

EMC STORAGE ANALYTICS FOR VMAX3



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Introduction

Business Challenge

Welcome to Big Telco Company



BIG Telco Company is a major Telco company in the United States with a strong presence throughout the world. They also have significant development shops in India and Bolivia. They are greatly diversified across communication infrastructure as well as the newer Wireless Infrastructure around the United States and Canada. BIG Telco Company also has begun establishing themselves in Hosting Facilities and has recently invested millions into a state of the art datacenter located in the Middle East.

As BIG Telco Company rapidly expands geographically, so does their service offerings to their customers. BIG Telco Company already provides integration and solutions consultation, and is now looking to add monitoring and analytics services to their portfolio. IT administrators at BIG Telco Company need to access information quickly, especially when it is related to critical systems in their customers' virtual environments. This can be a daunting task, particularly when these environments consist of many arrays and hosts. Navigating to each system is time consuming, and identifying systems that need immediate attention can be challenging.

You are one of the IT administrators at BIG Telco Company. Jamie, the IT Director, has assigned you the project of building an infrastructure that can monitor storage systems and VMware environments. Jamie needs to be able to create logical views that show specific resource utilization, available storage, and potential issues.

Solution

BIG Telco Company's customers have chosen EMC storage systems to store their business-critical information because of the products' reliability, robustness, and ease-of-use. You know that implementing EMC solutions will allow you to leverage the tight integration between the monitoring products, storage systems, and the VMware environment. To accommodate this request, you will evaluate EMC Storage Analytics for VMAX.

Key Components

EMC Storage Analytics

VMware vRealize Operations Manager (vROps) is a software product that collects performance and capacity data from monitored software and hardware resources. It provides users with real-time information about potential problems in the enterprise.

vRealize Operations Manager presents data and analysis in several ways:

- Through alerts that warn of potential or occurring problems.
- In configurable dashboards and predefined pages that show commonly needed information.
- In predefined reports.

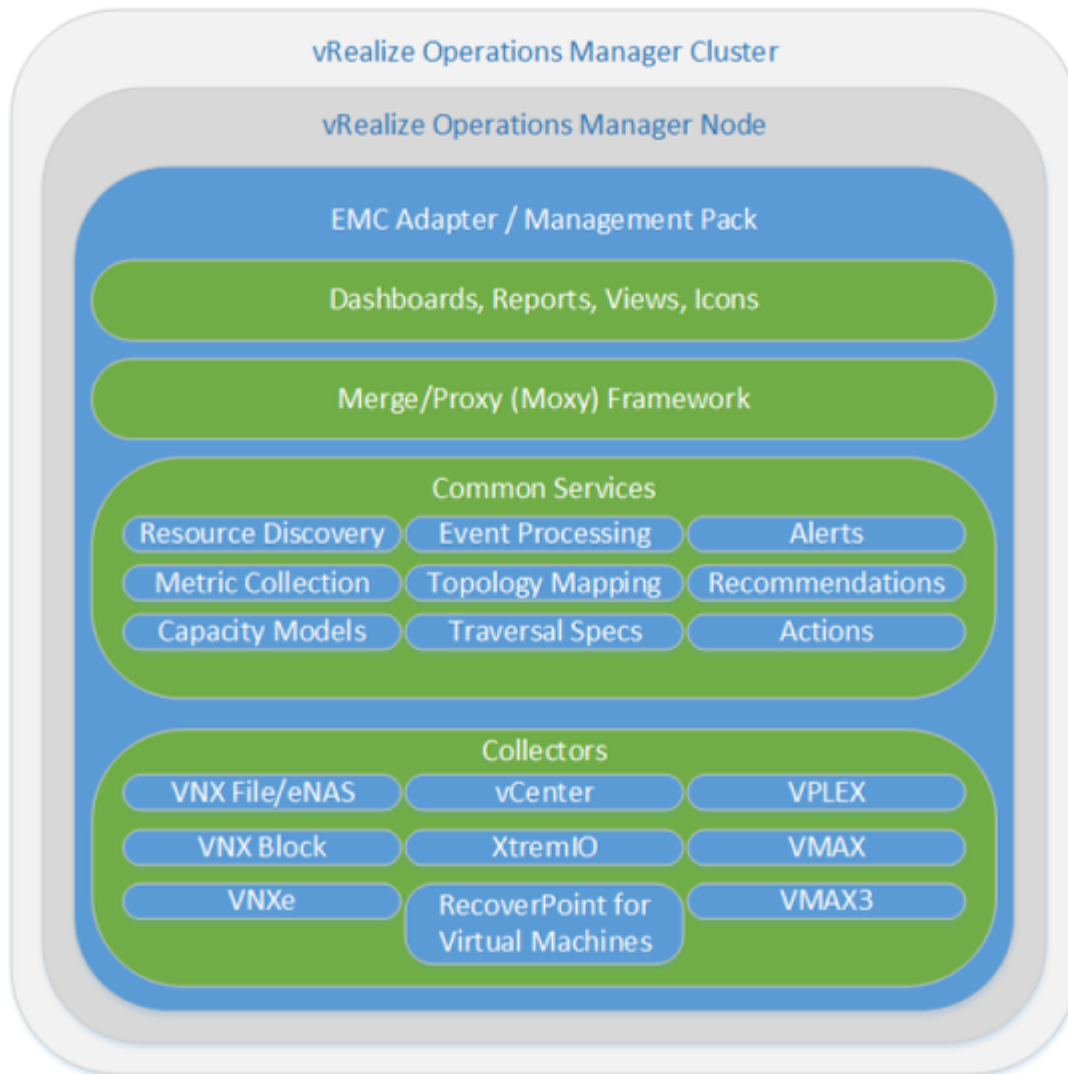
EMC® Storage Analytics links vRealize Operations Manager with an EMC adapter. The adapter is bundled with a connector that enables vRealize Operations Manager to collect performance metrics. The adapter is installed with the vRealize Operations Manager user interface.

The connector types are shown below.

EMC Storage Analytics uses the power of existing vCenter features to aggregate data from multiple sources and process the data with proprietary analytic algorithms. EMC Storage Analytics complies with VMware management pack certification requirements and has received the VMware Ready certification.

EMC Adapter Architecture

The image below details the high-level architectural components of vROps with ESA.



Terminology

The following terminology will be useful during the completion of the lab:

adapter

A vRealize Operations Manager component that collects performance metrics from an external source like a vCenter or storage system. Third-party adapters such as the EMC Adapter are installed on the vRealize Operations Manager server to enable creation of adapter instances within vRealize Operations Manager.

adapter instance

A specific external source of performance metrics, such as a specific storage system. An adapter instance resource is an instance of an adapter that has a one-to-one relationship with an external source of data, such as a VNX storage system.

dashboard

A tab on the home page of the vRealize Operations Manager GUI. vRealize Operations Manager ships with default dashboards. Dashboards are also fully customizable by the end user.

health rating

An overview of the current state of any resource, from an individual operation to an entire enterprise. vRealize Operations Manager checks internal metrics for the resource and uses its proprietary analytics formulas to calculate an overall health score on a scale of 0 to 100.

icon

A pictorial element in a widget that enables a user to perform a specific function. Hovering over an icon displays a tooltip that describes the function.

metric

A category of data collected for a resource. For example, the number of read operations per second is one of the metrics collected for each LUN resource.

resource

Any entity in the environment for which vRealize Operations Manager can collect data. For example, LUN 27 is a resource.

resource kind

A general type of a resource, such as LUN or DISK. The resource kind dictates the type of metrics collected.

widget

An area of the EMC Storage Analytics graphical user interface (GUI) that displays metrics-related information. A user can customize widgets to their own environments.

Lab Notes

These are some important things to keep in mind while completing the lab:

- The vROps/ESA environment is in a historical demo mode which allows it to show a small amount of data (12 hours) as if it were live. This is required as the lab is self-contained and cannot actively attach to a VMAX3 array.
- The lab environment cannot be broken in any way. Exploring dashboards, topologies, etc. is perfectly acceptable if you need to see other areas of ESA. Note however, that because of the limited time and data available it is possible certain functions may not return data, e.g. using different dates in the graphs of metrics.
- The default timeout in vROps is 30 minutes. This should not cause a problem given the length of the lab, however if you are logged out, logging in will return you to the last location.
- The screenshots in the lab may not exactly match the user environment. While the navigation and components will be the same, it is possible the health colors (red, yellow, green, gray) of particular resources may be different. This will not impact the lab in any way other than the pictures not being exact. If objects appear gray, try refreshing the screen in the top right-hand corner of vROps (below). You may need to refresh more than once.



Lab Overview

Lab Environment

Before you begin this lab, here is a summary of the key components found in the lab environment. The VMware vRealize Operations Management environment normally consists of the vROps virtual appliance, an EMC SMI-S installation, a VMware vCenter, and one or more VMAX arrays. Because the lab is a closed-system, this environment consists of a single virtual appliance VM which has been placed in a "demo" mode. The environment exists within a 12 hour period at all times. This will be reflected in the labs and where necessary mention will be made as to how it might impact certain screens. vROps will be access through a Firefox browser only.

Here is a summary of your environment:

VMware vRealize Operations (vROps) 6.0.2

EMC Storage Analytics (ESA) 3.2.1

Windows Credentials

- vlab\administrator
- Password123!

vROps IP: 192.168.1.61

Credentials

- admin
- Password123!

Labs

The following labs will be covered in EMC Storage Analytics for VMAX3:

- Lab1: Add and remove an adapter instance
- Lab2: Navigate eNAS topology
- Lab3: Dashboard and alert navigation
- Lab4: Capacity Analysis
- Lab5: SRDF

Lab 1: Add and Remove an Adapter Instance

ESA for VMAX3 initial setup

In the following labs you will now be exploring EMC Storage Analytics (ESA). ESA leverages VMware vRealize Operations Manager to proactively monitor storage performance and efficiency across virtual environments. For customer environments that utilize VMAX systems as back-end storage for their VMware infrastructure, ESA collects performance and capacity data for storage analysis. In addition, it can be used in troubleshooting system abnormalities or in forecasting for future storage needs.

Desktop Login

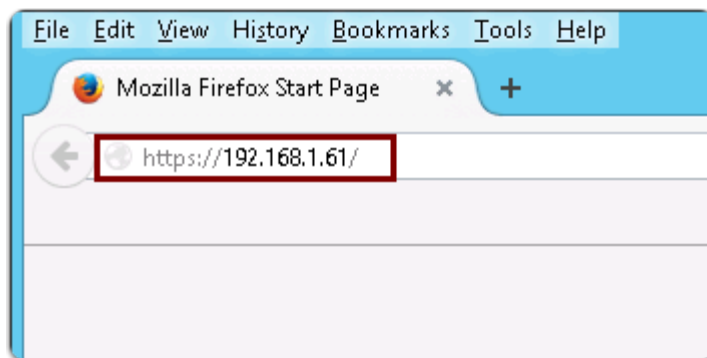
Once logged into the Launchpad desktop, open the Mozilla browser.



vROps IP

In the browser type

<https://192.168.1.61> and press Enter



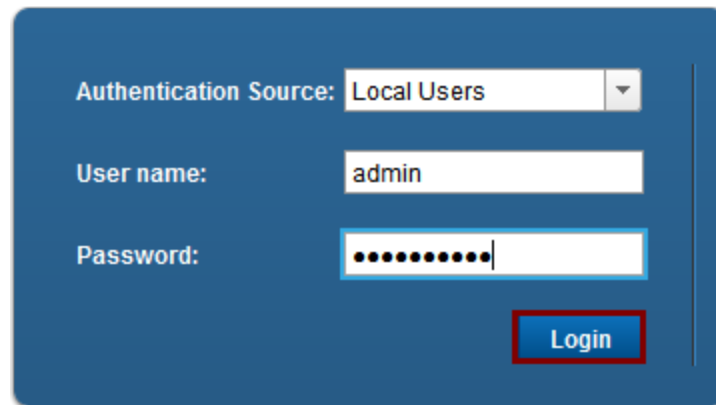
VMware vRealize Operations Manager Login Screen

Login using the following credentials:

admin

Password123!

Click Login



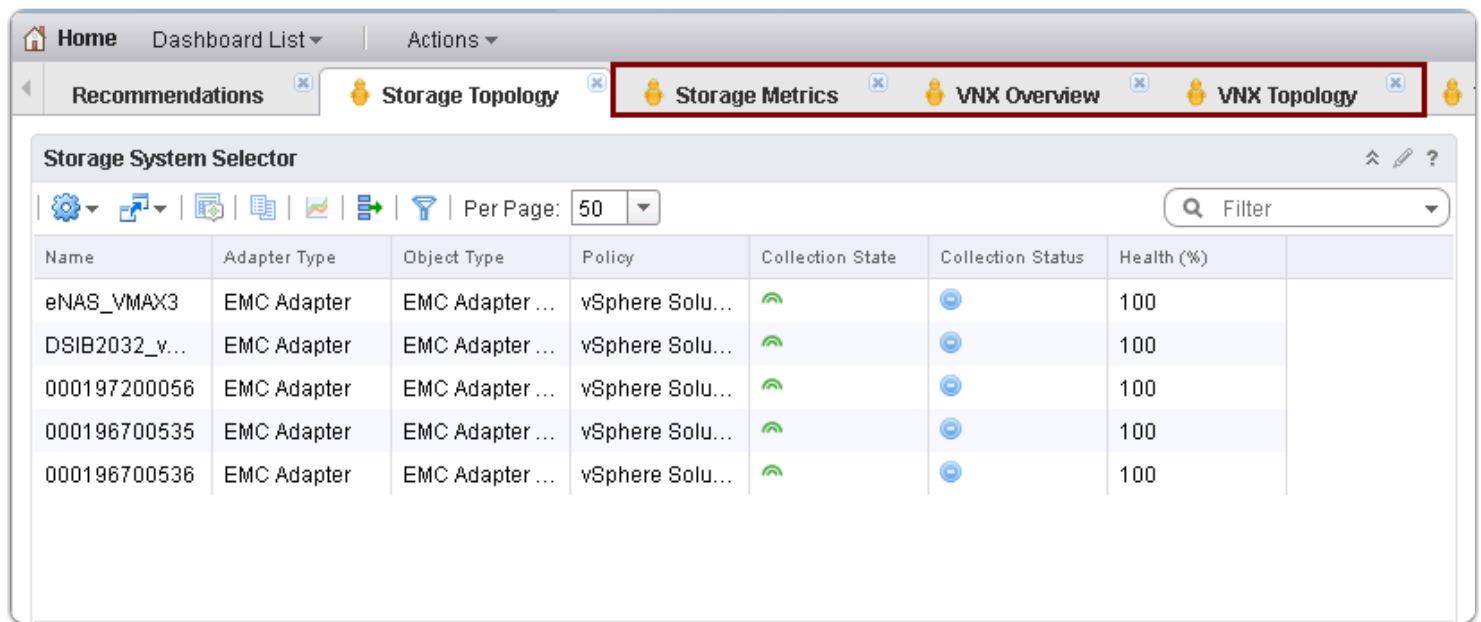
A login form with a blue background. It contains three input fields: 'Authentication Source' with a dropdown menu showing 'Local Users', 'User name' with the text 'admin', and 'Password' with masked characters. A 'Login' button is located at the bottom right of the form.

Authentication Source:	Local Users
User name:	admin
Password:	
Login	

Home - vRealize Operations Manager

Once logged in, the first screen you will see is the ESA default Storage Topology dashboard.

At the top of the vROps interface are the names of all the available dashboards for vSphere and EMC. As vSphere has many dashboards and EMC has dashboards for each platform, the number that can be scrolled through can be cumbersome. EMC has built in the ability to show only those dashboards that are of interest. The next step will walk through how to hide unwanted dashboards. For this lab, you will hide all vSphere dashboards and non-VMAX dashboards.

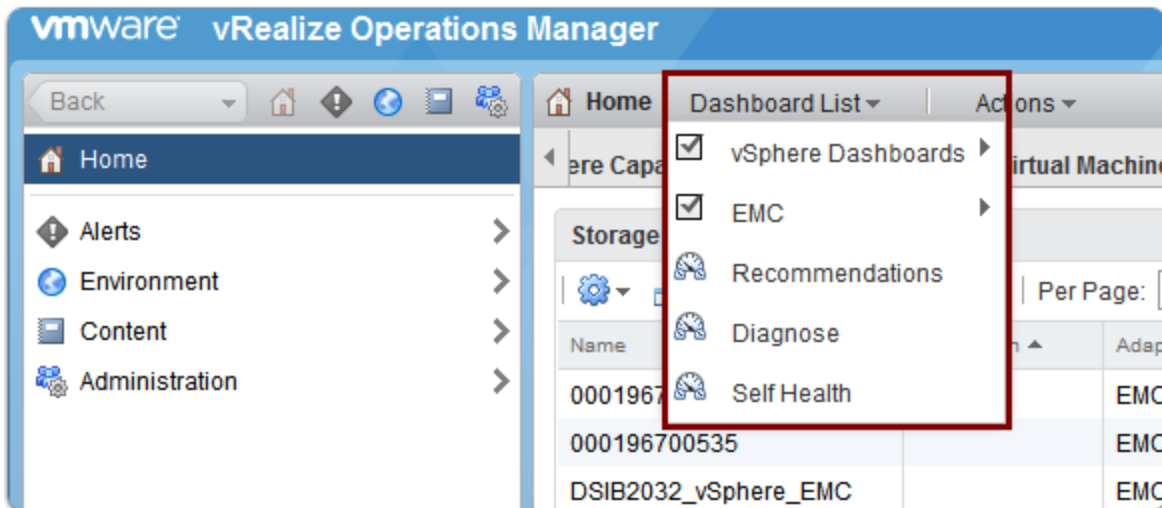


The screenshot shows the vRealize Operations Manager interface. At the top, there is a navigation bar with tabs for 'Home', 'Dashboard List', and 'Actions'. Below this, there is a row of dashboard tabs: 'Recommendations', 'Storage Topology', 'Storage Metrics', 'VNX Overview', and 'VNX Topology'. The 'Storage Metrics' tab is highlighted with a red box. Below the tabs, there is a 'Storage System Selector' section. This section contains a table with the following columns: Name, Adapter Type, Object Type, Policy, Collection State, Collection Status, and Health (%). The table lists five entries, all of which are EMC Adapters connected to vSphere Solu... and all showing a health of 100%.

Name	Adapter Type	Object Type	Policy	Collection State	Collection Status	Health (%)
eNAS_VMAX3	EMC Adapter	EMC Adapter ...	vSphere Solu...			100
DSIB2032_v...	EMC Adapter	EMC Adapter ...	vSphere Solu...			100
000197200056	EMC Adapter	EMC Adapter ...	vSphere Solu...			100
000196700535	EMC Adapter	EMC Adapter ...	vSphere Solu...			100
000196700536	EMC Adapter	EMC Adapter ...	vSphere Solu...			100

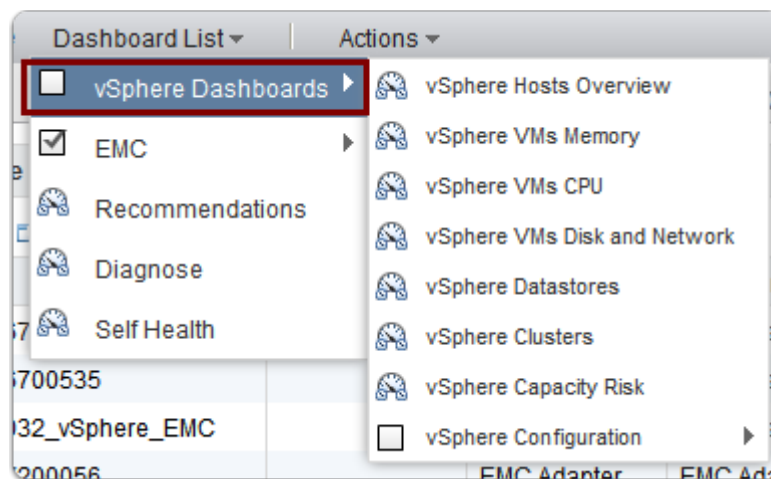
Home - vRealize Operations Manager

Click on Dashboard List



Remove vSphere Dashboards

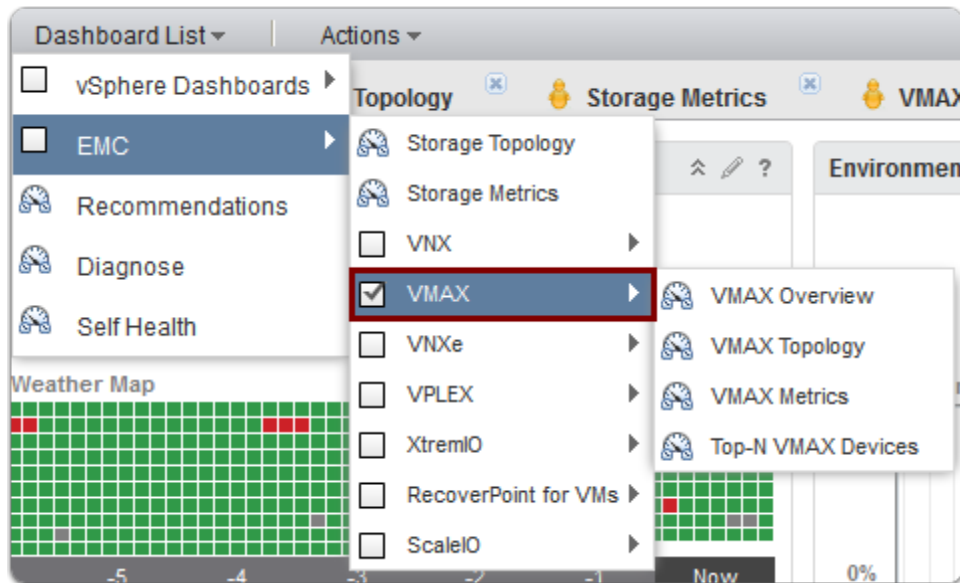
Uncheck the vSphere Dashboards which will hide them in the vROps interface.



Remove non-VMAX Dashboards

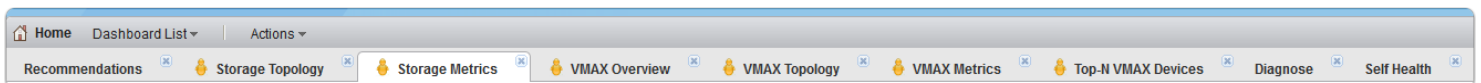
Next uncheck each EMC platform checkbox except **VMAX**. This will hide the other platform dashboards, while still showing the default Storage Topology and Metrics dashboards.

Do NOT select the EMC checkbox first, or that will remove the default Storage Topology and Metrics dashboards. The box will automatically uncheck when you remove the first platform. If you do make the mistake of selecting EMC, simply re-check it and start over.



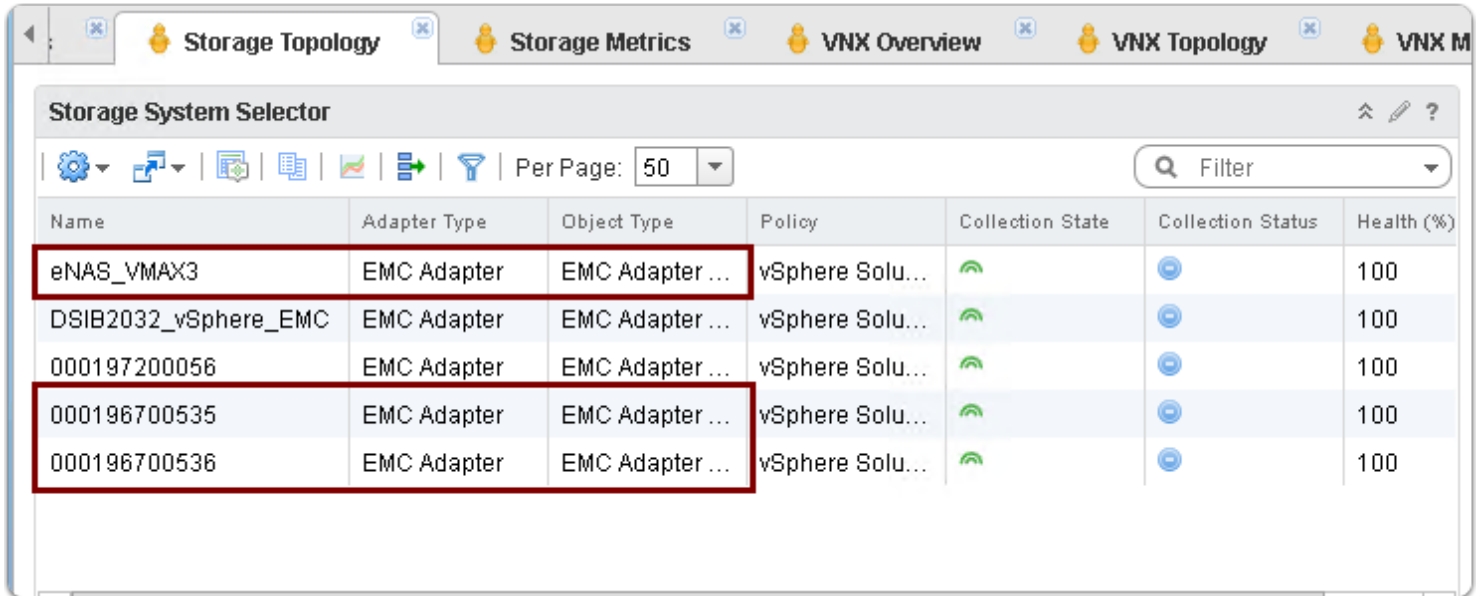
VMAX dashboard list

Upon completion the reduced dashboard list will appear. Now that you have the dashboard list, you will review the existing adapters configured in the environment by looking at the Storage Topology dashboard.



Storage Topology dashboard

Within the dashboard are all the EMC configured adapters. The configured adapters that you will use for the bulk of the lab are two VMAX3 200Ks (536, 535) and also a VMAX3 400K (056) which is the array housing the eNAS environment, eNAS_VMAX3.



The screenshot shows the 'Storage System Selector' interface with a table of configured adapters. The table has columns for Name, Adapter Type, Object Type, Policy, Collection State, Collection Status, and Health (%). The first row, 'eNAS_VMAX3', and the last two rows, '000196700535' and '000196700536', are highlighted with red boxes.

Name	Adapter Type	Object Type	Policy	Collection State	Collection Status	Health (%)
eNAS_VMAX3	EMC Adapter	EMC Adapter ...	vSphere Solu...			100
DSIB2032_vSphere_EMC	EMC Adapter	EMC Adapter ...	vSphere Solu...			100
000197200056	EMC Adapter	EMC Adapter ...	vSphere Solu...			100
000196700535	EMC Adapter	EMC Adapter ...	vSphere Solu...			100
000196700536	EMC Adapter	EMC Adapter ...	vSphere Solu...			100

Summary

In the previous steps you prepared the environment for the remainder of the lab sections.

You may now move on to the next step.

Add and Remove an adapter instance

An adapter is a vCenter Operations Manager component that collects performance metrics from an external source like a vCenter or VMAX storage system. Adapters, such as the EMC Adapter, are installed on the vRealize Operations Manager server to enable creation of adapter instances. An adapter instance is a one-to-one relationship with an external source of data, such as a VMAX storage system via SMI-S, where information and metrics can be collected from.

VMware vRealize Operations Manager Login Screen

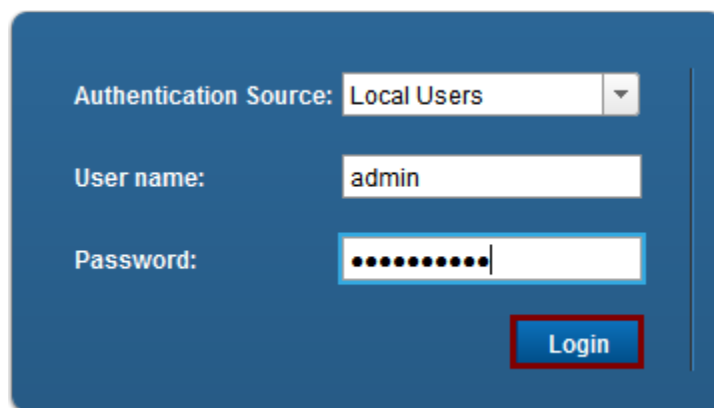
If not already logged in, in the browser, navigate to <http://192.168.1.61> which will display the login screen for vRealize Operations Manager.

Login using the following credentials:

admin

Password123!

Click Login

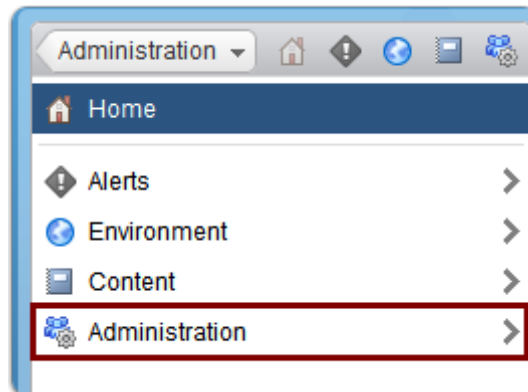


The image shows the login screen of VMware vRealize Operations Manager. It has a blue background with white text and input fields. The 'Authentication Source' is set to 'Local Users'. The 'User name' field contains 'admin'. The 'Password' field contains a series of dots. A red rectangle highlights the 'Login' button.

Authentication Source:	Local Users
User name:	admin
Password:	
	Login

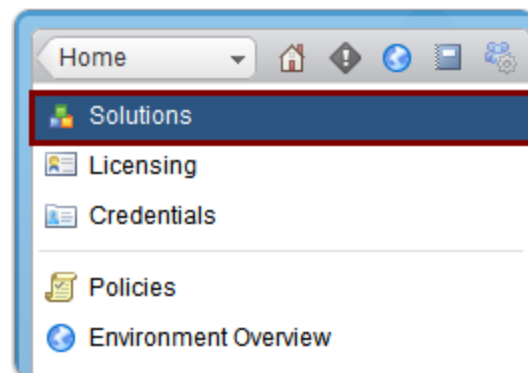
Home - vRealize Operations Manager

To begin, in the left-hand menu navigate and click on Administration.



Solutions - vRealize Operations Manager

Ensure Solutions is selected.



Solutions page

The Solutions page contains all the various plug-ins installed into the vROps environment, including the EMC ESA solution which is called **EMC Adapter** here. A number of EMC adapters are already present. Now you will add another adapter instance.

Solutions

Import Data




Show: All Solutions

Name	Description	Version
 EMC Adapter	Manages EMC systems such as VNX, VMAX...	3.2.0.141682
 VMware vSphere	Manages vSphere objects such as Clusters, ...	6.0.2765404

EMC Adapter Solution Details

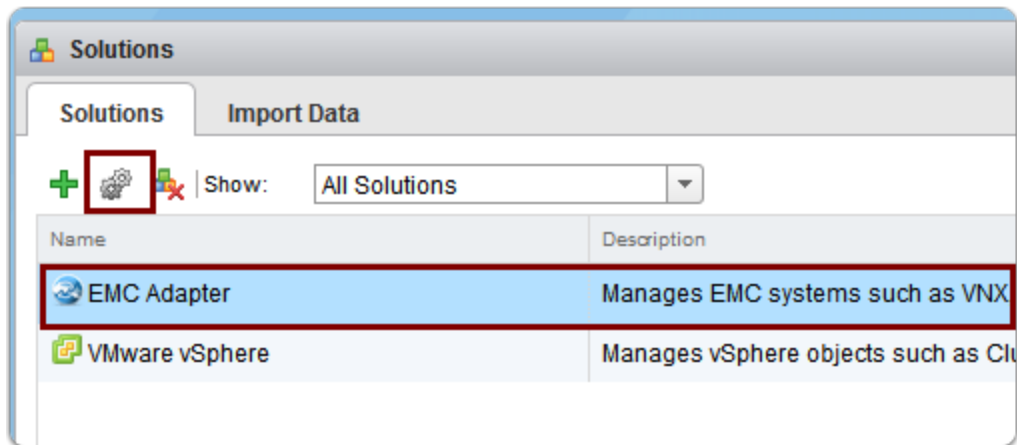




Adapter Type	Adapter Instance Name	Credential name	Collector
EMC Adapter	000196700536	smis	vRealize Oper
EMC Adapter	000196700535	smis	vRealize Oper
EMC Adapter	DSIB2032_vSphere_EMC	administrator@	vRealize Oper
EMC Adapter	000197200056	smis	vRealize Oper
EMC Adapter	eNAS_VMAX3	nasadmin	vRealize Oper

Add EMC Adapter solution - Step 1

Start by highlighting the EMC Adapter Solution and selecting the **configure** icon.



Add EMC Adapter solution - Step 3

A blank form will appear. You will be adding a VMAX adapter.

Manage Solution - EMC Adapter

Adapter Type	Description	Instances	Version	Pro
EMC Adapter		5	3.2.1 Build 14...	EM

+

×

Instance Name ▲

000196700535

000196700536

000197200056

DSIB2032_vSphere_EMC

eNAS_VMAX3

Adapter Settings

Display name

Adapter instance name

Description

Basic Settings

Management IP

Array ID (optional)

Connection Type

VNX Block

License (optional)

Credential

--Please Select--

+

Test Connection

Advanced Settings

Add EMC Adapter solution - Step 4

Fill in the information for the adapter instance as follows:

Display name: 0001968000193

Management IP: 192.168.1.10

Array ID (optional): 0001968000193

Connection Type: VMAX

License (optional): lfrE7-3ENMR-frqKv-Tb7LV-FA

Credential: smis

Select **Save Settings**.

