "Outbound Alert Send Failed," on page 125
- "Replication MQ Sender Is Blocked," on page 126

Analytics FSDB Overloaded

The vCenter Operations Manager file system database (FSDB) is overloaded.

Problem

The message `Analytics FSDB Overloaded` appears in the Reason pane of the Alert Summary page for the alert.

Cause

No more FSDB savings threads are available.

Solution

1 Increase the number of FSDB savings threads by modifying the `FSDBSaveThreads` property in the *vcenter-ops*`\user\conf\analytics\advanced.properties` file.

   The default value for the `FSDBSaveThreads` property is 3. You can increase the value up to the number of CPU cores on the host.

2 Use the FSDBHomeChanger tool to create additional mount points for the FSDB so that files are distributed on multiple file systems.

3 Use the FSDBHomeChanger tool to move the FSDB home to a larger or faster drive.

4 Reduce the number of resources and metrics that are collected to reduce the demand on the drive.

Analytics Threshold Checking Overloaded

No more threshold checking threads are available.

Problem

The message `Analytics Threshold Checking Overloaded` appears in the Reason pane of the Alert Summary page for the alert.

Cause

Threshold checking threads can become depleted when the vCenter Operations Manager Analytics server is CPU bound or when the database access has reached its limit.

Solution

1 If the Analytics server has unused CPU cycles, increase the number of dynamic threshold processing threads by changing the `ThresholdProcessingThreads` property in the *vcenter-ops*`\user\conf\analytics\advanced.properties` file.

   The default setting for the `ThresholdProcessingThreads` property is 10. The maximum value is 25, or the number of CPU cores, whichever is higher.

2 Reduce the number of resources and metrics that are collected to reduce the demand on the vCenter Operations Manager server host CPU.

3 If database access is causing the problem, check the latency between the vCenter Operations Manager server and the database server.

   Latency should be less than two milliseconds.

4 If necessary, upgrade the database server so that it can handle the load from vCenter Operations Manager.

Collector Is Down

A heartbeat message was not received from a collector.

Problem

The message `Collector is Down` appears in the Reason pane of the Alert Summary page for the alert.

Cause

By default, each collector sends a heartbeat message to the controller or Web service every three seconds to indicate that it is up and running. This alert indicates that a one of the collectors did not send a heartbeat for five minutes.

Solution

1 Verify that the collector service is running.

2 If the collector service is not running, check the collector (*vcenter-ops*\user\log\collector.log) and Java service wrapper (*vcenter-ops*\user\log\collector-wrapper.log) log files.

3 Verify that the network connection is available between the collector and the vCenter Operations Manager server.

For example, you can try to Telnet from the collector to the vCenter Operations Manager server on the RMI port that is used for communication, which is 1199 by default.

Controller Is Unable to Connect to MQ

The controller cannot connect to ActiveMQ.

Problem

The message `Controller is Unable to Connect to MQ` appears in the Reason pane of the Alert Summary page for the alert.

Cause

The controller cannot connect to ActiveMQ either during or after installation.

Solution

1 If the problem occurs during installation, determine if a port conflict is preventing the service from starting.

a Check the *vcenter-ops*\user\log\activemq-wrapper.log log file for messages that indicate a port conflict.

b Run the `netstat -ano` command and look for the process ID that is using ports 1099 and 61616, which are the ports that ActiveMQ uses.

2 (Optional) If the ActiveMQ service is running, use the `jconsole` *ipaddress*`:1099` command to determine if the sendQueue, receiveQueue, and dataQueue queues are running.

NOTE The JConsole tool is part of the Java SDK and is not included with vCenter Operations Manager.

3 (Optional) If the ActiveMQ service is not running, check the sendQueue setting, log files, and memory allocation.

a Use the `jconsole` *ipaddress*`:1099` command to determine if a sendQueue `ConsumerCount` attribute is greater than one.

A value that is greater than one indicates that the ActiveMQ service is attempting to communicate with more than one Web service.

b If a `ConsumerCount` attribute is greater than one, restart the vCenter Operations Manager service.

c Check the *vcenter-ops*\user\log\activemq-wrapper.log log file for a message that indicates the database behind ActiveMQ is corrupted.

d Check the *vcenter-ops*\user\log\activemq-wrapper.log log file for an out-of-memory error.

e If an out-of-memory error has occurred, increase the memory allocation in *vcenter-ops*\user\conf\activemq\wrapper.com and restart the ActiveMQ service.

DataQueue Is Filling Up

The data queue has reached the maximum limit.

Problem

The message `DataQueue is Filling Up` appears in the Reason pane of the Alert Summary page for the alert.

Cause

The size of the data queue has sequentially reached the predefined maximum limit.

Solution

- If the Analytics service is not running, restart it.
- If the Analytics service is running, select **Admin > Support** and examine the **DT Calculation** setting in the DT Calculation Info panel.

Option	Action
If DT Calculation: On	The dynamic threshold processing engine is running, but the queue might be filling up because of contention when the DT processing engine tries to read FSDB files. To reduce the number of DT threads and reduce the I/O load, modify the `DTProcessingThreads` property in the *`vcenter-ops`*`\user\conf\analytics\advanced.properties` file. The minimum setting is 1.
If DT Calculation: Off	The dynamic threshold processing engine is not running, which might mean that the drive system is not fast enough for the number of resources and metrics being processed. ■ Use the FSDBHomeChanger tool to create additional mount points for the FSDB so that files are distributed on multiple file systems. ■ Use the FSDBHomeChanger tool to move the FSDB to a larger or faster drive. ■ Reduce the number of resources and metrics being collected to reduce the demands on the drive.

Describe Failed

A describe failed for one of the adapters.

Problem

The message `Describe Failed` appears in the Reason pane of the Alert Summary page for the alert.

Cause

This problem can occur when you make changes to an adapter and try to update it. This alert is generated only when the vCenter Operations Manager Web resource already exits. If the first describe for an adapter fails, vCenter Operations Manager writes an error to the log file and sends a Describe failed email message.

Solution

1 Verify the changes to the adapter and try the update again.

2 If the update fails again, roll back the changes and revert to the older version of the adapter.

Failed to Connect to Replication MQ

vCenter Operations Manager cannot connect to the replication queue.

Problem

The message `Failed to Connect to Replication MQ` appears in the Reason pane of the Alert Summary page for the alert.

Cause

The connection to the replication queue failed.

Solution

1 Open the `replication.properties` file and verify that the replication queue is configured properly.

2 Verify that the ActiveMQ service configured in the `replication.properties` file is running.

You can use JConsole to connect to port 1099.

3 Verify that the connection to the replication server on ports 61616 and 1099 is available from the machine that is running the Analytics service.

Failed to Repair Corrupted FSDB Files

The FSDB check was unable to repair one or more corrupted files.

Problem

The message `Failed to repair corrupted FSDB file(s) for resource(s): resource_ID_list` appears in the Reason pane of the Alert Summary page for the alert.

Cause

The FSDB repair option was enabled for the analytics process, but the FSDB check cannot repair one or more corrupted files.

Solution

This alert indicates a significant problem with FSDB files for the resources listed in the alert message. Metric data for these resources might not be recorded until the problem is resolved.

File Queue Is Full

The file queue has reached its maximum limit.

Problem

The message `The File queue is full, replication MQ is no longer available. Data replication has been disabled.` appears in the Reason pane of the Alert Summary page for the alert.

Cause

The number of data points in the replication file queue reached its maximum limit. The hard drive is full because the replication service cannot retrieve data from the queue quickly enough.

Solution

1 Increase the size of the disk drive where the MQ resides.

2 Increase the network bandwidth between the vCenter Operations Manager server and the replication server or increase the processing capacity of the replication server.

   Increasing replication server performance enables the server to retrieve data from the queue more quickly, which prevents the queue from filling the disk.

FSDB Files Corrupted for Resources

One or more FSDB files are corrupted.

Problem

The message `FSDB file(s) corrupted for resource(s): resource_ID_list` appears in the Reason pane of the Alert Summary page for the alert.

Cause

The analytics process has the FSDB check enabled, and it found one or more corrupted FSDB files. The FSDB repair option was disabled.

Solution

Use the FSDBCheck tool to repair the corrupted files.

FSDB Storage Drive Free Space Is Less Than 10%

One of the FSDB drives has less than 10 percent free space.

Problem

The message `FSDB Storage Drive Free Space is Less Than 10%` appears in the Reason pane of the Alert Summary page for the alert.

Cause

The available free space on one of the FSDB drives is less than 10 percent of capacity.

Solution

1 Add storage capacity to the existing drive system or use the FSDBHomeChanger tool to move the FSDB location to a drive system that has more capacity.

2 Purge old metric data from vCenter Operations Manager.

   The minimum data that vCenter Operations Manager analytics requires is three times the length of your normal business cycle or data pattern. The business cycle might be weekly, monthly, quarterly, or yearly.

No DT Processors Connected

No data requests have been received from the dynamic threshold calculation process within the configured time period.

Problem

The message `No DT Processors Connected` appears in the Reason pane of the Alert Summary page for the alert.

Cause

The vCenter Operations Manager server did not receive data requests from the remote dynamic threshold calculation process, the DT Processor service, for at least the time period specified by the `externalDTAlertGenerationTime` property in the *`vcenter-ops`*`\user\conf\analytics\advanced.properties` file.

Solution

1 If the DT Processor service is not running on the remote server where it was installed, try to start it.

2 Select **Admin > Support**, click the **Logs** tab, open the `vCenter Operations Analytics` folder, and look for the cause of the problem in the log for the analytics process.

3 If the DT Processor service was stopped for maintenance, or if a network outage occurs between the vCenter Operations Manager server and the remove server, change the configuration so that dynamic thresholds are processed on the vCenter Operations Manager server.

One or More Resources Were Not Started

One or more resource or metric limits were reached.

Problem

One of the following messages appears in the Reason pane of the Alert Summary page for the alert.

- `One or more resources were not started because the maximum number of collecting resources/metrics was not reached.`
- `One or more resources/metrics were not started/created because the maximum number of resources/metrics was reached.`

Cause

One of the following problems has occurred.

- vCenter Operations Manager analytics reached the maximum number of resources or metrics and did not load caches for one or more resources. The resources are stopped.
- The controller did not create a resource because it reached the maximum number of resources or metrics in the database.

Solution

1 If the analytics process failed, remove recently added resources and restart the Analytics service.

2 Upgrade vCenter Operations Manager to a more powerful server host.

You can increase the resource and metric limits based on the new server host.

Outbound Alert Send Failed

One of the alert handler plug-ins failed to send an outbound alert.

Problem

The message `Outbound Alert Send Failed for` *`alert-plug-in`* appears in the Reason pane of the Alert Summary page for the alert.

Cause

This problem can occur with email filter, SNMP trap, log file, and EMC Smarts console handlers.

Solution

1 Check the alert handler for errors.

2 Verify that the alert destination is available.

For example, verify that the disk is not full. For email alerts, verify that the SMTP server is running.

Replication MQ Sender Is Blocked

The replication queue has reached its maximum size and cannot accept any more data from the vCenter Operations Manager server.

Problem

The message `Replication MQ sender is blocked, data replication has been disabled` appears in the Reason pane of the Alert Summary page for the alert.

