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About This Book

This Integration Guide provides information about integrating VMware® vCenter Operations Enterprise with EMC Smarts to improve the performance of both products, making it easier to predict, diagnose, and prevent problems in your IT infrastructure.

Intended Audience

This book is intended for IT management and system administrators.

VMware Technical Publications Glossary

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

Document Feedback

VMware welcomes your suggestions for improving our documentation. If you have comments, send your feedback to docfeedback@vmware.com.

VMware vCenter Operations Enterprise Documentation

The documentation set for VMware vCenter Operations Enterprise consists of the following documents.

- Analytics Guide for VMware vCenter Operations Enterprise. Contains conceptual information that describes the principles of the vCenter Operations Enterprise analytics features.
- Integration Guide for vCenter Operations Enterprise and EMC Smarts. Contains conceptual and procedural information on integrating vCenter Operations Enterprise with EMC Smarts.
- VMware vCenter Operations Enterprise online help. Contains conceptual and procedural information to help you complete your tasks when administering and using vCenter Operations Enterprise.
Abbreviations Used in Figures

The figures in this book use the abbreviations listed in Table 1.

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>VCOps</td>
<td>vCenter Operations Enterprise</td>
</tr>
</tbody>
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Technical Support and Education Resources

The following sections describe the technical support resources available to you. To access the current version of this book and other books, go to http://www.vmware.com/support/pubs.

Online and Telephone Support

To use online support to submit technical support requests, view your product and contract information, and register your products, go to http://www.vmware.com/support.

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VMware Professional Services

VMware Education Services courses offer extensive hands-on labs, case study examples, and course materials designed to be used as on-the-job reference tools. Courses are available onsite, in the classroom, and live online. For onsite pilot programs and implementation best practices, VMware Consulting Services provides offerings to help you assess, plan, build, and manage your virtual environment. To access information about education classes, certification programs, and consulting services, go to http://www.vmware.com/services.
This chapter describes how vCenter Operations Enterprise integrates with EMC Smarts, improving the performance of both products, making it easier to predict, diagnose, and prevent problems in your IT infrastructure. It discusses:

- “vCenter Operations Enterprise Overview” on page 7
- “The vCenter Operations Enterprise/EMC Smarts Integration” on page 7

vCenter Operations Enterprise Overview

vCenter Operations Enterprise collects performance data from monitored software and hardware resources—including those monitored by EMC Smarts—stores it, analyzes it, and uses that analysis to provide you with real-time information about problems, or potential problems, anywhere in your enterprise. It leverages the power of your existing system management tools by aggregating data from different sources and processing them with its proprietary analytic algorithms.

vCenter Operations Enterprise presents its data and analysis to you in several ways: through Smart Alerts that warn of potential or occurring problems, in configurable dashboards that can show the exact combination of data you want to see, on predefined pages that show commonly needed information, or in a number of predefined reports.

For information on installing and configuring vCenter Operations Enterprise, see the vCenter Operations Enterprise Installation and Administration Guide.

For information and instructions about the day to day use of vCenter Operations Enterprise, see the vCenter Operations Enterprise User’s Guide.

Each of those manuals includes a list of terms related to vCenter Operations Enterprise.

The vCenter Operations Enterprise/EMC Smarts Integration

The relationship of vCenter Operations Enterprise with most monitoring products is one-way: vCenter Operations Enterprise receives information from the monitoring product. The integration of vCenter Operations Enterprise with EMC Smarts is two-way: vCenter Operations Enterprise receives information from EMC Smarts and, when appropriate, sends alert information back to it, to be displayed in the Global Console.

vCenter Operations Enterprise receives the following types of information from EMC Smarts:

- Definitions of all the resources being monitored by the EMC servers or domains you select.
- The topology of container resources defined in EMC. This can save the effort of defining applications and tiers, or other containers, in vCenter Operations Enterprise, and ensures that the vCenter Operations Enterprise container definitions exactly match the EMC Smarts topology. This list is updated daily, at a time you choose. This is unique to the vCenter Operations Enterprise/EMC Smarts integration—with other monitoring products, you must define container resources in vCenter Operations Enterprise.
- Metric values for all the attributes monitored by EMC Smarts.
- When EMC detects that a resource is down, it generates a change event in vCenter Operations Enterprise. These change events are shown in the vCenter Operations Enterprise Mashup Charts widget or the Mashup tab of the Alert Details page for alerts on the related resource.
- When EMC detects that a resource is unresponsive, it creates an anomaly in vCenter Operations Enterprise. These anomalies do not generate alerts, but the vCenter Operations Enterprise analytics engine considers them as possible root cause symptoms for related alerts.

vCenter Operations Enterprise analyzes the metric data from EMC Smarts using its advanced analytics. When it detects a problem or potential problem, such as a pattern of events which has preceded a particular problem in the past, it sends an alert message back to EMC Smarts. The EMC Smarts operator sees the alert message in the Global Console Notification Log. The operator can display many details about the alert without leaving EMC Smarts. For complete information, he or she can click a button to open the vCenter Operations Enterprise client and see full troubleshooting details.