Adapter Settings

Display name

000196800193

Description

Basic Settings

Management IP

192.168.1.10

Array ID (optional)

000196800193

Connection Type

VMAX

License (optional)

lfrE7-3ENMR-frqKv-Tb7LV-FA

Credential

smis

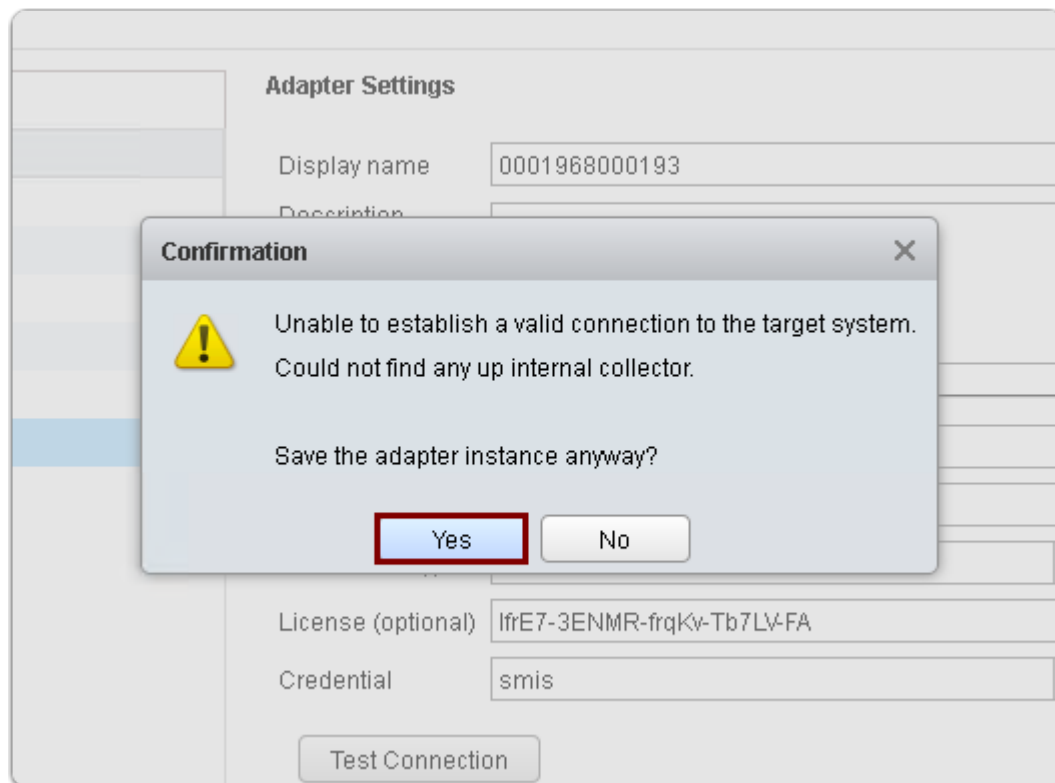
Test Connection

▶ **Advanced Settings**

Save Settings

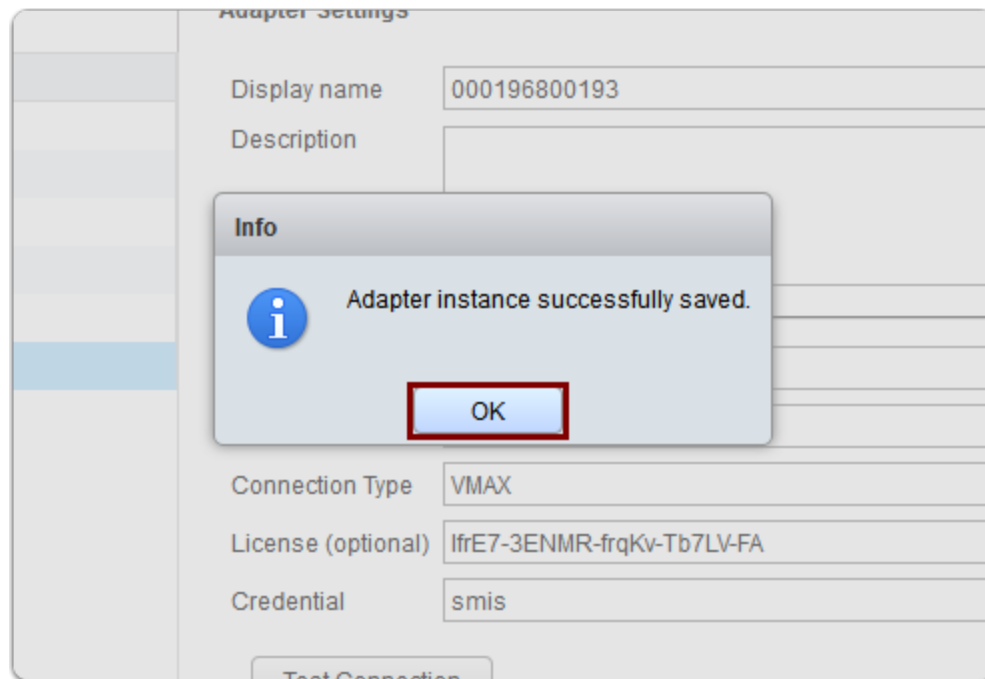
Add EMC Adapter solution - Step 5

Upon selecting Save Settings, vROps will indicate it cannot reach the SMI-S Provider. Choose **Yes** to add the instance anyway.



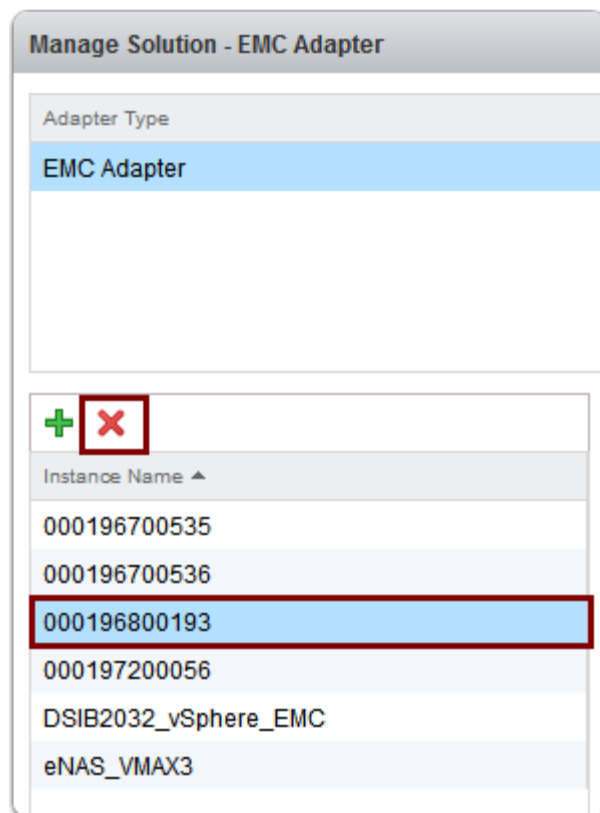
Add EMC Adapter solution - Step 6

Select **OK** again to close the dialog. This was an example of how to add an adapter instance but you will not be using this in the lab. You will now remove the adapter instance.



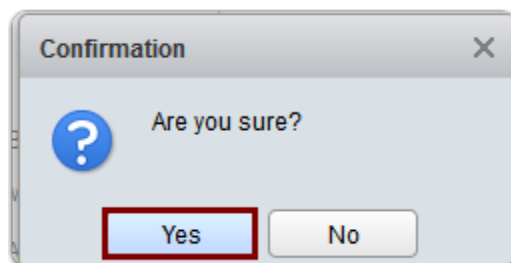
Remove EMC Adapter solution - Step 7

Highlight the 0001968000193 array on the left hand-side, and select the red X to delete the instance.



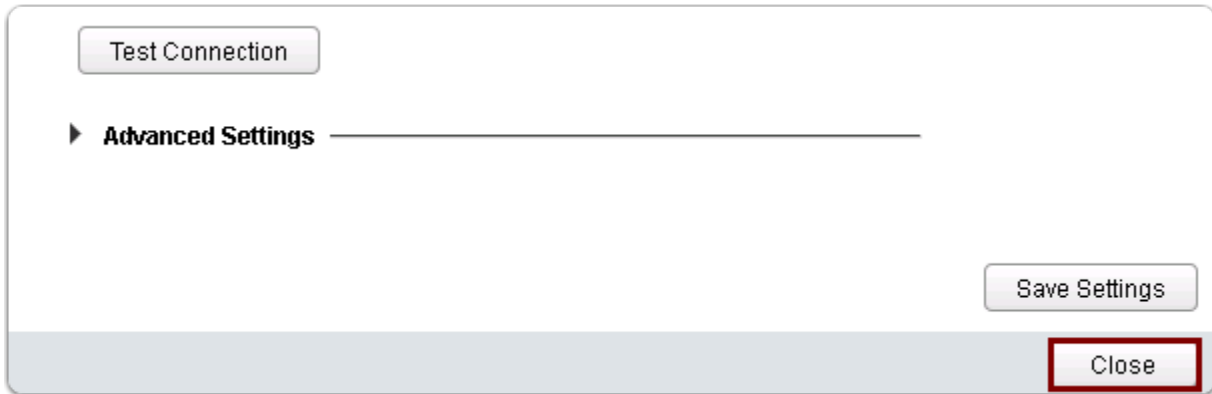
Remove EMC Adapter solution - Step 8

Accept the confirmation. Once complete select Yes to close on the dialog.



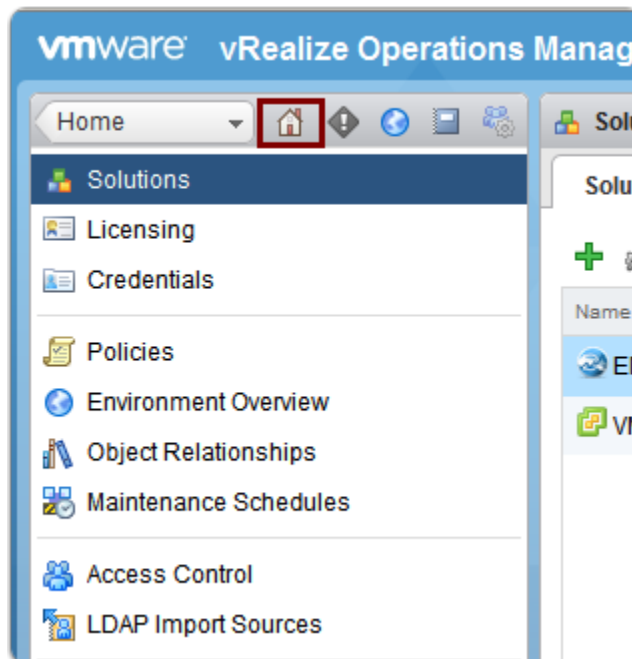
Remove EMC Adapter solution - Step 9

Select Close



Select Home

Return to the dashboard screen by selecting the **Home** icon at the top of the screen.



Summary

In this lab you learned how ESA is integrated into the vRealize Operations Manager product as a solution and how by configuring that solution you can add and remove VMAX adapter instances. ESA utilizes the SMI-S Provider which is a component of Solutions Enabler to gather metrics. These metrics are retrieved from the array and as such both the VMware administrator and Storage administrator see the same information, aiding root cause analysis. You may now move on to the next lab.

Lab 2: Navigate eNAS Topology

eNAS Topology

In this lab you will explore the eNAS topology within ESA. eNAS is a feature of the VMAX3 which provides NFS capability within the array.

VMware vRealize Operations Manager Login Screen

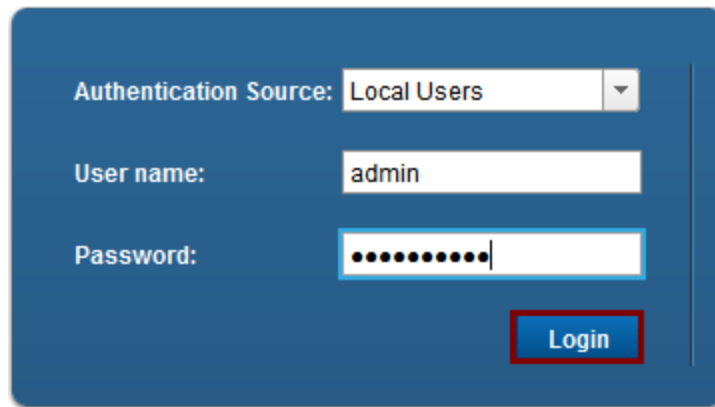
If not already logged in, in the browser, navigate to <http://192.168.1.61> which will display the login screen for vRealize Operations Manager.

Login using the following credentials:

admin

Password123!

Click Login

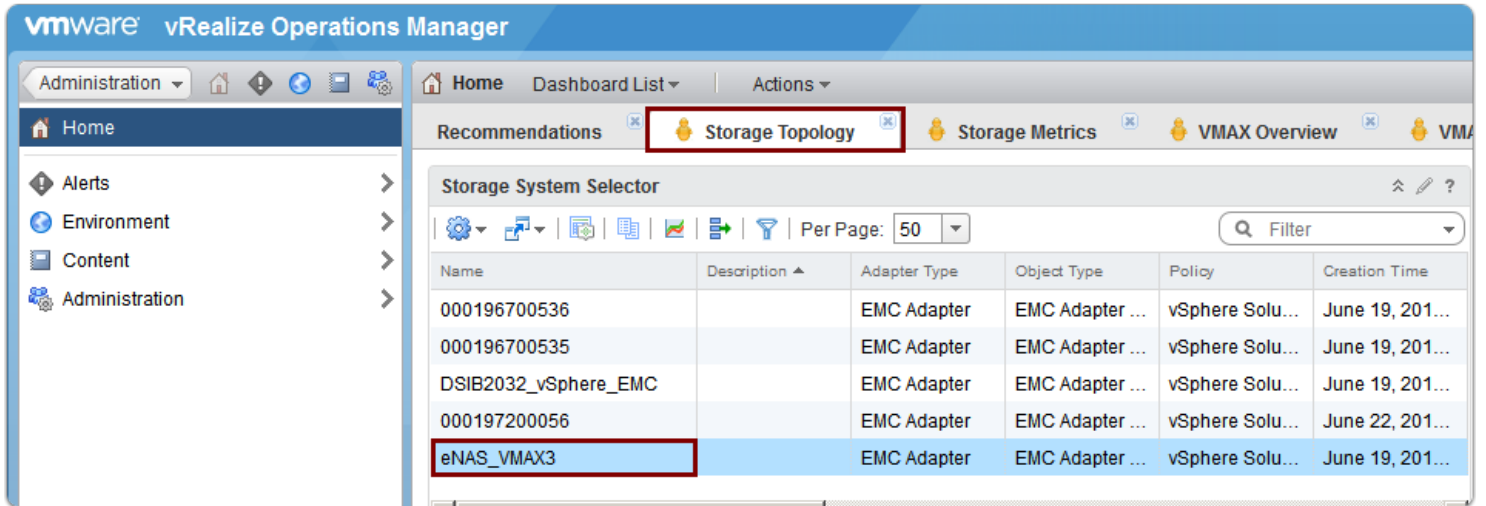


The image shows the login screen for VMware vRealize Operations Manager. It has a blue background with white text and input fields. The 'Authentication Source' dropdown is set to 'Local Users'. The 'User name' field contains 'admin'. The 'Password' field contains a series of dots. A red rectangle highlights the 'Login' button.

Authentication Source:	Local Users
User name:	admin
Password:	
	Login

eNAS topology

If not already selected, choose the **Storage Topology** dashboard from the list on the right. Highlight the **eNAS_VMAX3** adapter instance.



The screenshot shows the VMware vRealize Operations Manager interface. The left sidebar contains navigation links: Home, Alerts, Environment, Content, and Administration. The main dashboard area displays the 'Storage Topology' dashboard, which is highlighted with a red box. Below the dashboard title, there is a 'Storage System Selector' table. The table has columns for Name, Description, Adapter Type, Object Type, Policy, and Creation Time. The table lists five instances, with the last one, 'eNAS_VMAX3', highlighted with a red box.

Name	Description	Adapter Type	Object Type	Policy	Creation Time
000196700536		EMC Adapter	EMC Adapter ...	vSphere Solu...	June 19, 201...
000196700535		EMC Adapter	EMC Adapter ...	vSphere Solu...	June 19, 201...
DSIB2032_vSphere_EMC		EMC Adapter	EMC Adapter ...	vSphere Solu...	June 19, 201...
000197200056		EMC Adapter	EMC Adapter ...	vSphere Solu...	June 22, 201...
eNAS_VMAX3		EMC Adapter	EMC Adapter ...	vSphere Solu...	June 19, 201...

Parent and Child Resources

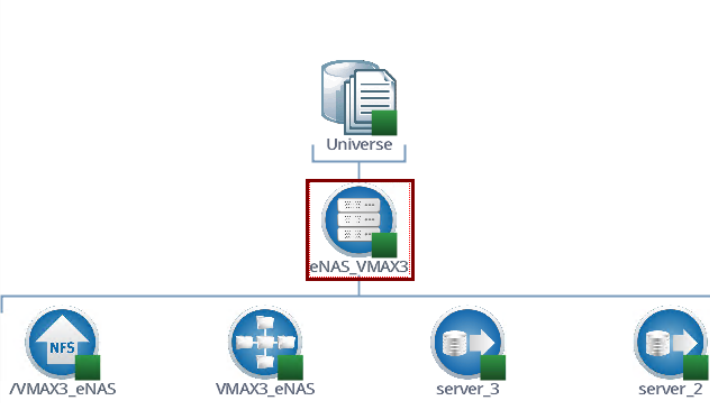
Click on the **eNAS_VMAX3** object. If there are issues highlighting an object, toggle between the two icons in the red box (hand and minus sign) to refocus. When an object is highlighted in this box, on the right-hand side widgets display any Parent Resources and Child Resources are shown. An adapter instance only has one parent, which is the Universe container. The eNAS adapter in this environment has two data movers, a file system, and a file export as seen in the Child Resources.

Storage System Selector

Name	Adapter Type	Object Type	Policy	Collection State	Collection Status
eNAS_VMAX3	EMC Adapter	EMC Adapter ...	vSphere Solu...		
DSIB2032_vSphere_EMC	EMC Adapter	EMC Adapter ...	vSphere Solu...		
000197200056	EMC Adapter	EMC Adapter ...	vSphere Solu...		
000196700535	EMC Adapter	EMC Adapter ...	vSphere Solu...		
000196700536	EMC Adapter	EMC Adapter ...	vSphere Solu...		

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Storage Topology and Health



The diagram shows a hierarchy where the 'Universe' container is at the top, connected to the 'eNAS_VMAX3' adapter. This adapter is then connected to four child resources: 'NFS', 'VMAX3_eNAS', 'server_3', and 'server_2'.

Parent Resources

Name	Adapter Type	Object Type	Policy	Collection State
Universe	Container	Universe	vSphere Solu...	

Page 1 of 1 | Displaying 1 - 1 of 1

Child Resources

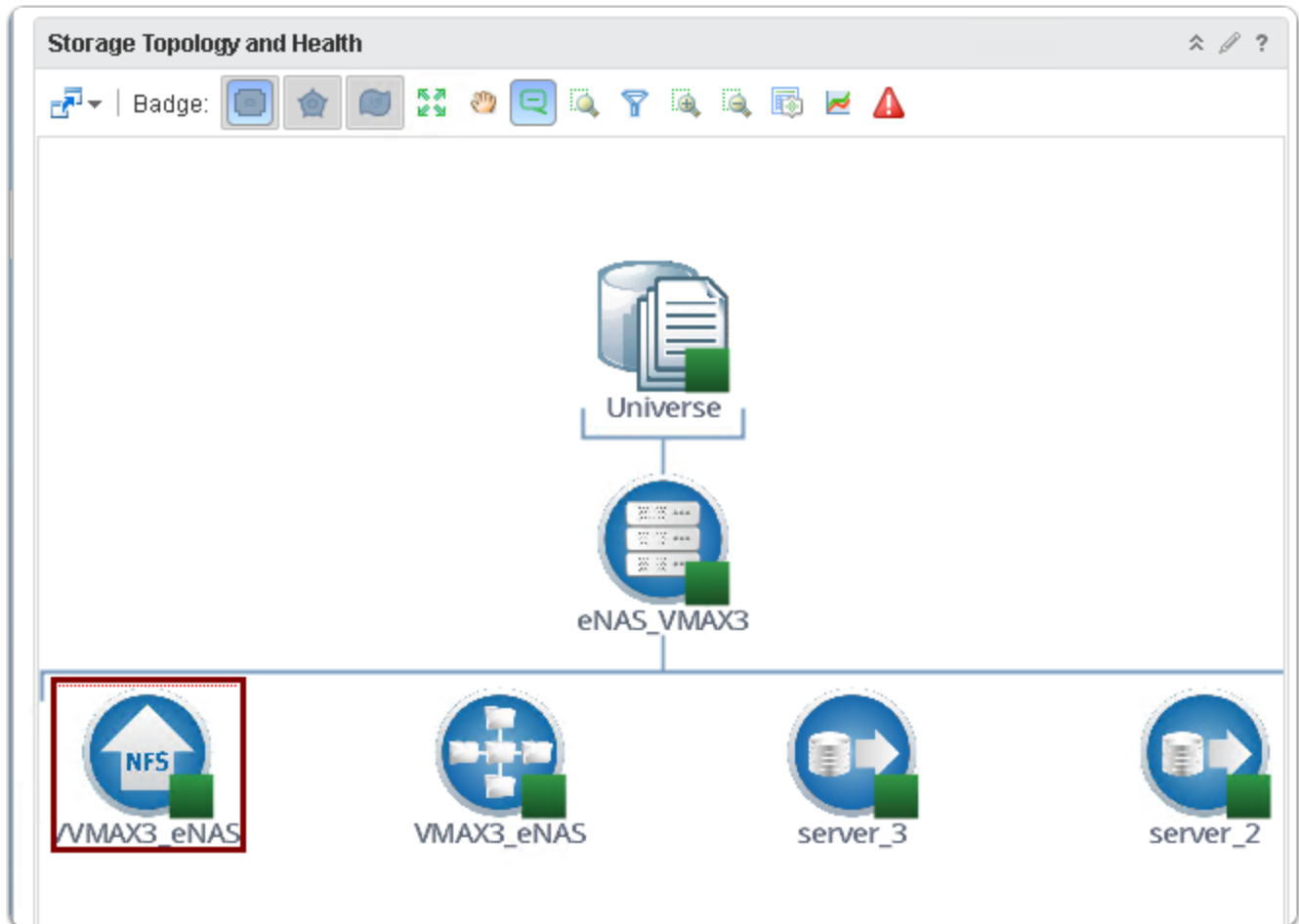
Name	Adapter Type	Object Type	Policy	Collection State	Collection Status	Health
VMAX3_eNAS	EMC Adapter	File System	vSphere Solu...			100
server_3	EMC Adapter	Data Mover	vSphere Solu...			100
VMAX3_eNAS	EMC Adapter	NFS Export	vSphere Solu...			100
server_2	EMC Adapter	Data Mover	vSphere Solu...			100

Page 1 of 1 | Displaying 1 - 4 of 4

Parent and Child Resources - continued

Next, double-click the NFS export /VMAX3_eNAS

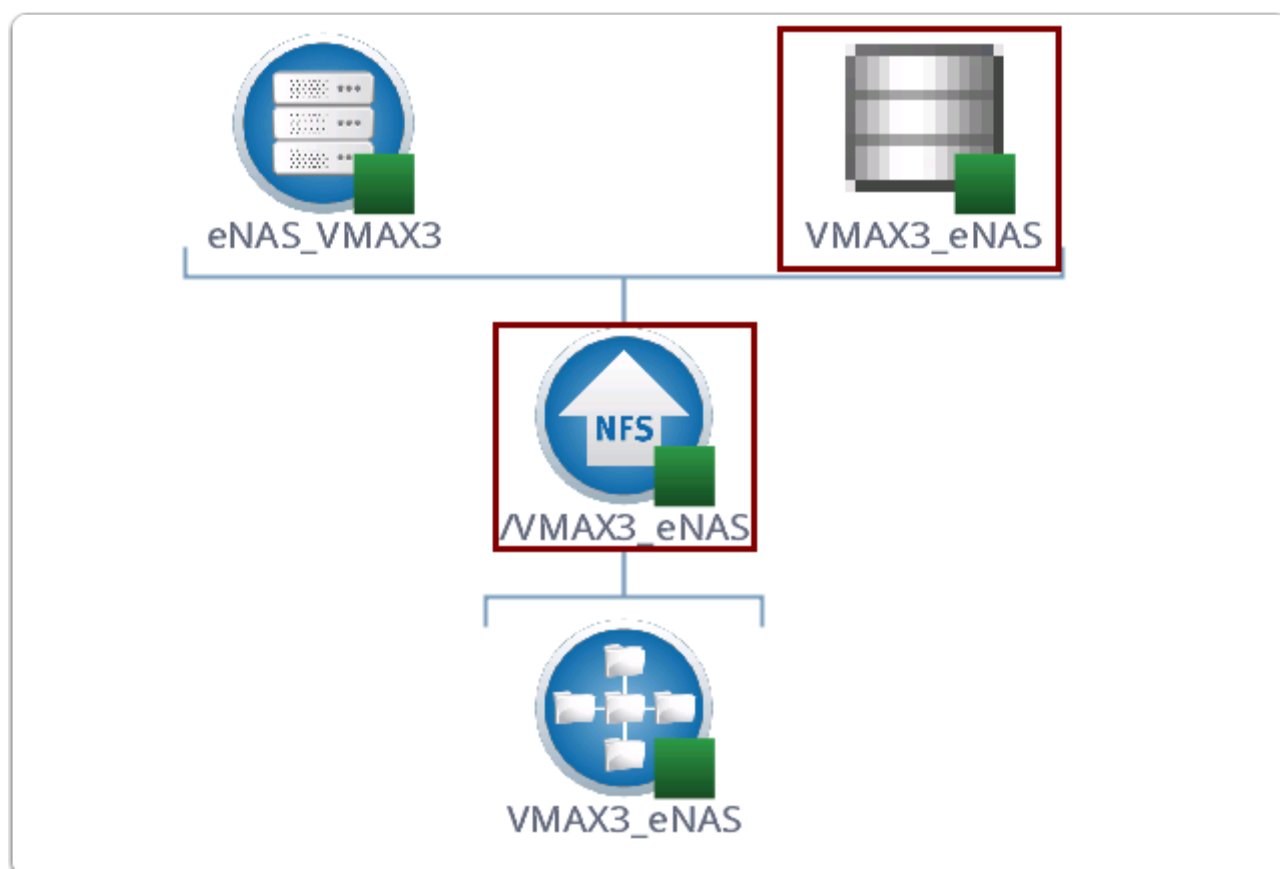
This will update the storage topology diagram to include the parents and child of the export.



Parent and Child Resources - continued

You can now see how the export is built on the file system **VMAX3_eNAS** while a VMware datastore called **VMAX3_eNAS** is built upon the NFS export. This represents the intersection of the VMware and EMC objects.

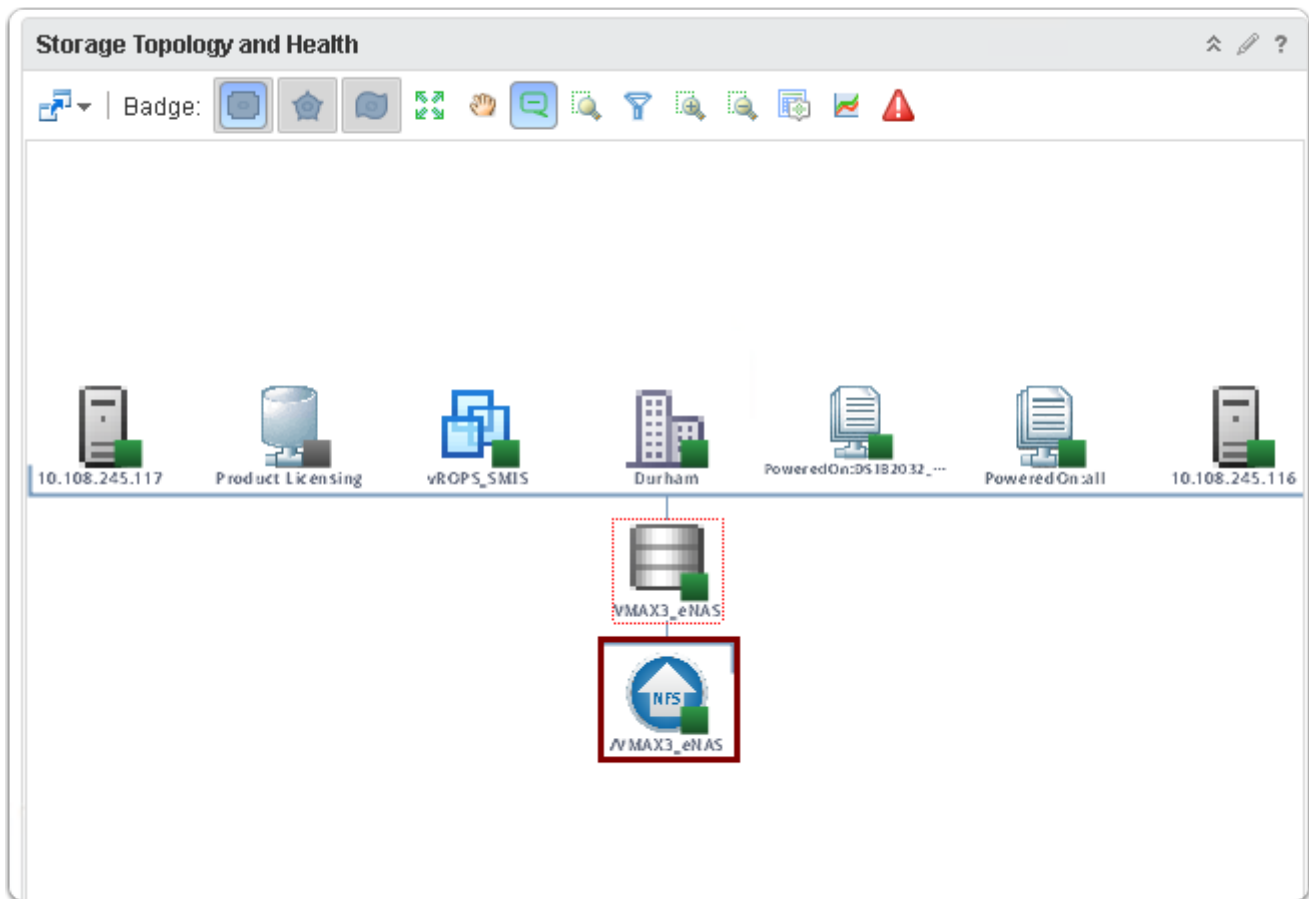
Double-click on the **VMAX3_eNAS** datastore.



Parent and Child Resources - continued

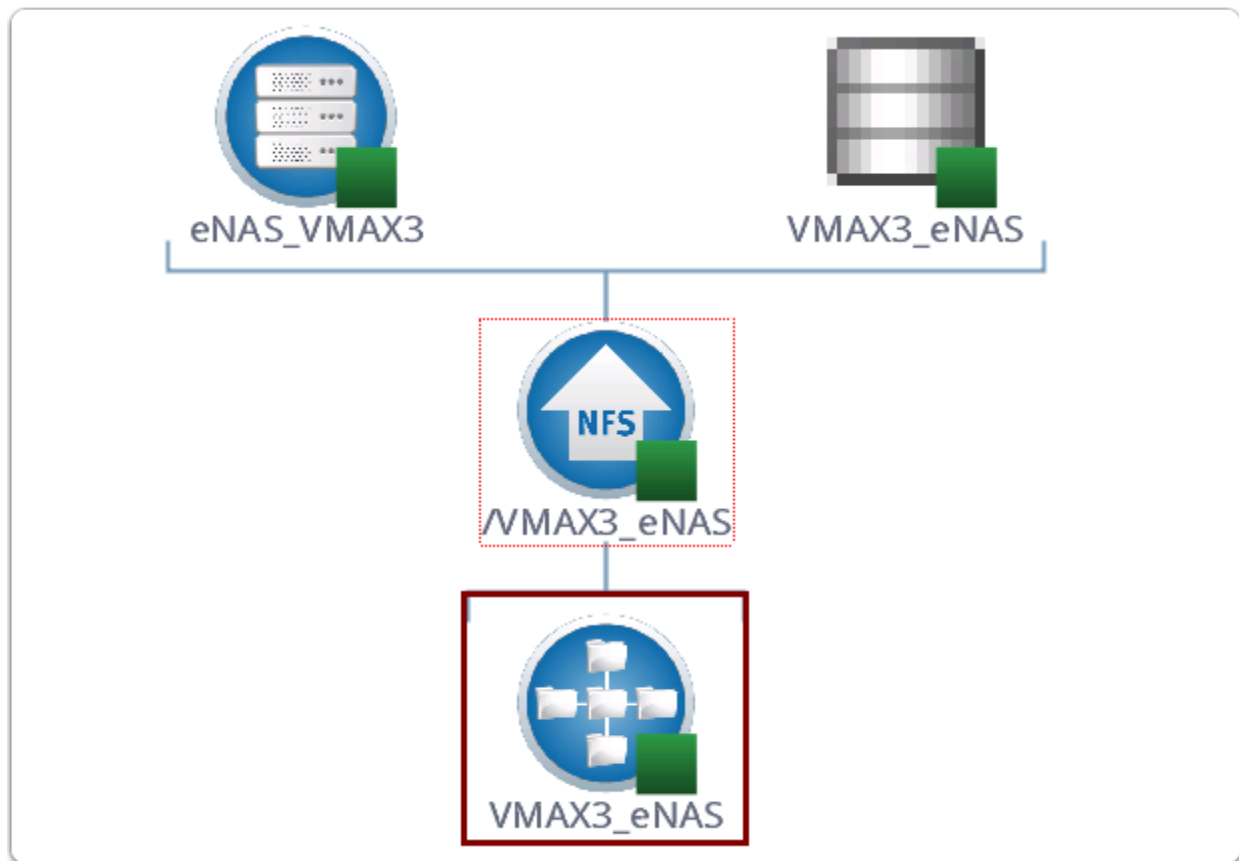
You will travel up through the VMware stack and see the VMware objects such as the VM (vROPS_SMIS) and ESXi hosts.