Cause

The replication server cannot keep up, either because of a lack of resources or a slow network connection.

Solution

1 Check for possible bottlenecks.

   a Increase network capacity.

   The most likely cause of a bottleneck is lack of network capacity between the vCenter Operations Manager server and the replication server.

   b If the disk drive on the replication server is slow, replace it with a disk drive that has faster I/O.

   c If the replication server CPU is the limiting factor, replace the CPU with a faster processor.

2 Decrease the amount of data that is replicated, either by decreasing the number of resources that are monitored or increasing the monitoring interval between metric data collection samples.

Backing Up and Recovering Data 10

You can configure vCenter Operations Manager to handle backup and recovery options, including high-availability clustering and remote failover. The appropriate amount of component redundancy varies from organization to organization.

At a minimum, include vCenter Operations Manager data components in the standard backup procedures of your organization. Perform a complete backup of vCenter Operations Manager data before you upgrade the vCenter Operations Manager software.

NOTE The vCenter Operations Manager vApp does not support replication, remote collectors, or distributed analytics.

This chapter includes the following topics:

- "Backing Up and Recovering Data Components," on page 127
- "Backing Up and Recovering Processing Components," on page 134

Backing Up and Recovering Data Components

vCenter Operations Manager stores data in the file system database (FSDB), its relational database (RDB), and its system files. Follow certain guidelines when you back up and recover these data components.

- Backing Up the FSDB on page 128

  All metric values that vCenter Operations Manager collects are stored in its file system database (FSDB). This implementation enables the vCenter Operations Manager analytics software high access rates to the large amounts of data that vCenter Operations Manager stores.

- Backing Up the RDB on page 131

  The vCenter Operations Manager RDB contains configuration and state information, such as dynamic threshold results, anomalies, alerts, and data correlation results that vCenter Operations Manager analytics and the vCenter Operations Manager user interface use.

- Backing Up System Files on page 132

  vCenter Operations Manager uses system files for configuration, integration, and logging. These files are located in the vCenter Operations Manager software directory tree.

- Recovering Data Components on page 133

  No data components depend on other components, and they do not need to be absolutely in sync relative to backup and recovery times. Keep the RDB and the vCenter Operations Manager system files as up-to-date as possible because they contain the configuration of the vCenter Operations Manager system, integration adapters, and monitored environment.

Backing Up the FSDB

All metric values that vCenter Operations Manager collects are stored in its file system database (FSDB). This implementation enables the vCenter Operations Manager analytics software high access rates to the large amounts of data that vCenter Operations Manager stores.

The FSDB is located on the vCenter Operations Manager server in either internal hard drives or a high-speed storage area network (SAN) device. vCenter Operations Manager does not support NAS or NFS file systems.

The default location for the FSDB is *vcenter-ops*\data, which is suitable for smaller environments. In larger environments, place the FSDB in a different file system than the vCenter Operations Manager software. You can store the FSDB in one path location, or split it into multiple locations.

Each resource has its own folder within the FSDB. The resource ID is the folder name. Each resource folder contains one data file for each month's data. Each file contains all metric values for all metrics for that resource for that month. While vCenter Operations Manager is collecting data, the current month's files in the FSDB are continually being updated.

FSDB Backup Guidelines

Back up all files in the vCenter Operations Manager FSDB folder regularly. You define these folders during installation, and you can find them by looking at the FSDB_HOME folder specification in the Configure VMware vCenter Operations Enterprise utility.

You can copy the FSDB at any time without stopping any vCenter Operations Manager services. The timing of the backup does not depend on other file backups. Performing incremental backups can reduce backup time and storage requirements, because only the most recent month's files are updated at any given time.

Over time, the FSDB can grow to be over 100GB. An efficient way to make incremental backups is to take advantage of the FSDB Replication Sync capability, which is provided to enable disaster recovery failover. The FSDB Replication Sync capability requires a separate vCenter Operations Manager server and FSDB data store, which runs in a warm or passive mode.

Set Up FSDB Replication

You can use the FSDB Replication Sync capability to make incremental backups of the FSDB. The FSDB Replication Sync capability requires a separate vCenter Operations Manager server and FSDB data store, which runs in a warm or passive mode.

NOTE The vCenter Operations Manager vApp does not support replication, remote collectors, or distributed analytics.

Prerequisites

- Become familiar with how to start and stop the Analytics service. See "Start or Stop vCenter Operations Manager Services," on page 108.
- Contact VMware technical support before you change any replication settings.

Procedure

1. Create two vCenter Operations Manager servers, one primary and one backup.
2. Install the same version and build number of vCenter Operations Manager on both servers.
3. Open the replication.properties file in the *vcenter-ops*\user\conf\analytics directory on the vCenter Operations Manager server.

4 Set `enabled=true` to enable replication of FSDB content.

NOTE Because the synchronization process is independent from the replication process, you do not need to enable replication to run the synchronization process.

5 Save your changes and close the `replication.properties` file.

6 Restart the Analytics service on the primary vCenter Operations Manager server.

If a resource file is deleted on the primary vCenter Operations Manager server, it is also deleted on the replication server.

Switch the Primary and Backup Replication Servers

You can use the Configure VMware vCenter Operations utility to switch the replication server configuration from primary to backup, and the reverse.

NOTE The vCenter Operations Manager vApp does not support replication, remote collectors, or distributed analytics.

Prerequisites

- Set up FSDB replication. See "Set Up FSDB Replication," on page 128.
- In a clustered environment, verify that the cluster resources are offline.

Procedure

1 From the **Start** menu, select **All Programs > VMware > vCenter Operations Enterprise > Configure VMware vCenter Operations** to start the Configure VMware vCenter Operations utility on each server.

   - On the primary vCenter Operations Manager server, on the Analytics page, select the **Enable Replication** check box and set the host to the backup vCenter Operations Manager server.
   - On the backup vCenter Operations Manager server, on the Replication Server page, set the host to be the local server.

2 Click **Finish** to save the configuration.

NOTE Because the vCenter Operations Manager services are reinstalled and restarted when you click **Finish**, click **Exit**, not **Finish**, to close the utility if you do not make any changes.

Enable FSDB Synchronization

Enable synchronization of FSDB content between the primary and backup vCenter Operations Manager servers only if missing or different data must be updated on the backup vCenter Operations Manager server. For example, if you configure and start the backup server after vCenter Operations Manager was already collecting data.

When synchronization is enabled, the task is sent to the replication server on the backup vCenter Operations Manager server. If the replication server is running, it returns a response to the primary Analytics service, which sends all missing and different data to the replication server.

If replication is enabled, the Analytics service continues to send real-time incoming data to the backup server, but not data from the FSDB.

NOTE The vCenter Operations Manager vApp does not support replication, remote collectors, or distributed analytics.

Prerequisites

- Create a replicaton server. Because the synchronization process is independent from the replication process, you do not need to enable replication to run the synchronization process. See "Set Up FSDB Replication," on page 128.
- Become familiar with how to start and stop the Analytics service. See "Start or Stop vCenter Operations Manager Services," on page 108.
- Contact VMware technical support before you change any FSDB synchronization settings.

Procedure

1 Open the `replication.properties` file in the *`vcenter-ops`*`\user\conf\analytics` directory on the vCenter Operations Manager server.

2 Set `synchronize=true`.

3 Specify the resource ID from which to start synchronization.

4 Save your changes and close the `replication.properties` file.

5 Restart the Analytics service on the primary vCenter Operations Manager server.

Manage the Replication Process

If you use a replication server to back up the primary vCenter Operations Manager server, you can use the Custom user interface to manage the replication process.

Prerequisites

Create and configure a replication server. See "Set Up FSDB Replication," on page 128.

Procedure

1 Select **Admin > Support** and click the **Info** tab.

Replication information appears in the Replication Info pane.

2 Use the icons at the top of the Replication Info pane to manage the replication process.

Option	Description
Start the replication process	a Click the **Start Replication** icon. b Click **Yes** in the **Start Replication** dialog box to start the replication process.
Stop the replication process	a Click the **Stop Replication** icon. b Click Yes in the **Stop Replication** dialog box to stop the replication process.

When the replication process begins, the **Replication** status changes to Running. If an error occurs during the replication process, an error message appears in the Replication Info pane.

3 (Optional) Click the **Refresh** icon to update the status information.

The status information refreshes every five minutes by default.

Manage the Synchronization Process

If you have a replication server, you can manage synchronization from the Custom user interface.

Prerequisites

Create a replication server. Because the synchronization process is independent from the replication process, you do not need to enable replication to run the synchronization process. See "Set Up FSDB Replication," on page 128.

Procedure

1 Select **Admin > Support** and click the **Info** tab.

The status of the synchronization process appears in the Replication Info pane.

2 Use the icons at the top of the Replication Info pane to manage the synchronization process.

Option	Action
Start the synchronization process	a Click the **Start Synchronization** icon. b (Optional) Select the **Restart synchronization** check box to restart the synchronization process for all resources that have already synchronized their data. c Select the start date and time of the data to be synchronized. d Click **OK** to save your configuration.
Pause the synchronization process	a Click the **Pause Synchronization** icon. b Click **Yes** in the **Pause Synchonization** dialog box to pause the synchronization process.

When the synchronization process begins, the **Synchronization** status changes to Running. If an error occurs during the synchronization process, an error message appears in the Replication Info pane.

3 (Optional) Click the **Reload** icon to refresh the status information in the Replication Info pane.

Status information refreshes every five minutes by default.

Backing Up the RDB

The vCenter Operations Manager RDB contains configuration and state information, such as dynamic threshold results, anomalies, alerts, and data correlation results that vCenter Operations Manager analytics and the vCenter Operations Manager user interface use.

In most cases, you put the RDB on a dedicated database server that is separate from the vCenter Operations Manager server but that is in close network proximity, such as in the same data center within the same firewall. In smaller environments, it might be suitable to host the RDB on the vCenter Operations Manager server.

Backing up the vCenter Operations Manager database has no special requirements. Your organization's database administrator can use standard corporate RDB procedures to back up the vCenter Operations Manager RDB on a regular basis.

Backing Up System Files

vCenter Operations Manager uses system files for configuration, integration, and logging. These files are located in the vCenter Operations Manager software directory tree.