**NOTE** The vCenter Operations Enterprise integration supports both EMC Smarts 7.x and 8.1.

In version 7.x, the Global Console is called the EMC Smarts Global Console. In version 8.1, it is called the EMC Ionix Global Console. To avoid confusion, throughout this document we refer simply to the Global Console.

**Data Sharing Flow Chart**

The chart below shows how data moves back and forth between the various components of EMC Smarts and vCenter Operations Enterprise.

**Figure 1-1. Data Sharing Flow Between vCenter Operations Enterprise and EMC Smarts**
This chapter describes the procedures necessary to integrate your vCenter Operations Enterprise and EMC Smarts installations. It discusses these topics:

- “Configuration Overview” on page 9
- “Installing the EMC Smarts Adapter” on page 10
- “Defining EMC Smarts Adapter Instances” on page 10
- “Discovering EMC Smarts Resources” on page 13
- “Configuring a vCenter Operations Enterprise Outbound Alert Type” on page 16
- “Installing the Global Console Custom View” on page 17
- “Installing vCenter Operations Enterprise Integration Tools Files” on page 18
- “The Adapter Properties File” on page 19

### Configuration Overview

Enabling and configuring the integration of vCenter Operations Enterprise with EMC Smarts is relatively simple, but it does involve procedures in both vCenter Operations Enterprise and EMC Smarts. You need to:

1. Install the EMC Smarts adapter.
2. Define an adapter instance in vCenter Operations Enterprise for each EMC Smarts domain and product you want vCenter Operations Enterprise to collect and analyze data from.
3. Discover resources for each EMC Smarts adapter instance.
4. Define an outbound alert type to send alerts to the Global Console.
5. Install the custom vCenter Operations Enterprise console view in EMC Smarts and add it to the desired EMC Smarts SAM console.
6. Install two tools which allow you to open the relevant vCenter Operations Enterprise pages directly from the Global Console.
7. Optionally, enter advanced configuration information into the adapter configuration file.

The rest of this chapter describes each of these procedures.

---

**NOTE** Before beginning any of the procedures in this chapter, you must have EMC Smarts and vCenter Operations Enterprise installed. Verify that EMC Smarts is collecting data from its monitored resources before performing the integration.

You may not be able to confirm that vCenter Operations Enterprise is working properly until after you have defined adapter instances and discovered resources for EMC Smarts, as described later in this chapter. vCenter Operations Enterprise does not store and analyze data until you have defined resources to it.
Installing the EMC Smarts Adapter

Like all vCenter Operations Enterprise adapters, the adapter for EMC Smarts is delivered in its own file. To install the adapter:

1. Copy the supplied SMARTS_Adapter.exe file for the adapter to a temporary folder.
2. Execute the SMARTS_Adapter.exe file.
3. On the Introduction dialog box, click Next.
4. On the Pre-Installation Summary dialog box, click Install.
5. Click Done.

Defining EMC Smarts Adapter Instances

You must create an adapter instance for each EMC Smarts domain or server you want to collect data from. The instance defines the type of adapter (in this case, EMC Smarts) to use and the information needed to identify and access the source: the host name or IP address of the EMC Smarts broker, the name and type of the domain or server, how often vCenter Operations Enterprise should collect data, and the credential (user name and password combination) for vCenter Operations Enterprise to use to identify itself to the domain.
Defining adapter instances is a two-step process: because each instance requires a credential, you first create one or more credentials, so you can use the correct credential when creating the adapter instance. This is the procedure described below. However, you can also create the credential while defining the instance.

The general procedure for defining credentials and adapter instances is described in the *vCenter Operations Enterprise Installation and Administration Guide*. The following procedures are specifically for the EMC Smarts adapter.

**Defining Credentials for EMC Smarts**

A credential for an EMC Smarts adapter instance consists of a valid EMC Smarts user name, the password for that user name, and a name to identify the credential, such as EMC Signon.

To define credentials for the EMC Smarts adapter:

1. From the Environment menu, select Configuration, Credentials. This opens the Manage Credentials window.
2. In the Adapter kind field, select EMC Smarts.
3. In the Credential kind field, EMC Smarts Credentials. This lists any existing EMC Smarts credentials. Before you define the first credential, the list is blank.
4. In the middle of the window, next to Action, click Add. This adds the fields Instance name, User Name, and Password to the Manage Credentials window.
5. In the Instance Name field, enter the name to give the credential. This name should be unique.
6. In the User Name field, enter the user name to use to connect to the EMC Smarts adapter instance.
7 In the **Password** field, enter the password for the user.

8 Click **Save**.

Your added credential appears in the list in the Manage Credentials window. To add another credential, return to step 5. If you need to edit a credential, follow the instructions in the *vCenter Operations Enterprise Installation and Administration Guide*.

**Defining Adapter Instances for EMC Smarts**

Once you have defined the credentials to use to connect to EMC Smarts domains, you can define an adapter instance for each domain vCenter Operations Enterprise will collect data from. To define each instance:

1 From the **Environment** menu, select **Configuration, Adapter Instances**. This opens the Manage Adapter Instances window.