Next, double-click on the /VMAX3_eNAS NFS export to return to the previous screen.



Parent and Child Resources - continued

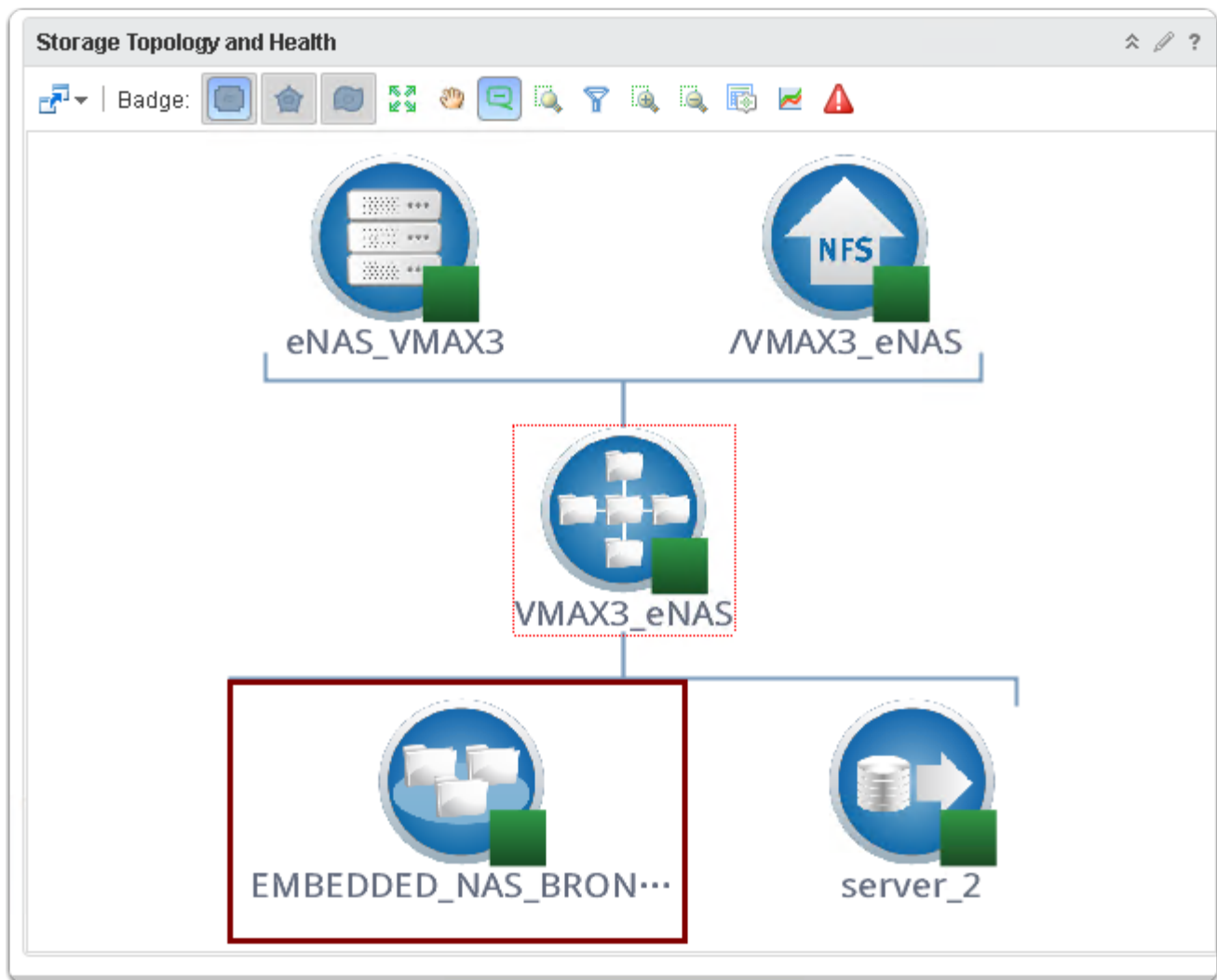
From here you will now proceed in the other direction through the eNAS objects. Double-click on the file system icon VMAX3_eNAS



NFS navigation

Here you see a Datamover, server_2, and a File Pool, EMBEDDED_NAS_BRONZE_SG (truncated). If you traverse down through that file pool, you can work your way down to the backing VMAX3 devices.

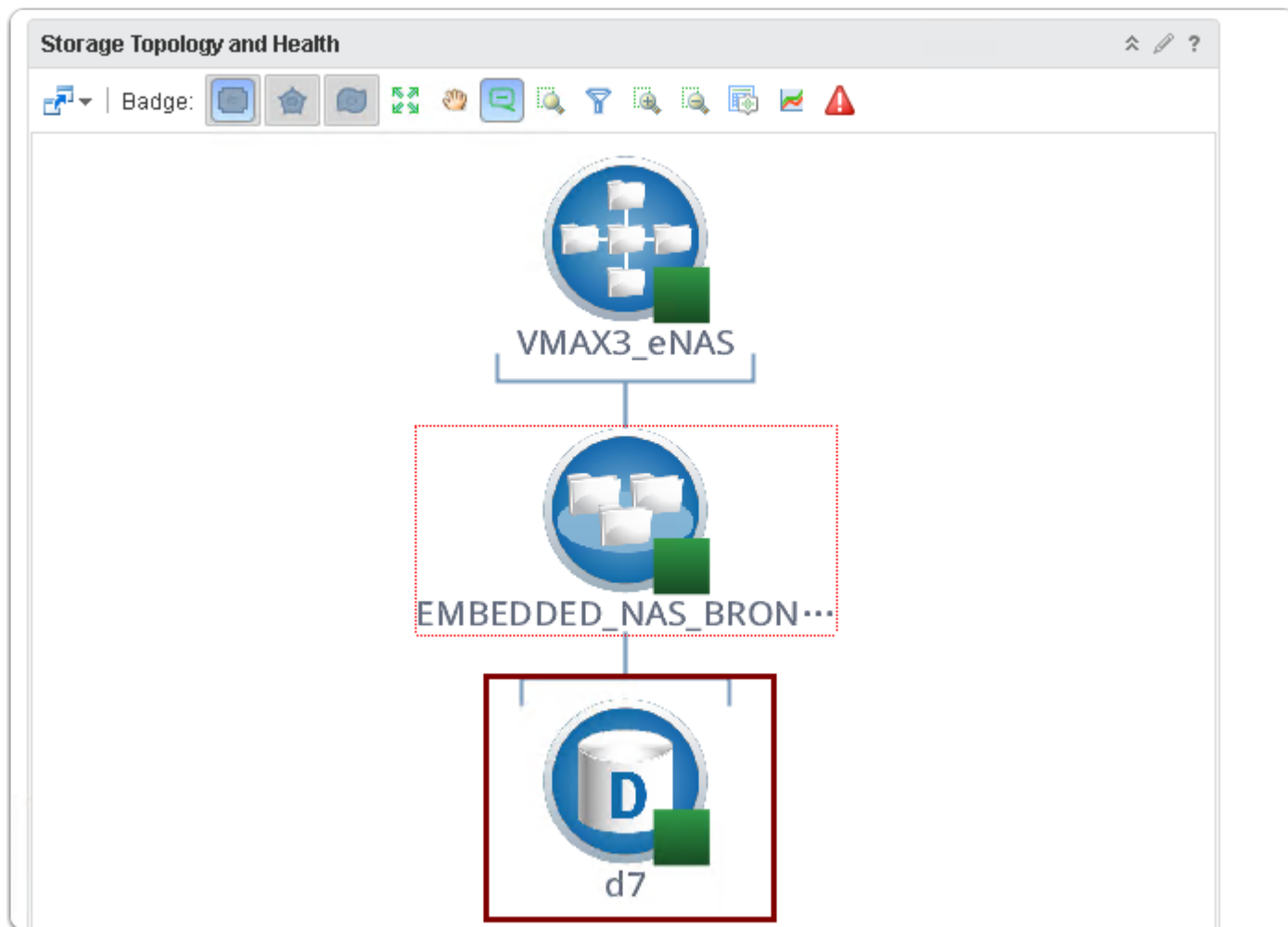
Double-click on the EMBEDDED_NAS_BRONZE_SG icon.



File Pool

This displays the dVol device, d7.

Double-click d7

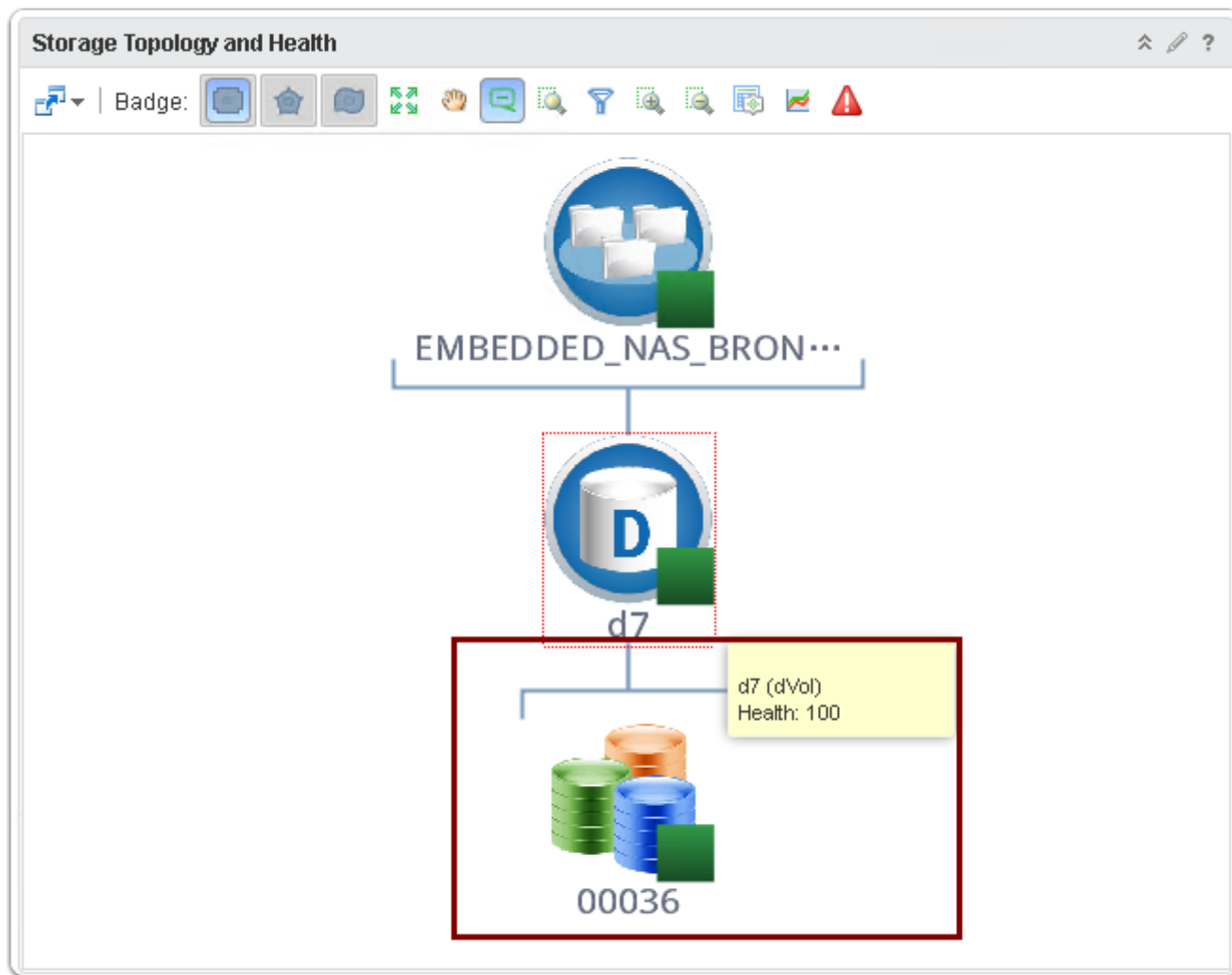


NFS VMAX3 device

This will complete the topology connection to the VMAX3 by displaying the underlying device.

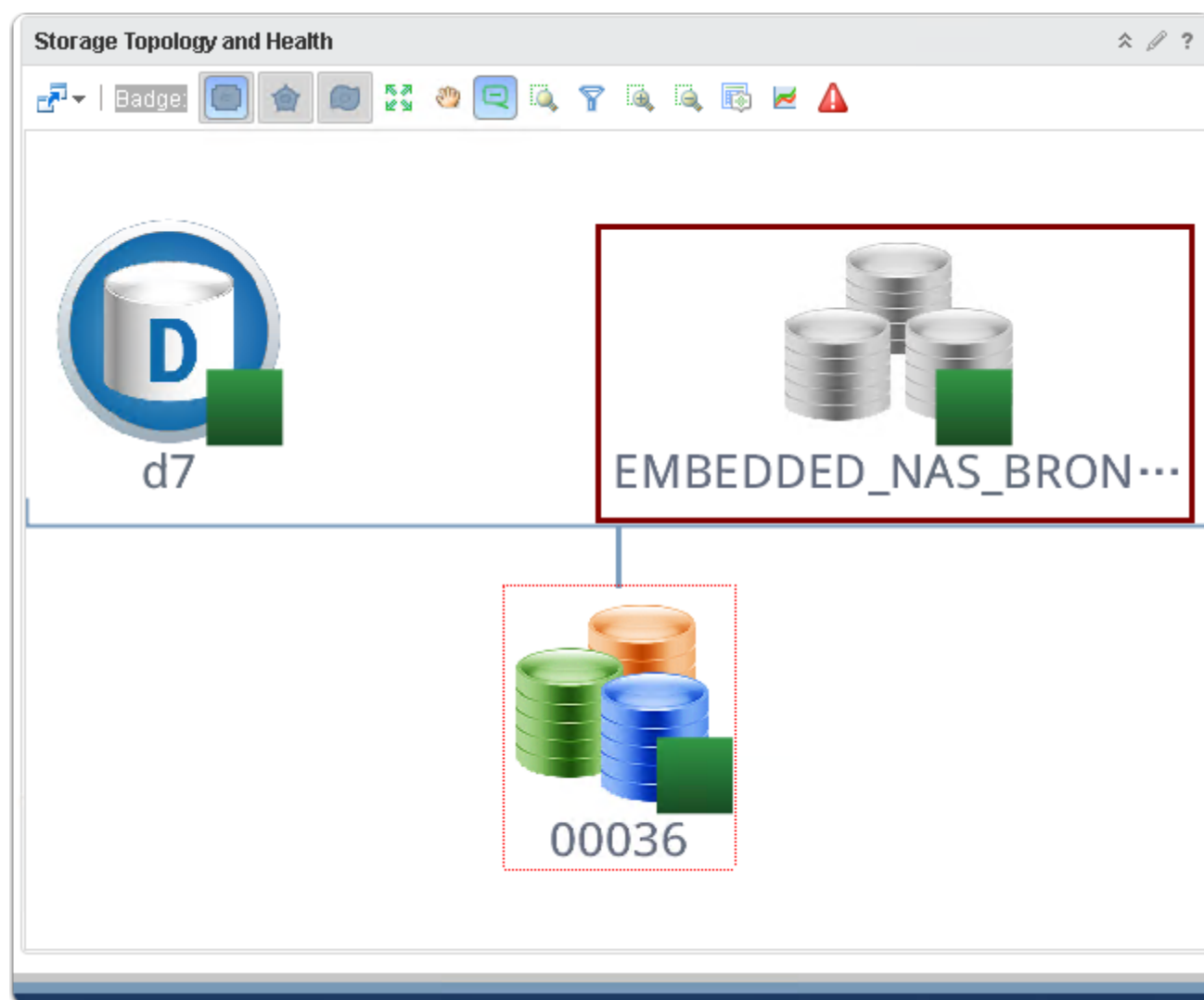
The VMAX3 device 00036 is now exposed. Note that if you run the cursor across any object, a yellow pop-up will appear showing the object name and type, along with the health.

At this level of the topology, the eNAS component is merged with the VMAX3 array. Double-click on device 00036. You are now into the VMAX3 objects.



VMAX3 Objects

Now that you are at the device level on the VMAX3, if desired you could traverse back up through the storage group (EMBEDDED_NAS_BRON...) and to the VMAX3 array.



Summary

In this lab you discovered the eNAS feature of the VMAX3 which is an optional component of the array providing NFS within the frame. By exploring the eNAS topology, you were able to see how the eNAS objects are related to each other and how through navigation you could move up the hierarchy into VMware objects as well as down through eNAS objects. In addition, when the VMAX3 adapter instance is also configured, as in this lab, the eNAS objects can be traversed down to the VMAX3 device and back up through the array via the storage group.

Lab 3: Dashboard and Alert Navigation

VMAX Alerts

This lab will show you how to view the alerts that are configured in ESA for VMAX and then edit the conditions under which the alert would trigger.

VMware vRealize Operations Manager Login Screen

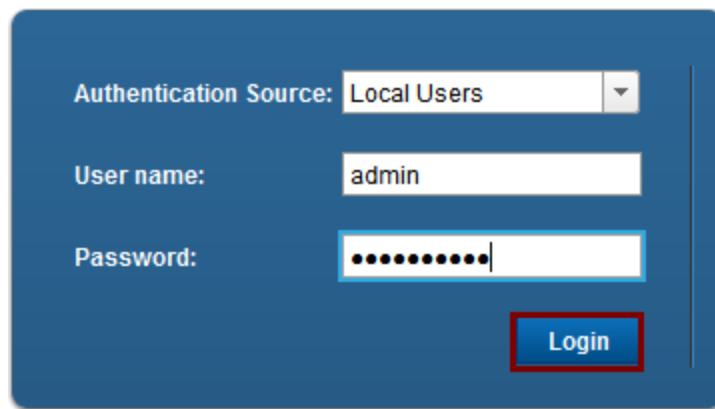
If not already logged in, in the browser, navigate to <http://192.168.1.61> which will display the login screen for vRealize Operations Manager.

Login using the following credentials:

admin

Password123!

Click Login

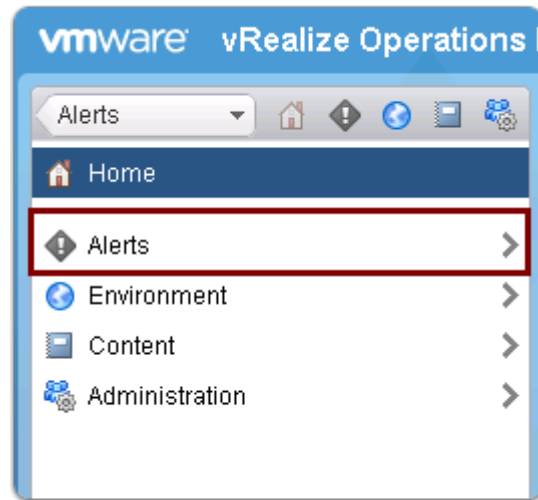


The image shows the vRealize Operations Manager login screen. It has a blue background with white text and input fields. The 'Authentication Source' dropdown is set to 'Local Users'. The 'User name' field contains 'admin'. The 'Password' field contains a series of dots. A red rectangle highlights the 'Login' button.

Authentication Source:	Local Users
User name:	admin
Password:	
	Login

Alerts

On the left-hand menu select **Alerts**



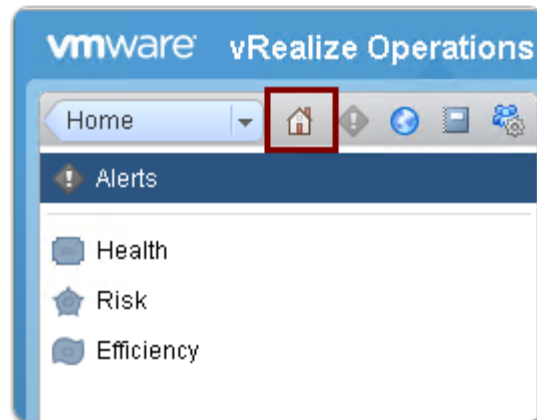
Alerts page

The Alerts screen contains alerts information from both VMware and EMC. You can see the various alerts that are currently active.

Alerts						
Criticality ▲	Alert	Alert Type	Alert Subtype	Status	Triggered On	Control State
	Capacity consumed (%) of the file pool is low.	Storage	Capacity		 NAS_DATA	 Open
	Notification event - License usage exceeded its capacity. The overused license is 5H09P-4934L-6895A-0A2HP-1HLKH. The usage is 4. The license capacity is 1	Application	Availability		 Unlicensed Group	 Open
	Capacity consumed (%) of the file pool is low.	Storage	Capacity		 embedded_enas_test_1	 Open
	Notification event - License usage exceeded its capacity. The overused license is 5H09P-4934L-6895A-0A2HP-1HLKH. The usage is 4. The license capacity is 1	Application	Availability		 Unlicensed Group	 Open
	Capacity consumed (%) of the file pool is low.	Storage	Capacity		 eNAS_Bronze_1	 Open
	One or more virtual machine guest file systems are running out of disk space	Virtualization...	Capacity		 DSIB2038	 Open
	One or more virtual machine guest file systems are running out of disk space	Virtualization...	Capacity		 DSIB2113	 Open
	Capacity consumed (%) of the file pool is high.	Storage	Capacity		 EMBEDDED_NAS_BRON...	 Open
	License usage exceeded its capacity	Application	Compliance		 Unlicensed Group	 Open
	License usage exceeded its capacity	Application	Compliance		 Unlicensed Group	 Open

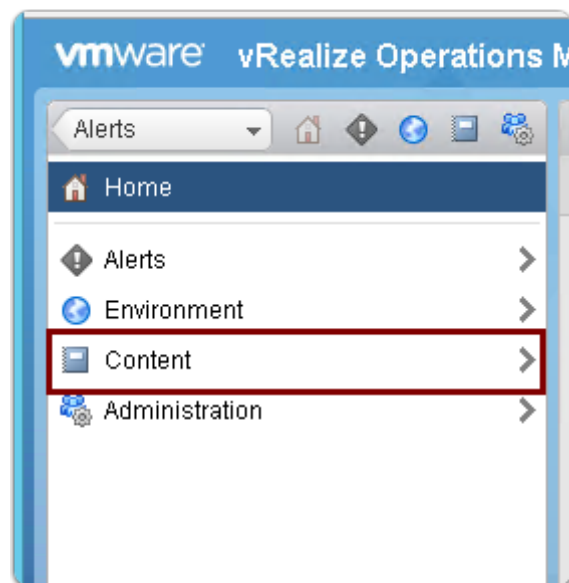
Home page

Return to the home page by selecting the **Home** icon.



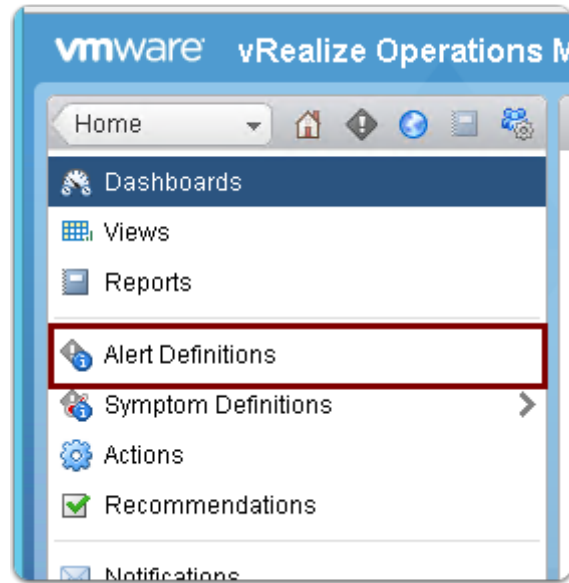
Content

Navigate to Content



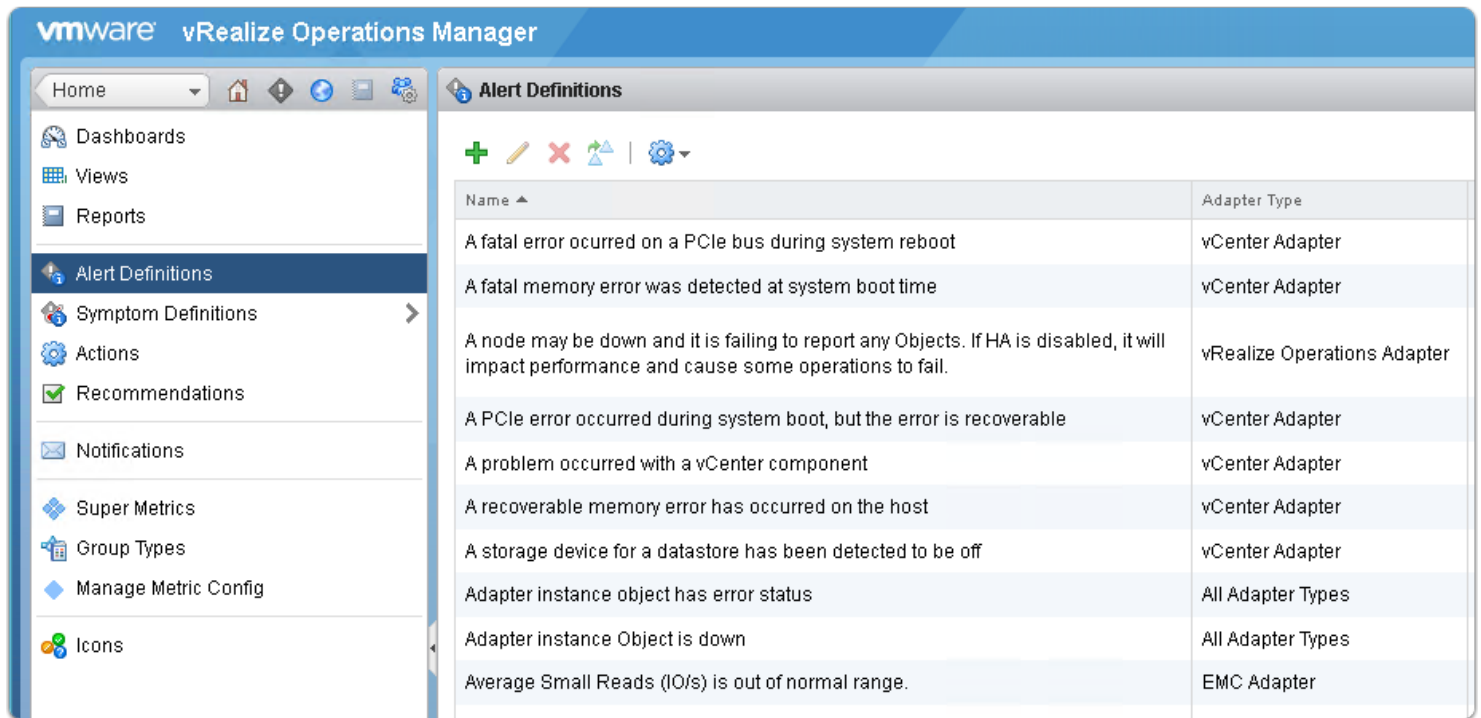
Alert Definitions

Select Alert Definitions



Alert definitions

Alert definitions include all alerts for vROps. This means both VMware and EMC alert definitions. Specifically you are going to look at one for the VMAX array.

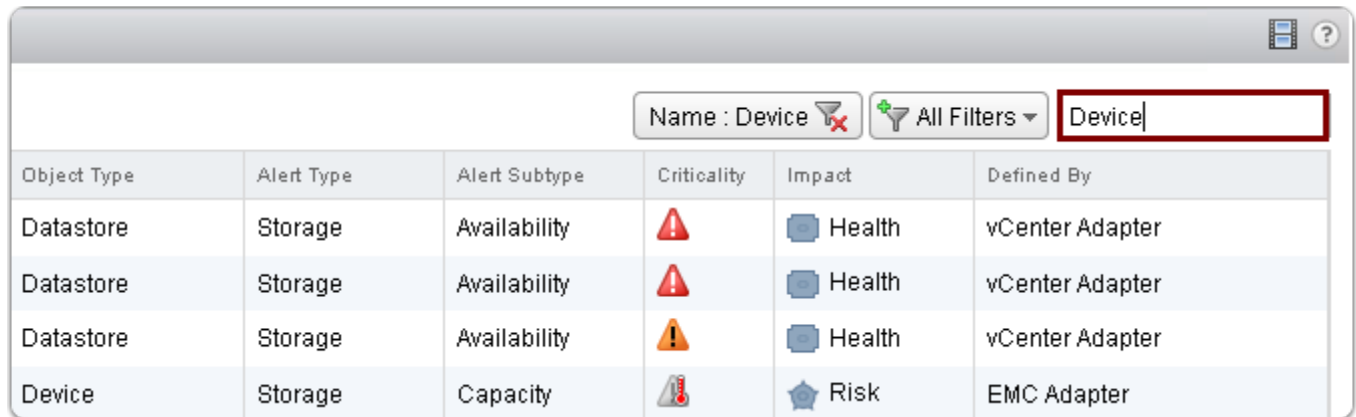


The screenshot shows the VMware vRealize Operations Manager interface. The left sidebar contains navigation links: Home, Dashboards, Views, Reports, Alert Definitions (selected), Symptom Definitions, Actions, Recommendations, Notifications, Super Metrics, Group Types, Manage Metric Config, and Icons. The main panel displays the 'Alert Definitions' table.

Name	Adapter Type
A fatal error occurred on a PCIe bus during system reboot	vCenter Adapter
A fatal memory error was detected at system boot time	vCenter Adapter
A node may be down and it is failing to report any Objects. If HA is disabled, it will impact performance and cause some operations to fail.	vRealize Operations Adapter
A PCIe error occurred during system boot, but the error is recoverable	vCenter Adapter
A problem occurred with a vCenter component	vCenter Adapter
A recoverable memory error has occurred on the host	vCenter Adapter
A storage device for a datastore has been detected to be off	vCenter Adapter
Adapter instance object has error status	All Adapter Types
Adapter instance Object is down	All Adapter Types
Average Small Reads (IO/s) is out of normal range.	EMC Adapter

Filter for VMAX alert

In the right-hand corner, type Device and press Enter. This will filter and return a reduced set of alerts.

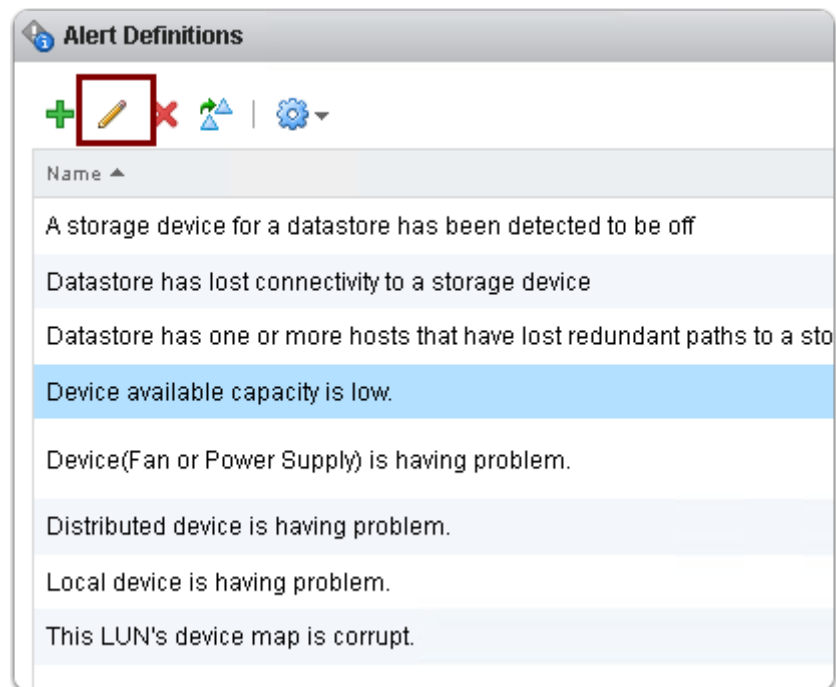


The screenshot shows the filtered alert results. At the top, there is a filter bar with 'Name : Device' and a search input field containing 'Device'. Below the filter bar is a table of filtered alerts.

