



EMC[®] Storage Analytics

Version 2.1

Installation and User Guide

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CHAPTER 1

Introduction

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Overview

VMware® vCenter Operations Manager 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.

vCenter Operations Manager presents data and analysis in several ways:

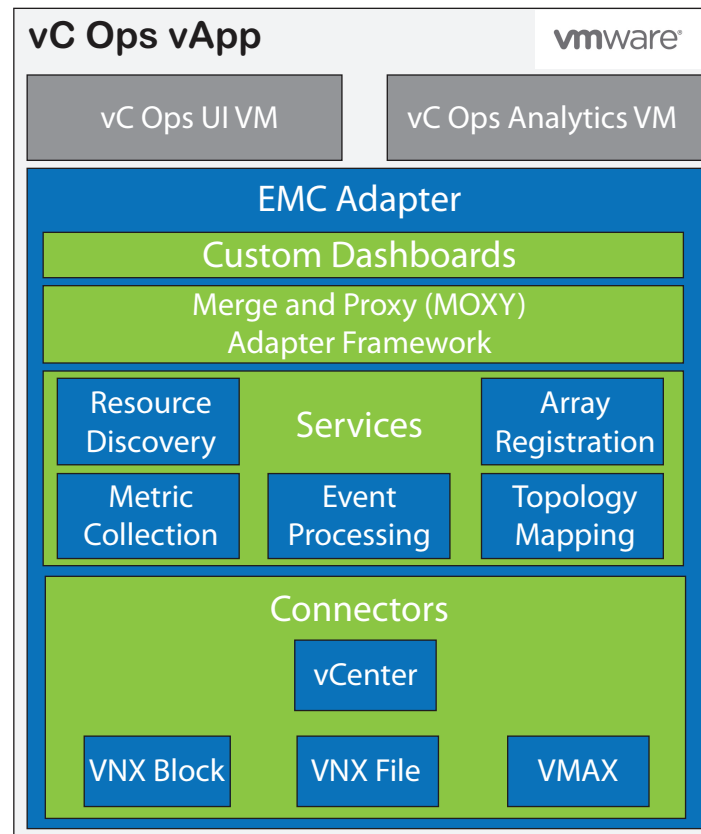
- ◆ Through alerts that warn of potential or occurring problems.
- ◆ In configurable dashboards and predefined pages that show commonly needed information.
- ◆ In predefined reports.

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

The connector types are shown in [Figure 1 on page 10](#).

EMC Storage Analytics leverages the power of existing vCenter features to aggregate data from multiple sources and process the data with proprietary analytic algorithms.

Figure 1 EMC adapter architecture



References

This topic provides a list of vCenter Operations Manager documentation.

VMware vCenter Operations Manager documentation includes:

- ◆ *vCenter Operations Manager Release Notes* . Contains descriptions of known issues and workarounds.
- ◆ *vCenter Operations Manager vApp Deployment and Configuration Guide* . Explains installation, deployment, and management of vCenter Operations Manager.
- ◆ *vCenter Operations Manager Getting Started Guide*. Explains basic features and use of vCenter Operations Manager.
- ◆ *vCenter Operations Manager Administration Guide*. Describes how to configure and manage the vCenter Operations Manager custom interface.
- ◆ *vCenter Operations Manager Adapter Guide* . Provides information on how vCenter Operations Manager uses adapters to consume data from the enterprise.

VMware documentation is available at <http://www.vmware.com/support/pubs>.

Terminology

This topic contains a list of commonly used terms.

adapter

A vCenter 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 vCenter Operations Manager server to enable creation of adapter instances within vCenter 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 vCenter Operations Manager GUI. vCenter 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. vCenter 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.

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 your environment for which vCenter 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.

CHAPTER 2

Installation and licensing

This chapter contains the following topics.

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Installation overview

EMC Storage Analytics 2.1 consists of two installation packages.

The two packages are:

- ◆ vCenter Operations Manager for EMC Storage
- ◆ EMC Adapter

vCenter Operations Manager for EMC Storage is a storage only version of vCenter Operations Manager 5.8 developed specifically for EMC storage customers. Installation instructions are in the *vCenter Operations Manager vApp Deployment and Configuration Guide* at <http://www.vmware.com/support/pubs/vcops-pubs.html>.