2 In the **Collector** field, select the collector to use. Unless a name was assigned to the collector during installation, the only choice is **vCenter Operations Enterprise Server**.

3 In **Adapter Kind**, select **EMC Smarts**. This displays any existing EMC Smarts adapter instances.

4 In the middle of the window, next to **Action**, click **Add**. This adds the fields necessary to define an EMC Smarts instance.

5 In **Instance Name**, enter the name for the adapter you are adding.
6 In Broker, enter the name or IP address and port number of the EMC broker for this instance, separated by a colon (:). For example, if the system name for the broker is broker.example.com, its IP address is 123.45.6.789, and it is listening on the default EMC port of 426, you could enter either broker.example.com:426 or 123.45.6.789:426.

7 In Manager, enter the name of the EMC Smarts domain to attach to. For example, for Smarts 7.x, the default domain for the INCHARGE-AM-PM-SUITE server kind would be INCHARGE–AM–PM. For version 8.1, it would be Network–Resource.

8 In Server Kind, select the type of EMC Smarts domain to attach to. This is the EMC Smarts product name.

9 In Auto Discovery, select true if you want to automatically discover resources for this instance or false if you do not. If you set this to true, you can skip the procedure in “Discovering EMC Smarts Resources” on page 13.

10 In Discovery Hour of Day, enter the hour (from 0 to 24) when vCenter Operations Enterprise should check this EMC Smarts domain for new resources.

11 In the Credential field, select the credential to use to sign on to this domain. To add a new credential for this adapter instance, click Add. For instructions on adding a credential, see “Defining Credentials for EMC Smarts” on page 11.

12 Click Save to save the instance.

The adapter instance you added appears in the list in the Manage Adapter Instances window. To add another instance, return to step 4. If you need to edit an instance, follow the instructions in the vCenter Operations Enterprise Installation and Administration Guide.

**NOTE** By default, an EMC Smarts adapter instance collects metric values every five minutes. If you want to change this to collect values more or less often, use the Environment Overview feature from the vCenter Operations Enterprise Environment menu to edit the resource for the adapter instance (the Adapter Instance Resource, or AIR). Set the Collection Interval field to the desired value. You cannot set this value by using the Configuration, Adapter Instances feature; you must use Environment Overview to edit the resource. See “Editing a Resource” in the vCenter Operations Enterprise Installation and Administration Guide.

---

**Discovering EMC Smarts Resources**

In vCenter Operations Enterprise, a resource is any entity vCenter Operations Enterprise collects data for. There are two ways to define resources to vCenter Operations Enterprise: you can add each resource individually by entering its characteristics, or you can use the discovery process to find all the resources available through the same adapter instance. Discovery is generally much easier and more efficient.

The vCenter Operations Enterprise/EMC Smarts integration makes resource discovery even more efficient than with other types of adapters vCenter Operations Enterprise supports. With most adapter types, after performing a discovery, you must select each resource you want to track in vCenter Operations Enterprise. With EMC Smarts, once you have performed the first resource discovery for an adapter instance and added one resource, vCenter Operations Enterprise will automatically add any resource it receives data from for that adapter instance. This means the resources list in vCenter Operations Enterprise will always include all EMC Smarts resources. In addition, once each day, at the time you select, vCenter Operations Enterprise will poll each adapter instance and add any new resources it finds for the adapter, including container resources (tiers, applications, and so on), so the vCenter Operations Enterprise resource topology will always match the EMC Smarts topology.
The procedure below describes how to discover resources for EMC Smarts adapter instances. For general information about resource discovery, please see the vCenter Operations Enterprise Installation and Administration Guide.

If you set Auto Discovery to true when defining the adapter instance, as described in the previous section, you do not have to perform this procedure. The adapter instance will automatically discover and add all resources available to it.

**NOTE** While you can discover resources for the various EMC Smarts adapter instances in any order, as a best practice we recommend you discover resources for AM, PM, or AM-PM instances first, followed by ACM, ESM, and SAM.

**Performing the Resource Discovery**

To discover resources for an EMC Smarts adapter instance:

1. From the Environment menu, select Environment Overview to open the Environment Overview page.
2. Click the Discover Resources icon. This opens the Resource Discovery window, showing just the Collector field. Other fields appear as you make your selections.
3. In the Collector field, select your preferred collector. Unless you have added additional collectors, the only collector listed is vCenter Operations Enterprise Server.
4. In the Adapter kind field, select EMC Smarts.
5. In the Adapter instance field, select the adapter instance to discover resources for.
6. In Discovery Info, select Initial Resource Import.

**NOTE** The Only New Resources box can be either checked or unchecked. Because no resources for this adapter have been added to vCenter Operations Enterprise yet, it does not affect the results.
Click the Discover button. The discovery can take anywhere from a few seconds to several minutes. Once it is complete, the Discovery Results window displays a list of your resources.

8 You need to add just one resource from the list; as noted above, vCenter Operations Enterprise will then add the other resources for this instance automatically. For any resource, click the found link (for example, 5 found) to the right of the resource name. The list of resources expands to show all resources of that name.

9 For one of the resources shown:
   a Check the Import and Collect boxes.
   b Select the Attribute Package (for example, All Metrics).