Object Type	Alert Type	Alert Subtype	Criticality	Impact	Defined By
Datastore	Storage	Availability	High (Red exclamation mark)	Health	vCenter Adapter
Datastore	Storage	Availability	High (Red exclamation mark)	Health	vCenter Adapter
Datastore	Storage	Availability	Medium (Yellow exclamation mark)	Health	vCenter Adapter
Device	Storage	Capacity	High (Red exclamation mark)	Risk	EMC Adapter

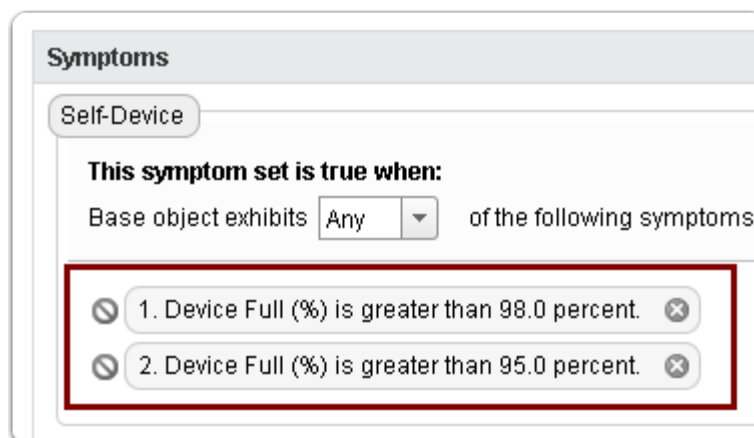
Device definition

Highlight the alert definition for "Device available capacity is low" and select the **pencil** icon to see the conditions of the alert.



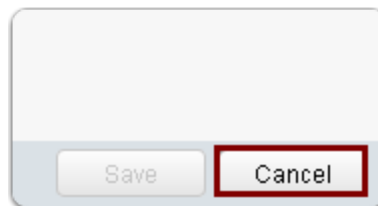
Device available capacity is low

There are two conditions listed for device capacity. When a device hits 95% and then again at 98% an alert will be generated which will appear on the aforementioned alerts page letting the user know that the device is approaching capacity.



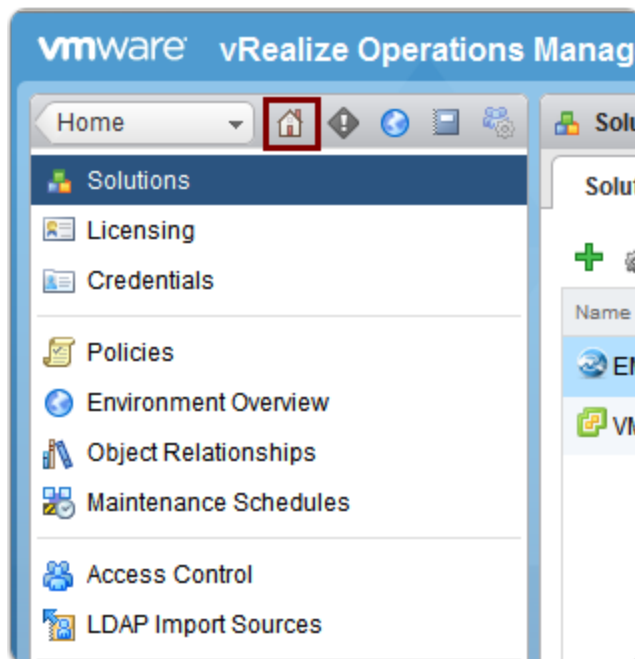
Cancel

Select **Cancel** to exit the dialog.



Home

Return to the dashboard screen by selecting the **Home** icon at the top of the screen.



Summary

In this lab you saw where alerts are generated and how they can be modified to suit the needs of your company.

You may now proceed to the next lab.

VMAX Overview dashboard

This lab will provide an overview of the VMAX Overview dashboard. The VMAX Overview dashboard is a collection of heat map widgets that provide a single view of the performance and capacity for all VMAX resources with configured adapter instances. Heat maps on this dashboard group the contents by adapter instance. The dashboard has two different color schemes, one which is measured by metric value from green to red, the other measured by relative value in comparison to other objects in the widget, light blue to dark blue.

VMware vRealize Operations Manager Login Screen

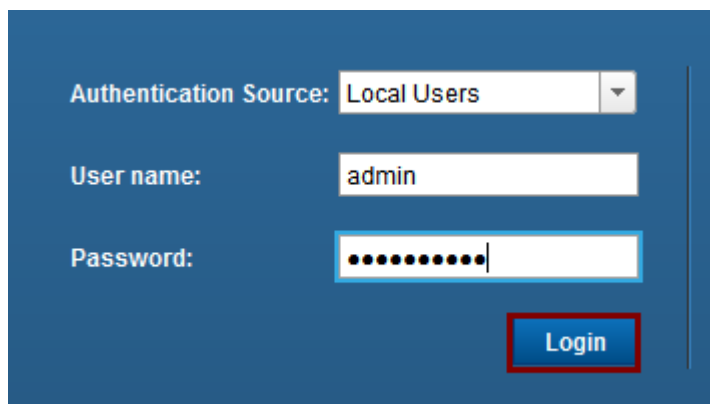
If not already logged in, in the browser, navigate to <http://192.168.1.61> which will display the login screen for vRealize Operations Manager.

Login using the following credentials:

admin

Password123!

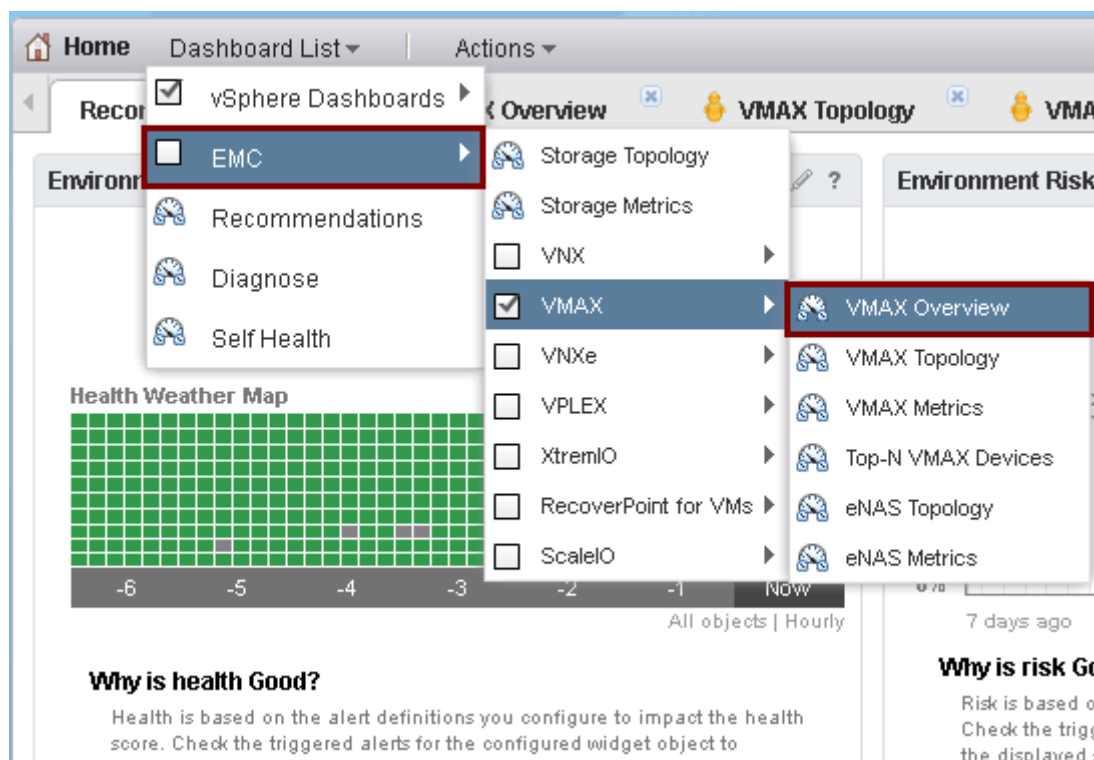
Click Login



The image shows the login screen of VMware vRealize Operations Manager. It has a dark blue background. At the top, there is a label 'Authentication Source:' followed by a dropdown menu showing 'Local Users'. Below this, there is a 'User name:' label followed by a text input field containing 'admin'. Underneath that is a 'Password:' label followed by a password input field with ten dots. At the bottom right, there is a blue 'Login' button with a red border.

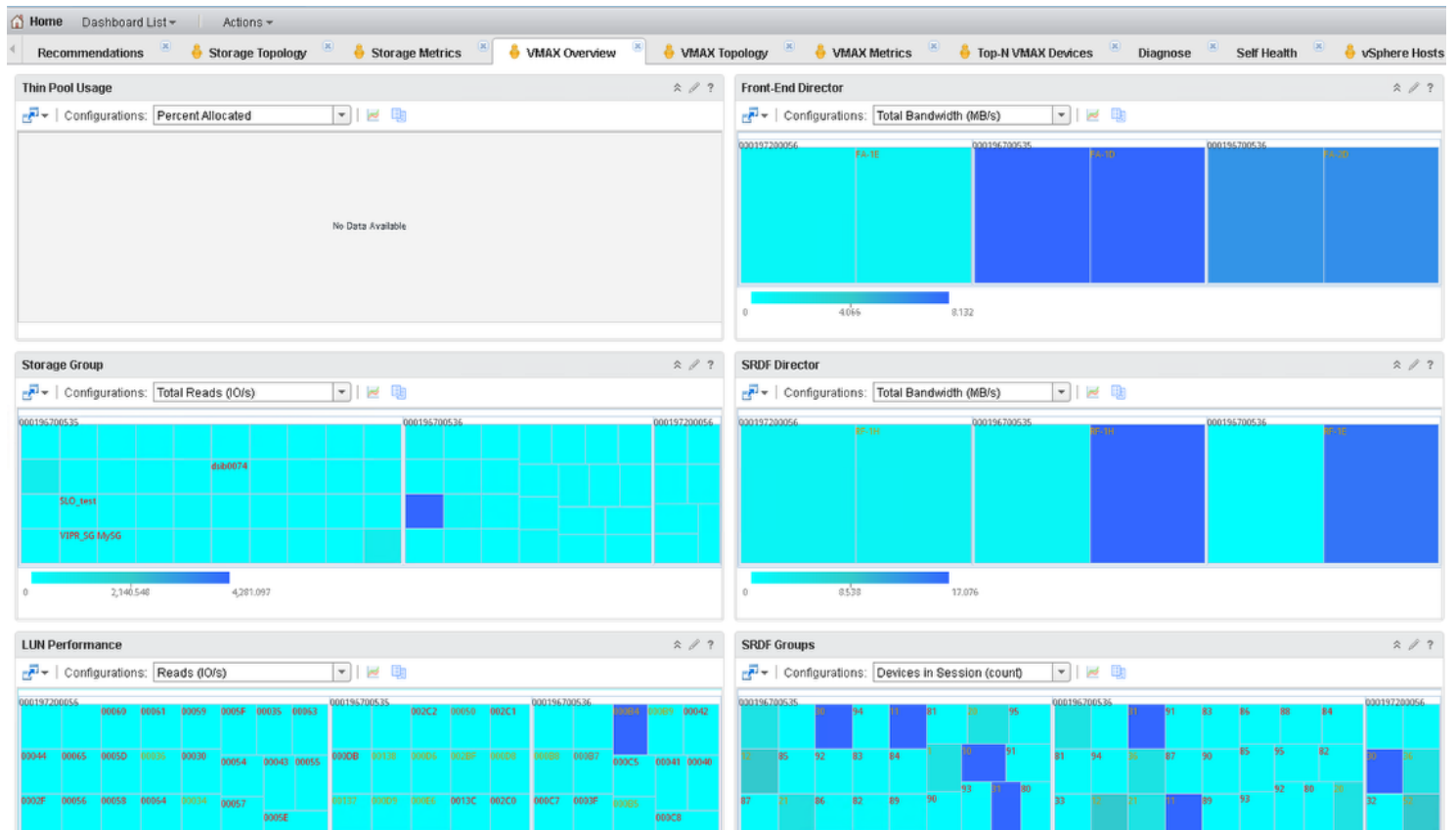
Dashboard navigation

Navigate to the **Dashboard List** drop-down at the top of the screen and select **EMC, VMAX, VMAX Overview**. If you completed the initial module, the checkbox next to each non-VMAX array and EMC will be unchecked.



VMAX Overview dashboard

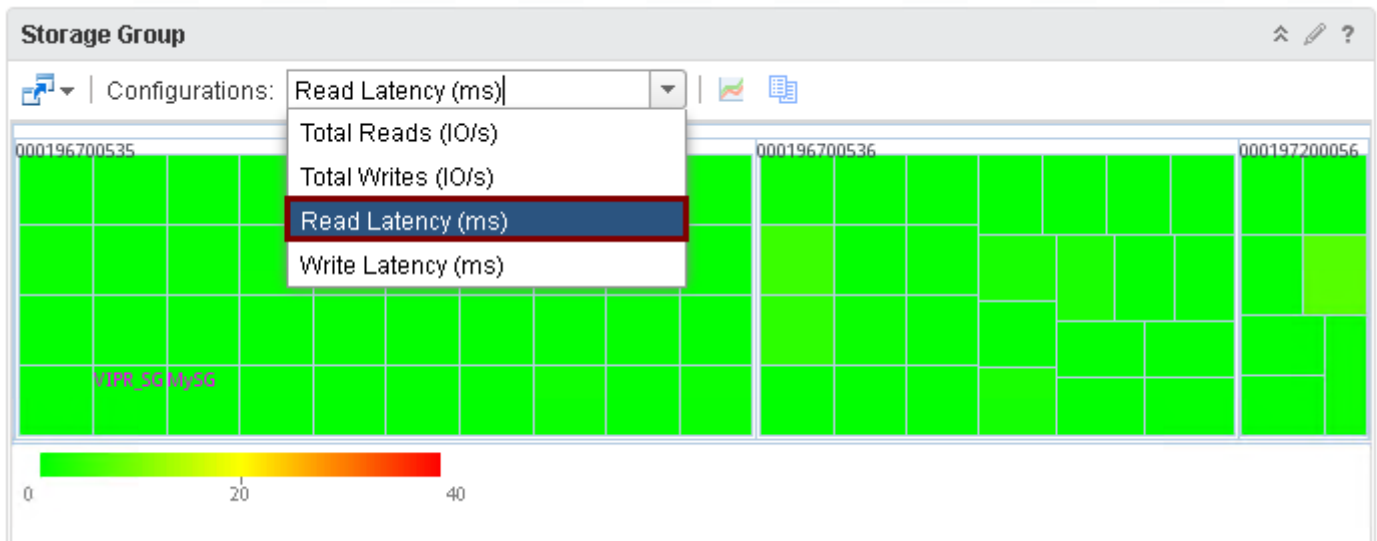
The overview dashboard has six different widgets. Each contains the most commonly desired metrics for each object. Note in particular the widget on the top left, Thin Pool Usage. As this environment only uses VMAX3 arrays, this widget is empty. Unlike the VMAX2, thin pools cannot be manipulated on the VMAX3 and therefore no data will be displayed here.



Widget legend

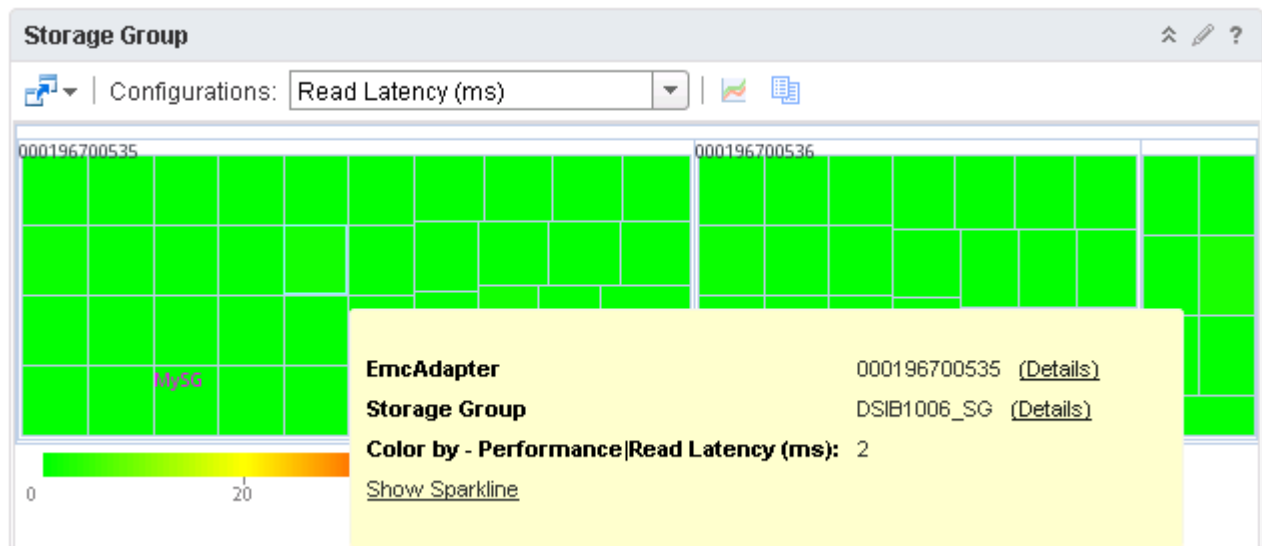
You will now examine the Storage Group widget. Using the drop-down box in the **Storage Group** widget, select **Read Latency (ms)**.

Both the Read and Write Latencies use a green/yellow/red range which is based on a low of 0 ms and a high of 40 ms. As the measured latency of a storage group (latency of the aggregate devices in that storage group) increases, the box that represents the storage group will change color.



High latency

If there is a particular storage group that exceeds the desired latency e.g. a high latency threshold, then by simply hovering the cursor over the box the detail is shown. If desired, you may take a few minutes to explore the different metrics in each widget by using the drop-down boxes.

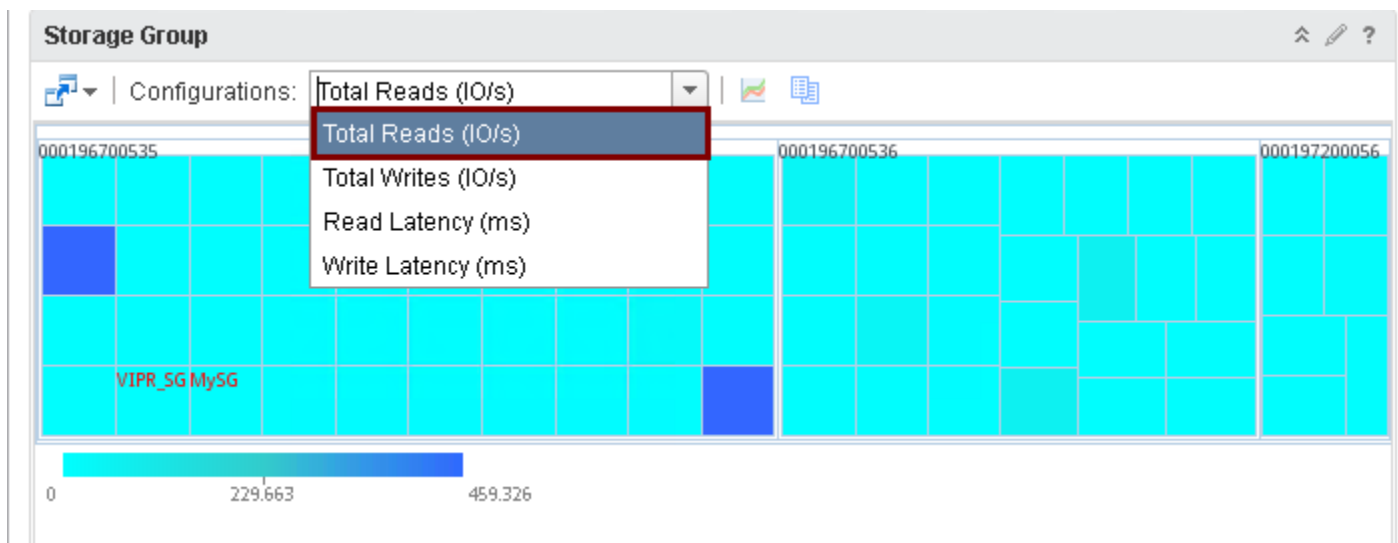


Widget metrics

The VMAX Overview dashboard contains the most common metrics that customers typically review on a daily basis; however for each VMAX object listed in this dashboard there are more metrics that are available and could be customized here.

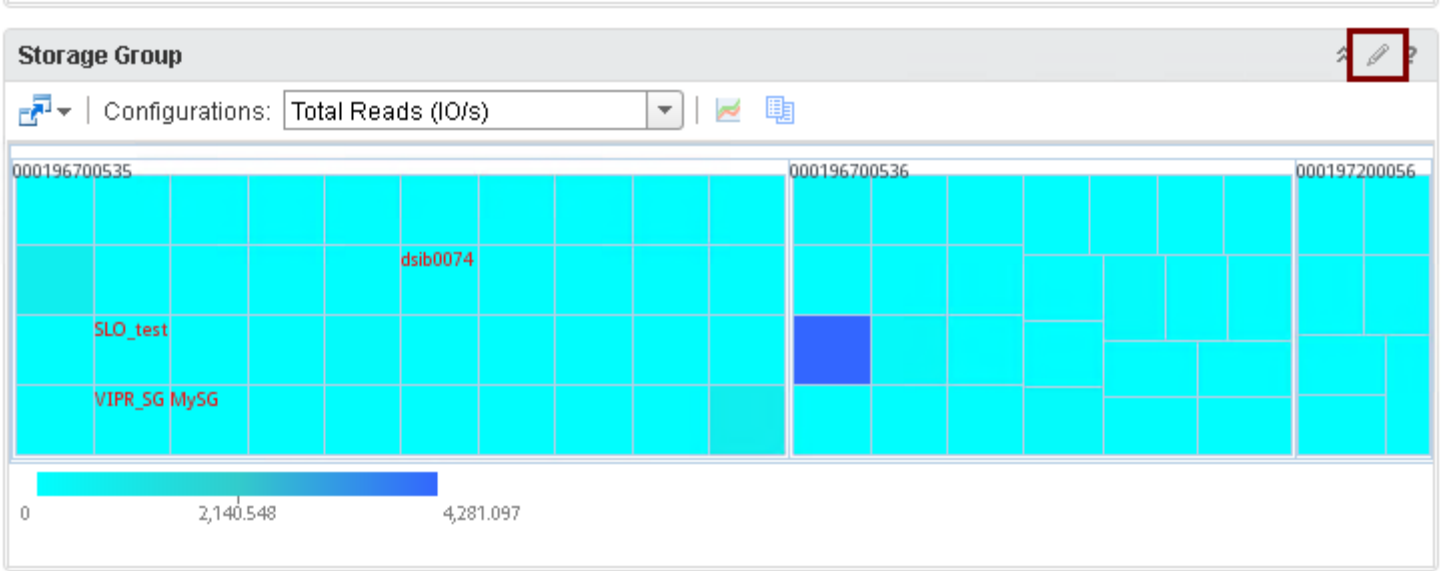
You will now add one to this Storage Group widget.

First select **Total reads (IO/s)** from the drop down list.



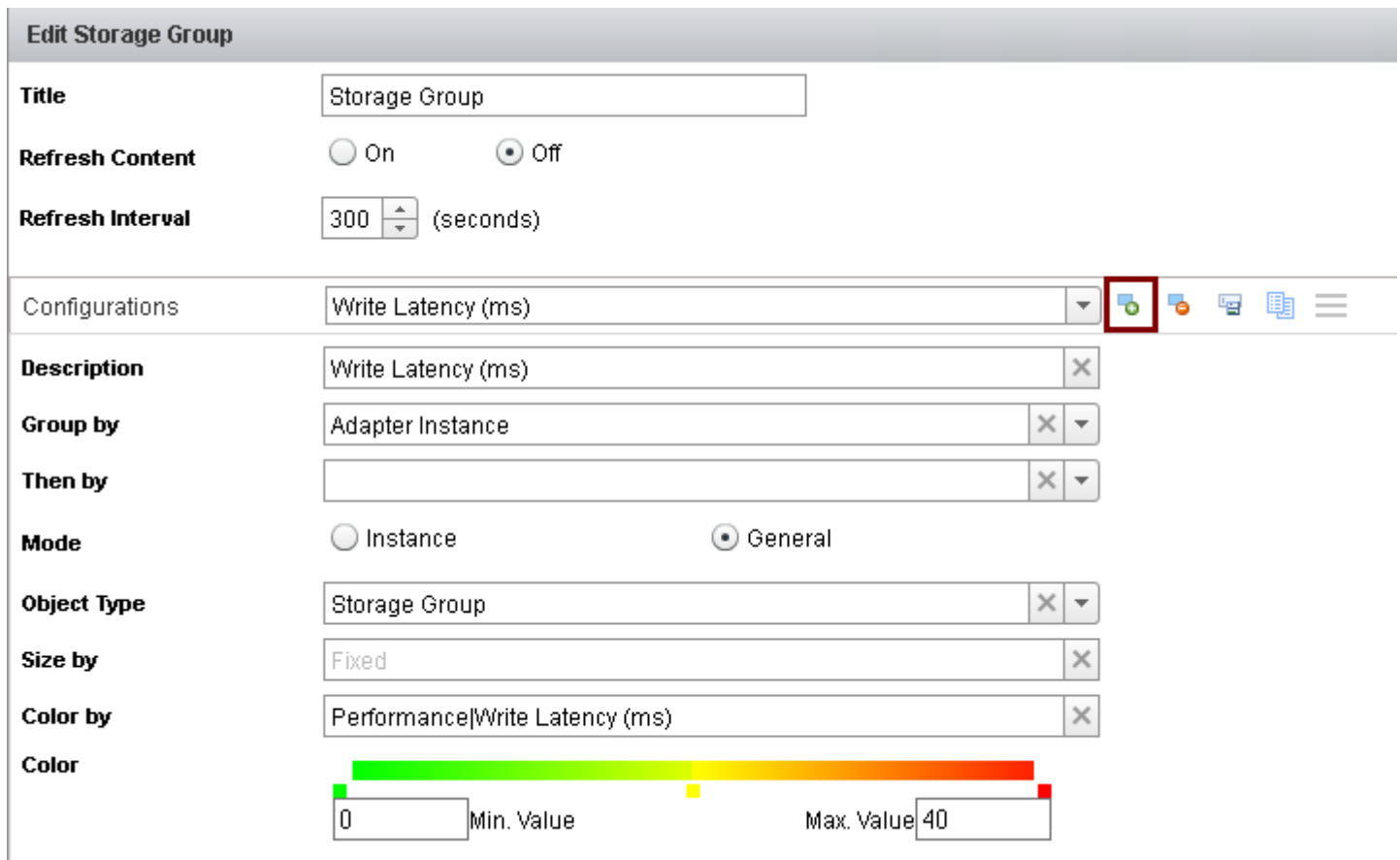
Adding a metric to a widget step 1

Select the **pencil** icon in the right-hand corner. This will bring up a dialog where you can specify a new metric.



Adding a metric to a widget step 2

Select the Add icon as shown below



Edit Storage Group

Title Storage Group

Refresh Content ☐ On ☒ Off

Refresh Interval 300 (seconds)

Configurations Write Latency (ms)     

Description Write Latency (ms) X

Group by Adapter Instance X

Then by X

Mode ☐ Instance ☒ General

Object Type Storage Group X

Size by Fixed X

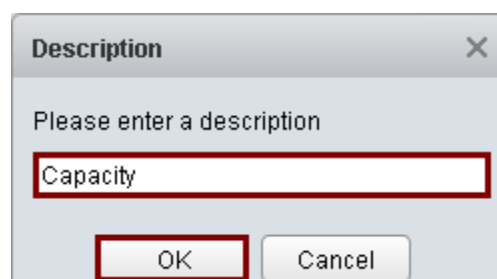
Color by Performance\Write Latency (ms) X

Color 
0 Min. Value Max. Value 40

Adding a metric to a widget step 3

Type Capacity

Click OK



Description X

Please enter a description

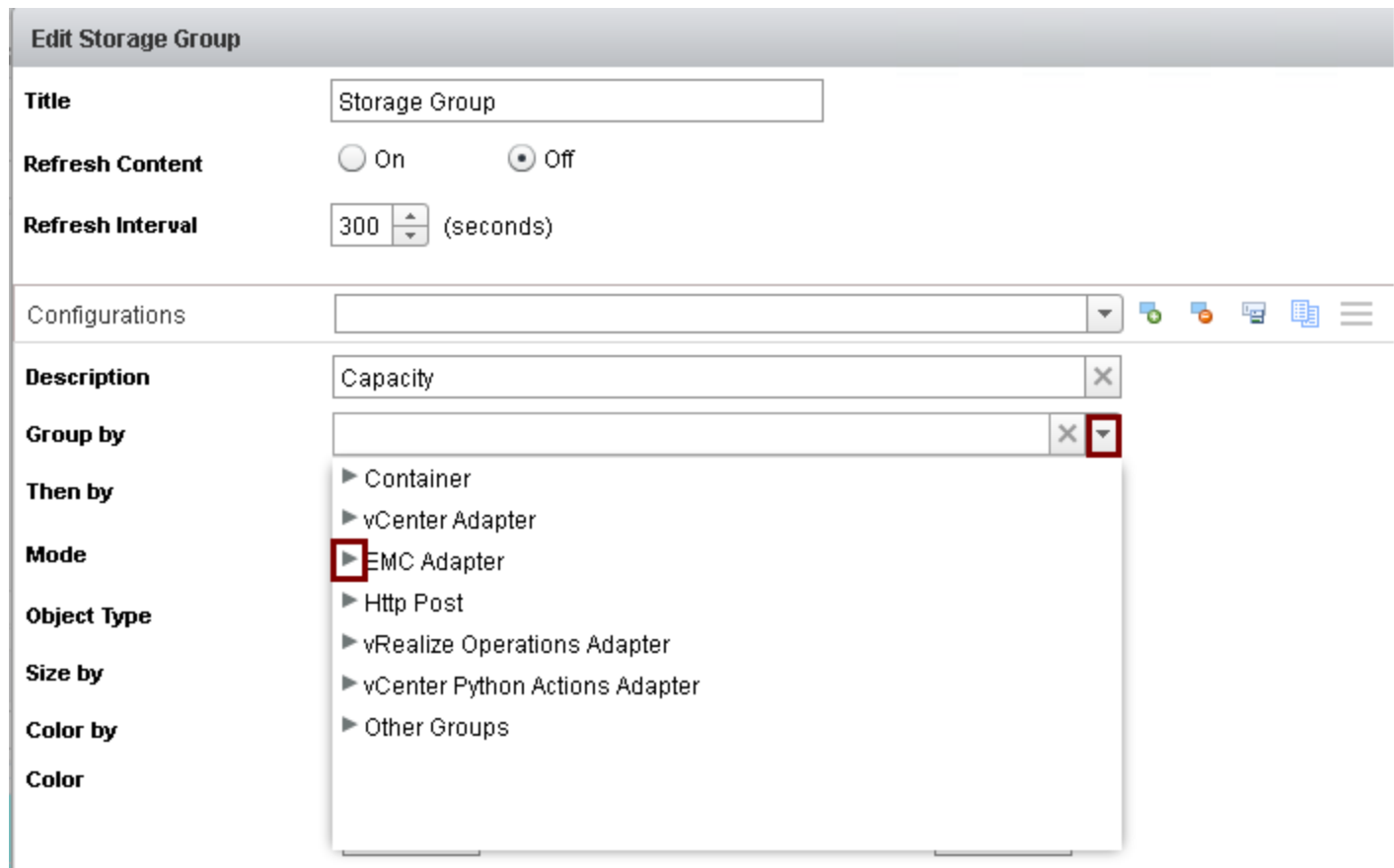
Capacity

OK Cancel

Adding a metric to a widget step 4

Start by selecting the down arrow next to the **Group By** row.

Now expand the category **EMC Adapter** by selecting the arrow next to the name.



The screenshot shows the 'Edit Storage Group' dialog box. The 'Title' field is set to 'Storage Group'. The 'Refresh Content' is set to 'Off'. The 'Refresh Interval' is set to '300 (seconds)'. The 'Configurations' dropdown is empty. The 'Description' field is set to 'Capacity'. The 'Group by' dropdown is expanded, showing a list of categories: Container, vCenter Adapter, EMC Adapter (highlighted with a red box), Http Post, vRealize Operations Adapter, vCenter Python Actions Adapter, and Other Groups. The 'Then by' field is empty. The 'Mode' field is empty. The 'Object Type' field is empty. The 'Size by' field is empty. The 'Color by' field is empty. The 'Color' field is empty.

Adding a metric to a widget step 5

With the EMC Adapter group expanded, scroll down until you locate **Storage Group** and select.

Description	Capacity
Group by	Storage Group
Then by	Storage Group
Mode	Storage Group
Object Type	Storage Group
Size by	Storage Group
Color by	Storage Group
Color	Storage Group

Adding a metric to a widget step 6

Repeat steps 4 and 5 for the row **Object Type** so that it too shows Storage Group.