Table 10-1. System File Backup Guidelines

System File Directory	Description	Backup Guidelines
vcenter–ops\user\conf\analytics	Analytics configuration directory. It includes files that contain parameters for the analytics algorithms, including which algorithms are enabled.	Back up this directory after vCenter Operations Manager is installed and configured and again if you make any configuration changes. This directory and its files are copied from the *vcenter–ops*\save directory during vCenter Operations Manager software upgrades.
vcenter–ops\user\conf\plugins	Analytics plug-ins directory. It contains algorithms that vCenter Operations Manager analytics uses, including files delivered with the software and any future algorithms that might become available. It contains a subdirectory for each installed Dynamic Threshold algorithm. Each plug-in directory includes a plug-in properties file, *vcenter–ops*\user\conf\plugins\plugin_name\conf\plugin_name.properties, that contains parameters for the algorithms.	Files in this directory are rarely updated after vCenter Operations Manager is in production. Back up the directory after vCenter Operations Manager is installed and configured and again if you change the configuration.
vcenter–ops\user\plugins\outbound	Outbound alert plug-ins directory. It contains alert notification formats that vCenter Operations Manager uses.	Files in this directory are rarely updated after vCenter Operations Manager is in production. Back up the directory after vCenter Operations Manager is installed and configured and again if you make any changes to the notification configuration.
vcenter–ops\collector	vCenter Operations Manager collector adapters directory. It contains all of the currently installed and configured collector adapters and their configurations.	Files and subdirectories in this directory are updated whenever you add or remove adapters. Back up this directory, on the vCenter Operations Manager server and any remote server, after installation and after installing any new adapters. The installer does not overwrite these files and directories during software upgrades unless adapter code has changed.
vcenter–ops\user\config\collector	vCenter Operations Manager collector configuration directory. It contains files that include parameters for the CollectorService and the trap listener.	Files in this directory are rarely updated after vCenter Operations Manager is in production. Back up this directory, on the vCenter Operations Manager server and any remote server, after installation and after installing any new adapters. This directory and its files are copied to the *vcenter–ops*\save directory during vCenter Operations Manager software upgrades.

Table 10-1. System File Backup Guidelines (Continued)

System File Directory	Description	Backup Guidelines
vcenter–ops\uninstall_vcops\installvariables.properties	Install variables file. It contains key data from the initial install, which is reused for upgrades and the vCenter Operations adapter.	Rarely updated after vCenter Operations Manager is in production. Back up this file after installation. This file is overwritten during vCenter Operations Manager software upgrades.
vcenter–ops\activemq\conf\log4j.properties	ActiveMQ logging properties file. It contains log4j parameters for ActiveMQ logging.	Rarely updated after vCenter Operations Manager is in production. Back up this file after installation. Ths file is overwritten during vCenter Operations Manager software upgrades.
vcenter–ops\user\logs	vCenter Operations Manager log files, which include the optional vCenter Operations Manager Logs and the vCenter Operations Manager Collector Logs.	Files in this directory are rolled over on a daily basis. By default, vCenter Operations Manager is configured to keep up to seven daily log files of each type, but you can adjust this limit. To retain a copy of these files, you can back up this directory regularly on the vCenter Operations Manager server and remote servers. You can copy log files at any time without stopping vCenter Operations Manager services. To restore these log files, you must stop vCenter Operations Manager services.

Recovering Data Components

No data components depend on other components, and they do not need to be absolutely in sync relative to backup and recovery times. Keep the RDB and the vCenter Operations Manager system files as up-to-date as possible because they contain the configuration of the vCenter Operations Manager system, integration adapters, and monitored environment.

If you need to restore the RDB, follow the guidelines provided by your database administrator.

For information about how to recover the FSDB or vCenter Operations Manager system files, see "Recover the FSDB or System Files," on page 133.

Recover the FSDB or System Files

You can recover the FSDB or vCenter Operations Manager system files.

Procedure

1 Stop the vCenter Operations Manager processes.

vCenter Operations Manager processes lock some files, particularly log files. You cannot restore them until the associated process stops. The vCenter Operations Manager processes include vcopsWebService, AnalyticsServer, ActiveMQ, and CollectorService.

2 Copy and paste the backup files back to their live locations.

3 After restoring all files, restart the vCenter Operations Manager processes.

Backing Up and Recovering Processing Components

You must follow certain guidelines when you back up and recover the vCenter Operations Manager processing components. The processing components include the vCenter Operations Manager server, the vCenter Operations Manager Remote Collector server, the DT processor server, and the database server.

- Selecting a Backup and Recovery Strategy for the Server on page 134

  The vCenter Operations Manager server runs the services that make up the vCenter Operations Manager application. These services include the vCenter Operations Manager Web service, Collector service, ActiveMQ service , and Analytics service. Because it is a high-performance and resource-intensive application, vCenter Operations Manager usually requires a dedicated server.

- Backing Up and Recovering the RDB Server on page 136

  vCenter Operations Manager uses commercially available relational databases. If the vCenter Operations Manager RDB is unavailable, vCenter Operations Manager becomes unavailable. If you require a high availability or remote failover capability, configure the RDB server to use clustering or a remote warm backup.

- Backing Up and Recovering a Remote Collector Server on page 136

  The vCenter Operations Manager remote collector is a remote host that has only the vCenter Operations Manager collector installed. A remote collector does not store data. You might want to install one or more remote collectors to navigate firewalls, reduce bandwidth across data centers, and reduce the load on the vCenter Operations Manager server.

- Backing Up and Recovering a Remote DT Processor Server on page 136

  A remote DT processor is a vCenter Operations Manager Server process that performs analytics calculations. It does not store data. You can distribute the load by starting a separate analytics process on one or more remote hosts to perform just the dynamic threshold (DT) portion of analytics processing.

Selecting a Backup and Recovery Strategy for the Server

The vCenter Operations Manager server runs the services that make up the vCenter Operations Manager application. These services include the vCenter Operations Manager Web service, Collector service, ActiveMQ service , and Analytics service. Because it is a high-performance and resource-intensive application, vCenter Operations Manager usually requires a dedicated server.

Many organizations use the vCenter Operations Manager server, and by extension the FSDB, as a mission-critical application. You can implement vCenter Operations Manager as a set of clustered servers for high availability, or as a set of remote servers for disaster recovery or failover purposes, or both.

Implementing High Availability for the Server

You can implement high availability for the vCenter Operations Manager server by using shared disks and clustering software. When a server that hosts vCenter Operations Manager becomes unavailable, the clustering software maps the shared disk and vCenter Operations Manager services to the backup server and brings them online.

High availability capability has the following hardware and software requirements.

- A shared disk (SAN) to install the vCenter Operations Manager software and vCenter Operations Manager FSDB.
- Two separate servers on which to deploy vCenter Operations Manager services and environment variables.
- Cluster software on both servers to manage vCenter Operations Manager services.

- A virtual IP address representing the cluster, for end users and remote collectors that point to the vCenter Operations Manager server to use.

When a server that hosts vCenter Operations Manager becomes unavailable and is remapped by the clustering software, any users that are logged in to vCenter Operations Manager are logged out and the vCenter Operations Manager system becomes unavailable for about 15 seconds. Because it is installed on the shared disk, the FSDB is not affected. The RDB remains accessible from both servers because it is installed on a different server than the vCenter Operations Manager software.

For more information about how to install and configure of a clustered environment, see your specific clustering documentation.

Implementing Disaster Recovery for the Server

vCenter Operations Manager has built-in abilities to enable a quick transition to a completely separate backup vCenter Operations Manager server or cluster if the primary server or cluster is unavailable. You must manually switch the vCenter Operations Manager software to use the backup server or cluster as the primary server or cluster.

The separate backup server typically resides in a different location than the primary system for disaster recovery purposes. The remote backup server or cluster contains a vCenter Operations Manager instance that serves as a backup replication server. This instance keeps a warm, updated copy of the FSDB.

Disaster recovery has the following hardware and software requirements.

- A separate remote vCenter Operations Manager instance that is configured as a backup server.
- A vCenter Operations Manager FSDB replication server that is running the replication service. After the remote FSDB is synchronized with the local FSDB, the data should be identical.
- A vCenter Operations Manager database that is synchronized with the appropriate vendor software.
- A scheduled batch file that copies key vCenter Operations Manager files to the backup server. For information about the vCenter Operations Manager files that are required on the backup server, see "Backing Up System Files," on page 132.

When the primary server or cluster that hosts vCenter Operations Manager becomes unavailable, the vCenter Operations Manager database should failover to the backup database by using the appropriate vendor software. Users who were logged in to vCenter Operations Manager are logged out. The vCenter Operations Manager system is unavailable until you configure the backup server to be the primary server and all services are turned back on. See "Switch the Primary and Backup Servers," on page 135.

The typical critical path timing item is the restoration of the RDB. All alerts in the new vCenter Operations Manager system at the time of the most recent RDB backup are active, but vCenter Operations Manager analytics should reset all alerts to the appropriate state after 15 minutes.

Switch the Primary and Backup Servers

If the primary server or cluster is unavailable, you must manually switch the vCenter Operations Manager software to use the backup server or cluster as the primary server or cluster.

Prerequisites

Implement disaster recovery. See "Implementing Disaster Recovery for the Server," on page 135.

Procedure

1 From the **Start** menu, select **All Programs > VMware > vCenter Operations Enterprise > Configure VMware vCenter Operations** to start the Configure VMware vCenter Operations utility on the backup server.

2 On the Full Configuration page, change the **Server Configuration** setting from **Backup** to **Primary**.

This setting converts the vCenter Operations Manager system on the backup server to serve as the new primary server.

3 Update the server IP address, or the virtual IP address that represents the cluster, to the correct IP address for the new primary server or cluster.

End users and remote collectors that point to the vCenter Operations Manager server must use the new IP address.

4 Click **Finish** to save the configuration.

NOTE Because the vCenter Operations Manager services are reinstalled and restarted when you click **Finish**, click **Exit**, not **Finish**, to close the utility if you do not make any changes.

What to do next

If you need to switch a vCenter Operations Manager replication server to the primary server, you might need to make additional changes. See "Switch the Primary and Backup Replication Servers," on page 129.

Backing Up and Recovering the RDB Server

vCenter Operations Manager uses commercially available relational databases. If the vCenter Operations Manager RDB is unavailable, vCenter Operations Manager becomes unavailable. If you require a high availability or remote failover capability, configure the RDB server to use clustering or a remote warm backup.

Instances that are configured against a single database are unavailable if that database becomes unavailable. If this situation occurs, a high availability strategy that includes a clustered database environment enables the cluster to immediately switch the shared disks and the vCenter Operations Manager instance to the backup server if one database becomes unavailable.

Backing Up and Recovering a Remote Collector Server

The vCenter Operations Manager remote collector is a remote host that has only the vCenter Operations Manager collector installed. A remote collector does not store data. You might want to install one or more remote collectors to navigate firewalls, reduce bandwidth across data centers, and reduce the load on the vCenter Operations Manager server.

If a remote collector server becomes unavailable, the primary vCenter Operations Manager server does not receive data from the portion of the monitored environment that is configured for that particular remote collector.

Although you can install a remote collector on a cluster, typical implementations install a separate collector on another server. This backup remote collector should have the same vCenter Operations Manager collector adapters folder and the same vCenter Operations Manager collector configuration folder as the primary remote collector. If the primary remote collector becomes unavailable, you can bring the backup remote collector online.

Backing Up and Recovering a Remote DT Processor Server

A remote DT processor is a vCenter Operations Manager Server process that performs analytics calculations. It does not store data. You can distribute the load by starting a separate analytics process on one or more remote hosts to perform just the dynamic threshold (DT) portion of analytics processing.

If a remote processor server goes down, vCenter Operations Manager continues to collect and store data, but dynamic thresholds are not recalculated based on the new data.

You do not need to have a backup of a remote DT processor. If the remote DT processor becomes unavailable, you can configure the analytics process on the vCenter Operations Manager server to perform the dynamic threshold calculations. See "Configure the Analytics Process to Perform DT Calculations," on page 137.

You can also install the remote DT analytics process on a different host. See the *VMware vCenter Operations Installation Guide*.