   **NOTE** If you want to define a new attribute package for the resource, click the Add link to the right of the Attribute Package field. For more information on attribute packages, see the vCenter Operations Enterprise Installation and Administration Guide.

10 Click the Save button. The Discovered Resources window closes, and you see the new resource in the List pane of the Environment Overview page.

Adding resources for this adapter instance is now complete. If you have other EMC Smarts adapter instances, repeat the process for each one.

As vCenter Operations Enterprise receives metric data from resources for each adapter instance, it will add the resources to the list of resources in Environment Overview. Once a resource is listed, you can edit it if desired. For example, you may want to define attribute packages other than All Metrics, or set hard thresholds for certain resources. For information on editing resources and creating attribute packages, please see the vCenter Operations Enterprise Installation and Administration Guide.

**NOTE** Once vCenter Operations Enterprise has imported container resources from EMC Smarts, you may want to define super metrics for those resources. Please see the vCenter Operations Enterprise Installation and Administration Guide for more information.
Configuring a vCenter Operations Enterprise Outbound Alert Type

As part of the vCenter Operations Enterprise/EMC Smarts integration, vCenter Operations Enterprise can send alert notifications directly to a Global Console. To make this feature work, you configure an outbound alert type in vCenter Operations Enterprise. If you have multiple Global Consoles, you can configure an alert type for each one, so all vCenter Operations Enterprise alerts will be listed in each console.

NOTE An outbound alert type sends all vCenter Operations Enterprise alerts to the defined destination. If you are using vCenter Operations Enterprise to track resources that are outside the EMC Smarts system, alert messages for those resources will also be sent to the Global Console.

To configure vCenter Operations Enterprise alerts to appear in the Global Console

1 From the Admin menu, select Outbound Alert Config. The Outbound Alert Setup page opens.
2 Click the Add Alert Handler icon.
3 In Alert Handler Type, select Smarts SAM Notification.
4 In Instance Name, type the name to give this outbound alert type. This can be anything; it is the name that will appear in lists in vCenter Operations Enterprise, so use a name that will mean something to you.
5 In Broker, enter the name or IP address and port number of the EMC broker for this instance, separated by a colon (:). For example, if the system name for the broker is broker.example.com, its IP address is 123.45.6.789, and it is listening on the default EMC port of 426, you could enter either broker.example.com:426 or 123.45.6.789:426.
6 In SAM Server, type the name of the SAM domain/server to send alerts to.
7 In Username and Password, type a valid user name and password for this SAM server.

![Alert Handler](image)

8 Click OK to save the configuration.

To send alerts to another Global Console as well, repeat steps 2 through 7.

NOTE The Test button does not work with a Smarts SAM Notification handler.
Installing the Global Console Custom View

Configuring the outbound alert type, as described in the previous section, causes vCenter Operations Enterprise alerts to be sent to the Global Console and displayed in the Notification Log for the defined domain. To be able to see details for an alert in the Global Console, you must also install a custom view and add it to the console.

**NOTE** In all procedures in the following section, <SmartsRoot> refers to the root directory of the EMC Smarts installation. By default, this is InCharge7 for version 7.x and InCharge8 for version 8.1.

Installing the vCenter Operations Enterprise Custom View

To install the vCenter Operations Enterprise alert custom view

1 Copy the vcops_emc.jar from <vcops>\tools\smarts\vcops_emc.jar to the <SmartsRoot>\SAM\smarts\local\classes on the EMC Smarts server.

2 Add the jar file to the class path:
   a. Open the file SmartsRoot\SAM\smarts\local\conf\runcmd_env.sh with a text editor.
   b. Find the SM_CLASSPATH statement, or add one if it does not exist. Set the path to the path to the vcops_emc.jar file you copied to the EMC Smarts server. For example:

   SM_CLASSPATH= C:\InCharge7\SAM\smarts\local\classes\vcops_emc.jar

Adding the Custom View to a Global Console

To add the installed vCenter Operations Enterprise custom view to a Global Console

1 Open the Global Console.

2 From the View menu, select Add View.

3 Select Custom View.

4 In the Java Class field, enter com.integrien.alive.alertsummary.AlertSummaryView.

5 Under Console Panel, select the Panel and Tile options to place the view where you want it.

6 Click OK.
Installing vCenter Operations Enterprise Integration Tools Files

One of the features of the vCenter Operations Enterprise/EMC Smarts integration is the ability to right-click an item in the Global Console to open the vCenter Operations Enterprise page describing the resource. You can do this for two types of EMC Smarts items: a notification in the Notification Log or an object in the Topology Browser or Map.

For this feature to work, you must install and configure two vCenter Operations Enterprise files in EMC, one on the SAM server computer and one on each Global Console client.

Before you begin the procedure below, ensure you have a valid EMC Smarts user name and password. You might need to enter them during the import command.

To install and configure the tools files

1. Copy the `Launch-vcops-UI-Object.cmd` file to the `SmartsRoot\SAM\smarts\local\actions\client` directory on each Global Console client computer.