Edit Storage Group

Title

Storage Group

Refresh Content

☐ On
 ☒ Off

Refresh Interval

300

↑

↓

(seconds)

Configurations

Description

Capacity

X

Group by

Storage Group

X

▼

Then by

X

▼

Mode

☐ Instance
 ☒ General

Object Type

Storage Group

X

▼

Size by

Fixed

X

Color by

Fixed

X

Color



0

Min. Value

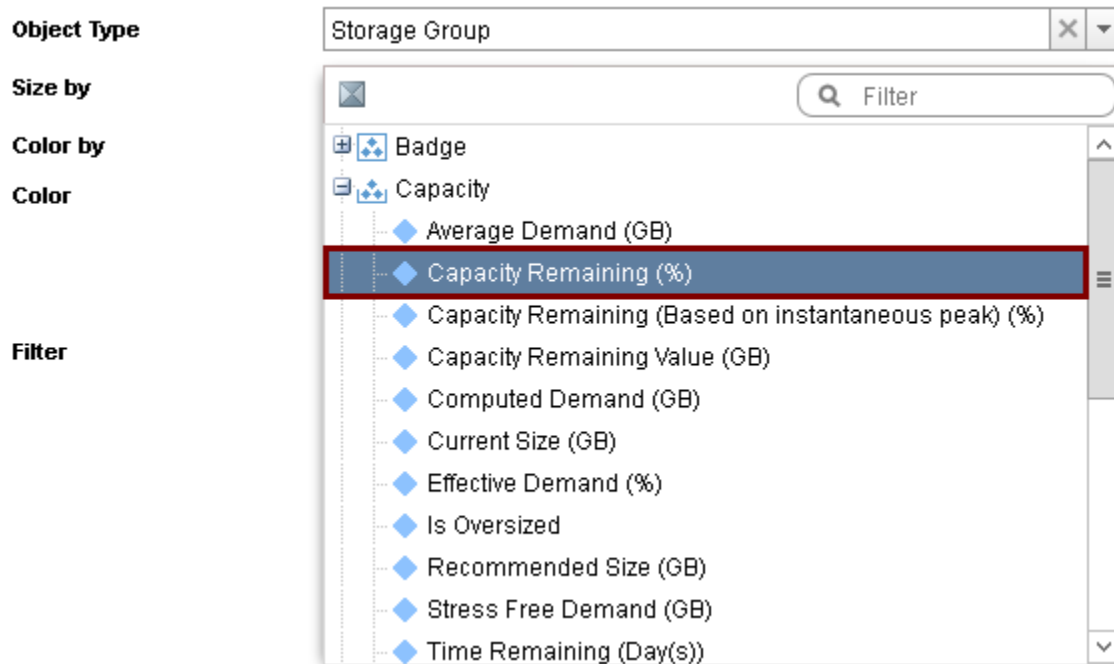
Max. Value

40

Adding a metric to a widget step 7

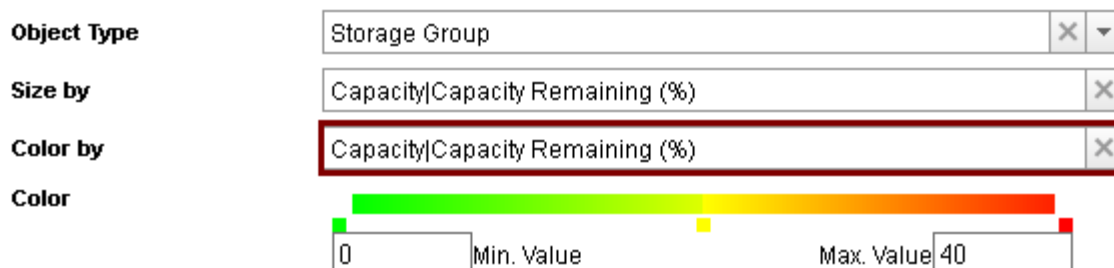
Now click in the **Size by** field. This will bring up the available metrics for the storage group.

Expand **Capacity** and double click **Capacity Remaining (%)**



Adding a metric to a widget step 8

Repeat step 7 for the **Color by** field, again by selecting **Capacity Remaining (%)** and double-clicking it.



Adding a metric to a widget step 9

Finally the legend needs to be changed from the current values.

First change the values from 0 and 40 in min and max to 5 and 100.

Next you will reverse the colors on the legend. Click on the red box on the right.

Object Type

Size by

Color by

Color



5 Min. Value Max. Value 100

Adding a metric to a widget step 10

In the pop-up colors, select **bright green**

Object Type

Size by

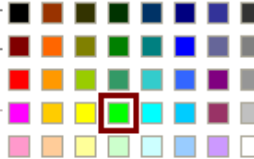
Color by

Color



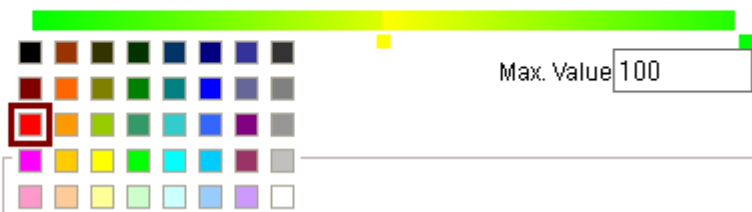
5 Min. Value Max. Value 100

Filter



Adding a metric to a widget step 11

Now repeat this process for the color on the left, this time selecting red

Size by	Capacity Capacity Remaining (%)	X
Color by	Capacity Capacity Remaining (%)	X
Color		
Filter		

Adding a metric to a widget step 12

The end result is shown as below.

Object Type	Storage Group	X
Size by	Capacity Capacity Remaining (%)	X
Color by	Capacity Capacity Remaining (%)	X
Color		

Adding a metric to a widget step 12

Save the configuration by selecting the **save** icon..

Once this is done, the Configurations field will be populated by the Description, or in this case Capacity.

Finally click **Save**

?

×

Edit Storage Group

Title

Storage Group

Refresh Content

☐ On
 ☒ Off

Refresh Interval

300

↑

↓

(seconds)

Configurations

Capacity

Description

Capacity

×

Group by

Storage Group

×

▼

Then by

×

▼

Mode

☐ Instance
 ☒ General

Object Type

Storage Group

×

▼

Size by

Capacity|Capacity Remaining

×

Color by

Capacity|Capacity Remaining

×

Color

5

Min. Value

Max. Value

100

Filter

Collectors (Full Set)

Applications (Full Set)

Maintenance Schedules (Full Set)

Adapter Types

Adapter Instances

Object Types

Recently Added Objects

Object Statuses

Collection States

Health Ranges

Cluster Compute Resources

^

≡

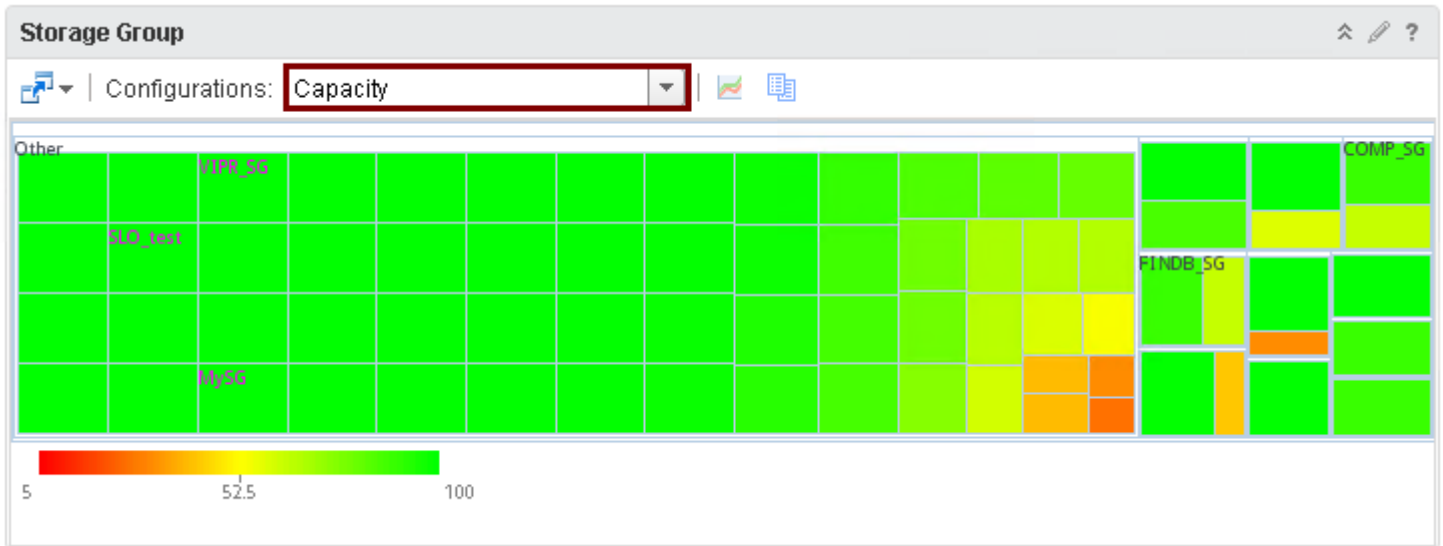
▼

Save

Cancel

New Capacity metric

With this completed, now use the drop-down list in the Storage Group widget and select **Capacity** to see the results.



Summary

In this lab you navigated through the VMAX Overview dashboard and learned how to customize it.

You may now proceed to the next lab.

VMAX Topology dashboard

This lab covers the VMAX Topology dashboard. It provides an entry point for viewing resources and relationships between storage and virtual infrastructure objects for supported adapter instances.

VMware vRealize Operations Manager Login Screen

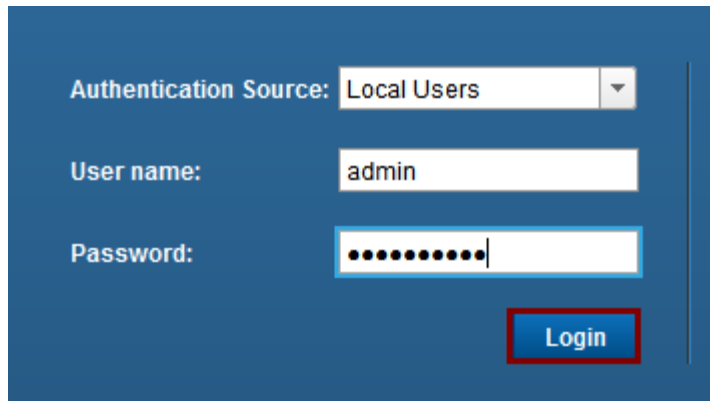
If not already logged in, in the browser, navigate to <http://192.168.1.61> which will display the login screen for vRealize Operations Manager.

Login using the following credentials:

admin

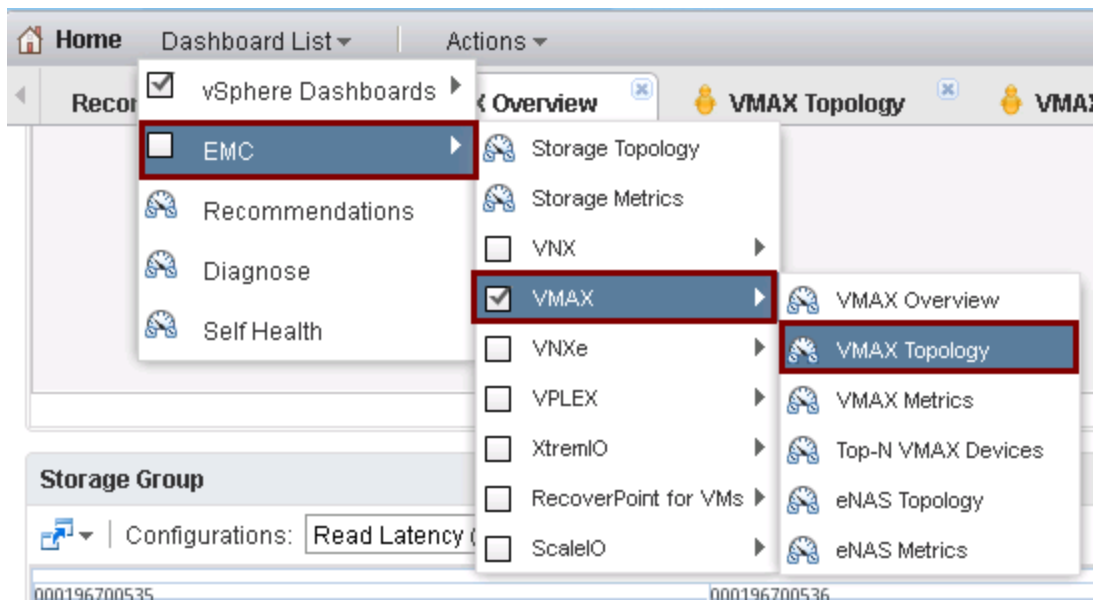
Password123!

Click **Login**



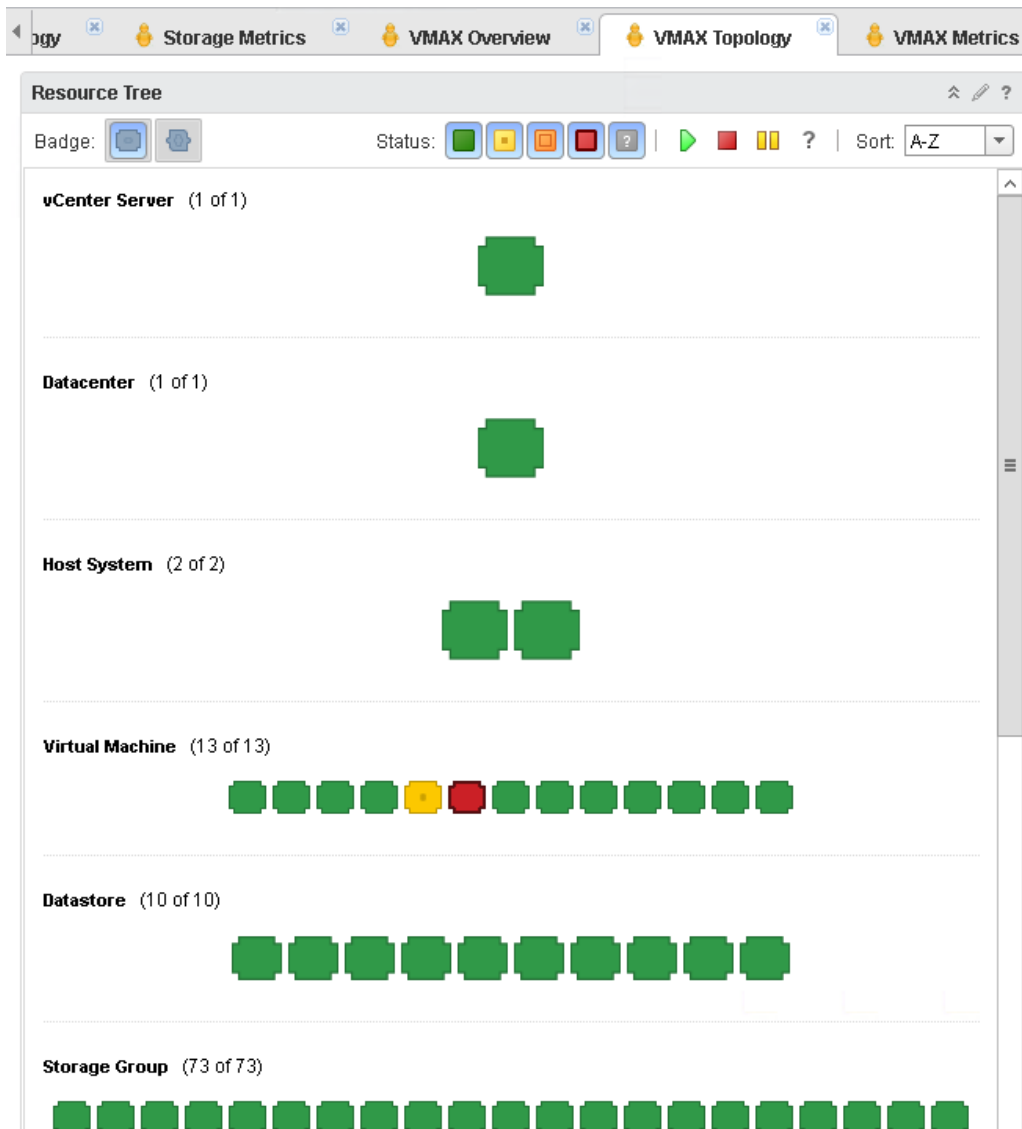
Dashboard navigation

Navigate to the Dashboard List drop-down at the top of the screen and select **EMC, VMAX, VMAX Topology**. If you completed the initial module, the checkbox next to each non-VMAX array and EMC will be unchecked.



VMAX Topology dashboard

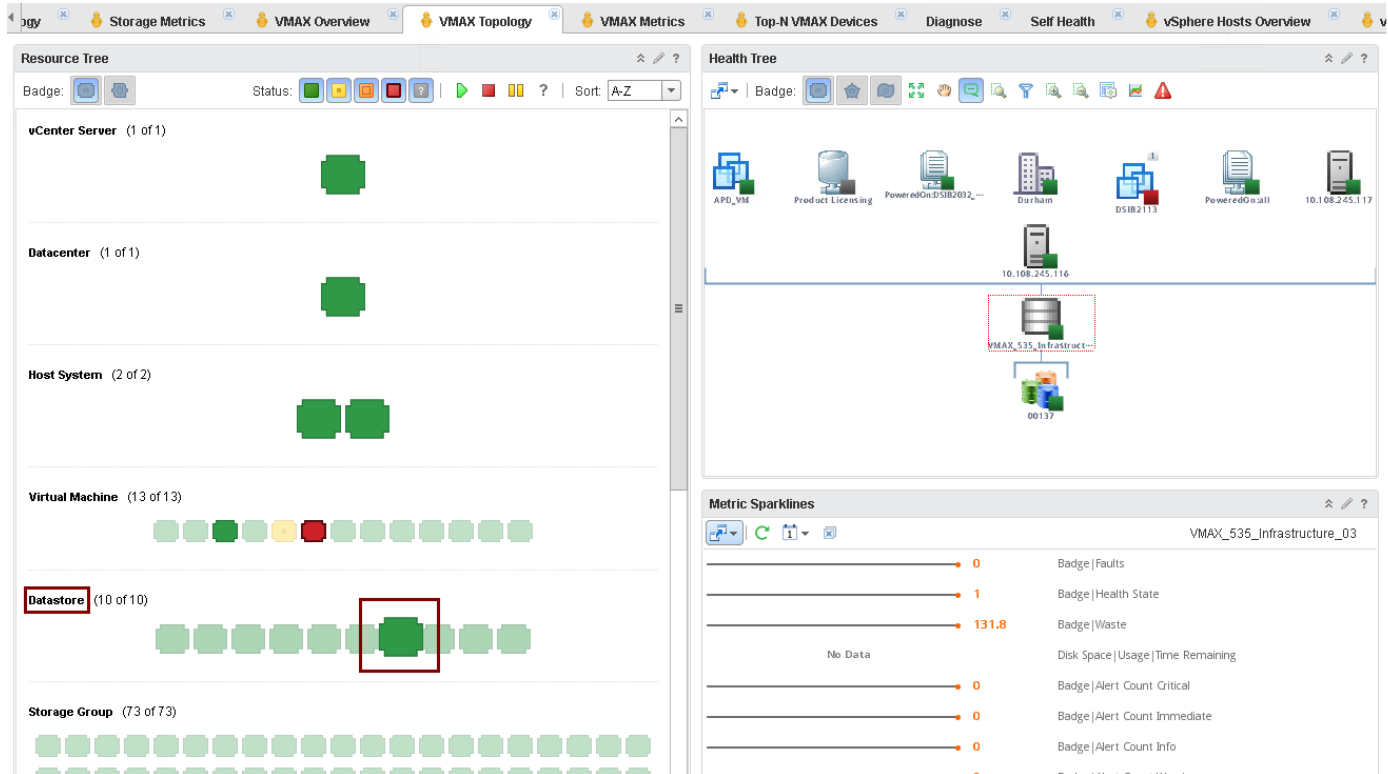
The VMAX Topology dashboard allows you to graphically see the relationship between the various VMware and EMC objects.



VMAX Topology detail

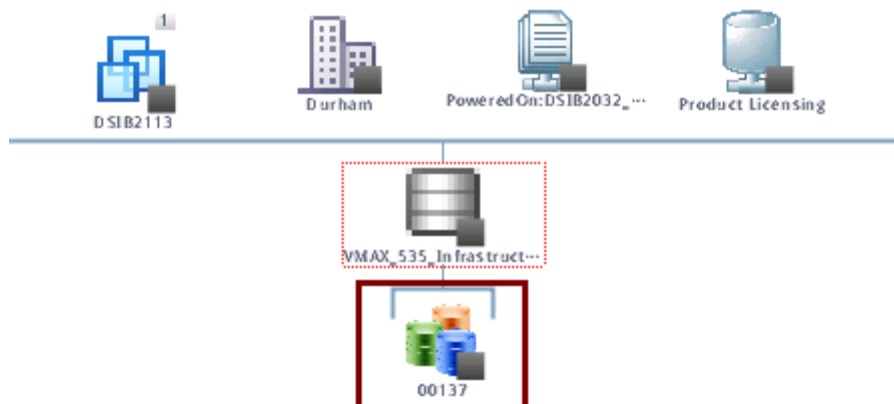
Move across the Datastore objects until you discover VMAX_535_Infrastructure_03. Click on that object.

Note how other objects automatically highlight while the rest fade, showing the object relationships to the datastore. On the right-hand side the Health Tree will include all the VMware objects above the datastore such as the ESXi host and the virtual machines that have vmdks on that datastore.



Topology device detail

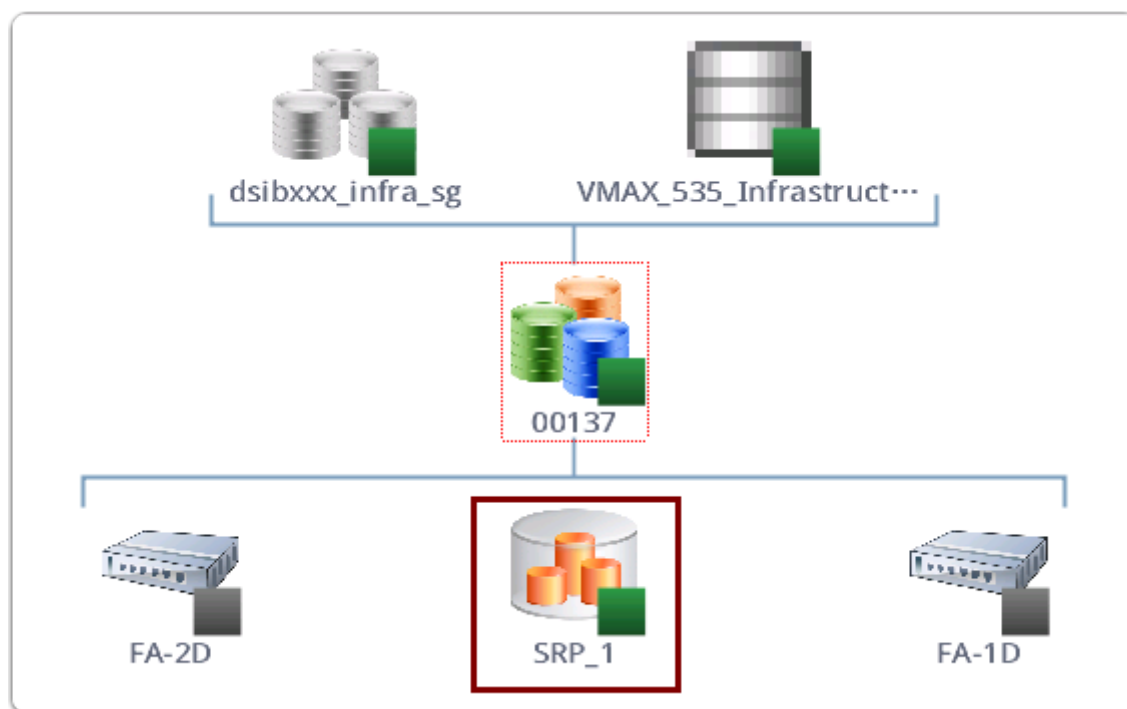
Double click device 00137



Parents and Children

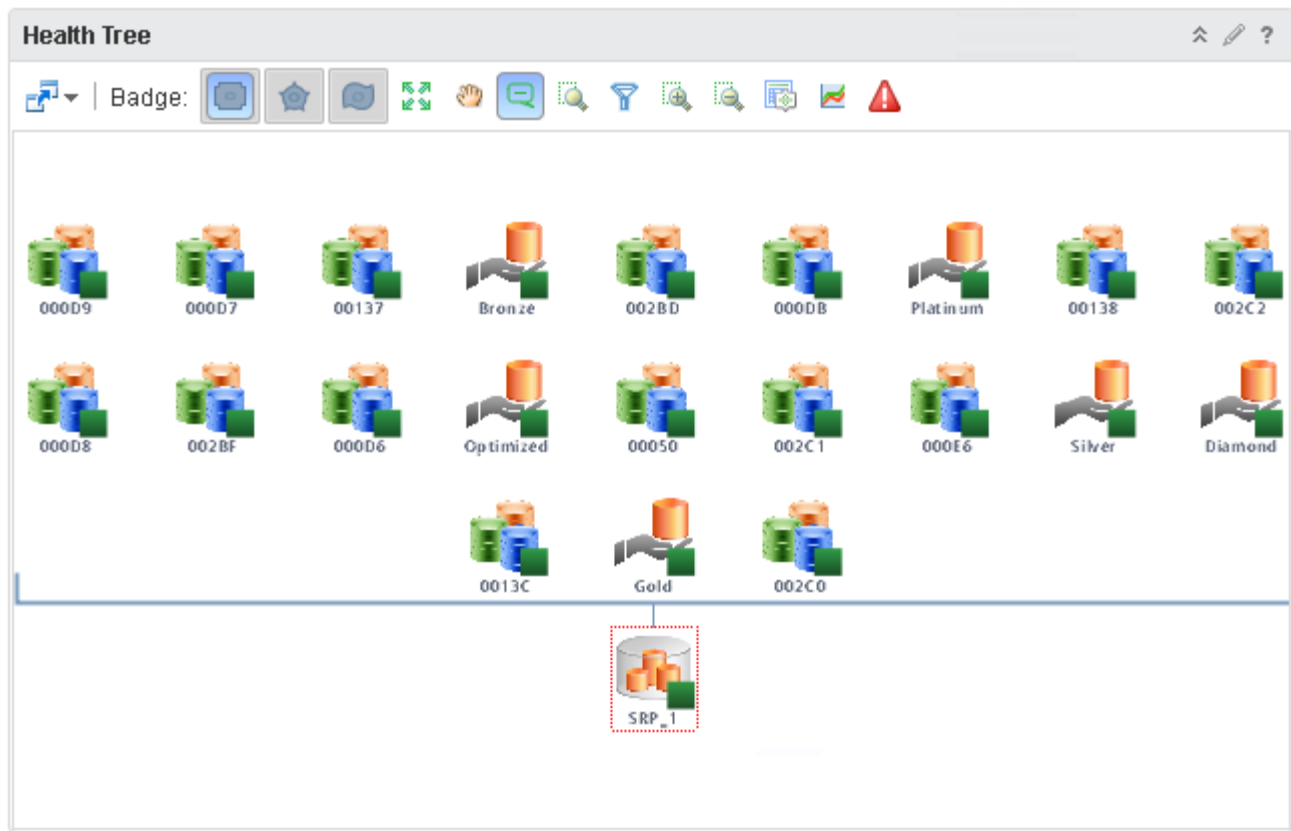
Notice how the health tree now shows the parents and children of that object, namely the datastore and storage group and the SRP and FA directors (they may appear gray). It is also possible to navigate directly within the Health Tree.

Double-click on the SRP object **SRP_1**



SRP objects

Within the Health Tree all devices and SLOs associated with the SRP are displayed.



Summary

In this lab you examined the VMAX Topology dashboard.

You may now proceed to the next lab.

VMAX Metrics dashboard

This lab will provides an overview of the VMAX Metrics dashboard. The metric dashboard displays resources and metrics for storage systems and allow the user to view graphs of resource metrics.

VMware vRealize Operations Manager Login Screen

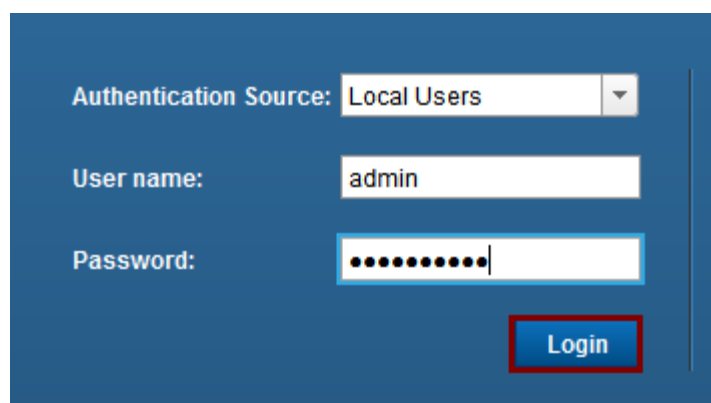
If not already logged in, in the browser, navigate to <http://192.168.1.61> which will display the login screen for vRealize Operations Manager.

Login using the following credentials:

admin

Password123!

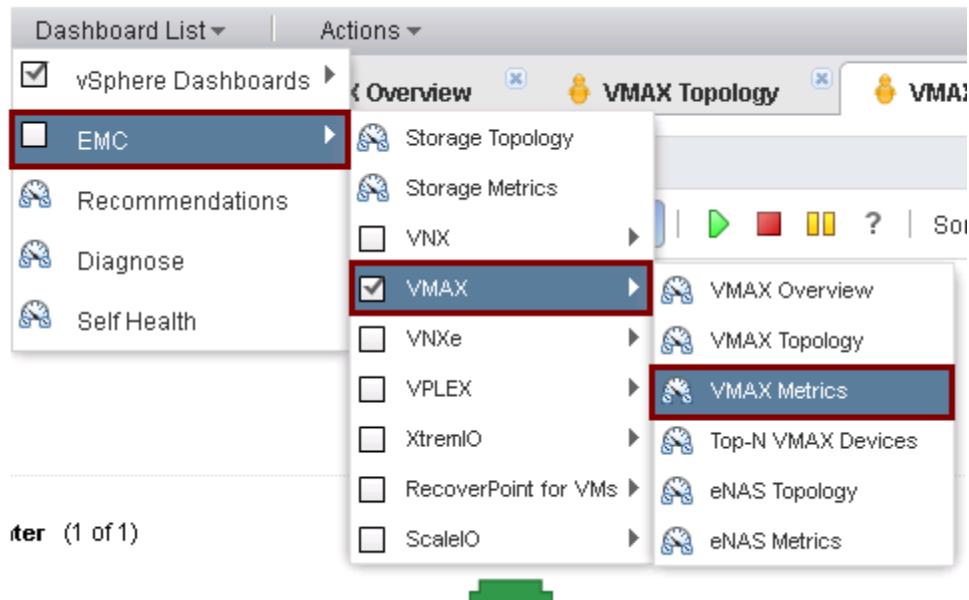
Click Login



The image shows the login screen of VMware vRealize Operations Manager. It has a dark blue background. There are three main input fields: 'Authentication Source' with a dropdown menu showing 'Local Users', 'User name' with the text 'admin', and 'Password' with a masked password of 12 characters. A red rectangular box highlights the 'Login' button in the bottom right corner.

Dashboard navigation

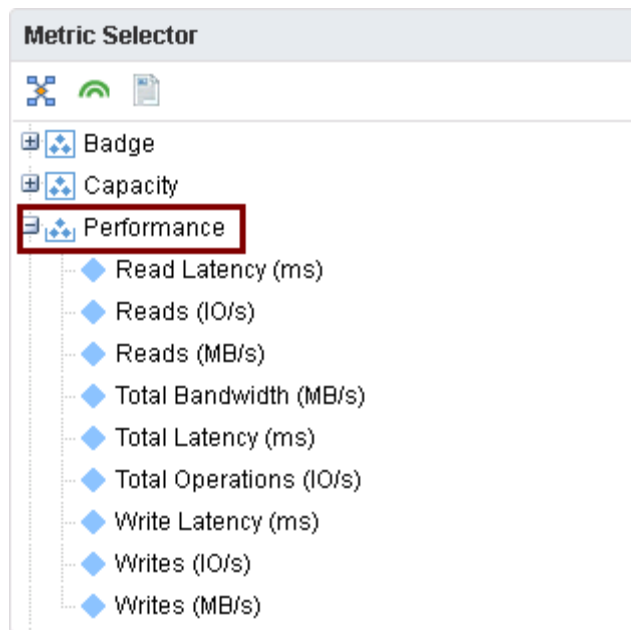
Navigate to the Dashboard List drop-down at the top of the screen and select **EMC, VMAX, VMAX Metrics**. If you completed the initial module, the checkbox next to each non-VMAX array and EMC will be unchecked.