Configure the Analytics Process to Perform DT Calculations

If the remote DT processor becomes unavailable, you can configure the analytics process on the vCenter Operations Manager server to perform dynamic threshold calculations.

IMPORTANT Always make a backup copy of the `advanced.properties` file. Changes that you make might cause errors in the file that can adversely affect vCenter Operations Manager operations.

Prerequisites

Become familiar with how to start and stop the Analytics service. See "Start or Stop vCenter Operations Manager Services," on page 108.

Procedure

1. Make a backup copy of the `advanced.properties` file in the *`vcenter-ops`*`\user\conf\analytics` directory on the vCenter Operations Manager server.
2. Open the original `advanced.properties` file and find the `distributedDTCalculationsEnabled` property.
3. Change `distributedDTCalculationsEnabled` to `false`.
4. Save your changes and close the `advanced.properties` file.
5. Restart the Analytics service.

Configuring the Repository Adapter 11

You can use the Repository adapter to export metrics from vCenter Operations Manager on a schedule that you set. The destination can be a relational database or a comma-separated value (CSV) file.

This chapter includes the following topics:

- "Repository Adapter Requirements and Limitations," on page 139
- "Repository Adapter Configuration Steps," on page 141
- "Creating a Database User for the Repository Adapter," on page 141
- "Configure the Source Database Connection for the Repository Adapter," on page 141
- "Configure the Output Destination for the Repository Adapter," on page 142
- "Configuring the Source and Destination Columns for the Repository Adapter," on page 143
- "Configure Data Export Values for the Repository Adapter," on page 144
- "Customizing Repository Adapter Operation," on page 146
- "Start the Repository Adapter," on page 146

Repository Adapter Requirements and Limitations

The Repository adapter has certain requirements and limitations.

Connection Requirements

You must configure a connection to the vCenter Operations Manager relational database for the Repository adapter.

You do not configure a connection to the FSDB. The Repository adapter uses the local RMI configuration (`rmi.properties` file) to connect to the Analytics service and retrieve FSDB data.

Database Requirements

If you plan to use the Repository adapter to export data to an output database rather than a CSV file, you must create a table on the destination database server. You must also configure the source database and destination database columns. The *`vcenter-ops`*`\tools\RepositoryAdapter\conf` directory contains several sample creation scripts.

The following sample creation script is for SQL server.

```
CREATE TABLE TestTable
(    RID1 int,
     RNAME1 nvarchar(1000),
     MID1 int,
     MNAME1 nvarchar(900),
     RKNAME1 nvarchar(50),
     MKNAME1 nvarchar(1000),
     AKNAME1 nvarchar(50),
     timestamp1 datetime,
     min_threshold1 nvarchar(50),
     value1 nvarchar(50),
     max_threshold1 nvarchar(50)
)
```

The following sample creation script is for Oracle.

```
CREATE TABLE TestTable (
      RID1 INTEGER,
      RNAME1 NVARCHAR2(1000),
      MID1 INTEGER,
      MNAME1 NVARCHAR2(900),
      RKNAME1 NVARCHAR2(50),
      MKNAME1 NVARCHAR2(1000),
      AKNAME1 NVARCHAR2(50),
      timestamp1 TIMESTAMP,
      min_threshold1 NVARCHAR2(50),
      value1 NVARCHAR2(50),
      max_threshold1 NVARCHAR2(50)
);
```

The following sample creation script is for Postgres.

```
CREATE TABLE TestTable
(     RID1 int2 ,
      RNAME1 varchar(1000),
      MID1 int2,
      MNAME1 varchar(900),
      RKNAME1 varchar(50),
      MKNAME1 varchar(1000),
      AKNAME1 varchar(50),
      timestamp1 timestamp,
      min_threshold1 varchar(20) null,
      value1 varchar(20),
      max_threshold1 varchar(20) null
)
```

Limitations

The Repository adapter is designed to extract only a small subset of data for specific purposes. Exporting a large amount data can result in a significant load on the system.

Repository Adapter Configuration Steps

You must perform certain steps to configure the Repository adapter.

1. (Optional) If you have a vApp installation, create a Postgres database user for the Repository adapter to use. See "Creating a Database User for the Repository Adapter," on page 141.
2. Configure the connection to the vCenter Operations Manager relational database . See "Configure the Source Database Connection for the Repository Adapter," on page 141.
3. Configure the connection to the output database or CSV file. See "Configure the Output Destination for the Repository Adapter," on page 142.
4. (Optional) If you use the Repository adapter to export data to an output database, configure the source and destination columns. See "Configuring the Source and Destination Columns for the Repository Adapter," on page 143.
5. Configure the resources and metrics for which the Repository adapter exports values. See "Configure Data Export Values for the Repository Adapter," on page 144.
6. (Optional) Customize Repository adapter operation. See "Customizing Repository Adapter Operation," on page 146.
7. Start the Repository adapter. See "Start the Repository Adapter," on page 146.

Creating a Database User for the Repository Adapter

In a vApp installation, the relational database is the Postgres instance on the Analytics virtual machine. If you have a Postgres instance, you should create a read-only user for the Repository adapter to use and configure that user to have access to select tables.

For example:

```
su postgres
psql –d alivevm
create user repouser with password 'my_password';

grant select on aliveresource to repouser;
grant select on resourceattributekey to repouser;
grant select on attributekey to repouser;
grant select on resourcekind to repouser;
grant select on adapterkind to repouser;
grant select on resourcekindattribute to repouser;
```

Configure the Source Database Connection for the Repository Adapter

You must configure a connection to the vCenter Operations Manager relational database for the Repository adapter.

Prerequisites

In a vApp installation, the relational database is the Postgres instance in the Analytics virtual machine. If your relational database is the Postgres instance, create a read-only user for the Repository adapter to use and configure the user to have access to select tables. See "Creating a Database User for the Repository Adapter," on page 141.

Procedure

1 Open the `conf.properties` file in a text editor.

The `conf.properties` file is in the *vcenter-ops*`\tools\RepositoryAdapter\conf` directory. In a vApp installation, edit the `conf.properties` file on the Analytics virtual machine.

2 Use the `sourcedb` properties to define the connection to the source database.

The following example is an SQL Server source database definition.

```
sourcedbDriver = com.microsoft.sqlserver.jdbc.SQLServerDriver
sourcedbUrl = jdbc:sqlserver://host:port
sourcedbName = databasename
sourcedbUserName = username
sourcedbPassword = password
```

The following example is an Oracle source database definition.

```
sourcedbDriver = oracle.jdbc.driver.OracleDriver
sourcedbUrl = jdbc:oracle:thin:@host:port:sid
sourcedbUserName = username
sourcedbPassword = password
```

The following example is a Postgres source database definition.

```
sourcedbDriver = org.postgresql.Driver
sourcedbUrl = jdbc:postgresql://host:port
sourcedbName = alivevm
sourcedbUserName = username
sourcedbPassword = password
```

3 Verify that the `encrypted` property is set to `false`.

When the Repository adapter runs, it encrypts the `sourcedbName` and `sourcedbUserName` values and sets the `encrypted` property to `true`.

IMPORTANT If you set the `encrypted` property to `true` before the Repository adapter runs for the first time, the adapter fails because vCenter Operations Manager expects the credentials to be in an encrypted state. If you need to change the user name and password values, type them in plain text and set `encrypted` to `false`.

---

4 Save your changes and close the `conf.properties` file.

Configure the Output Destination for the Repository Adapter

You must configure a connection to an output destination for the Repository adapter. The output destination can be a relational database or a CSV file.

Procedure

1 Open the `conf.properties` file in a text editor.

The `conf.properties` file is in the *vcenter-ops*`\tools\RepositoryAdapter\conf` directory. In a vApp installation, edit the `conf.properties` file on the Analytics virtual machine.

2 Define the output destination method.

You can define only one output destination method.

Option	Action
Send output to a database	Set `exportToCsv` to `false`.
Send output to a CSV file	Set `exportToCsv` to `true`.

3 If you set `exportToCsv` to **`false`**, use the `destdb` properties to define the connection to the output database.

The following example is an SQL Server output database definition.

```
destdbDriver = com.microsoft.sqlserver.jdbc.SQLServerDriver
destdbUrl = jdbc:sqlserver://host:port
destdbName = databasename
destdbuserName = username
destdbPassword = password
```

The following example is an Oracle output database definition.

```
destdbDriver = oracle.jdbc.driver.OracleDriver
destdbUrl = jdbc:oracle:thin:@host:port:sid
destdbuserName = username
destdbPassword = password
```

The following example is a Postgres output database definition.

```
destdbDriver = org.postgresql.Driver
destdbUrl = jdbc:postgresql://host:port
destdbName = databasename
destdbuserName = username
destdbPassword = password
```

4 If you set `exportToCsv` to **`true`**, use the `csvFilePath` and `csvDelimiter` properties to specify the location of the CSV file.

For example:

```
csvFilePath = /path/filename.csv
csvDelimiter = \,
```

5 Save your changes and close the `conf.properties` file.

Configuring the Source and Destination Columns for the Repository Adapter

If you use the Repository adapter to export data to an output database, you must use the `insertCommand` statement in the `conf.properties` file to define where the Repository adapter puts the data that it exports.

The `conf.properties` file is in the *`vcenter-ops`*`\tools\RepositoryAdapter\conf` directory on the vCenter Operations Manager server. In a vApp installation, edit the `conf.properties` file on the Analytics virtual machine.

insertCommand Format

The `insertCommand` statement contains two sets of values in parentheses, for example:

```
insertCommand=INSERT INTO TestTable (column1; column2) values(field1; field2)
```

The first set of values defines the columns in the output database. You change `TestTable` to the name of your output table. The second set of values, which appears after `values` in the statement, defines the source fields in the vCenter Operations Manager data model to export to the output database columns.

Source Fields

The sample `conf.properties` file includes all of the possible source fields. You can change the order of the source fields or remove fields, but you cannot add source fields. If you change the source fields, you must also change the output column list.

Field names that start with `alive` are from the vCenter Operations Manager relational database.

Table 11-1. Relational Database Fields

Field	Description
`alive.RID`	Resource ID.
`alive.RNAME`	Resource name.
`alive.MID`	Metric ID.
`alive.MNAME`	Metric key, hierarchical format, including group keys, instance names, and attribute kind keys. For example, `cpu:0|utilization_pct`.
`alive.RKNAME`	Resource kind key.
`alive.MKNAME`	Attribute kind key, one level (the last item in the metric key).
`alive.AKNAME`	Adapter kind key.

Field names that start with `fsdb` are from the vCenter Operations Manager FSDB.

Table 11-2. FSDB Fields

Field	Description
`fsdb.timestamp`	Metric time stamp.
`fsdb.min_threshold`	Minimum threshold for the metric.
`fsdb.value`	Metric value.
`fsdb.max_threshold`	Maximum threshold for the metric.

insertCommand Statement Example

The following `insertCommand` statement exports the `alive.RID` field from the vCenter Operations Manager relational database to the `RID1` column of the output database and the `alive.RNAME` field from the vCenter Operations Manager relational database to the `RNAME1` column of the output database.

```
insertCommand=INSERT INTO TestTable (RID1; RNAME1) values(alive.RID; alive.RNAME)
```

Configure Data Export Values for the Repository Adapter

You can use the `conditions.properties` file to filter the resources and metrics for which the Repository adapter exports values. If you do not use the `conditions.properties` file, the Repository adapter exports all data.