2. Copy the `launch-vcops-action-windows.xml` file to the `SmartsRoot\SAM\smarts\local\conf\ics` directory on the SAM server computer.

3. Open `launch-vcops-action-windows.xml` using Notepad or another editor. Find the line that starts set `VCOPS_HOST_PORT=` and change the IP address and port number to the correct ones for your vCenter Operations Enterprise server.

4. Open the file `SmartsRoot\SAM\smarts\local\conf\runcmd_env.sh` and add the following line:

   ```
   VCOPS_HOST_PORT=IP address:Port
   ```

   Where `IP address` and `port` are the vCenter Operations Enterprise server host and port.

5. If the SAM server computer runs Windows:
   a. Open a DOS command window.
   b. Change directory to `SmartsRoot\SAM\smarts\local\conf\ics`.
   c. Enter this command:

   ```
   ..\..\..\bin\sm_config -s SAM-DOMAIN import --force launch-vcops-action-windows.xml
   ```

   `SAM-DOMAIN` is the SAM domain name for your EMC Smarts deployment. It is frequently INCHARGE-SA, but it does not have to be.

   If the SAM server computer runs UNIX or Linux:
   b. Enter this command:

   ```
   ../../../bin/sm_config -s SAM-DOMAIN import --force launch-vcops-action-windows.xml
   ```

   `SAM-DOMAIN` is the SAM domain name for your EMC Smarts deployment. It is frequently INCHARGE-SA, but it does not have to be.

6. If you are prompted for logon credentials, enter the user name and password given to you by the EMC Smarts administrator.

   If the import was successful, the command does not return anything. Any type of displayed message indicates that the import failed.

7. Restart the EMC service. For version 7.x, the service name is EMC Smarts Service Assurance Manager Server. For version 8.1, it is EMC Ionix Service Assurance Manager Server.
Testing the Tools Installation

To make sure the import was successful and the integration features work, do the following:

1. Stop and start the Global Console.

2. In the Notification Log, right-click a notification which originated in vCenter Operations Enterprise and select Client Tools, then View Object or Browse Object.

   This should open a new browser window, showing the Resource Detail page for the object the notification is about. The URL will have a format similar to: http://server/emcResponder.naaction?mainAction=showResourceDetails&objectName=Host::10.1.10.17.

3. In the Topology Browser, right-click a UCS-type object (host, switch, router, and so on). Select Client Tools, Browse Object.

   This should open a new browser window, showing the Resource Detail page for the object. The URL will have a format similar to: http://server/emcResponder.naaction?mainAction=showResourceDetails&objectName=Host::10.1.10.17.

The Adapter Properties File

When you perform a discovery for an EMC Smarts adapter instance, as described in “Discovering EMC Smarts Resources” on page 13, vCenter Operations Enterprise does not necessarily list every object defined in the EMC Smarts domain as a resource to add to vCenter Operations Enterprise. Similarly, when vCenter Operations Enterprise collects metrics for an EMC Smarts resource, it may not take every metric defined for each EMC Smarts object. Instead, vCenter Operations Enterprise discovers, imports, and collects data only for resources and metrics defined in the EMC Smarts adapter properties file. This makes both resource discovery and data collection more efficient, as vCenter Operations Enterprise will not take time and processing resources on EMC Smarts objects that you do not want to monitor.

The properties file is called smarts_adapter.properties and it is in the installation directory\user\plugins\inbound\smarts_adapter\conf folder. The file contains three types of information:

- At the top there is a ThreadCount parameter. This defines the number of threads and connections vCenter Operations Enterprise will generate to collect metrics from each EMC Smarts adapter instance. Adding more threads can improve performance, but also uses more domain resources. In our tests, keeping the count between 1 and 4 yields the best results; setting it higher gives little or no benefit in vCenter Operations Enterprise and can seriously degrade performance in the EMC Smarts domain.

- This is followed by a series of statements defining what parts of the EMC Smarts object hierarchy should be included in the vCenter Operations Enterprise “world.” Only those objects and metrics defined in these statements will be eligible for discovery and collection in vCenter Operations Enterprise. These are described in detail in “Defining Object Classes” on page 21.

- Finally, there is a series of topo statement defining relationships to be used when defining container resources in vCenter Operations Enterprise. These are described in the section “Defining Resource Topology” on page 22.

**NOTE** You can modify the properties file using any text editor. We recommend making a backup copy before you make any changes. After making any change to the file, you must stop and restart the vCenter Operations Enterprise collector for it to take effect.

The default file looks like this:

```
ThreadCount=2

#classes
# First pair (:: separated)
#   1) where to start (top/bottom)
#   2) the class to start with
#
# following this is any number of groups representing how to walk the class hierarchy
```
# each group is 3 items (:: separated)
# 1) Relationship type
#   1.1) op = Operation. This should be a class operation that returns a set of objects and
takes no parameters.
#   1.2) rel = relationship. This is a normal multiple relationship property of the object
(e.g. ComposedOf or InstrumentedBy)
#   1.3) rel1 = single relationship property. It returns only 1 item rather than an array
(e.g. SystemName or SystemPackagedIn)
# 2) Relationship property name (should match the type)
# 3) Base class to expect from the relationship.