Storage group detail

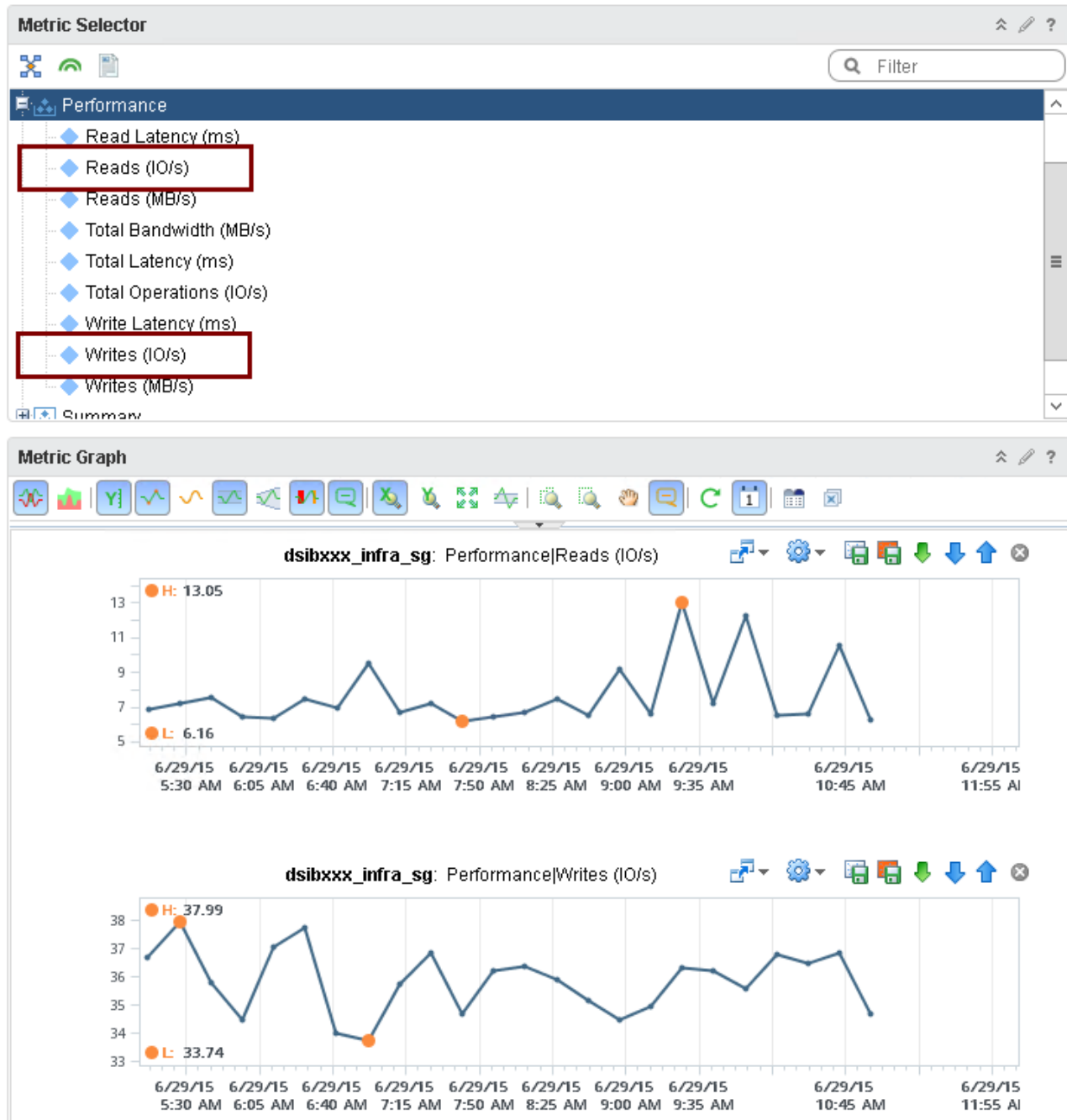
When you select the dsibxxx_infra_sg storage group, on the right-hand side the available metrics will be listed for this object. EMC storage metrics are located in the categories Capacity and Performance.

Start by expanding the **Performance** category.



Metric graphs

With Performance expanded, you will now look at a couple metrics. In order to create the graphs in the bottom half of the panel, double-click the **Reads (IO/s)** and **Writes (IO/s)**. These graphs are generated based on the past 6 hours by default.

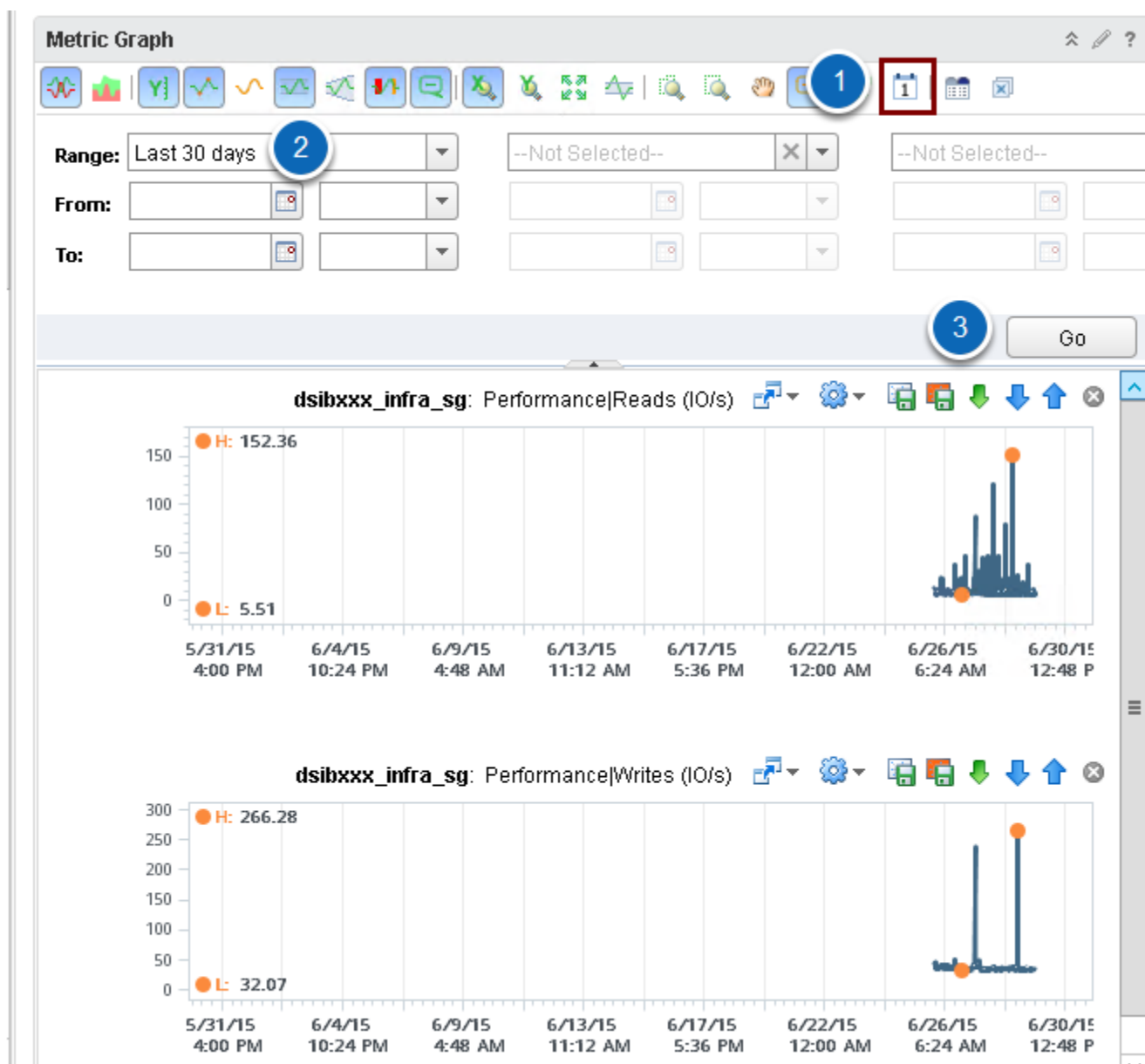


Metric graphs date function

vROps also provides the ability to choose a different time period for the graph. In fact it can go back an entire year.

1. Select the **date** function icon from the menu.
2. Select **Last 30 days**
3. Select **Go** to generate new graphs.

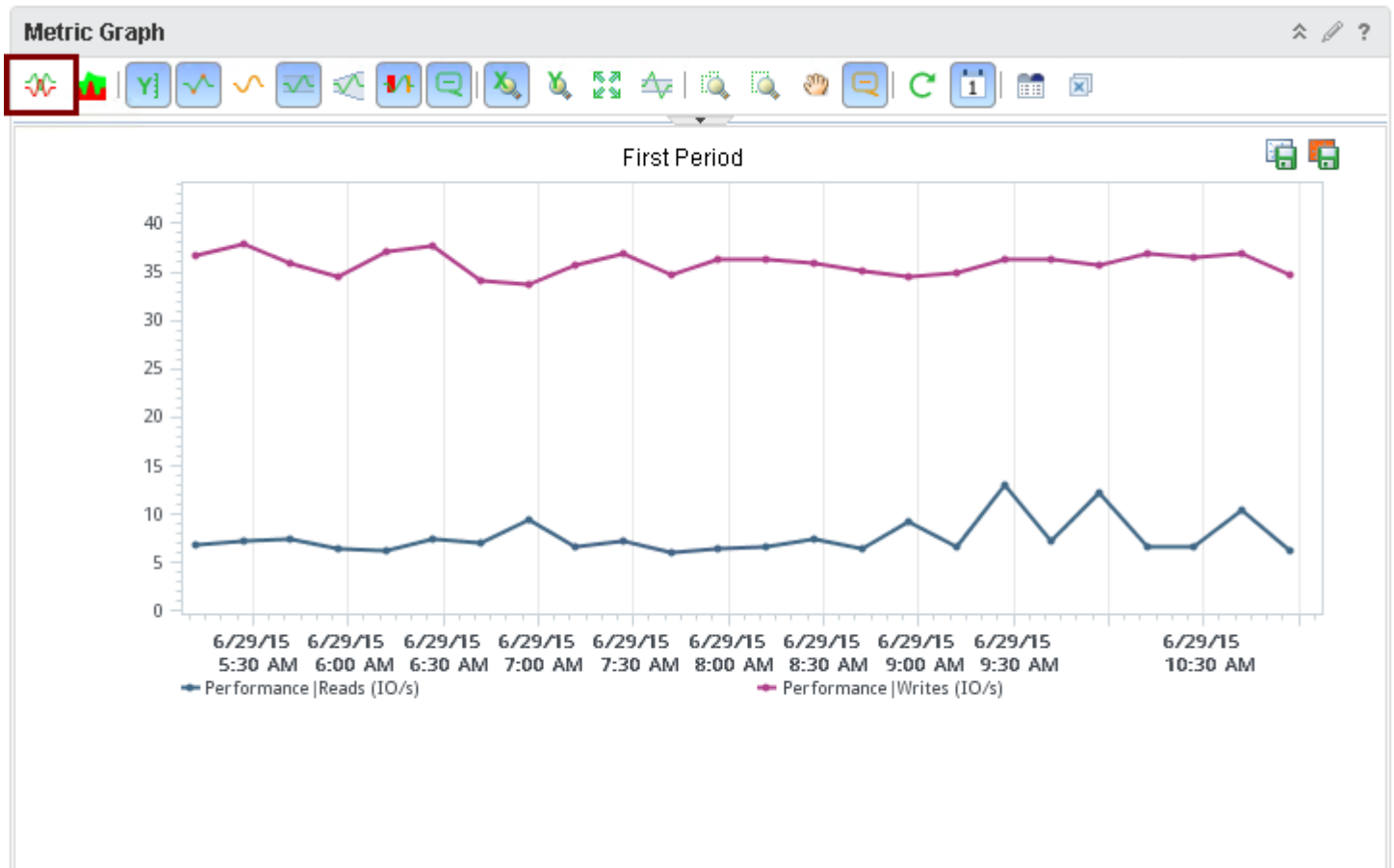
As this is in demo mode, there is limited data. Repeat steps 2 and 3 to return the graphs to the last 6 hours.



Split function

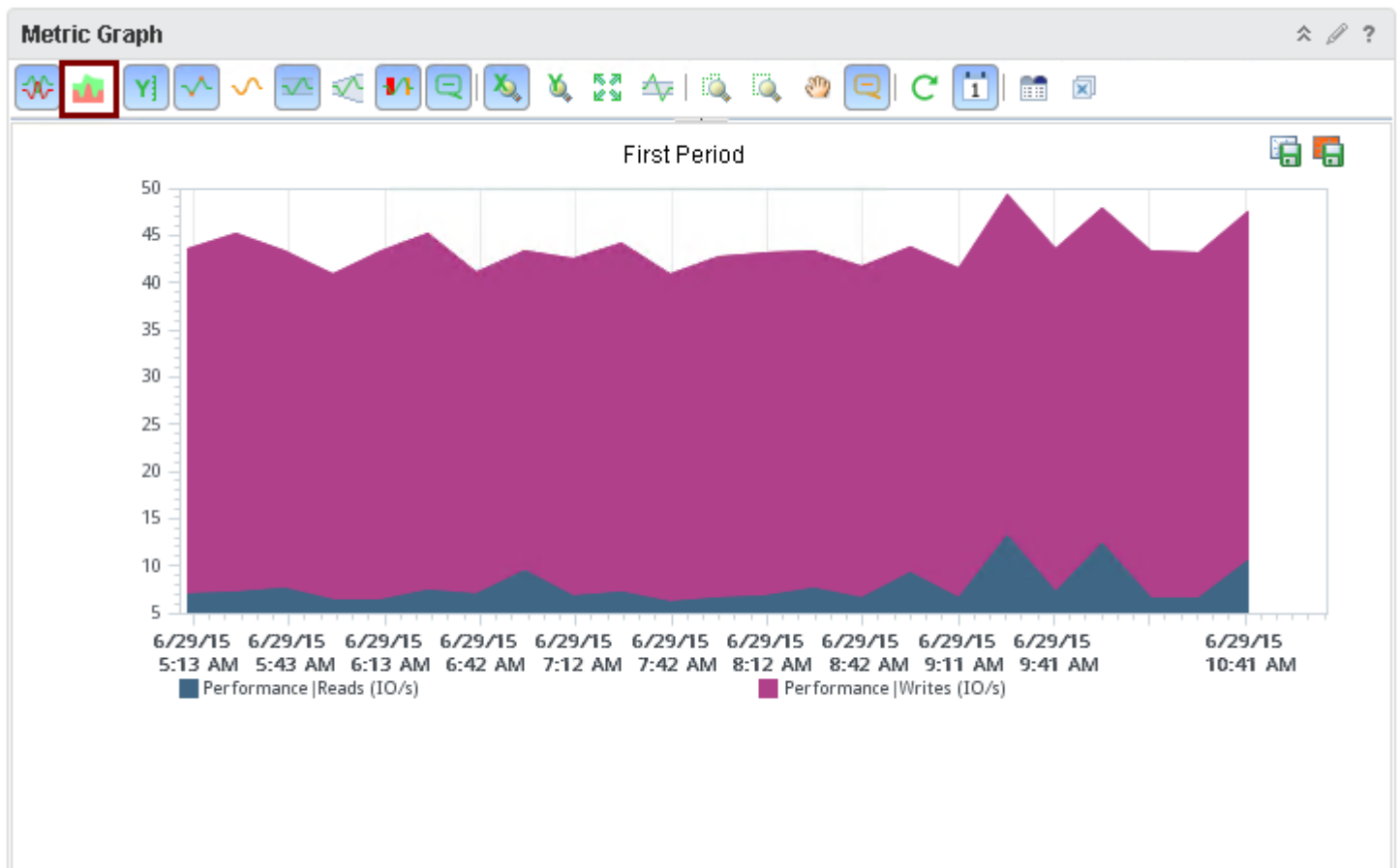
There are any number of options available in the Metric Graph widget. These are located at the top in an icon bar. Slowly run the cursor across the icons to see the different capabilities.

Now select the first icon, **Split Charts** which will combine the graphs. This view is very useful to see how two or more metrics interact with each other.



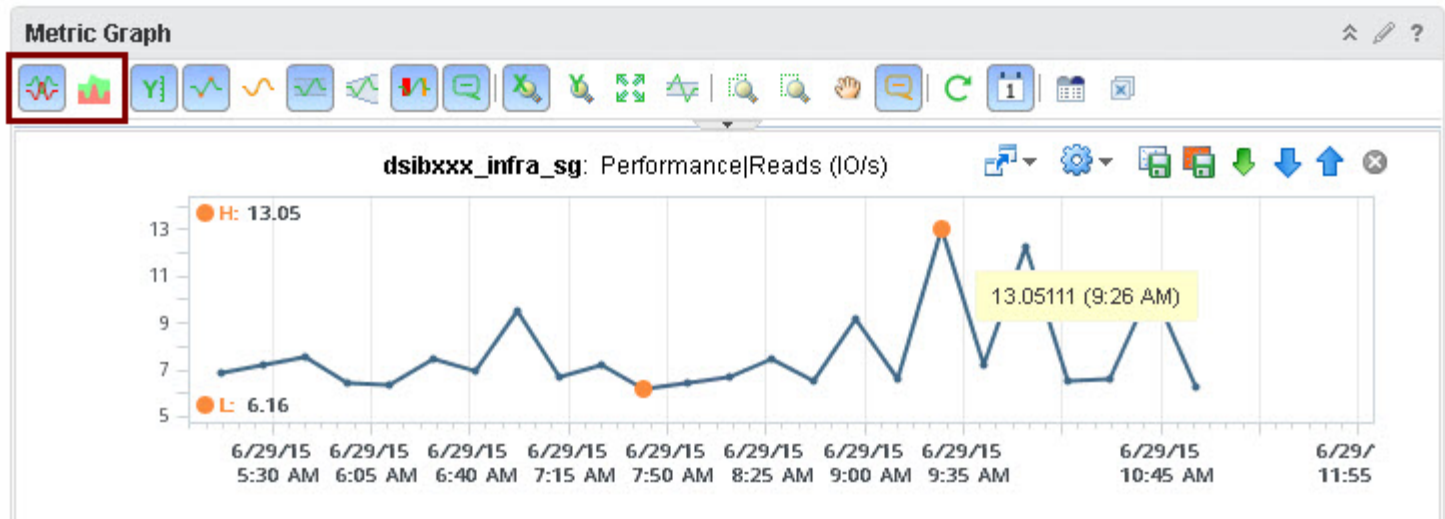
Stacked chart

Now select the second icon, **Stacked Charts**



Values

Next, select first the **Stacked Charts** icon and then the **Split Charts** icon to return the view to two individual graphs. Now run the cursor slowly across the line graph and you can see the individual values at each data point.



Close graphs

When finished reviewing the different options, select the **close** button to remove all.



Summary

In this lab you navigated through the VMAX Metrics dashboard and learned how to customize it.

You may now proceed to the next lab.

VMAX Top-N dashboard

This lab covers the VMAX Top-N dashboard. A Top-N dashboard provides a view of the top performing devices at a glance.

VMware vRealize Operations Manager Login Screen

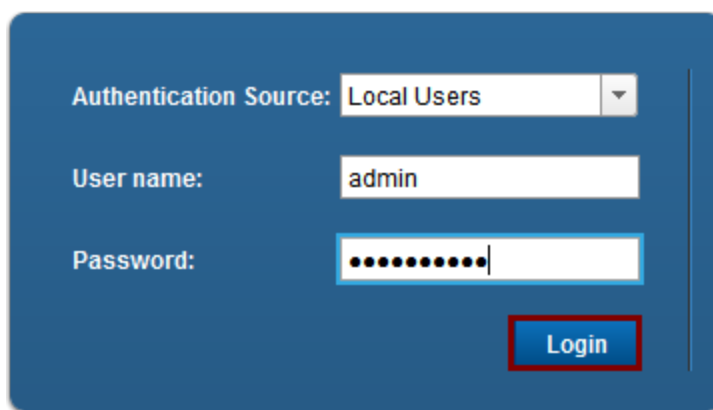
If not already logged in, in the browser, navigate to <http://192.168.1.61> which will display the login screen for vRealize Operations Manager.

Login using the following credentials:

admin

Password123!

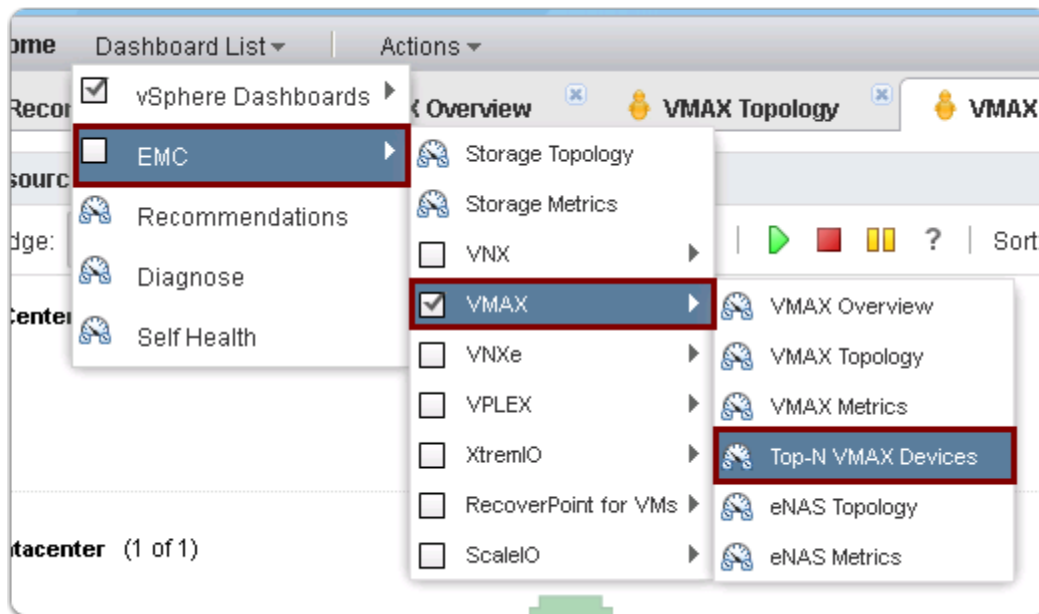
Click Login



The image shows the login screen of VMware vRealize Operations Manager. It is a blue rectangular box with rounded corners. Inside, there are three input fields: 'Authentication Source' with a dropdown menu showing 'Local Users', 'User name' with the text 'admin', and 'Password' with a masked password of 12 characters. A blue 'Login' button is located at the bottom right of the form, highlighted with a red rectangular border.

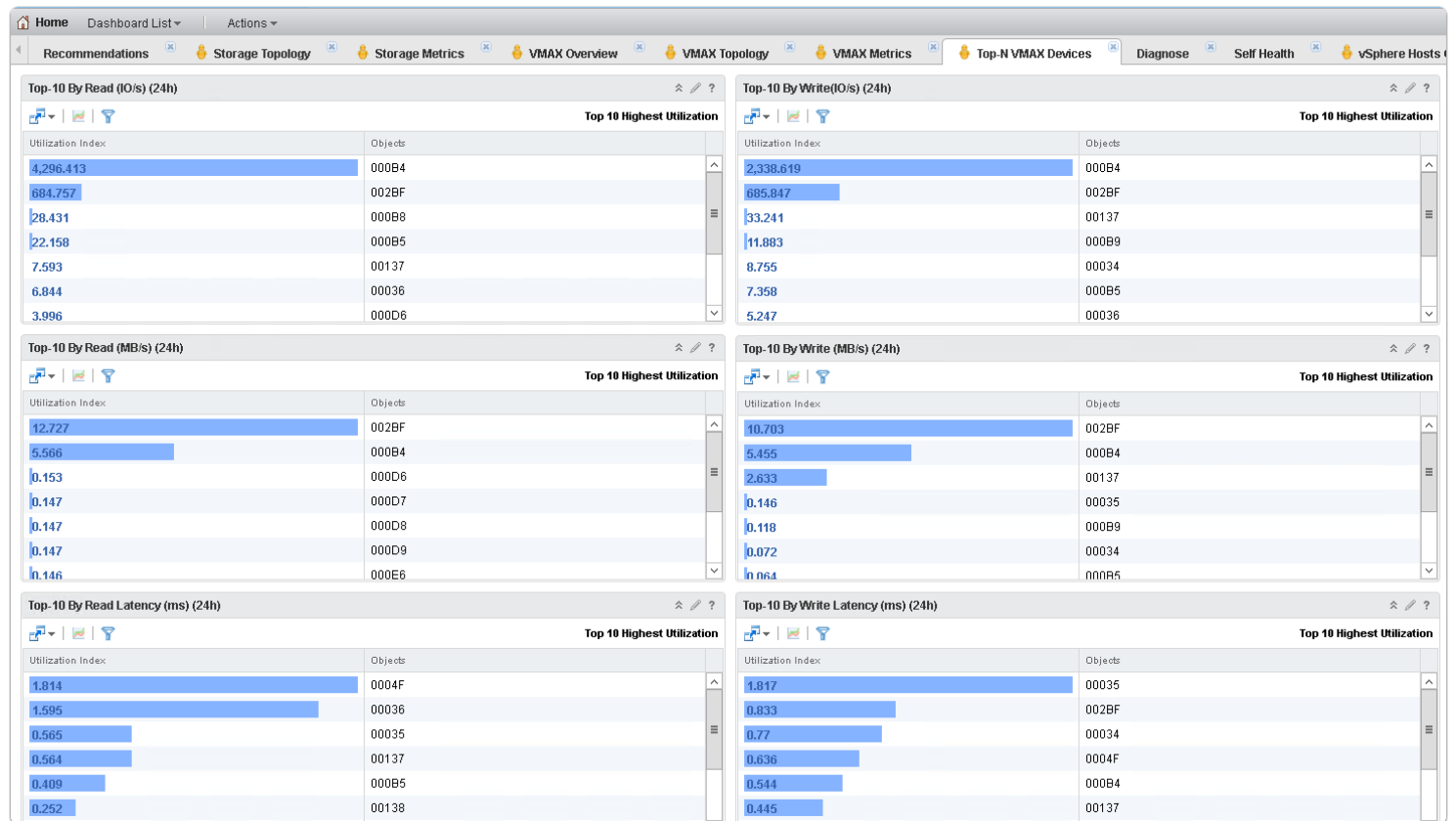
Dashboard navigation

Navigate to the Dashboard List drop-down at the top of the screen and select **EMC, VMAX, Top-N VMAX Devices**. If you completed the initial module, the checkbox next to each non-VMAX array and EMC will be unchecked.



Top-N VMAX Devices dashboard

This dashboard will show some top-10 metrics for devices over the course of the past 24 hours. Note that since this lab is not actively collecting metrics, the values in this graph are low.



Edit widget

Each of the widgets in the dashboard can be adjusted. Select the pencil to edit the **Top-10 By Read (IO/s) (24h)** widget.

Home
Dashboard List
Actions

Recommendations
Storage Topology
Storage Metrics
VMAX Overview
VMAX Top

Top-10 By Read (IO/s) (24h)

Top 10 Highest Utilization

Utilization Index	Objects
4,296.413	000B4
687.22	002BF
28.431	000B8
22.158	000B5
7.563	00137
6.844	00036
3.995	000D6

EMC Storage Analytics for VMAX3

Page 90

Edit widget - continued

Within the Edit dialog, many options are available for adjusting what is displayed. For instance the Period Length can be adjusted to show as much as a year's worth of values, or the number of values reduced.

Edit Top-10 By Read (IO/s) (24h)

Title

Top-10 By Read (IO/s) (24h)

Refresh Content

☒ On
☐ Off

Refresh Interval

300

↑

↓

(seconds)

Image Redraw Rate*

15 minutes

▼

Self Provider

☒ On
☐ Off

Period Length

Range:

Last 24 hours

▼

From:

📅

▼

To:

📅

▼

Bars Count

10

▼

↑

↓

Depth

1

↑

↓

Filter old metrics

☐ On
☒ Off

Selected Object

Selected Object Type

Device

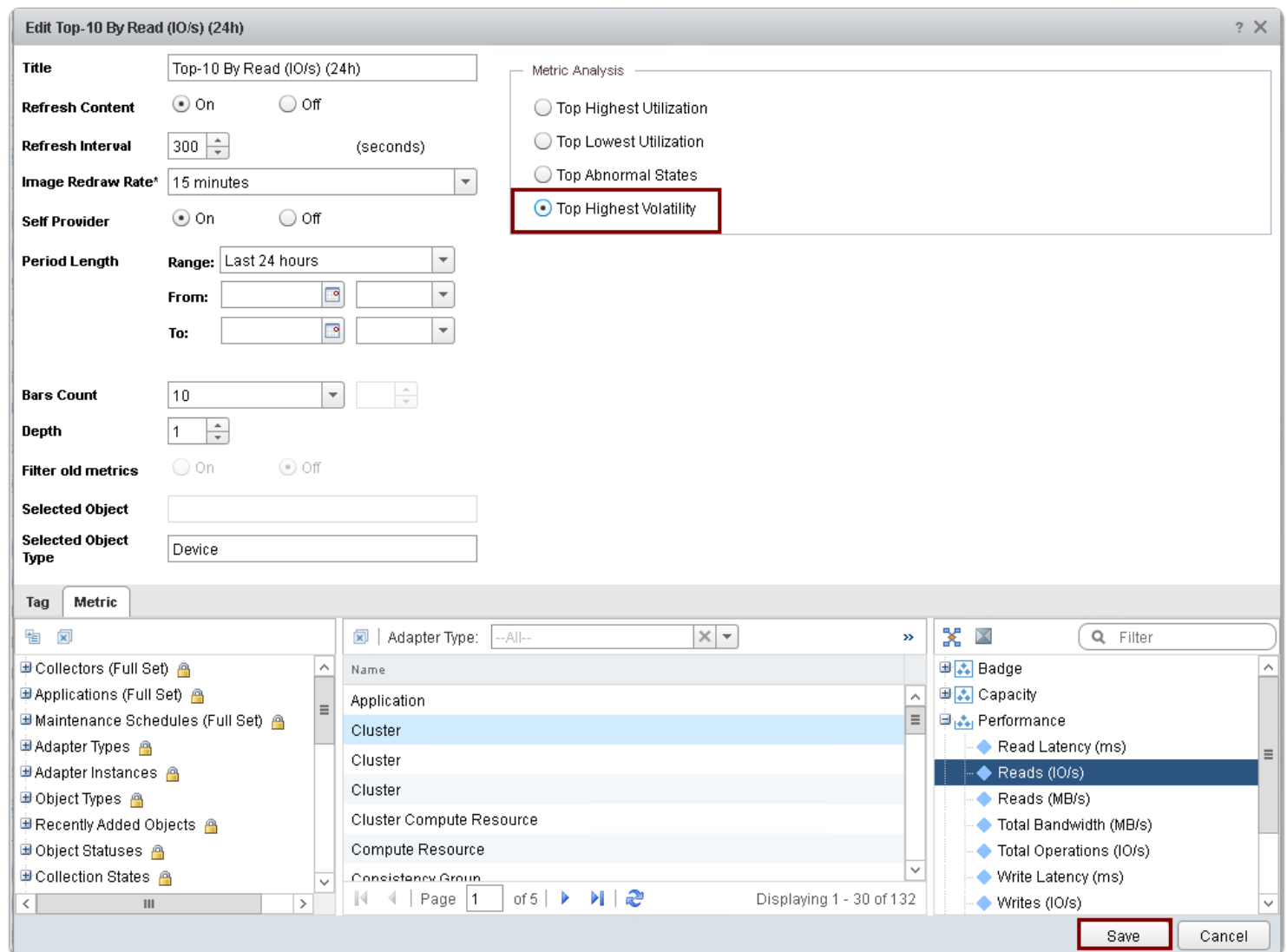
Metric Analysis

☒ Top Highest Utilization
☐ Top Lowest Utilization
☐ Top Abnormal States
☐ Top Highest Volatility

Volatility

Now you will change one of these values. Rather than showing the devices with the highest utilization, you will change it to the highest volatility.

Select the **Top Highest Volatility** radio button and then **Save**.