Licensing depends on which version of the vCenter Operations Manager you have installed:

- ◆ VMware issues the license for vCenter Operations Manager Advanced and Enterprise versions.
- ◆ EMC issues the license for vCenter Operations Manager for EMC Storage.

NOTICE

If you have vCenter Operations Manager Advanced or Enterprise versions with a VMware-issued license, do not install the EMC-issued license for vCenter Operations Manager; installing the EMC-issued license restricts vCenter Operations Manager to storage-only mode.

A 90-day trial license is available with EMC Storage Analytics 2.1 for all supported products. The 90-day trial license provides the same features as a permanent license, but after 90 days of usage, the adapter stops collecting data. You can add a permanent license at any time.

The EMC Adapter collects metrics from resources. It supports vCenter Operations Manager for EMC Storage and the VMware vCenter Operations Manager Advanced and Enterprise versions. EMC Adapter 2.1 supports vCenter Operations Manager versions 5.7.1 and higher.

The adapter installation includes:

- ◆ Installing the adapter and dashboards.
- ◆ Configuring the adapter instances with licensing.

[Installing the EMC Adapter and dashboards on page 20](#) provides installation instructions. The adapter is licensed when [Adding EMC Adapter instances for your storage system on page 24](#) or [Editing EMC Adapter instances for your storage system on page 27](#).

[Table 1 on page 15](#) lists the installation and upgrade options for different vCenter Operations Manager and the EMC Adapter combinations. To perform an installation or upgrade, refer to the instructions for the task that matches your objective.

Table 1 Installation and Upgrade options

Task	Instructions
Install VMware vCenter Operations Manager 5.8 with EMC Adapter 2.1.	<ul style="list-style-type: none"> • <i>vCenter Operations Manager vApp Deployment and Configuration Guide</i> at http://www.vmware.com/support/pubs/vcops-pubs.html • Installing the EMC Adapter and dashboards on page 20 • Adding EMC Adapter instances for your storage system on page 24
Upgrade EMC Adapter 2.0 to EMC Storage Analytics 2.1 on a system running VMware vCenter Operations Manager 5.7.1 or later.	<ul style="list-style-type: none"> • Installing the EMC Adapter and dashboards on page 20 • Editing EMC Adapter instances for your storage system on page 27
Install EMC Adapter 2.1 on a system running VMware vCenter Operations Manager 5.8.	<ul style="list-style-type: none"> • Installing the EMC Adapter and dashboards on page 20 • Adding EMC Adapter instances for your storage system on page 24
Install vCenter Operations Manager for EMC Storage and EMC Adapter 2.1.	<ul style="list-style-type: none"> • Installing vCenter Operations Manager for EMC Storage on page 19 • Installing the EMC Adapter and dashboards on page 20 • Adding EMC Adapter instances for your storage system on page 24

Installation requirements

Before installing the EMC Adapter, verify that hardware and software component compatibility requirements are satisfied.

EMC Adapter requirements

Supported vCenter Operations Manager version

- ◆ vCenter Operations Manager 5.7.1 and higher
- ◆ vCenter Operations Manager for EMC Storage

EMC Storage Analytics requires vCenter Operations Manager Advanced or Enterprise editions. EMC Storage Analytics does not support vCenter Operations Manager Foundation and Standard editions.

Note

vCenter Operations Manager 5.7.1 and higher is supported with EMC Adapter 2.1, but vCenter Operations Manager 5.8 is recommended.

Deploy the vApp for vCenter Operations Manager before installing the EMC Adapter. Check the *vCenter Operations Manager vApp Deployment and Configuration Guide* at <http://www.vmware.com/support/pubs/vcops-pubs.html> for system requirements pertaining to your version of vCenter Operations Manager. The deployment instructions for vCenter Operations Manager 5.8 apply to vCenter Operations Manager for EMC Storage.

Supported VNX series (1st generation)

- ◆ VNX5100
- ◆ VNX5300
- ◆ VNX5500
- ◆ VNX5700
- ◆ VNX7500
- ◆ VG2
- ◆ VG8

Supported VNX series (2nd generation)

- ◆ VNX5200
- ◆ VNX5400
- ◆ VNX5600
- ◆ VNX5800
- ◆ VNX7600
- ◆ VNX8000

Supported CX series

- ◆ CX4-120
- ◆ CX4-240
- ◆ CX4-480
- ◆ CX4-960

Supported NS series

- ◆ NS120
- ◆ NS480
- ◆ NS960

Supported VMAX series

- ◆ VMAX (all models)
- ◆ VMAXe
- ◆ VMAX 10K
- ◆ VMAX 20K
- ◆ VMAX 40K

Supported web browser

- ◆ Internet Explorer 8 or 9.
- ◆ Firefox 10.0 or later.
- ◆ Google Chrome version 19 or later.