# subscription is the list of properties to gather as metrics.

#topo
# One pair (:: separated)
# First element is the smarts class to create the container from
# Second element is the property to get the children of this container.

ICPM.classes.1=top::UnitaryComputerSystem op::getProcessors::Processor
rel::InstrumentedBy::Processor_Performance
ICPM.subscription.1=CurrentUtilization

ICPM.classes.2=top::UnitaryComputerSystem op::getMemory::Memory
rel::InstrumentedBy::Memory_Performance
ICPM.subscription.2=BufferMissPct,BufferUtilizationPct,FreeMemory,FreeMemoryPct,
LargestFreeBuffer,LargestFreeBufferPct,TotalBufferAllocationFailures,TotalMemory

ICPM.classes.3=top::UnitaryComputerSystem rel1::SystemPackagedIn::Chassis
rel::InstrumentedBy::Chassis_Performance
ICPM.subscription.3=BackplaneUtilization

ICPM.classes.4=top::UnitaryComputerSystem op::getFileSystems::FileSystem
rel::InstrumentedBy::FileSystem_Performance
ICPM.subscription.4=AvailableSpace,StorageSize,UtilizationPct

ICPM.classes.5=bottom::NetworkAdapter_Performance rel1::Instruments::NetworkAdapter
op::getSystem::UnitaryComputerSystem
ICPM.subscription.5=AvgInputPacketSize,AvgOutputPacketSize,CurrentUtilization,
InputPacketBroadcastPct,InputPacketBroadcastRate,InputPacketDiscardPct,
InputPacketDiscardRate,InputPacketErrorRate,InputPacketNoErrorRate,InputPacketQueueDropPct,
InputPacketQueueDropRate,InputPacketRate,InputPacketsQueuedRate,MaxSpeed,MaxTransferUnit,
OutputPacketBroadcastPct,OutputPacketBroadcastRate,OutputPacketDiscardPct,
OutputPacketDiscardRate,OutputPacketErrorRate,OutputPacketNoErrorRate,OutputPacketQueueDropPct,
OutputPacketQueueDropRate,ifInDiscardsRate,ifInErrorsRate,ifInNUcastPktsRate,ifInOctetsRate,
ifInUcastPktsRate,ifInUnknownProtosRate,ifOutDiscardsRate,ifOutErrorsRate,
ifOutNUcastPktRate,ifOutOctetsRate,ifOutUcastPktRate

ICPM.classes.6=top::UnitaryComputerSystem op::getVoltageSensors::VoltageSensor
rel::InstrumentedBy::VoltageSensor_Fault
ICPM.subscription.6=CurrentValue

ICPM.classes.7=top::UnitaryComputerSystem op::getTemperatureSensors::TemperatureSensor
rel::InstrumentedBy::TemperatureSensor_Fault
ICPM.subscription.7=CurrentValue

ICPM.topo.1=VLAN::ConnectedSystems

ACM.classes.1=top::UnitaryComputerSystem rel::HostsServices::SoftwareService
rel::CheckedBy::SoftwareElementCheck
#ACM.classes.1=bottom::SoftwareElementCheck rel::Checks::SoftwareService
op::getSystem::UnitaryComputerSystem
ACM.subscription.1=ResponseTime

ESM.classes.1=bottom::ICIM_Processor_Performance rel1::Instruments::ICIM_Processor
op::getSystem::UnitaryComputerSystem
Defining Object Classes

Each `classes` statement defines a part of the EMC Smarts object hierarchy for a particular domain. Only objects defined by a `classes` statement will be included when vCenter Operations Enterprise performs a resource discovery for the adapter instance for that domain. Each `classes` statement is followed by a `subscription` statement which lists the metrics which vCenter Operations Enterprise can collect for the objects defined by the `classes` statement.

Here is a sample `classes`/subscription pair, which we will refer to in the following explanation:

```
ICPM.classes.4=top::UnitaryComputerSystem op::getFileSystems::FileSystem
   rel::InstrumentedBy::FileSystem_Performance
ICPM.subscription.4=AvailableSpace,StorageSize,UtilizationPct
```

The classes statement contains a name, the starting point, one or more object-definition groups, and a subscription statement.

The Statement Name

The identifying name for the statement. This consists of the domain name, the word `classes`, and a sequential number, separated by periods. It ends with an equals sign. In the sample statement, this is `ICPM.classes.4`.

The Starting Point

A pair defining whether to start at the top or bottom of the object hierarchy and the object class to start with. In the sample, this is `top::UnitaryComputerSystem`.

The Object Definitions

One or more groups of items describing how to “walk” the object hierarchy from the starting point to find the desired objects. Each group contains three values, separated by double colons (`::`). The first object definition in the sample is: `op::getFileSystems::FileSystem`.

The values are:

- The relationship type. This is either `op`, `rel`, or `rel1`:
  - `op`: A class operation that takes no parameters and returns a set of objects.
  - `rel`: A normal multiple-relationship property of the object, such as `ComposedOf` or `InstrumentedBy`.
  - `rel1`: A single-relationship property of the object. It returns only one item rather than an array. For example, `SystemName` or `SystemPackagedIn`.