Edit Top-10 By Read (IO/s) (24h)

Title: Top-10 By Read (IO/s) (24h)

Refresh Content: ☒ On ☐ Off

Refresh Interval: 300 (seconds)

Image Redraw Rate*: 15 minutes

Self Provider: ☒ On ☐ Off

Period Length: Range: Last 24 hours

From: [] []

To: [] []

Bars Count: 10

Depth: 1

Filter old metrics: ☐ On ☒ Off

Selected Object: []

Selected Object Type: Device

Metric Analysis

- ☐ Top Highest Utilization
- ☐ Top Lowest Utilization
- ☐ Top Abnormal States
- ☒ Top Highest Volatility

Tag **Metric**

Adapter Type: --All--

Name

Application

Cluster

Cluster

Cluster

Cluster Compute Resource

Compute Resource

Consistency Group

Badge

Capacity

Performance

- Read Latency (ms)
- Reads (IO/s)**
- Reads (MB/s)
- Total Bandwidth (MB/s)
- Total Operations (IO/s)
- Write Latency (ms)
- Writes (IO/s)

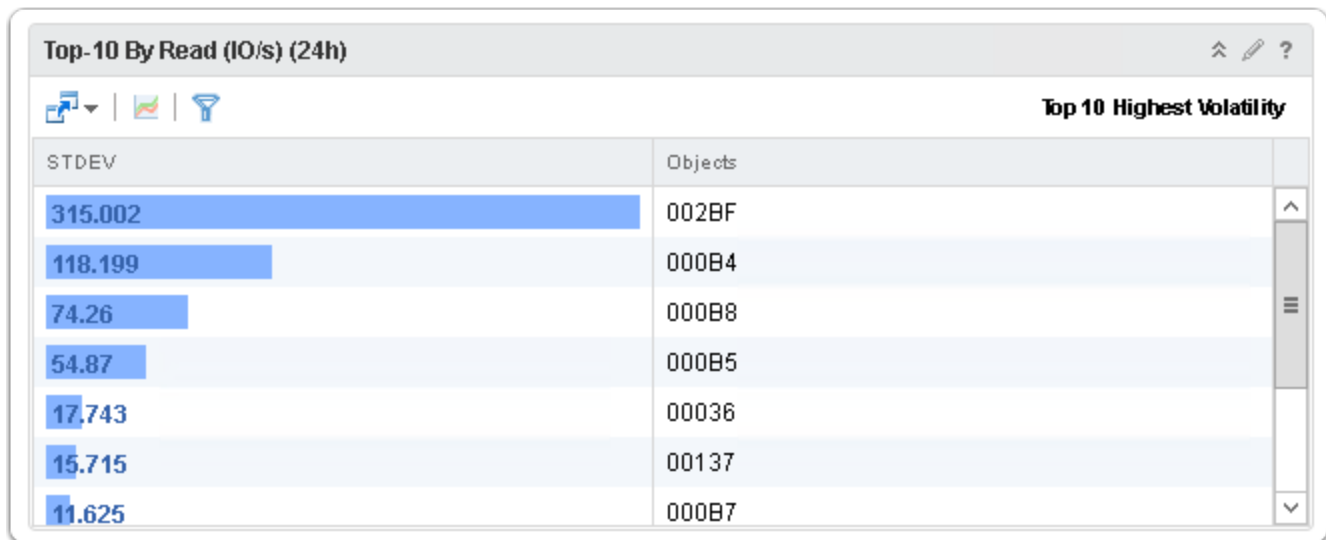
Page 1 of 5

Displaying 1 - 30 of 132

Save **Cancel**

Volatility result

This image represents the result of the change.



Summary

This lab had two focus areas: The first was to show you the alerting capability of ESA and vROps and the second was to provide an overview of the various VMAX dashboards in ESA. The alert dashboard in vROps provides a quick view of any problem areas that need to be addressed. Specific VMAX alerts such as those relating to device capacity let the user know of datastores that are nearly full. In the second part of the lab, you had an opportunity to explore the VMAX dashboards which are designed to focus on specific areas of management. For instance, the VMAX Overview dashboard has a consolidated look at the performance of the configured arrays, while the Top-N dashboard just completed, specifically calls out those devices most active in the VMware environment. Such information can help you not only understand the usage patterns of the environment better, but also quickly identify problem areas that require immediate action.

Lab 4: Capacity Analysis

Capacity Analysis

The capacity analysis lab will demonstrate how you can determine the growth projection of a particular device and how long it will take to reach capacity.

VMware vRealize Operations Manager Login Screen

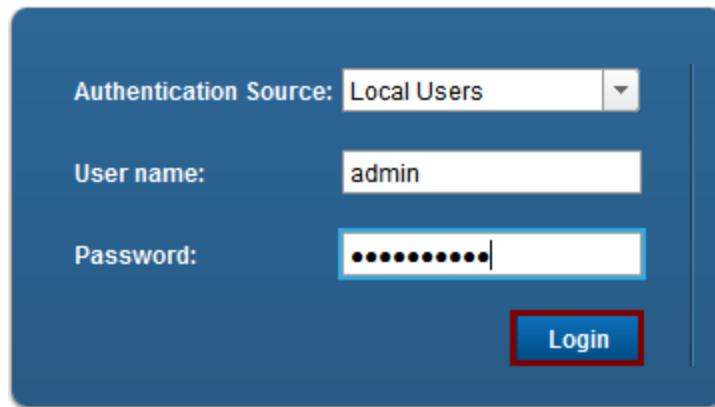
If not already logged in, in the browser, navigate to <http://192.168.1.61> which will display the login screen for vRealize Operations Manager.

Login using the following credentials:

admin

Password123!

Click Login



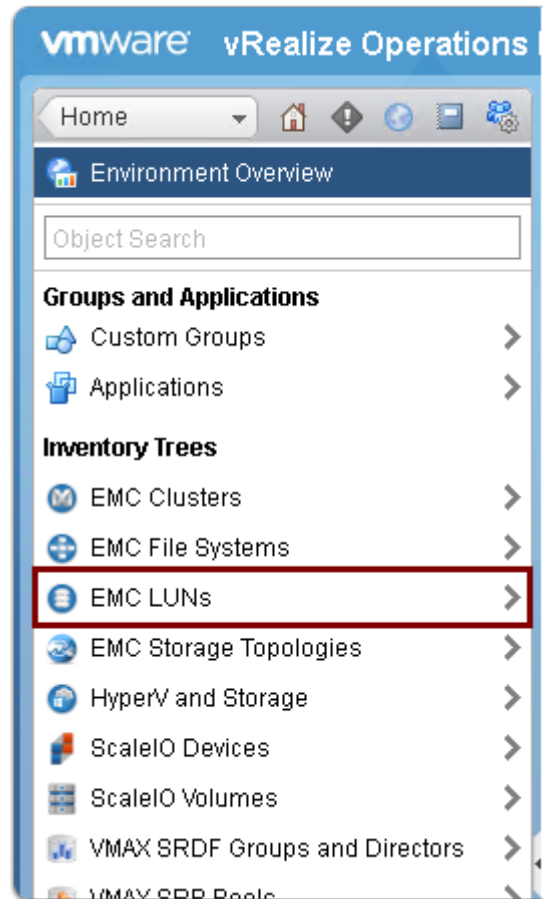
Environment

From the Home page, select Environment



EMC LUNs

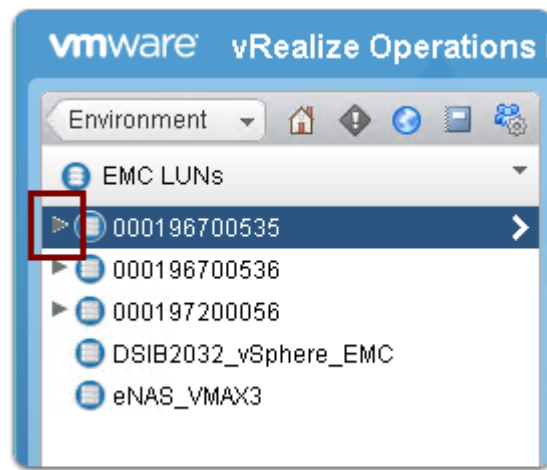
Select EMC LUNs to expand the Inventory Tree.



Adapter instance in EMC LUNs

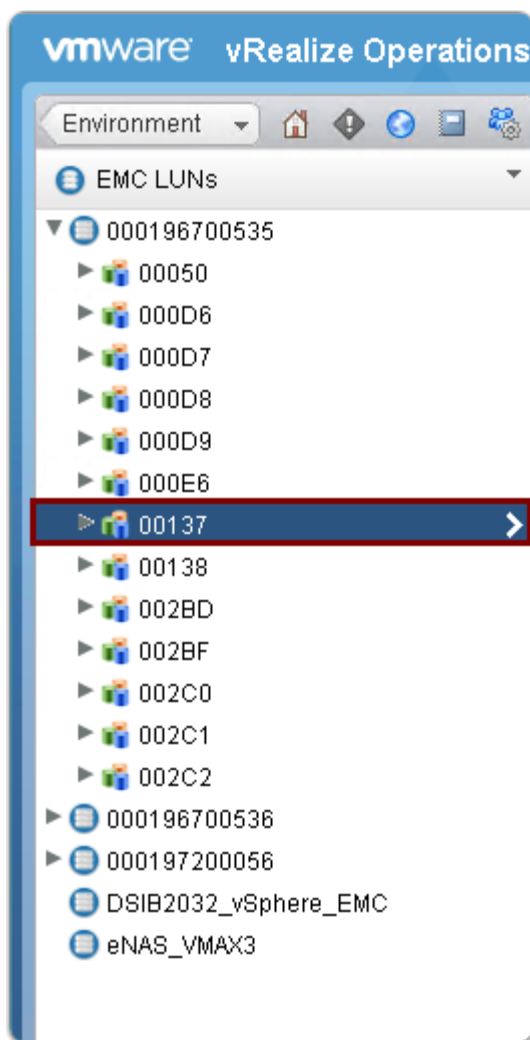
Upon expanding EMC LUNs, each EMC adapter instance is represented. Note that the EMC vSphere adapter and the eNAS adapter (bottom two) do not have arrows to expand them as they do not have device (LUN) objects.

Select the arrow next to 000196700535 to expand the available devices in that instance.



Device 137

Find and highlight device **00137** in the list. At this point just highlight the device, do not select the arrow next to the device.

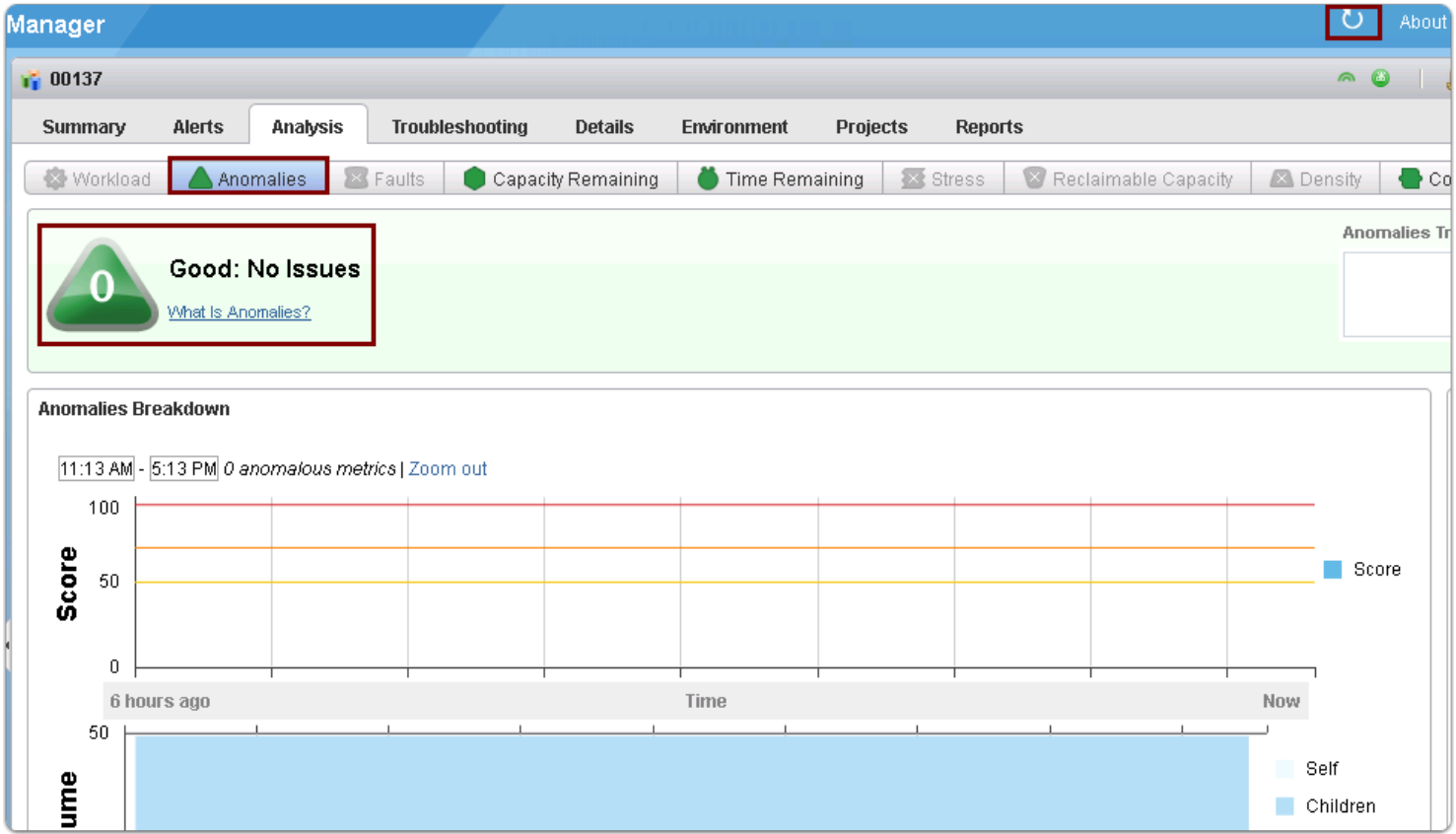


Analysis tab

On the right-hand side panel, select the **Analysis** tab.

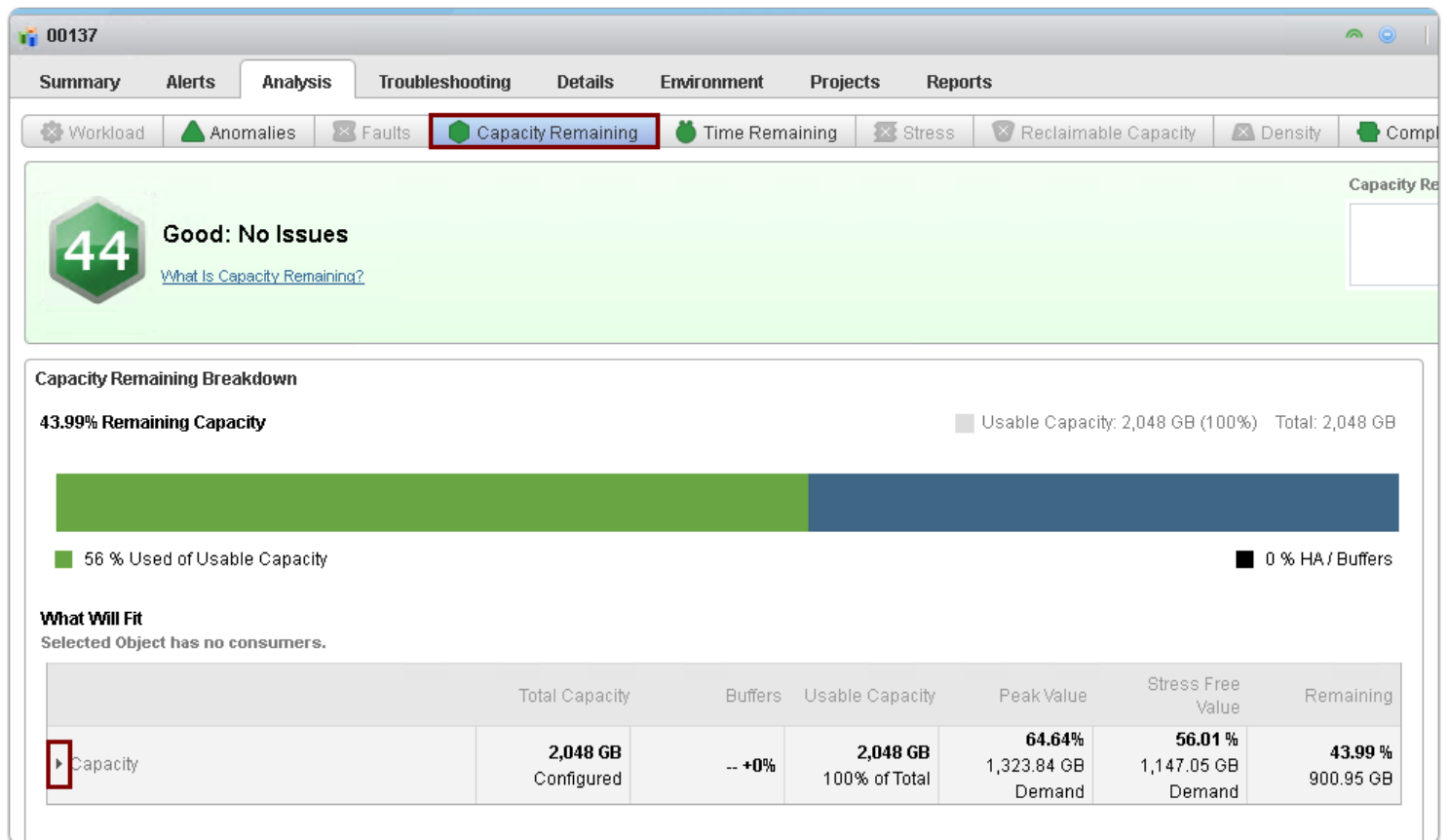
Initially all the sub-tabs (e.g. Anomalies) may appear gray with question marks. This is due to the nature of demo mode. If so, you can resolve this by selecting Refresh which is located in the right-hand corner with an arrow. You may also need to toggle across a few devices which will also trigger a refresh until the green badges appear. This should

not take more than a minute. Note that even if the information is gray scale, it will still have the same numbers so you can continue the lab.



Sub-tab Capacity Remaining

Once the badges are green (or if OK with gray), select the **Capacity Remaining** sub tab. The purpose of the Capacity Remaining screen is to provide you with a history of storage usage of the device (and hence datastore). vROps provides a 180 day trend graph at the top. In this example you see that 56% of the device is full, which leaves 44% available as the health badge shows at the top. Now click on the arrow next to **Capacity**.



00137

Summary Alerts Analysis Troubleshooting Details Environment Projects Reports

Workload Anomalies Faults **Capacity Remaining** Time Remaining Stress Reclaimable Capacity Density Completion

44 Good: No Issues
[What Is Capacity Remaining?](#)

Capacity Remaining Breakdown

43.99% Remaining Capacity

Usable Capacity: 2,048 GB (100%) Total: 2,048 GB

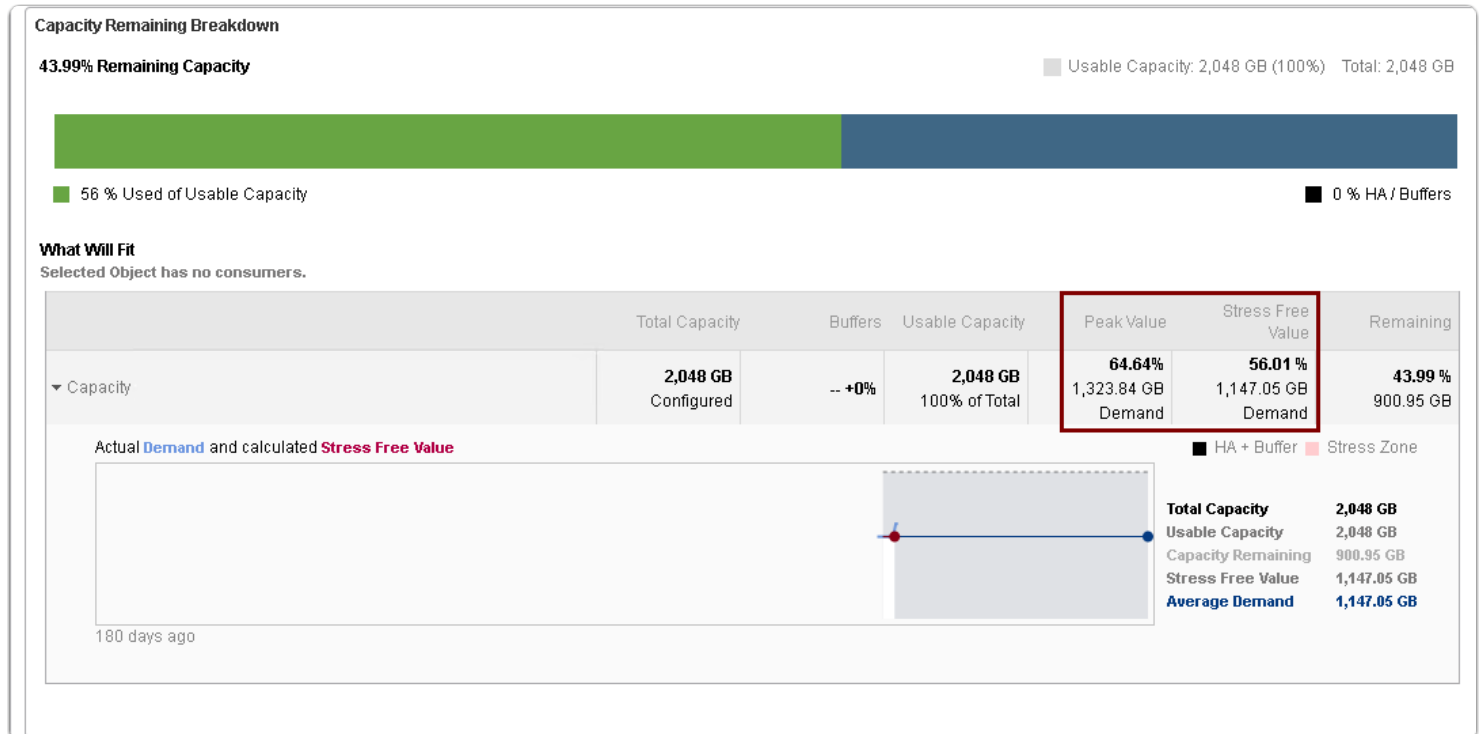
56 % Used of Usable Capacity 0 % HA / Buffers

What Will Fit
 Selected Object has no consumers.

	Total Capacity	Buffers	Usable Capacity	Peak Value	Stress Free Value	Remaining
Capacity	2,048 GB Configured	-- +0%	2,048 GB 100% of Total	64.64% 1,323.84 GB Demand	56.01% 1,147.05 GB Demand	43.99 % 900.95 GB

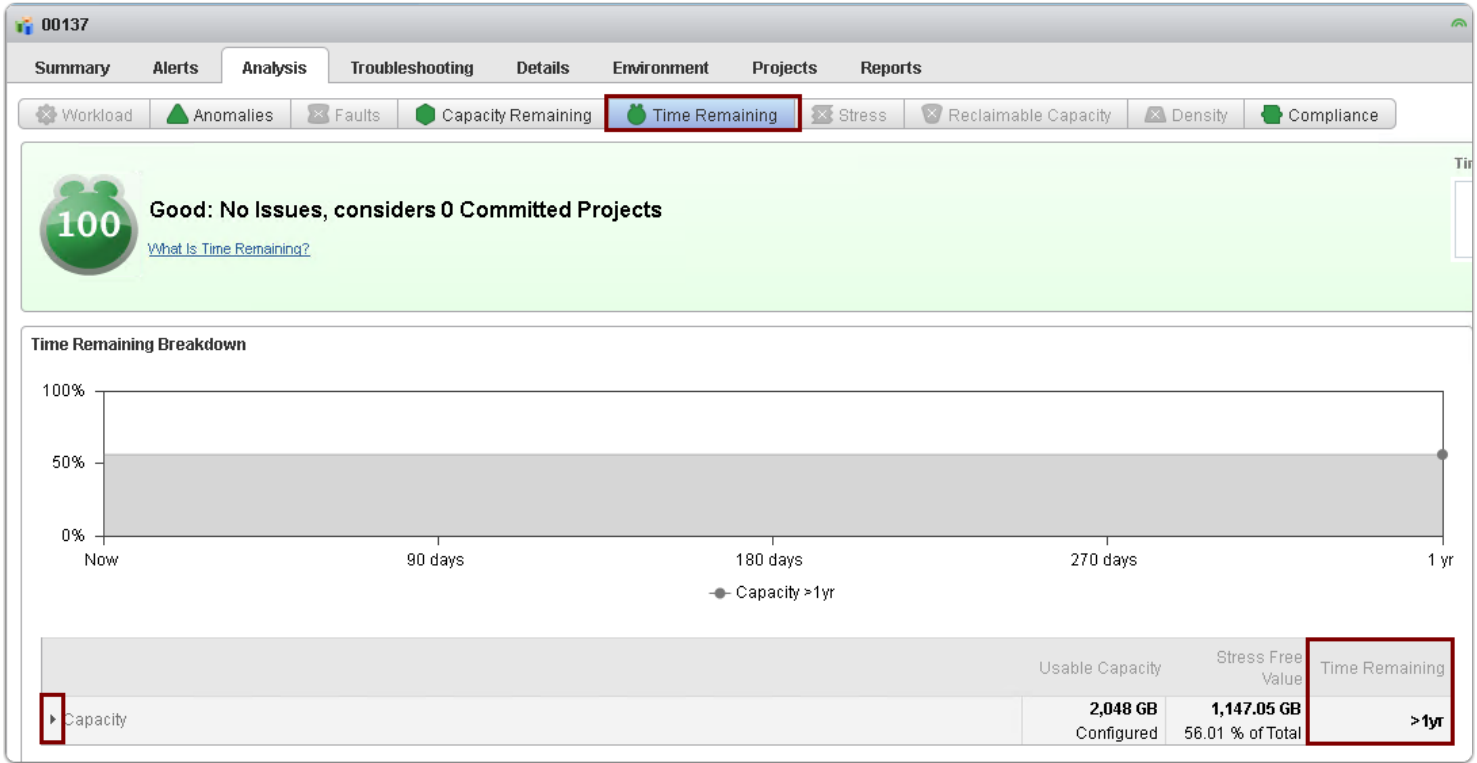
What Will Fit

This is a more detailed analysis of the device capacity. Note that the **Peak Value** is different from the **Stress Free Value** (current). This indicates at one point perhaps a VM or large virtual disk was deleted from the datastore. From here you can see how much time is left until the device/datastore is full.



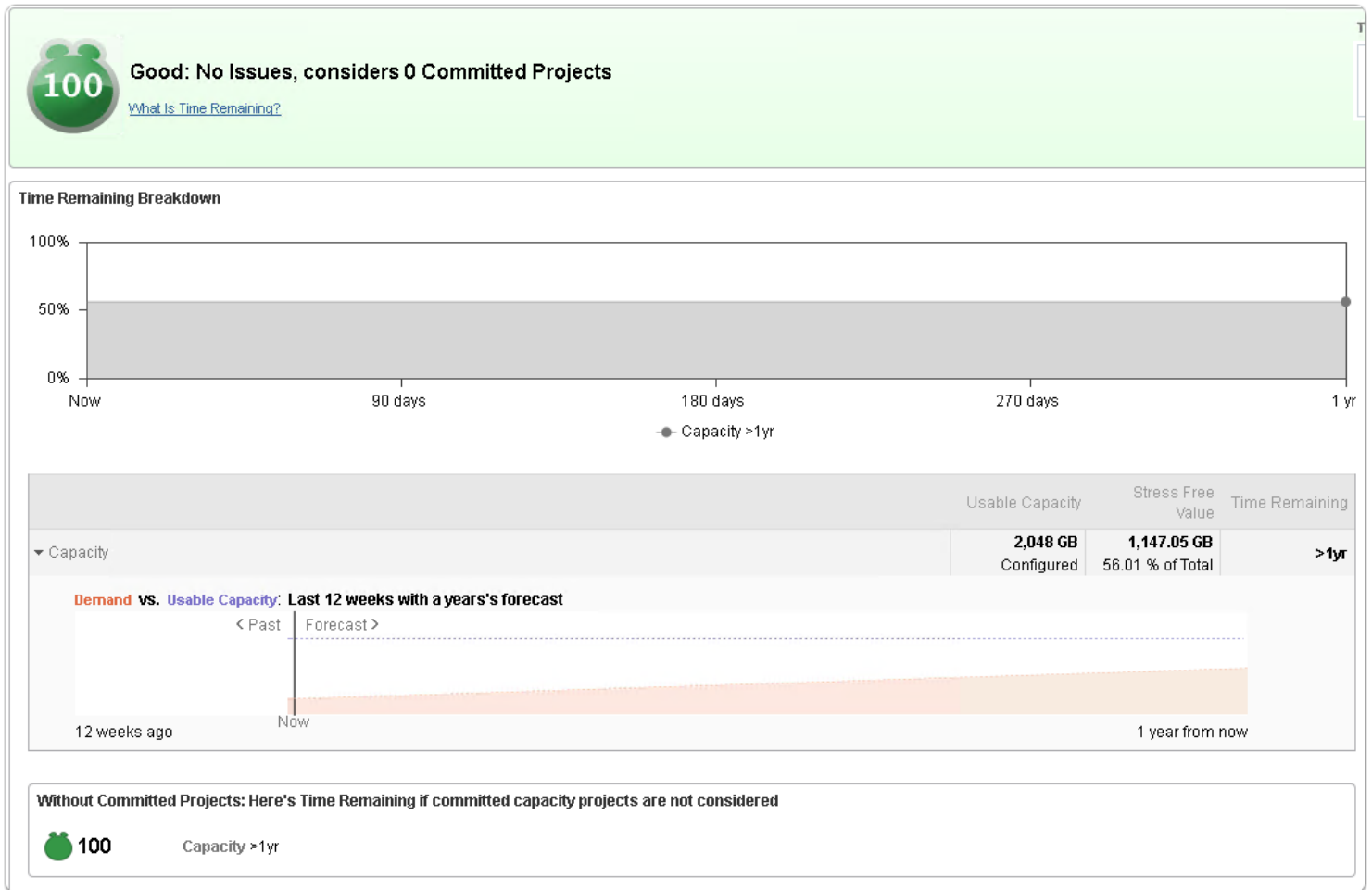
Time Remaining

Select the **Time Remaining** sub tab. The Time Remaining screen functions to provide you with an estimate of how long it will take until the device/datastore is full. It does this by analyzing the past 180 days and also taking into account any Projects that have been entered into vROps. Given the nature of the timeless demo mode of the environment, vROps has little past data for calculation so the growth is estimated to be very slow - it will take over a year. To get more detail expand the **Capacity** arrow.



Time Remaining detail

Using the last 12 weeks, you can see an upward trend in growth, however slight. vROps will only estimate the time up to a year.



Peers

Finally, scroll down to the bottom of the page and see that you can also find time remaining for other devices. Move your cursor over the **Peers** and a yellow box will provide detail.

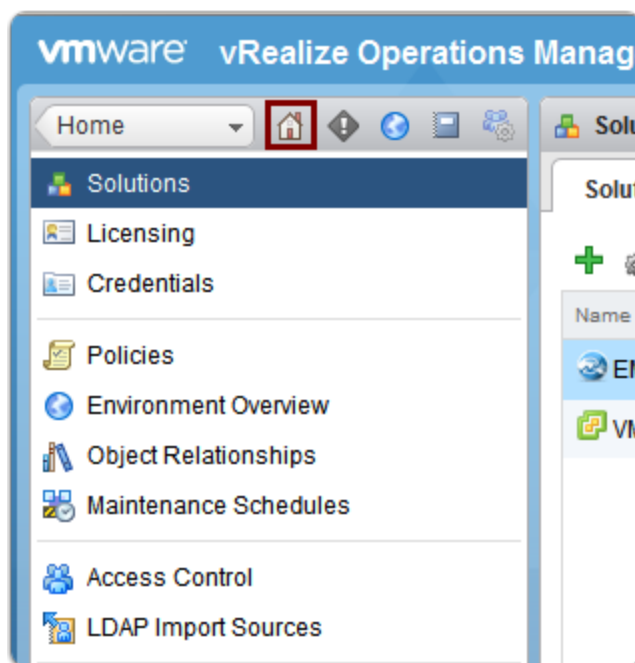
Peer (12 of 12)

Children (1 of 1)

Object:	000D9
Object Type:	Device
Time Remaining:	100 → 100
Health:	100
Workload:	--
Anomalies:	0
Faults:	--
Risk:	0
Capacity Remaining:	69
Stress:	--
Compliance:	100
Efficiency:	100
Reclaimable Capacity:	--
Density:	--

Home

Return to the dashboard screen by selecting the Home icon at the top of the screen.



Summary

Capacity planning is a critical task in any customer environment. Understanding the current storage usage of your VMware environment and how it will grow in the future will dictate how much storage needs to be allocated and purchased. By utilizing the capacity planning feature of ESA and vROps, it takes the guesswork out of how much storage you will need to meet your future growth. The capacity and time remaining screens are available for all devices in your VMware environment as you saw in the lab and the graphical presentation makes it easy for any decision maker to understand.

Lab 5: SRDF

SRDF navigation

The SRDF lab serves to show the different topologies that are available when viewing SRDF groups. SRDF is a family of disaster recovery, parallel processing, and data migration solutions. SRDF configurations require at least two arrays - a primary and a secondary. The arrays can be co-located, in different buildings, or around the world. SRDF has various replication topologies. In ESA there is support for two-site.

VMware vRealize Operations Manager Login Screen

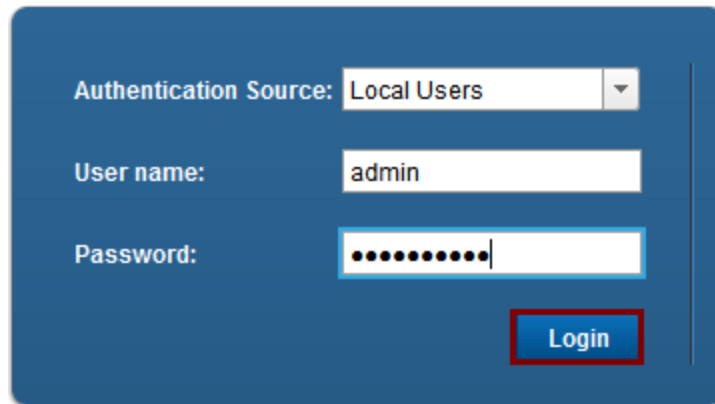
If not already logged in, in the browser, navigate to <http://192.168.1.61> which will display the login screen for vRealize Operations Manager.