The `conditions.properties` file can contain multiple conditions. Each condition specifies the name of an output column in the destination database or CSV file and one or more values.

A condition defines either a white list of values (equals operator) or a black list of values (not equals operator). If you define both a white list and a black list, the Repository adapter applies AND logic to the lists. For example, the following conditions cause the Repository adapter to export data if resource ID equals 1, 21, or 54 and metric ID is not equal to 1, 2, or 3.

```
RID1=1;21;154
MID=<>1;2;3
```

If you do not specify an output column in the `conditions.properties` file, the Repository adapter does not filter on that column and exports all of its values.

Follow these rules when you add or edit values in the `conditions.properties` file:

- Enclose string values in single quotes.
- Do not quote numeric values, such as resource or attribute IDs.
- Use an asterisk (*) to specify a wildcard character. A wildcard matches any number of characters, including no characters. You cannot use wildcards in numeric values.

Procedure

1. Open the `conditions.properties` file in the *vcenter-ops*`\tools\RepositoryAdapter\conf` directory.

   In a vApp installation, edit the `conditions.properties` file on the Analytics virtual machine.

2. Use an equals operator (=) to define the values to include in an output column.

   For example:

   ```
   Column=value1;value2
   ```

   The Repository adapter exports the value only if the value for the corresponding field in the vCenter Operations Manager database matches one of the listed values.

3. Use a not equals operator (=<>) to define the values to exclude from an output column.

   For example:

   ```
   Column=<>value1;value2
   ```

   The Repository adapter exports the value only if the value for the corresponding field in the vCenter Operations Manager database does not match any of the listed values.

4. Save your changes and close the `conditions.properties` file.

Example: conditions.properties File

The following example maps the resource name field to the `RNAME1` output column and the metric name field to the `MKNAME1` output column. The Repository adapter exports data for the `Collector`, `Web`, and `Analytics` resources, and for any resource that has a name that begins with `Business`. The adapter does not export data for the `health` metric or for any metric that has a name that begins with `avail`.

```
RKNAME1='Collector';'Web';'Analytics';'Business*'
MKNAME1=<>'health';'avail*'
```

Customizing Repository Adapter Operation

You can modify properties in the *vcenter-ops*\tools\RepositoryAdapter\conf\conf.properties file to customize Repository adapter operation. In a vApp installation, edit the conf.properties file on the Analytics virtual machine.

Table 11-3. Repository Adapter Properties

Property	Description	Default
runOnce	Set to true to run the adapter once, or set to false to sleep and run the adapter again after scheduleTime.	true
scheduleTime	Time to run the adapter, in hours. Set this property to a positive number to run the adapter at a particular time of day, or set it to a negative number to run the adapter at specific intervals. For example, if you set this property to 23, the adapter runs at 11:00 p.m. each day. If you set this property to -1, the adapter runs once per hour.	24
dtEnabled	Enables or disables retrieval of dynamic thresholds for metrics. NOTE Enabling this property can affect performance. Enable this property only when required and only if the adapter selectively exports metrics	false
readResourceDataAtOnce	Set to true to read all of the data for a resource at one time. Enabling this property improves retrieval performance because the number of read operations is decreased. You must set dtEnabled to false for this property to be effective.	true
incremental	Set to true to retrieve only metric values collected after the last adapter run.	true
maxDays	Specifies the number of days to retrieve data. For example, if you set this property to 365, the adapter retrieves data for the past year.	1
retryConnectCount	Number of times that the adapter retries the database connection.	5
delayBetweenRetries	Amount of time, in milliseconds, between retries.	10000

Start the Repository Adapter

You can start the Repository adapter on a Windows or Linux host.

Procedure

- Start the Repository adapter on a Windows host.
  a. Open a command prompt on the Windows host.
  b. Change the directory to *vcenter-ops*\tools\RepositoryAdapter.
  c. Run the batch file.

     For example: **run.bat**
- Start the Repository adapter on a Linux host or on the Analytics virtual machine.
  a. Open a terminal window on the Linux host or Analytics virtual machine.
  b. Change the directory to *vcenter-ops*/tools/RepositoryAdapter.
  c. Run the shell script.

     For example: **./run.sh**

After the Repository adapter starts, it runs according to the schedule that you configured in the `conf.properties` file.

12 Using System Tools

vCenter Operations Manager includes several system tools. You can use these tools to manage and troubleshoot the file system database (FSDB), monitor and troubleshoot vCenter Operations Manager performance, check communication between the vCenter Operations Manager server host and remote or local collectors, configure and run the Repository Adapter, and estimate how many resources a host can support.

This chapter includes the following topics:

- "Summary of System Tools," on page 149
- "Check the FSDB and Repair Problems," on page 150
- "Move the FSDB," on page 151
- "Monitor vCenter Operations Manager Services in JConsole," on page 152
- "Configuring and Running runvcopsServerConfiguration," on page 152
- "Eliminating Linearly Correlated Metrics from the DT Calculation," on page 155

Summary of System Tools

For each system tool, vCenter Operations Manager provides a batch (`.bat`) file version for Windows hosts and a shell script (`.sh`) file version for Linux hosts.

Table 12-1. Summary of System Tools

Tool	Description
dbcli	Database command line interface. You can use this tool to perform operations in the vCenter Operations Manager database, including importing and exporting dashboards, dashboard templates, and super metrics. See Chapter 13, "Using the Database Command Line Interface," on page 157.
FilterPluginConfEditor	Configuration File editor. You can use the Configuration File editor to edit the `emailFilter.xml` file. See Chapter 7, "Configuring Alert Notifications," on page 79.
FSDBCheck	Checks for and repairs problems, such as data corruption caused by a power failure, in the vCenter Operations Manager FSDB.
FSDBHomeChanger	Moves the vCenter Operations Manager FSDB to a new location and updates all properties associated with its location.
PCA	Eliminates linearly correlated metrics from the dynamic threshold calculation.

Table 12-1. Summary of System Tools (Continued)

Tool	Description
run-jconsole	Starts the Java JConsole tool to open the Java application console. You can use this tool to troubleshoot certain vCenter Operations Manager performance issues. NOTE You must install the Java SDK, which includes JConsole, to use run-jconsole. JConsole is not shipped with vCenter Operations Manager.
Reporting Repository Adapter	Copies a defined subset of data from the vCenter Operations Manager FSDB to another database where you can use the data for reporting purposes.
runvcopsServerConfiguration	Estimates how many resources a server can support based on the server CPU, memory, disk space, and file I/O specifications.

Check the FSDB and Repair Problems

You can use the FSDBCheck tool to check for and repair problems, such as data corruption caused by a power failure, in the vCenter Operations Manager FSDB. FSDBCheck stores a corrected copy of the FSDB in an output directory that you specify.

Prerequisites

- Become familiar with how to start and stop the Analytics service. See "Start or Stop vCenter Operations Manager Services," on page 108.
- Become familiar with the FSDBHomeChanger tool. See "Move the FSDB," on page 151.

Procedure

1 Stop the Analytics service.

2 Start the FSDBCheck tool.

Option	Action
Windows host	Open a command prompt and type ***vcenter-ops*\tools\FSDBCheck\fsdbcheck.bat** .
Linux host	Open a terminal window and type ***vcenter-ops*/tools/SDBCheck/sdbcheck.sh** .

For example:

path_fsdbcheck fsdb_dir [-out *fsdb_outdir*] [-5 *count*]

- *path_fsdbcheck* is the path to the `.bat` or `.sh` file.
- *fsdb_dir* is the path the FSDB home directory to check.
- *fsdb_outdir* is the path to the output directory for the checked files. If the output directory does not exist, FSDBCheck creates it. If you do not include the `-out` option, the output directory is *vcenter-ops*\data_backup_*yyyy_mm_dd_hh_mm_ss*. The final lines of the output file specify whether any files were fixed.
- *count* is the number of threads to use for the command. The thread count can be 1 to 100. The default thread count is 1. For best load balancing, set the thread count to the number of cores in the server where you are running the command.

3 If FSDBCheck fixes any files, change the home directory or continue using the current directory.

Option	Action
Switch vCenter Operations Manager to use the new copy of the FSDB	Use FSDBHomeChanger to change the FSDB home directory to use the corrected files, for example, `FSDBHomeChanger homedir –out FSDBCheck_output_dir`. Do not include the `–o` option. Do not overwrite the files in the new directory.
Continue using the current FSDB home directory	Use Windows Explorer to copy the files from the FSDBCheck output directory back to the home directory, overwriting the files there.

4 Restart the Analytics service.

Move the FSDB

You can use the FSDBHomeChanger tool to copy all of the files in the vCenter Operations Manager FSDB to a new disk drive or file system. FSDBHomeChanger also updates all of the vCenter Operations Manager properties that are associated with the FSDB location to use the new location. You might need to use FSDBHomeChanger after you use FSDBCheck to correct problems in the database.

Prerequisites

Become familiar with how to stop and start the Analytics service. See "Start or Stop vCenter Operations Manager Services," on page 108.

Procedure

1 Stop the Analytics service.

2 Start FSDBHomeChanger.

Option	Action
Start FSDBHomeChanger on a Windows host	Open a command prompt and type ***vcenter–ops*\tools\FSDBHomeChanger\fsdbhomechanger.bat**.
Start FSDBHomeChanger on a Linux host	Open a terminal window and type ***vcenter–ops*/tools/FSDBHomeChanger/fsdebhomechanger.sh**.

For example:

path_fsdbhomechanger fsdbd–indir –out *fsdb_outdir* [–o] [–s]

- *path_fsdbhomechanger* is the path to the `.bat` or `.sh` file.
- *fsdbd-indir* is the path to the source FSDB home directory.
- *fsdb_outdir* is the path to the output directory for the copied files. If the output directory does not already exist, FSDBHomeChanger creates it.

The `–o` option causes FSDBHomeChanger to overwrite files if they already exist in the output directory. By default, existing files are not overwritten. The `–s` option puts all data for each resource in a single file instead of a separate file for each month's data for each resource. Using `–s` reduces I/O operations, but it slows the calculation of dynamic thresholds.

3 (Optional) If you are using FSDBHomeChanger after using FSDBCheck, and FSDBCheck corrects any files, you might want to change the FSDB home directory to the FSDBCheck output directory so that it uses the corrected files.

For example:

`FSDBHomeChanger homedir –out FSDBCheck_output–dir`

In the example, *homedir* is the currently defined FSDB home directory and *FSDBCheck_output_dir* is the output directory from the FSDBCheck command. Because you do not want to overwrite the corrected files in the new location, do not include the `–o` option. The example assumes that you are using a Windows server and that you changed to the directory that contains `fsdbhomechanger.bat`.

4 Restart the Analytics service.

Monitor vCenter Operations Manager Services in JConsole

You can use the run-jconsole tool to monitor vCenter Operations Manager services and troubleshoot performance issues. run-jconsole starts the Java JConsole tool to open the Java application console.