---

VMware, Inc.
The relationship property name. This must match the relationship type.
- The base class to expect from the relationship.

So, the sample object definition performs an operation on the `getFileSystems` property and returns a list of `FileSystem` names.

There can be any number of groups. Each group must be separated by a single space.

**The Subscription List**

The final part of a classes statement is a subscription statement. The subscription statement lists the parameters for vCenter Operations Enterprise to collect for the objects defined by the classes statement. It consists of:
- The statement name. This matches the classes statement name, except that it says subscription instead of classes. In the sample, it is `ICPM.subscription.4=`
- A list of EMC Smarts properties for the defined objects. These will be imported into vCenter Operations Enterprise as metrics for the discovered resources. In the sample, these are `AvailableSpace`, `StorageSize`, `UtilizationPct`.

**Defining Resource Topology**

Each topo statement defines a topology in EMC Smarts that is to be replicated in vCenter Operations Enterprise. Each statement consists of an object class and a property to get for that class. For example:

```
SAM.topo.1=RedundancyGroup::ComposedOf
```

defines the `RedundancyGroup` object class and `ComposedOf` property. The result is a list of the objects under `RedundancyGroup` that are derived from a `UnitaryComputerSystem` (hosts routers, switches, and so on). vCenter Operations Enterprise uses this information to define an equivalent application topology.
This chapter describes the information vCenter Operations Enterprise sends to EMC Smarts for display, how you view it, and what actions to take depending on what you see. It also discusses looking at data about EMC Smarts objects in vCenter Operations Enterprise. It includes these topics:

- “vCenter Operations Enterprise Alerts” on page 23
- “Viewing Alerts in EMC Smarts” on page 24
- “Dealing with Alerts” on page 25
- “Viewing Resource Details in vCenter Operations Enterprise” on page 27
- “Viewing EMC Smarts Data in vCenter Operations Enterprise” on page 27

**vCenter Operations Enterprise Alerts**

The information vCenter Operations Enterprise sends back for display in EMC Smarts is in the form of *alerts*. Alerts are the mechanisms vCenter Operations Enterprise uses to notify you of abnormal behavior.

There are several types and subtypes of alerts, each of which has its own triggers and contents and indicates a different problem or potential problem in the enterprise. An alert may be generated by abnormal behavior of one or more metrics for any resource, including a tier or application, or when a fingerprint predicts an upcoming problem. vCenter Operations Enterprise determines the type of alert to send based on what triggers it.

The vCenter Operations Enterprise alert types are Smart, Classic, and Admin, each of which has two or more subtypes. Only Smart and Classic Alerts are sent to the Global Console, as described in the next section. Admin alerts are not.

In addition to a type, every alert has a criticality level that indicates how serious a problem it is likely to indicate and how important it is to deal with it quickly. There are four criticality levels. From most to least critical, they are: Critical, Immediate, Warning, and Info.

This is a very brief summary of the alerting functionality, which is broad, powerful, and efficient. For more information about alerts in vCenter Operations Enterprise, see the *vCenter Operations Enterprise User Guide* chapter on them.
Viewing Alerts in EMC Smarts

You can configure an vCenter Operations Enterprise outbound alert type to send alerts to EMC Smarts, as described in “Configuring a vCenter Operations Enterprise Outbound Alert Type” on page 16. When you do this, vCenter Operations Enterprise alerts display on the Notification Log Console page of the Global Console.

If you have defined the vCenter Operations Enterprise custom view for the console, as described in “Installing the Global Console Custom View” on page 17, you can click any alert message to see more information about it in the panel for the custom view.

This display is very similar to the vCenter Operations Enterprise Alert Summary page. It is divided into three sections:

- The top left shows the type of alert, when it started and how long it lasted, and the name of the resource it is for. The top right shows the internally assigned alert ID.
- The middle pane shows information about the event that triggered the alert: the type of trigger, the resource or metric the trigger was on, and details about the trigger.
- The bottom pane shows information “around” the alert: health information for the last six hours for the resource the alert is for and for any subcontainers in it. It also shows a metric graph for up to five metrics for the resource, in this order: breaching KPI, breaching super metrics, non-breaching KPI, non-breaching super metrics.

The exact information shown in the bottom two panes depends on the type of alert and the type of resource it is for.

To see information about the calculated root causes of the alert, click the Root Cause tab. This tab page shows the likely root cause container resources, ranked by the analytical algorithm on the container resource. You can double-click any resource to see the symptom groups, ranked by percentage of possible resources exhibiting symptoms in the group, and double-click any group to see the top five individual symptoms, ranked by percentage of possible resources exhibiting the symptom. This is very similar to the Root Cause tab of the vCenter Operations Enterprise Alert Summary window. For more information, see the vCenter Operations Enterprise User’s Guide.
Viewing More Information in vCenter Operations Enterprise

If you want more information about the alert, click the arrow at the top right of the custom view panel. This opens the Alert Detail page in vCenter Operations Enterprise, which contains much more information to help you troubleshoot the possible problem. It also contains icons that let you update the status of the alert in vCenter Operations Enterprise. For a complete description of this page, see the Alerts chapter in the vCenter Operations Enterprise User’s Guide.