Login using the following credentials:

admin

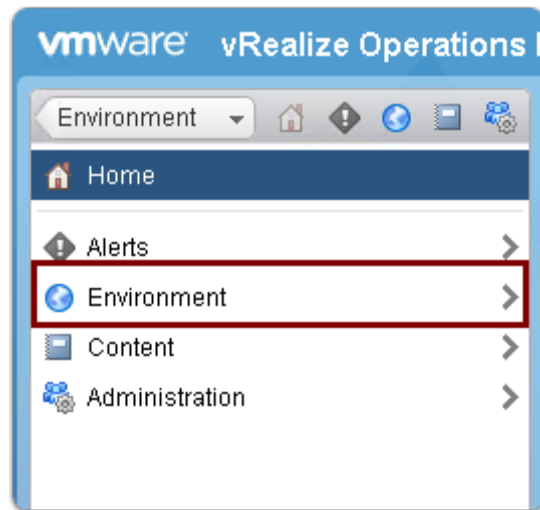
Password123!

Click **Login**



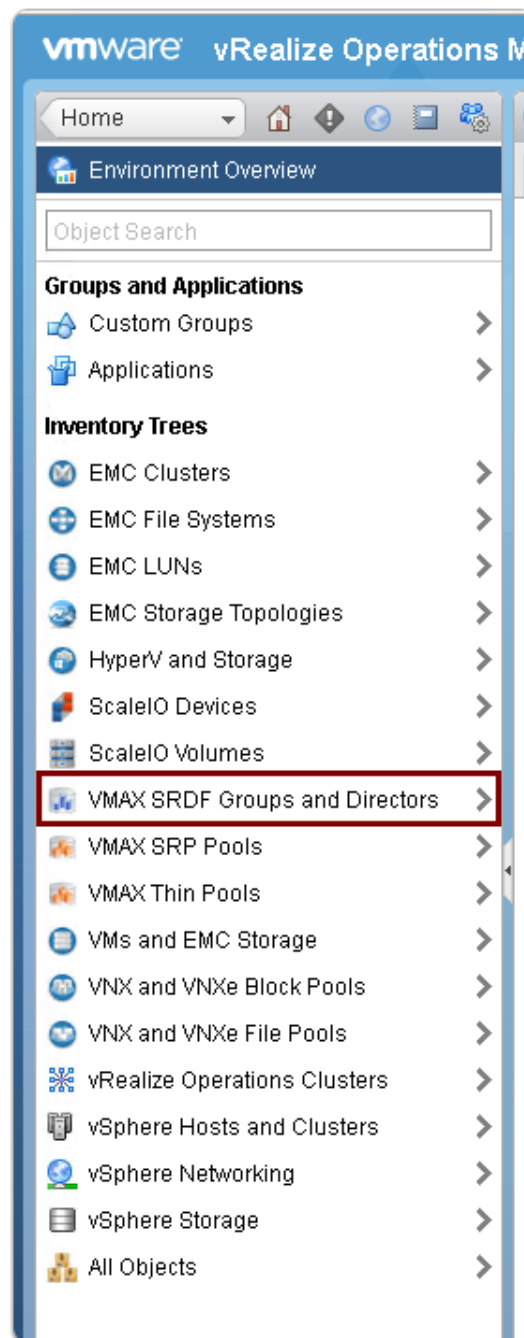
SRDF topologies

On the left-hand side, select **Environment**



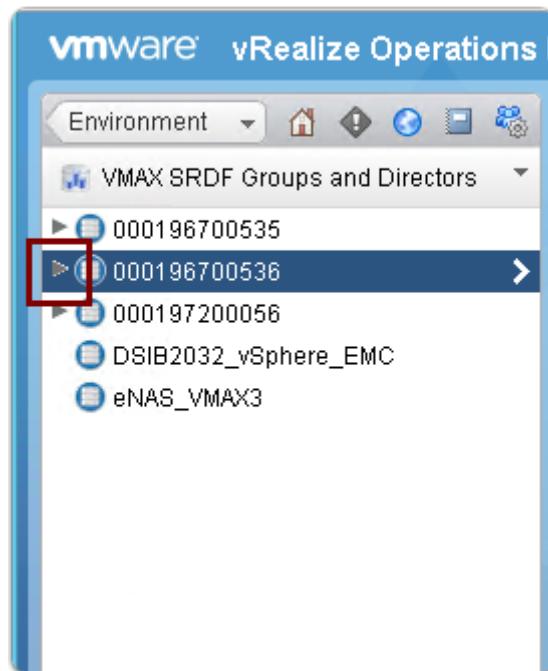
Inventory Trees

This view is known as Inventory Trees. It consolidates objects into groups for easier navigation. You are going to view the objects related to SRDF so select **VMAX SRDF Groups and Directors**



VMAX SRDF Groups and Directors

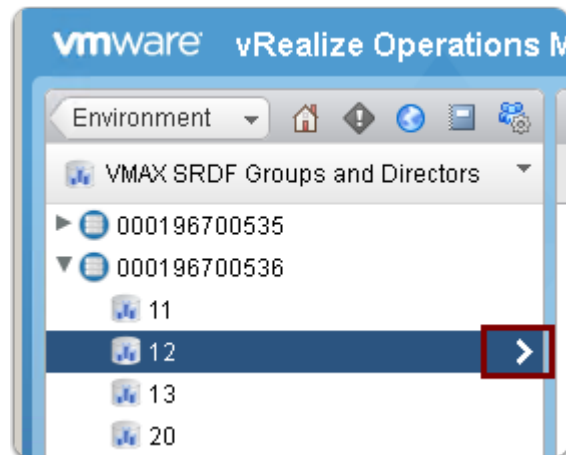
You will note in this view, ESA groups the objects by EMC adapter instance. Start by expanding the second adapter instance in the list, 000196700536, by clicking on the arrow on the left.



Expand adapter instance

Once expanded, highlight SRDF group 12. You are going to see how the Inventory Tree feature enables the user to see the interaction of the EMC objects with SRDF.

Select the **arrow**



Expand SRDF group

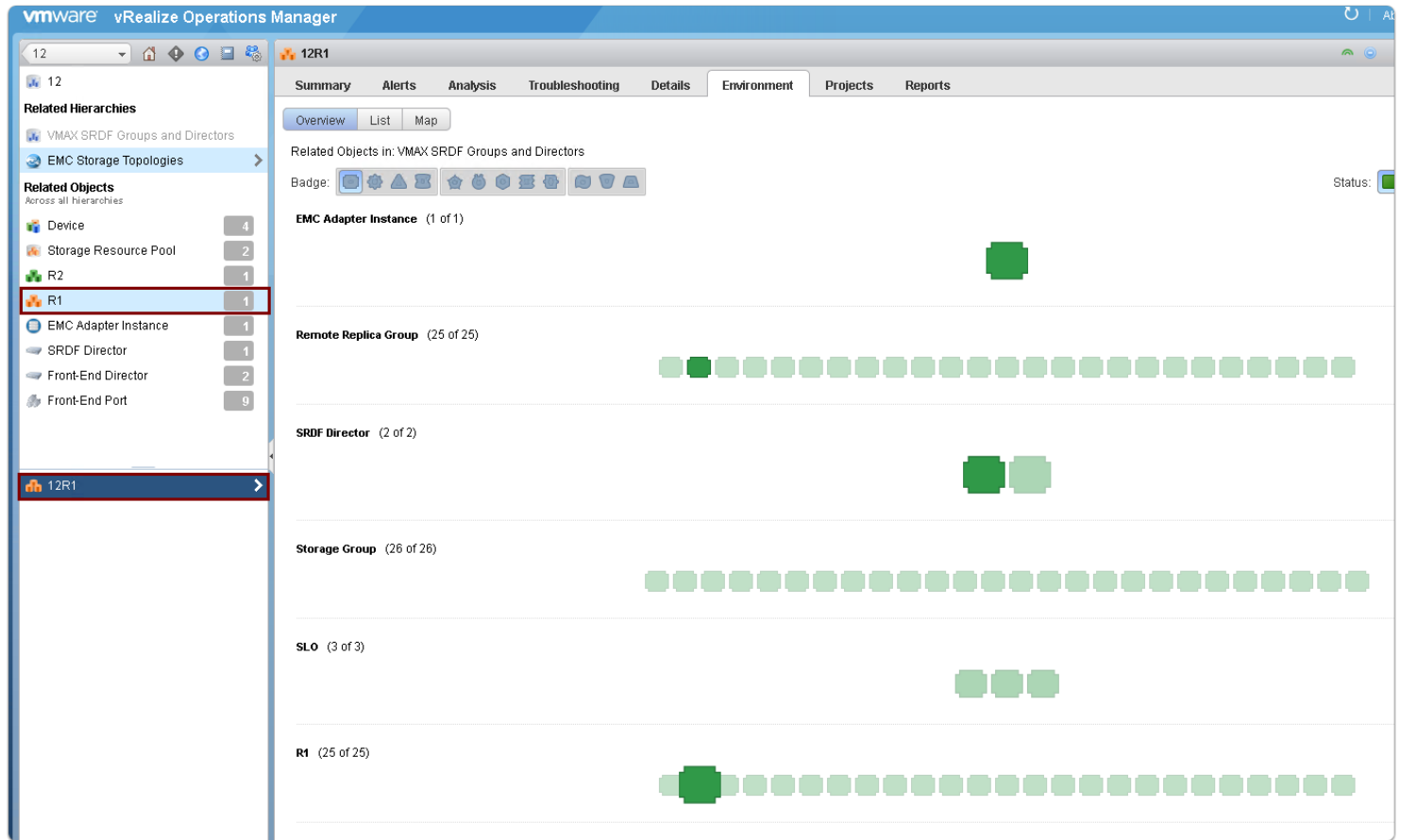
With group 12 expanded, you can view all the related objects across the hierarchies. Group 12 is in a synchronous SRDF configuration with array 000196700535. In this group there are four devices, or two pairs of replicating devices, two SRPs (representing each array), an R1 and R2 group which are the parent objects containing the R1 and R2 devices, a single adapter instance - the one selected, an SRDF and Front-End directors, and finally front-end ports.

Select the **Environment** tab. This accesses the topology you will examine next.

The screenshot displays the VMware vRealize Operations Manager interface. On the left, a sidebar shows the 'Related Objects' section for group 12, which is highlighted with a red box. This section lists various objects and their counts: Device (4), Storage Resource Pool (2), SRDF Port (1), R2 (1), R1 (1), EMC Adapter Instance (1), SRDF Director (1), Front-End Director (2), and Front-End Port (9). The main panel on the right shows the 'Environment' tab selected, with a red box around the tab name. The main panel is divided into four sections: 'Health' (showing 'Immediate issues' with a green cross icon), 'Risk' (showing a green star icon), 'Top Health Alerts' (showing 'No Health Issues'), and 'Top Risk Alerts' (showing 'No Risk Issue').

R1 group

On the left-hand side, highlight the **R1** object which will reveal the R1 object for SRDF group 12 in the bottom panel. Now highlight that **12R1** object and on the right-hand panel the topology will appear. You'll notice that the R1 object at the bottom is highlighted and also the associated RDF group, RDF director, and other objects like devices.



The screenshot displays the VMware vRealize Operations Manager interface. On the left-hand side, the 'Related Objects' list is visible, with 'R1' highlighted. Below it, the '12R1' object is also highlighted. The main panel shows the 'Environment' tab for the '12R1' object. The 'Related Objects in: VMAX SRDF Groups and Directors' section displays a topology diagram. The diagram shows a hierarchy of objects: 'EMC Adapter Instance' (1 of 1), 'Remote Replica Group' (25 of 25), 'SRDF Director' (2 of 2), 'Storage Group' (26 of 26), 'SLO' (3 of 3), and 'R1' (25 of 25). Each object is represented by a green square icon, and the 'R1' object at the bottom is highlighted with a red border.

R1 devices

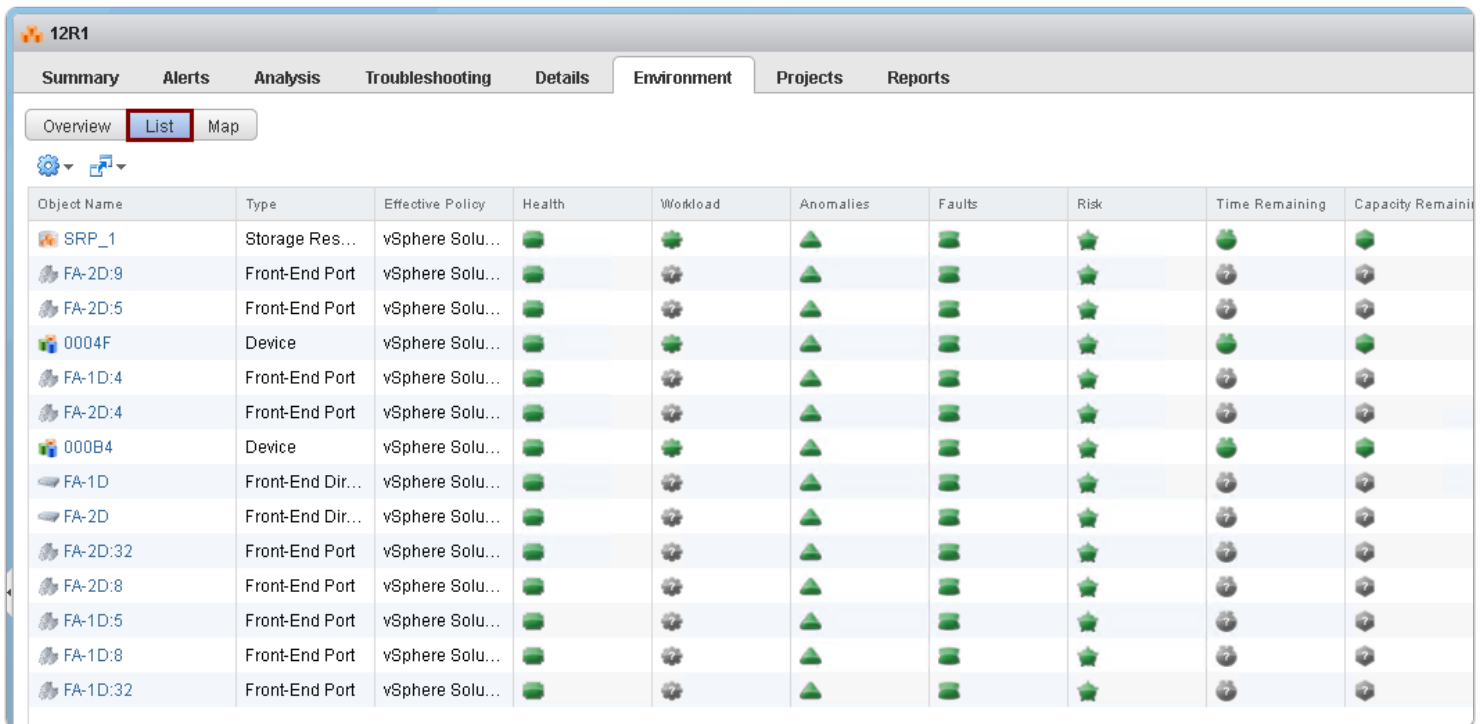
Scroll down the screen if necessary. In the Device category, move your cursor over the green box devices to find and select device **000B4**

A different set of green boxes (some the same) are highlighted now, including the storage group. Take your cursor and hover over the various objects that are highlighted and a yellow box will appear next to the object with detail about it.



List view

At the top of the screen, select the List view. This will show all the currently highlighted objects by name. Note the gray icons under the various columns are expected as this is demo mode.



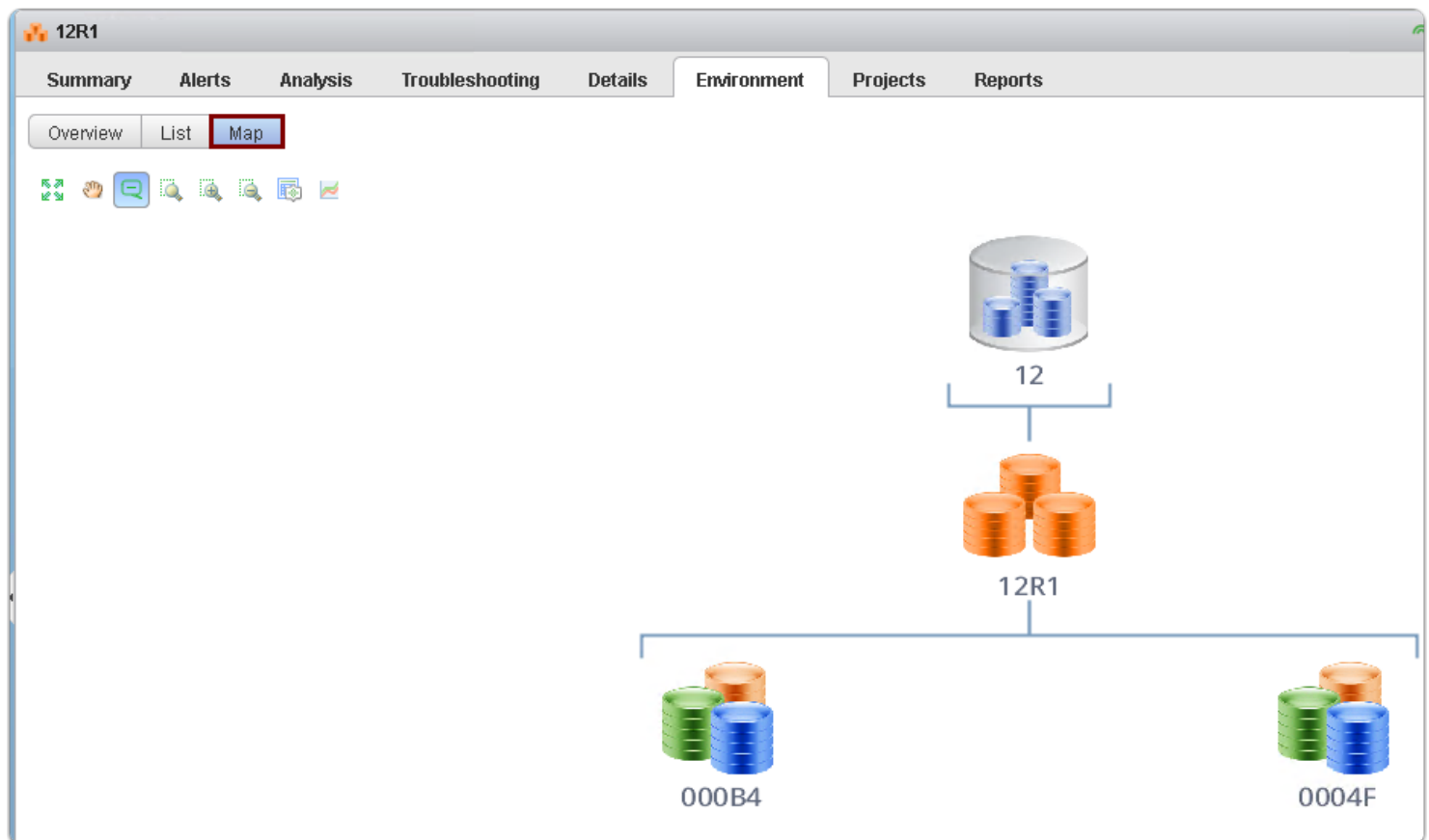
The screenshot shows the 'List' view of the EMC Storage Analytics interface. The 'List' tab is selected, and a table of objects is displayed. The table has columns for Object Name, Type, Effective Policy, Health, Workload, Anomalies, Faults, Risk, Time Remaining, and Capacity Remaining. The objects listed are SRP_1, FA-2D:9, FA-2D:5, 0004F, FA-1D:4, FA-2D:4, 000B4, FA-1D, FA-2D, FA-2D:32, FA-2D:8, FA-1D:5, FA-1D:8, and FA-1D:32. The 'Health' column shows green icons for all objects, and the 'Risk' column shows green stars for all objects.

Object Name	Type	Effective Policy	Health	Workload	Anomalies	Faults	Risk	Time Remaining	Capacity Remaining
SRP_1	Storage Res...	vSphere Solu...							
FA-2D:9	Front-End Port	vSphere Solu...							
FA-2D:5	Front-End Port	vSphere Solu...							
0004F	Device	vSphere Solu...							
FA-1D:4	Front-End Port	vSphere Solu...							
FA-2D:4	Front-End Port	vSphere Solu...							
000B4	Device	vSphere Solu...							
FA-1D	Front-End Dir...	vSphere Solu...							
FA-2D	Front-End Dir...	vSphere Solu...							
FA-2D:32	Front-End Port	vSphere Solu...							
FA-2D:8	Front-End Port	vSphere Solu...							
FA-1D:5	Front-End Port	vSphere Solu...							
FA-1D:8	Front-End Port	vSphere Solu...							
FA-1D:32	Front-End Port	vSphere Solu...							

Map view

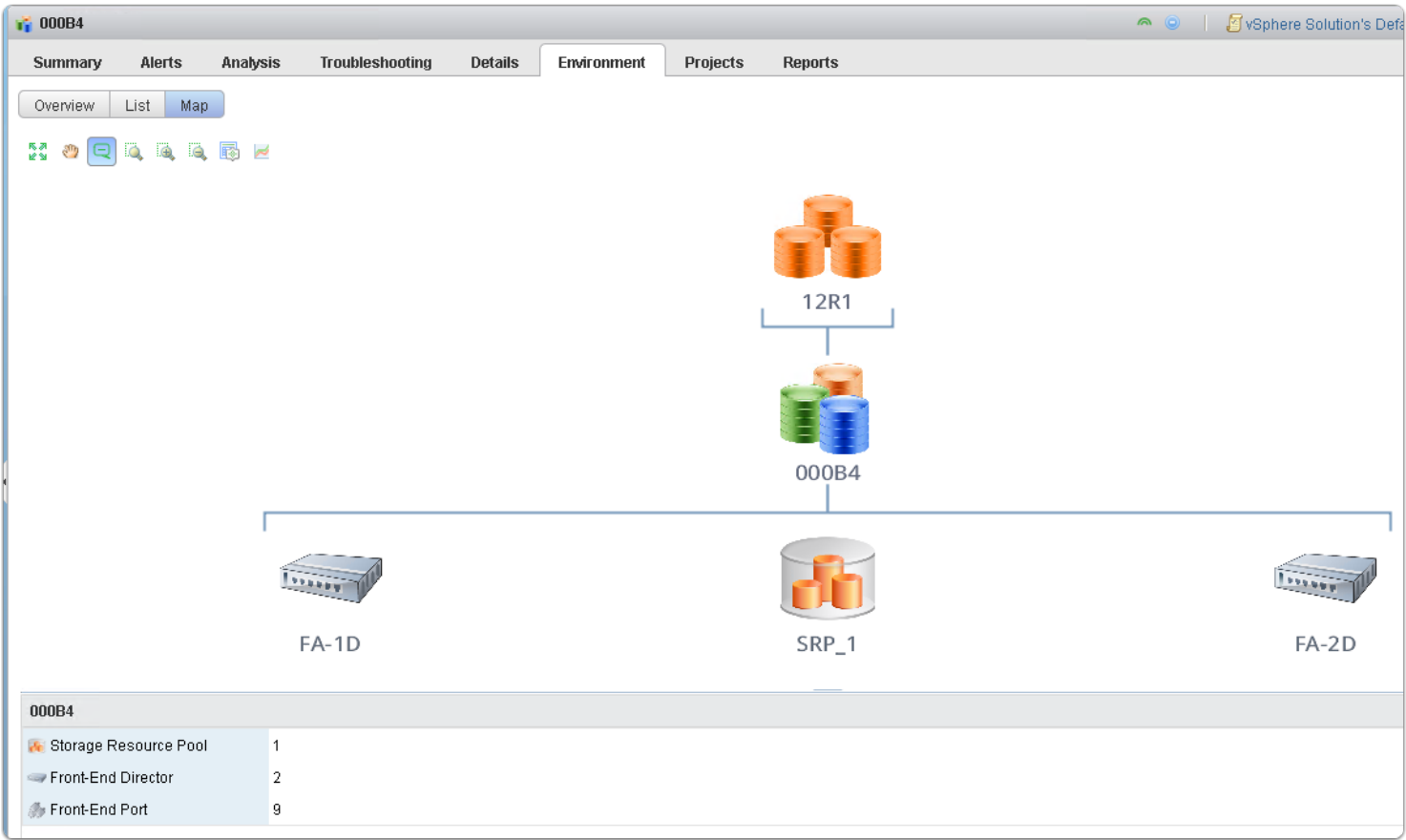
Finally select the **Map** view. This is the icon view and graphically demonstrates the topology. Note that this view is based on the last object selected in the Overview view.

If you changed from the device selection, your map may appear different than below. If you double-click on one of the objects in this view, you can traverse up and down the relationships seen in the next step.



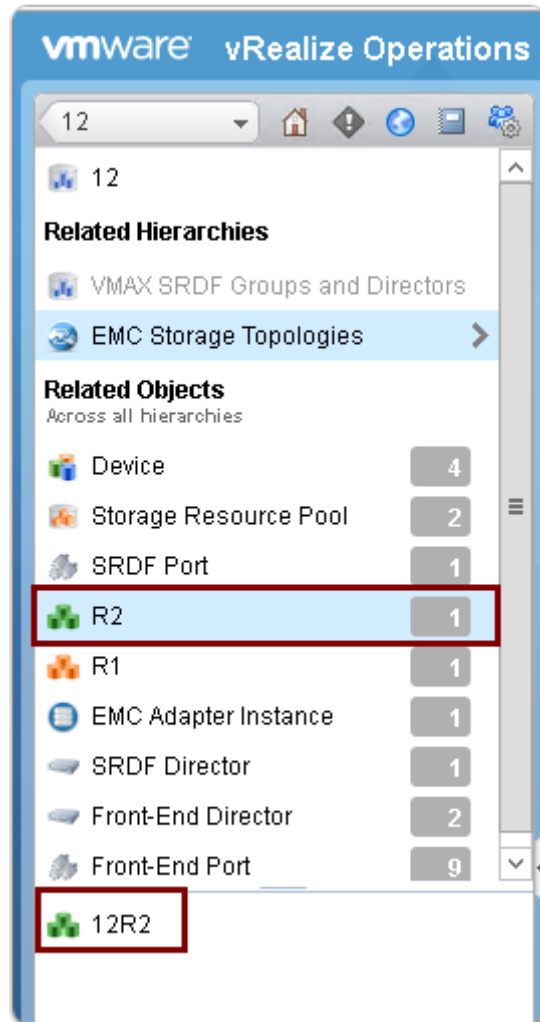
Map traverse

By focusing on a device, the parents and children are revealed.



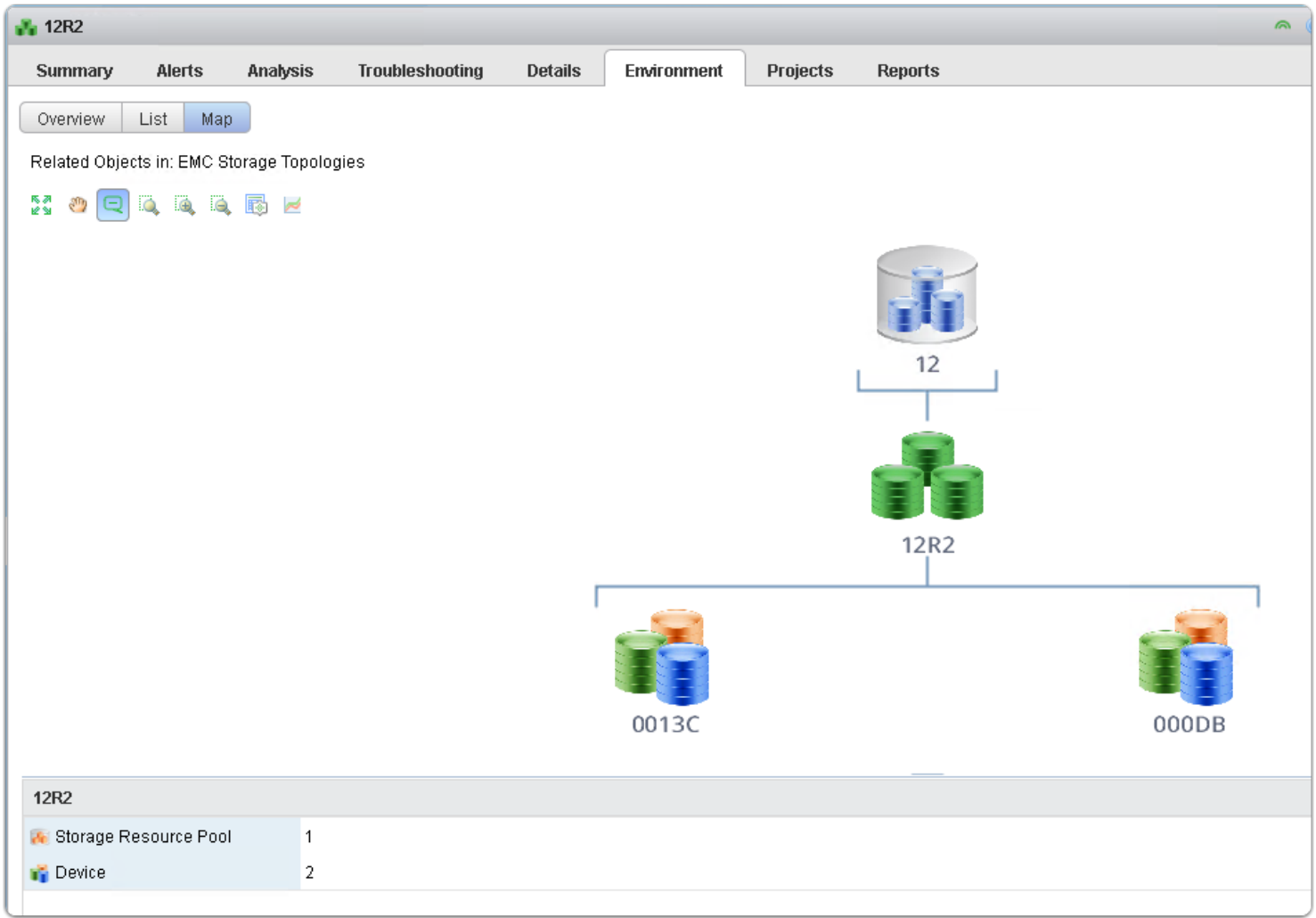
R2 group

Now on the left hand side panel, now select the R2 group and then the 12R2 object.



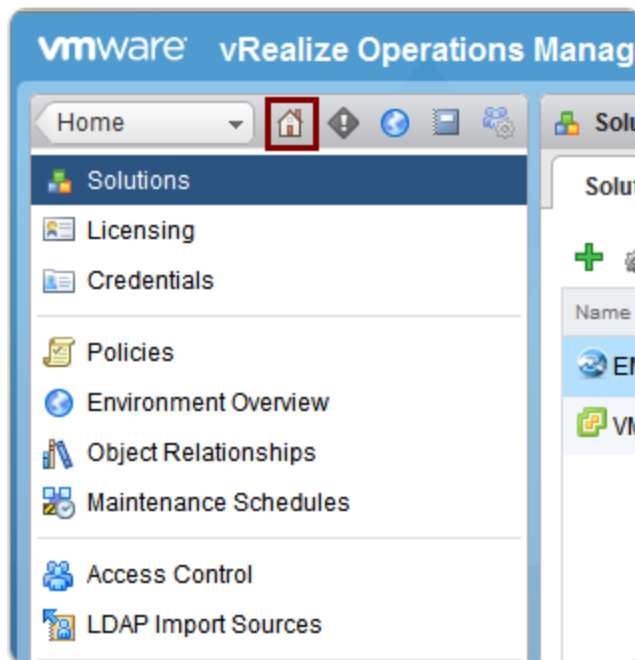
R2 group map

With the 12R2 object highlighted, the map will show the two devices which are in the SRDF relationship. In this way you can see relationships across arrays.



Home

Return to the dashboard screen by selecting the Home icon at the top of the screen.



Summary

SRDF is VMAX's enterprise replication software enabling customers to replicate their critical infrastructure and safeguard against disaster. This lab provided you with a broad look at the different views available for SRDF in ESA. Being able to view multiple arrays through a single topology provides a better understanding of the overall environment and makes it easier for the VMware administrator to manage both production and DR. And if a failover occurs, ESA is able to update the topology to ensure the new production environment is recognized properly now as the R1 or primary devices in such views as the Inventory Trees.

Conclusion

Conclusion

Nicely done! You were able to obtain a firm understanding of EMC Storage Analytics (ESA). The following tasks were performed:

- Added and removed an adapter instance
- Navigated the eNAS topology, investigating this feature of the VMAX3
- Learned how to view and modify alerts
- Explored the VMAX custom dashboards
- Learned how capacity analysis works in vROps
- Navigated SRDF inventory trees and groups

In environments where you want to integrate VMAX arrays in your VMware virtual infrastructure, ESA allows administrators to increase visibility across the virtual to storage infrastructure. You are provided health alerts and health scores to help identify when mission critical resources are at risk of reaching capacity in the future.

Furthermore, ESA helps to build a stronger relationship between the VMware and Storage administrators.