Prerequisites

Install the Java SDK, which includes JConsole. JConsole must be installed to use run-jconsole. JConsole is not included with vCenter Operations Manager. For more information about JConsole, see the Java Web site (http://java.sun.com).

Procedure

1 Start run-jconsole.

Option	Action
Start run-jconsole on a Windows host	Open a command prompt and type ***vcenter–ops*\tools\run–jconsole.bat**.
Start run-jconsole on a Linux host	Open a terminal window and type ***vcenter–ops*/tools/run–jconsole.sh**.

2 Type the name of the service to monitor.

You can type **`all`**, **`web`**, **`analytics`**, **`collector`**, or **`mq`**.

Configuring and Running runvcopsServerConfiguration

The runvcopsServerConfiguration tool calculates the resources that a vCenter Operations Manager server host can support with acceptable performance based on the host's available CPU, memory, disk space, and file I/O and your vCenter Operations Manager configuration.

Before you can use runvcopsServerConfiguration, you must set values in the `vcops_parameters.properties` and `vcops_server_configuration.properties` files. Both files are located in the `vcenter–ops\vcopsServerConfiguration\vcops_server_configuration\conf` directory.

vcops_parameters.properties File

runvcopsServerConfiguration uses values in the `vcops_parameters.properties` file to estimate the maximum number of resources that a vCenter Operations Manager server host can support.

The `vcops_parameters.properties` file is located in the *`vcenter–ops`*`\vcopsServerConfiguration\vcops_server_configuration\conf` directory.

Table 12-2. vcops_parameters.properties File Properties

Property	Description
NUMBER_INBOUND_ADAPTERS_ON_ALIVE_SERVER	Number of inbound adapters that vCenter Operations Manager uses.
NUMBER_CONTAINERS	Estimated number of container resources that will be configured.
NUMBER_RESOURCES	Number of resources for the tool to use as a starting point for the estimation. Set this number to approximately twice the maximum number of resources that you estimate this installation needs to support.
NUMBER_METRICS_PER_RESOURCE	Average number of metrics to track for each resource.
NUMBER_APPLIED_SUPERMETRICS_PER_CONTAINER	Average number of super metrics for each container resource.
MINUTE_COLLECTION_PERIOD	How often metric values are collected, in minutes.
DAYS_DATA_RETENTION	Number of days metric data is retained.
CONCURRENT_USERS	Estimated average number of concurrent vCenter Operations Manager users.
REMOTE_COLLECTORS	Number of installed remote collectors.
OUTBOUND_ADAPTERS	Number of outbound adapters.
NUMBER_FSDB_WRITE_CYCLES	Number of times to write data to the FSDB during the file I/O test. The higher the number, the more accurate the estimation, but the longer the test takes.
GOAL_HOURS_DT_CALCULATION	Maximum number of hours dynamic threshold calculations should take to complete.
NUMBER_DT_PLUGINS	Average number of dynamic threshold processors that are used for dynamic threshold calculations.

vcops_server_configuration.properties File

The `vcops_server_configuration.properties` file contains connection information for the vCenter Operations Manager server on the host. runvcopsServerConfiguration uses the values in this file to connect to a host.

You set the properties in `vcops_server_configuration.properties` only on a Windows host. You do not need to modify this file on a Linux host.

Table 12-3. vcops_server_configuration.properties Properties

Property	Description
ALIVE_SERVER_HOSTNAME	Host name or IP address of the host. If you are using runvcopsServerConfiguration on the host, you can set this property to `localhost`.
ALIVE_SERVER_USERNAME	User name to use to connect to the host.
ALIVE_SERVER_PASSWORD_ENCRYPTED	Leave this property set to `false`. When you first run the runvcopsServerConfiguration, the tool encrypts the password value and change this value to `true`.
ALIVE_SERVER_PASSWORD	Password for the user named in ALIVE_SERVER_USER_NAME. This property is encrypted when you run runvcopsServerConfiguration.

Set Properties for runvcopsServerConfiguration

runvcopsServerConfiguration uses values in the `vcops_parameters.properties` file to estimate the maximum number of resources that the vCenter Operations Manager server host can support. The `vcops_server_configuration.properties` file contains connection information for the vCenter Operations Manager server on the host. runvcopsServerConfiguration uses the values in this file to connect to a host.

Prerequisites

Become familiar with the properties in the `vcops_parameters.properties` and `vcops_server_configuration.properties` files. See "vcops_parameters.properties File," on page 152 and "vcops_server_configuration.properties File," on page 153.

Procedure

1. Open the `vcops_parameters.properties` file and set each property to the correct value, or the best estimate of the correct value, for the vCenter Operations Manager server host.
2. Save your changes and close the `vcops_parameters.properties` file.
3. (Windows host only) Open the `vcops_server_configuration.properties` file and configure connection information for the vCenter Operations Manager server host.
4. Save your changes and close the `vcops_server_configuration.properties` file.

What to do next

Run runvcopsServerConfiguration. See "Run runvcopsServerConfiguration," on page 154.

Run runvcopsServerConfiguration

On a Windows host, you start runvcopsServerConfiguration by running a batch (`.bat`) file. On a Linux host, you start runvcopsServerConfiguration by running a shell script.

Prerequisites

Configure runvcopsServerConfiguration. See "Configuring and Running runvcopsServerConfiguration," on page 152.

Procedure

- On a Windows host, open a command prompt and type the following command.

  ```
  vcenter-ops\tools\vcopsServerConfiguration\runvcopsServerConfiguration.bat [-print | -test]
  ```

- On a Linux host, open a terminal window and type the following command.

  ```
  vcenter-ops\tools\vcopsServerConfiguration\runvcopsServerConfiguration.sh [-print | -test ]
  ```

When you run runvcopsServerConfiguration in print mode using the `-print` option, it returns a summary that shows the number of CPU cores, total physical memory, available free space on drives or file systems where the vCenter Operations Manager FSDB is located, and the estimated number of resources that the host can support.

When you run runvcopsServerConfiguration in test mode using the `-test` option, it returns the same information, but it also runs a file I/O test. The file I/O test writes data to the defined FSDB home directory and uses the measured speed of the writes in its estimation of the maximum number of resources. The value of the `NUMBER_FSDB_WRITE_CYCLES` property in the `vcops_parameters.properties` file determines the number of times to writes to the FSDB. For information on the `NUMBER_FSDB_WRITE_CYCLES` property, see "vcops_parameters.properties File," on page 152. Test mode takes longer than print mode, but it generally returns a more accurate estimate.

If FSDB home directories exist on more than one Windows drive or Linux file system, runvcopsServerConfiguration uses the minimum amount of available space on any of the defined drives or file systems and multiplies it by the defined number of drives or file systems. If the drives or files systems have very different amounts of available space, runvcopsServerConfiguration might underestimate the amount of available space. For example, if FSDB home directories exist on two drives and one drive has 40GB available and the other drive has 300GB available, runvcopsServerConfiguration estimates the disk space as 80GB (40GB multiplied by 2).

The maximum number of resources that runvcopsServerConfiguration calculates is an approximation. In many cases, the server host might be able to support a slightly higher number of resources. For example, if runvcopsServerConfiguration estimates that the host can support 1485 resources, the host might be able to support 1500 resources.

Eliminating Linearly Correlated Metrics from the DT Calculation

In certain circumstances, you might want to eliminate linearly correlated metrics from the dynamic threshold calculation. For example, if the CPU | Usage (%) metric is outside of normal bounds for a virtual machine, the CPU | Usage (MHz) metric also will be outside of normal bounds because the metrics are correlated. In this case, calculating dynamic thresholds on both metrics is not necessary.

The PCA tool eliminates linearly correlated metrics from the dynamic threshold calculation. You use the `pca.properties` file to identify the resource kinds on which to run the PCA tool, specify the number of days of data to include in the PCA calculation, and configure other properties.

pca.properties File

The `pca.properties` file in the *`vcenter-ops`*`\tools\pca\conf` folder contains configuration information for the PCA tool. In a vApp installation, you edit the `pca.properties` file on the Analytics virtual machine.

Table 12-4. pca.properties File Properties

Property	Description
`pcaRKList`	Comma-separated list of resource kind keys. This list determines the resource kinds on which to run the PCA tool.
`pcaDaysToProcess`	Number of days of data to include in the PCA calculation.
`pcaDaysAgoEnd`	End date for the metric data to include in the PCA calculation, counted in number of days from the current date.
`pcaTimeWindowIncrement`	Size of the interval between data windows, expressed as a number of samples.
`pcaTimeWindowSize`	Size of each data window, expressed as a number of samples.
`pcaPFraction`	Value of the p fraction variable to use in the PCA calculation.
`pcaDataSetSamplePercent`	Percentage, from 0 to 100, of the data set to use as a random sample when determining the monitoring cycle.
`pcaConstantPercentile`	Percentile to take when determining when data sets are constant.
`pcaEpsilon`	Rounding error for determining when data sets are constant.

The following example is a sample `pca.properties` file.

```
pcaRKList = Tier
pcaDaysToProcess = 1
pcaDaysAgoEnd = 0
pcaTimeWindowIncrement = 10.0
pcaTimeWindowSize = 20.0
```

```
pcaPFraction = 0.9
pcaDataSetSamplePercent = 10.0
pcaConstantPercentile = 90.0
pcaEpsilon = 0.00001
```

Run the PCA Tool

You can use the PCA tool to eliminate linearly correlated metrics from the dynamic threshold calculation.

Prerequisites

Become familiar with the `pca.properties` file. See "pca.properties File," on page 155.

Procedure

1 Configure the resource kinds on which to run the PCA tool and the number of days to include in the PCA calculation.

   a Open the `pca.properties` file in a text editor.

   The `pca.properties` file is in the *`vcenter-ops`*`\tools\pca\conf` directory. In a vApp installation, edit the `pca.properties` file on the Analytics virtual machine.

   b Set the `pcaRKList` property to a comma-separated list of resource kind keys.

   This list determines the resource kinds on which to run the PCA tool.

   c Set the `pcaDaysToProcess` property to the number days of data to include in the PCA calculation.

   d Save your changes and close the `pca.properties` file.

2 Start the PCA tool.

Option	Description
Windows host	Open a command prompt and type *`vcenter-ops`*`\tools\pca\run-pca.bat`.
Linux host	Open a terminal window and type *`vcenter-ops`*`/tools/pca/run-pca.sh`.

A PCA results file appears in the *`vcenter-ops`*`\user\conf\analytics` directory. The PCA log file contains the statistics of how many metrics were eliminated. The Analytics service stops calculating dynamic thresholds for the eliminated metrics.

Using the Database Command Line Interface 13

The database command line interface, `dbcli`, is a command line Java application that you can use to perform operations in the vCenter Operations Manager database. With `dbcli` commands, you can manage dashboards, dashboard templates, attributes, super metrics, and resources. You can also perform certain control operations.

This chapter includes the following topics:

- "Run the Database Command Line Interface," on page 157
- "Managing Dashboards," on page 157
- "Managing Dashboard Templates," on page 160
- "Managing Attributes and Super Metrics," on page 163
- "Managing Resource Kinds," on page 167
- "Performing Control Operations," on page 168

Run the Database Command Line Interface

You can run the database command line interface on Windows and Linux systems.
vCenter Operations Manager provides a batch (`.bat`) file version for Windows and a shell script (`.sh`) file version for Linux.