NOTE If you are not logged in to vCenter Operations Enterprise, you will be asked to log in before the Alert Detail page opens. You need to log in using a user name and password which has access rights to view alert details. vCenter Operations Enterprise will open in a new browser window or tab page, depending on your browser settings.

For more information about the resource the alert is for, click the resource name in the top line of the custom view panel. This opens the vCenter Operations Enterprise Dynamic Dashboard page for the resource. This page is described in the Viewing Resources and Applications chapter of the vCenter Operations Enterprise User’s Guide.

You can also view the Dynamic Dashboard for the resource directly from the entry for the alert in the Notification Log. To do so:

1 Right-click the alert in the Notification Log.
2 From the pop-up menu, select Client Tools.
3 Select View Object or Browse Object.

Dealing with Alerts

How to proceed after vCenter Operations Enterprise notifies you of an alert varies greatly depending on the alert’s type, criticality level, and other characteristics, such as whether the resource the alert is for is your responsibility. The details of any process for resolving alerts will also depend on your organization’s rules, procedures, and priorities. The flow chart on the next page gives some general procedures for dealing with alerts.
Figure 3-1. Flow Chart Diagram for Resolving Alerts

Examine REASON section

- Is it about App/Tier/Container?
  - Yes: Identify the owner of the App/Tier/Container on which the alert occurred

- Is it about KPI?
  - Yes: Identify the SLA associated with the KPI

Examine the IMPACT section

- Are there KPI’s breaching?
  - Yes: Identify the SLA’s associated with the KPI’s

Examine the ROOT CAUSE section

- Does it have multiple tiers?
  - Yes: Examine the 1st Tier and identify its owner. Pick all Tier metrics with >=50% probability

  Identify Resource owner. Pick all metrics with >=50% probability

Problem resolution hand-off
- Notify the owner identified from the ROOT CAUSE section
- Provide highest probability abnormal metrics from the ROOT CAUSE section
- Provide URL of alert summary page
- If predictive alert, provide due time and probability from REASON section

Problem notification for interested parties
- Notify the owner identified from the REASON section
- Provides SLA and KPI breach information
- If requested provide URL of alert summary page
- Provide name of who the problem resolution was handed to
Viewing Resource Details in vCenter Operations Enterprise

You can easily view the vCenter Operations Enterprise Resource Detail: Dynamic Dashboard page for any EMC Smarts object which is being tracked by vCenter Operations Enterprise, directly from the Topology Tree in the Global Console.

To open vCenter Operations Enterprise and see the Dynamic Dashboard page for an object:
1. Expand the Topology Tree to show the object you want.
2. Right-click the object in the list.
3. From the pop-up menu, select Client Tools, then View Object in vCenter Operations.

If you are already logged into vCenter Operations Enterprise, this opens the Dynamic Dashboard page for the vCenter Operations Enterprise resource. If you are not logged in, you will need to log in using a user name and password with access rights to view resource details.

**NOTE** vCenter Operations Enterprise will open in a new browser window or tab page, depending on your browser settings.

Viewing EMC Smarts Data in vCenter Operations Enterprise

In addition to opening vCenter Operations Enterprise from the Global Console to see information about a specific alert notification or object, you can view data about EMC Smarts objects using the vCenter Operations Enterprise dashboards. A dashboard can contain any combination of vCenter Operations Enterprise widgets; each widget shows a specific view of a type of collected data. Both dashboards and widgets are highly configurable, so you can design dashboards to show exactly the data you want about exactly the objects (vCenter Operations Enterprise resources) you want. Below are a few examples of vCenter Operations Enterprise dashboards configured to show EMC Smarts information.

The first example gives a quick view of the overall health of a section of the resource tree, with the most likely root causes of any problems.
The Resources widget on the left lists the EMC Smarts resources defined in vCenter Operations Enterprise, with the vCenter Operations Enterprise-calculated health score for each. On the right, the Advanced Health Tree widget on the top shows the parent and child relationships for the resource selected in the Resources widget, color-coded by health. The Root Cause Ranking widget on the bottom shows the metrics vCenter Operations Enterprise has determined are the biggest contributors to the health problems of the selected resource.

The second example shows real-time performance of two selected metrics—in this case, CPU utilization and overall health—for a defined set of resources, such as all resources imported from EMC Smarts.

The dashboard include two Heat Map widgets. Each heat map shows a color-coded square for each defined resource—red indicates a poorly performing resource and green indicates good performance. The predominate color of the widget gives a rough idea of the overall performance of the metric. For specific information, you can click on a resource square to show the root cause metrics for the performance problems of that resource in the Root Cause Ranking widget.
The final sample shows performance charts of selected metrics for the last six hours, including the minimum and maximum values, the moving average value, and the calculated dynamic thresholds for the metric.

On this dashboard, you select a resource and the desired metrics using the widgets on the left, and graphs showing the metric data appear in the Metric Graph widget on the right. The Metric Graph widget offers many options of chart type, time period (you can show up to three periods on a single graph), and what to include on the graph.
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