Procedure

- Start the database command line interface.

Option	Action
Windows host	Open a command prompt and type ***vcenter-ops*\tools\dbcli\dbcli.bat *command***.
Linux host	Open a terminal window and type ***vcenter-ops*/tools/dbcli/dbcli.sh *command***.

vcenter-ops represents the vCenter Operations Manager installation directory and *command* represents a `dbcli` command.

Managing Dashboards

You can use `dbcli` commands to efficiently create, modify, and maintain dashboards for multiple users and vCenter Operations Manager instances.

You can also use the Custom user interface to perform many dashboard operations. For more information, see the *VMware vCenter Operations Manager Getting Started Guide (Custom User Interface)*.

Export a Dashboard

You can use the `dbcli dashboard export` command to export a dashboard from a vCenter Operations Manager instance. When you export a dashboard, vCenter Operations Manager creates a dashboard file in XML format.

The `dashboard export` command has the following syntax.

```
dashboard export user-name "dashboard-name" [output-dir]
```

user-name	Name of the user account that owns the dashboard.
dashboard-name	Name of the dashboard to export.
output-dir	Directory where the command exports the dashboard file. If you do not provide an output directory name, the command exports the dashboard file to the current directory.

If the user account or dashboard does not exist, the command fails.

The following `dashboard export` command exports a dashboard named MyDashboard that belongs to the MyUser user account to the `MyDashboard.xml` file in the `tools\dbcli\dashboards` directory.

```
dbcli.sh dashboard export MyUser "MyDashboard" dashboards
```

Import a Dashboard

You can use the `dbcli dashboard import` command to import a dashboard that you exported from another instance of vCenter Operations Manager. You can import XML format and Java binary object (`.bin`) format dashboard files.

The `dashboard import` command has the following syntax.

```
dashboard import user-name "input-file" [--force] [--share all | group-name[,group-name]...] [--retry maxRetryMinutes] [--default]
```

user-name	Name of the user account to own the imported dashboard on the target system.
input-file	Name of a previously exported dashboard file.

If the user name or dashboard file does not exist, the command fails.

The `dashboard import` command has certain options.

Table 13-1. dashboard import Command Options

Option	Description
`--force`	Use this option to import the dashboard even if a dashboard that has the same name already exists on the target system. **NOTE** This option can cause the command to create a duplicate dashboard on the target system.
`--share all |` *group-name* `[,`*group-name*`]...`	List of user groups that can share the dashboard on the target system. Separate multiple names with a comma. To share the dashboard with all user groups, type **`all`** instead of individual user group names.

Table 13-1. dashboard import Command Options (Continued)

Option	Description
`--retry` *maxRetryMinutes*	Maximum amount of time, in minutes, that the command retries the import operation. The command retries the import operation at one-minute intervals until it reaches this time limit. NOTE This option is useful if data is missing from the dashboard when you initiate the command.
`--default`	Makes the imported dashboard the default dashboard for the specified user account or user groups. The default dashboard is the first dashboard users see when they log in.

The following `dashboard import` command imports the `dashboards/MyDashboard.xml` dashboard file. The MyUser2 user account owns the dashboard and members of the Users user group can share the dashboard. If the required information is not available when you initiate the command, the command retries the import operation at one-minute intervals for up to 10 minutes.

```
dbcli.sh dashboard import MyUser2 "dashboards/MyDashboard.xml" --retry 10 --share Users
```

Share a Dashboard

You can use the `dbcli dashboard share` command to share a dashboard with one or more user groups.

The `dashboard share` command has the following syntax.

```
dashboard share user-name "dashboard-name" {all | group-name[,group-name]...}
```

user-name Name of the user account that owns the dashboard.

dashboard-name Name of the dashboard to share.

You can type the name of each user group that can share the dashboard or type **`all`** to share the dashboard with all user groups. Use a comma to separate multiple user group names.

The following `dashboard share` command shares a dashboard named MyDashboard that belongs to the MyUser user account with members of the Users and Operators user groups.

```
dbcli.sh dashboard share MyUser "MyDashboard" Users,Operators
```

Unshare a Dashboard

You can use the `dbcli dashboard unshare` command to stop sharing a dashboard that you previously shared.

The `dashboard unshare` command has the following syntax.

```
dashboard unshare user-name "dashboard-name" {all | group-name[,group-name]...}
```

user-name Name of the user account that owns the dashboard.

dashboard-name Name of the dashboard to stop sharing.

You can type the name of each user group with which to stop sharing the dashboard or type **`all`** to stop sharing the dashboard with all user groups. Use a comma to separate multiple user group names.

The following `dashboard unshare` command stops sharing for the dashboard named MyDashboard. The dashboard is owned by the MyUser user account. The command stops sharing the dashboard with all user groups.

```
dbcli.sh dashboard unshare MyUser "MyDashboard" all
```

Reorder a Dashboard

You can use the `dbcli dashboard reorder` command to control the order in which a dashboard appears in the user interface.

The `dashboard reorder` command has the following syntax.

```
dashboard reorder user-name "dashboard-name" [--set rank] [--default]
```

user-name Name of the user account that owns the dashboard.

dashboard-name Name of the dashboard to reorder.

The `dashboard reorder` command has certain options.

Table 13-2. dashboard reorder Command Options

Option	Description
`--set` *rank*	Sets the dashboard order. For example, `--set 1` makes the dashboard the first dashboard in the dashboard list. If you do not specify this option, the dashboard order is not changed.
`--default`	Makes the dashboard the default dashboard for the specified user. The default dashboard is the first dashboard users see when they log in.

The following `dashboard reorder` command makes the dashboard named MyDashboard the first dashboard in the dashboard list and the default dashboard for the MyUser user account.

```
dbcli.sh dashboard reorder MyUser "MyDashboard" --set 1 --default
```

Delete a Dashboard

You can use the `dbcli dashboard delete` command to delete a dashboard.

The `dashboard delete` command has the following syntax.

```
dashboard delete user-name "dashboard-name"
```

user-name Name of the user account that owns the dashboard.

dashboard-name Name of the dashboard to delete.

The following `dashboard delete` command deletes the dashboard named MyDashboard that belongs to the MyUser user account.

```
dbcli.sh dashboard delete MyUser "MyDashboard"
```

Managing Dashboard Templates

You can use `dbcli` commands to efficiently create, modify, and maintain dashboard templates for multiple users and vCenter Operations Manager instances.

You can also use the Custom user interface to perform many dashboard template operations. For more information, see the *VMware vCenter Operations Manager Getting Started Guide (Custom User Interface)*.

Export a Dashboard Template

You can use the `dbcli template export` command to export a dashboard template from a vCenter Operations Manager instance. When you export a dashboard template, vCenter Operations Manager creates a dashboard template file in XML format.

The `template export` command has the following syntax.

```
template export "template-name" [output-dir]
```

template-name	Name of the dashboard template to export. If the dashboard template does not exist, the command fails.
output-dir	Directory where the command exports the dashboard template file. If you do not provide an output directory name, the command exports the dashboard template file to the current directory.

The following `template export` command exports a dashboard template named MyTemplate to a file named `MyTemplate.xml` in the `tools\dbcli\templates` directory.

```
dbcli.sh template export "MyTemplate" templates
```

Import a Dashboard Template

You can use the `dbcli template import` command to import a dashboard template that you exported from another instance of vCenter Operations Manager. You can import XML format and Java binary object (`.bin`) format dashboard template files.

The `template import` command has the following syntax.

```
template import "input-file" [--force] [--share all | group-name[,group-name]... ] [--retry
maxRetryMinutes]
```

input-file is the name of a previously exported dashboard template file. If the file does not exist, the command fails.

The `template import` command has certain options.

Table 13-3. template import Command Options

Option	Description
`--force`	Use this option to import the dashboard template even if a dashboard template that has the same name already exists on the target system. **NOTE** This option can cause the command to create a duplicate dashboard tempate on the target system.
`--share all |` *group-name*`[,`*group-name*`]...`	List of user groups that can share the dashboard template on the target system. Separate multiple names with a comma. To share the dashboard template with all user groups, type **`all`** instead of individual user group names.
`--retry` *maxRetryMinutes*	Maximum amount of time, in minutes, that the command retries the import operation. The command retries the import operation at one-minute intervals until it reaches this time limit. **NOTE** This option is useful if data is missing from the dashboard template when you initiate the command.

The following `template import` command imports a dashboard template file named `templates\MyTemplate.xml` and shares it with all existing user groups. If the required information is not available when you initiate the command, the command retries the import operation at one-minute intervals for up to 10 minutes.

```
dbcli.sh template import "templates\MyTemplate.xml" --retry 10 -share all
```

Share a Dashboard Template

You can use the `dbcli template share` command to to share a dashboard template with one or more user groups.

The `template share` command has the following syntax.

`template share "`*`template-name`*`" {all | `*`group-name`*`[,`*`group-name`*`]...}`

template-name is the name of the dashboard template to share.

You can type the name of each user group that can share the dashboard template or type **`all`** to share the dashboard with all user groups. Use a comma to separate multiple user group names.

The following `template share` command shares the dashboard template named MyTemplate with members of the Users user group.

```
dbcli.sh template share "MyTemplate" Users
```

Unshare a Dashboard Template

You can use the `dbcli template unshare` command to stop sharing a dashboard template that you previously shared.

The `template unshare` command has the following syntax.

`template unshare "`*`template-name`*`" {all | `*`group-name`*`[,`*`group-name`*`]...}`

template-name is the name of the dashboard template to stop sharing.

You can type the name of each user group with which to stop sharing the dashboard template or type `all` to stop sharing the dashboard template with all user groups. Use a comma to separate multiple user group names.

The following `template unshare` command stops sharing the dashboard template named MyTemplate with all user groups.

```
dbcli.sh template unshare "MyTemplate" all
```

Reorder a Dashboard Template

You can use the `dbcli template reorder` command to control the order of dashboards that are created from a specific dashboard template.

The `template reorder` command has the following syntax.

`template reorder "`*`template-name`*`" [--set `*`rank`*`]`

template-name is the name of the dashboard template.

You can use the `--set` option to set the dashboard rank to a certain value. For example, `--set 1` makes dashboards created from the specified dashboard template first in the list of dashboards that are created from templates. If you do not specify this option, the dashboard template order is not changed.

The following `template reorder` command makes dashboards created from the dashboard template named MyTemplate first in the list of dashboards that are created from templates.

```
dbcli.sh template reorder "MyTemplate" --set 1
```

Delete a Dashboard Template

You can use the `dbcli template delete` command to delete a dashboard template.

The `template delete` command has the following syntax.

```
template delete "template-name"
```

template-name is the name of the dashboard template to delete.

The following `template delete` command deletes a dashboard template named MyTemplate.

```
dbcli.sh template delete "MyTemplate"
```

Managing Attributes and Super Metrics

You can use `dbcli` commands to manage attributes and super metrics.

You can also use the Custom user interface to perform attribute and super metric operations. For more information, see Chapter 4, "Configuring Attribute Packages," on page 39.

Configure an Attribute

You can use the `dbcli attribute configure` command to configure properties of an attribute in an attribute package.

The `attribute configure` command provides similar functionality to the attribute package editor in the Custom user interface. For more information, see "Add an Attribute Package," on page 42.

The `attribute configure` command has the following syntax.

```
attribute configure "adapterkind-key:resourcekind-key" "attribute-name" --packages {all |
"package-name[,package-name]..."} --check {true | false} --ht {true | false} --htcriticality
level-name --dtabove {true | false} --dtbelow {true | false} --thresholds {none | "threshold-
def[;threshold-def]..."}
```

adapterkind-key:resourcekind-key — Defines the resource kind to configure. The value consists of an adapter kind key and a resource kind key. If the keys contain spaces, you must enclose the combination of both values in quotes, for example, `"VMWARE:VirtualMachine"`.

attribute-name — Hierarchical name of the attribute to configure. Use the metric key naming convention *group_key*`[|`*group_key*`]|`*attributekind_key*, for example, `mem|active_average`.

Because the configuration is associated with attribute kinds, the `attribute configure` command ignores group instance names.

The `attribute configure` command has certain options. All of the options are required.

Table 13-4. attribute configure Command Options

Option	Description
`--packages {all | "`*package-name*`[,`*package-name*`]..."}`	List of attributes packages to which to apply the operation. To apply the operation to all existing attribute packages, type `all` instead of individual attribute package names. If a named attribute package does not exist, the command creates it.
`--check {true | false}`	Checks or unchecks the attribute for collection in the specified attribute packages.
`--ht {true | false}`	Marks or unmarks hard threshold violations of the attribute as KPI violations.
`--htcriticality` *level-name*	Sets the criticality level for hard threshold violations of the attribute to generate KPI violations.
`--dtabove {true | false}`	Marks or unmarks violations above the dynamic threshold of the attribute as KPI violations.

Table 13-4. attribute configure Command Options (Continued)

Option	Description
`--dtbelow {true | false}`	Marks or unmarks violations below the dynamic threshold of the attribute as KPI violations.
`--thresholds {none | "`*threshold-def*`[;`*threshold-def*`]..."}`	List of threshold definitions for the attribute package. Type **none** instead of a threshold definition to remove all existing thresholds. For more information, see "Threshold Definitions," on page 166.

The following `attribute configure` command checks the attribute named `active_average` under the group named `mem` for collection inside attribute packages named `Default Attributes` and `Reduced package`. If either attribute package does not already exist, the command creates it. The command also creates two thresholds and marks HT from level critical and DT above and DT below as KPI violations.

```
dbcli.sh attribute configure "VMWARE:VirtualMachine" "mem|active_average" --packages "Default Attributes,Reduced package" --check true --ht true --htcriticality critical --dtabove true --dtbelow true --thresholds "critical,>=,90,2,3;immediate,=,70,3,3"
```

Configure a Super Metric

You can use the `dbcli supermetric configure` command to configure properties of a super metric in a super metric package.

The `supermetric configure` command provides similar functionality to the super metric editor in the Custom user interface. For more information, see "Add a Super Metric," on page 50.

The `supermetric configure` command has the following syntax.

```
supermetric configure supermetric-name --packages {all | "package-name[,package-name]..."} --check {true | false} --ht {true | false} --htcriticality level-name --dtabove {true | false} --dtbelow {true | false} --thresholds {none | "threshold-def[;threshold-def]..."}
```

supermetric-name is the name of the super metric to configure.

The `supermetric configure` command has certain options. All of the options are required.

Table 13-5. supermetric configure Command Options

Option	Description
`--packages {all | "`*package-name*`[,`*package-name*`]..."}`	List of super metric packages to which to apply the operation. To apply the operation to all super metric packages, type `all` instead of individual super metric package names.
`--check {true | false}`	Checks or unchecks the super metric for collection in the specified packages.
`--ht {true | false}`	Marks or unmarks hard threshold violations of the super metric as KPI violations.
`--htcriticality` *level-name*	Sets the criticality level for hard threshold violations of the super metric to generate KPI violations.
`--dtabove {true | false}`	Marks or unmarks violations above the dynamic threshold of the super metric as KPI violations.
`--dtbelow {true | false}`	Marks or unmarks violations below the dynamic threshold of the super metric as KPI violations.
`--thresholds {none | "`*threshold-def*`[;`*threshold-def*`]..."}`	List of threshold definitions for the super metric. Type **none** instead of a threshold definition to remove all existing thresholds. For more information, see "Threshold Definitions," on page 166.

The following `supermetric configure` command checks the super metric named SM1 for collection in the super metric package named package1. It creates two thresholds and marks HT from level critical and DT above and DT below as KPIs violations.

```
dbcli.sh supermetric configure "SM1" --packages "package1" --check true --ht true --
htcriticality critical --dtabove true --dtbelow true --thresholds "critical,>=,
90,2,3;immediate,=,70,3,3"
```

Export a Super Metric

You can use the `dbcli supermetric export` command to export a super metric from a vCenter Operations Manager instance. When you export a super metric, vCenter Operations Manager creates a super metric file in XML format.

The `supermetric export` command has the following syntax.

```
supermetric export "supermetric-name" [output-dir]
```

supermetric-name Name of the super metric to export. If the named super metric does not exist, the command does not export a super metric file. If multiple super metrics exist that have the same name, the command exports only one of the super metrics.

output-dir Name of the directory where the command exports the super metric file. If you do not provide an output directory name, the command exports the super metric file to the current directory.

The following `supermetric export` command exports a super metric named SM1 to the `SM1.xml` file in the `supermetrics` directory.

```
dbcli.sh supermetric export "SM1" supermetrics
```

Import a Super Metric

You can use the `dbcli supermetric import` command to import a super metric that you exported from another instance of vCenter Operations Manager.

```
supermetric import "input-file" [--force] [--packages {all | "package-name[,package-name]..."}]
[--check {true | false} ] [--retry maxRetryMinutes] [--create]
```

input-file is the name of the a previously exported super metric file. If the super metric file does not exist, the command fails.

The `supermetric import` command has certain options.

Table 13-6. supermetric import Command Options

Option	Description
`--force`	Use this option to import the super metric even if a super metric that has the same name already exists on the target system. **NOTE** This option can cause the command to create a duplicate super metric on the target system.
`--packages {all | "`*package-name*`[,`*package-name*`]..."}`	List of super metric packages to which to apply the import operation. To apply the import operation to all super metric packages, type `all` instead of individual super metric package names.
`--check {true | false}`	Checks or unchecks the super metric for collection in the specified packages.

Table 13-6. supermetric import Command Options (Continued)

Option	Description
`--retry` *maxRetryMinutes*`--retry`	Maximum amount of time, in minutes, that the command retries the import operation. The command retries the import operation at one-minute intervals until it reaches this time limit. **NOTE** This option is useful if data is missing from the super metric when you initiate the command.
`--create`	Creates missing resources, if any, in the imported configuration.

The following `supermetric import` command imports the `SM1.xml` super metric file. If the required information is not available when you initiate the command, the command retries the import information at one-minute intervals for up to 10 minutes. The command applies the import information to all super metric packages and creates missing resources, if any, in the imported configuration.

```
dbcli.sh supermetric import "SM1.xml" --retry 10 --packages all --check true
```

Delete a Super Metric

You can use the `dbcli supermetric delete` command to delete a super metric.

The `supermetric delete` command has the following syntax.

```
supermetric delete "supermetric-name"
```

supermetric-name is the name of the super metric to delete. If multiple super metrics have the same name, the command deletes all of those super metrics.

The following `supermetric delete` command deletes the super metric named SM1.

```
dbcli.sh supermetric delete "SM1"
```

Threshold Definitions

You can use the `--thresholds` option to define thresholds in the `dbcli attribute configure` and `supermetric configure` commands. An attribute or super metric can have one or more threshold definitions within an attribute package or super metric package.

The `--thresholds` option has the following syntax.

```
--thresholds {none | "threshold-def[;threshold-def]..."}
```

`none` is a special value that removes all existing thresholds. It does not create new thresholds. *threshold-def* defines a threshold. Each *threshold-def* has the following format.

```
criticality-name,threshold-operator,compare-value,wait-cycle,cancel-cycle
```

criticality-name Criticality level of the threshold. Can be one of the following values.

- critical
- immediate
- warning
- info
- none

threshold-operator Numeric operator. Can be one of the following values.

- >
- >=

- <
- <=
- =
- !=

compare-value Threshold value. Can be a floating number for regular metrics or a string value for string metrics.

wait-cycle Number of consecutive violations that can occur before generating an alarm.

cancel-cycle Number of consecutive violation-free cycles that can occur before canceling the alarm.

The following definition contains two thresholds. In the first definition, the criticality level is critical, the operator is >=, the threshold value is 90, the wait cycle is 2, and the cancel cycle is 3. In the second definition, the criticality level is immediate, the operator is =, the threshold value is 70, and the wait and cancel cycles are both 3.

```
"critical,>=,90,2,3;immediate,=,70,3,3"
```

Managing Resource Kinds

You can use `dbcli` commands to manage resource kinds.

You can also use the Custom user interface to perform resource kind operations. See Chapter 3, "Configuring Resources," on page 19.

Configure Resource Kind Default Settings

You can use the `dbcli reskind configure` command to set the default packages to use for a resource kind and specify whether resources generate early warning smart alerts and use dynamic thresholds by default.

The `reskind configure` command has the following syntax.

```
reskind configure "adapterkind-key:resourcekind-key" [--package {none | "package-name"}] [--
smpackage {none | "smpackage-name"}] [--dt {true | false} ] [--smartalert {true | false}]
```

adapterkind-key:*resourcekind-key* defines the resource kind to configure. The value consists of an adapter kind key and a resource kind key. If the keys contain spaces, you must enclose the combination of both values in quotes, for example,`"SampleStorage:Volume"`.

The `reskind configure` command has certain options.

Table 13-7. reskind configure Command Options

Option	Description
`--package {none | "`*package-name*`"}`	Name of an attribute package to use as the default attribute package for the specified resource. Type `none` instead of an attribute package name to reset the default attribute package.
`-smpackage {none | "`*smpackage-name*`"}`	Name of a super metric package to use as the default super metric package for the specfiied resource. Type `none` instead of a super metric package name to reset the default super metric package.
`--dt {true | false}`	Enables or disables dynamic threshold calcuation for resources of the specfiied resource kind.
`--smartalert {true | false}`	Enables or disables early warning smart alert generation for resources of the specified resource kind.

The following `reskind configure` command sets default values for the SampleStorage adapter's Volume resource kind. It enables early warning smart alert generation, sets the default attribute package to Default Attributes, and resets the default super metric package setting.

```
dbcli.sh reskind configure "SampleStorage:Volume" --smartalert true --package "Default
Attributes" --smpackage none
```

Performing Control Operations

You can use `dbcli` commands to perform certain control operations.

Start the Describe Process for Adapters

You can use the `dbcli control redescribe` command to start the describe process for adapters.

The `control redescribe` command provides the same functionality as the **Describe** icon on the **Support** page in the Custom user interface. For more information about the describe process, see the *VMware vCenter Operations Manager Adapter Guide*.

The `control redescribe` command has the following syntax.

```
dbcli.sh control redescribe
```

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