VNX Block systems

The EMC Adapter uses `naviseccli` to collect metrics from VNX Block systems. It is bundled into the EMC Adapter install file and is automatically installed along with the adapter. Storage processors require IP addresses that are reachable from the vCenter Operations Manager server. Bidirectional traffic for this connection flows through port 443 (HTTPS). Statistics logging must be enabled on each storage processor (SP) for metric collection (**System > System Properties > Statistics Logging in Unisphere**).

VNX File systems

CLI commands issued on the Control Station direct the EMC Adapter to collect metrics from VNX File systems. The Control Station requires an IP address that is reachable from the vCenter Operations Manager server. Bidirectional ethernet traffic flows through port 22 using Secure Shell (SSH). If you are using the EMC VNX `nas_stig` script for security (`/nas/tools/nas_stig`), do not use root in password credentials. Setting `nas_stig` to ON limits direct access for root accounts, preventing the adapter instance from collecting metrics for VNX File.

SMI-S Provider for VMAX requirements

The EMC SMI-S Provider for VMAX must be on the network and accessible through port 5988 (non-secure port) or port 5989 (secure port) for communication. If the SMI-S Provider is also used for vSphere vStorage API for Storage Awareness (VASA), follow the recommendations in the *SMI-S Provider Release Notes* to increase the number of available connections. The user configured in the EMC Adapter instance and connecting to the SMI-S instance must have the role of monitor or administrator.

VMAX software requirements

VMAX software requirements include Enginuity 5876 or higher and Solutions Enabler 7.6.1 (for SMI-S Provider) or higher.

Minimum OE requirements

Platform	Supported OE versions
VNX 1st generation series	Block: <ul style="list-style-type: none"> R31 - 05.31.000.5.727 and higher R32 - 05.32.000.5.006 and higher File: <ul style="list-style-type: none"> 7.0.546 and higher 7.1.47.5 and higher
VNX 2nd generation series	Block: R33 - 05.33.000.5.015 and higher File: 8.1.0.15 and higher
CX4 series	R30 04.30.000.5.004 and higher
NS series	6.0.40-0 and higher

User accounts

To create an EMC Adapter instance for a storage array, you must have a user account that allows you to connect to the storage array or SMI-S Provider. For example, to add an EMC Adapter for a VNX array, use a global account with operator or administrator role (a local account will not work).

To create an EMC Adapter instance for vCenter (where **Adapter Kind = EMC Adapter** and **Connection Type = VMware vSphere**), you must have an account that allows you access to vCenter and the objects it monitors. In this case, vCenter enforces access credentials (not the EMC Adapter). To create an EMC Adapter instance for vCenter, use, at minimum, an account assigned to the **Read-Only** role at the root of vCenter, and enable propagation of permissions to descendant objects. Depending on the size of the vCenter, wait approximately 30 seconds before testing the EMC Adapter. More information on user accounts and access rights is available in the *vSphere API/SDK Documentation* available at: http://pubs.vmware.com/vsphere-51/index.jsp?topic=%2Fcom.vmware.wssdk.pg.doc%2FPG_Authenticate_Authorize.8.3.html.

DNS configuration

To use the EMC Adapter, the vCenter Operations Manager vApp requires network connectivity to the storage systems to be monitored. DNS must be correctly configured on the vCenter Operations Manager server to enable hostname resolution by the EMC Adapter.

Time zone and synchronization settings

Ensure time synchronization for all EMC Storage Analytics resources by using Network Time Protocol (NTP). Also, set correct time zones for EMC Storage Analytics resources (including the SMI-S Provider if using an adapter for VMAX) and related systems. Failure to observe these practices may affect the collection of performance metrics and topology updates.

Installing vCenter Operations Manager for EMC Storage

If no vApp for vCenter Operations Manager is deployed, install the vCenter Operations Manager for EMC Storage.

Before you begin

Pre-requisites:

- ◆ Obtain the OVA installation package for vCenter Operations Manager 5.8 from VMware or vCenter Operations Manager for EMC Storage.
- ◆ Obtain a vCenter Operations Manager for EMC Storage license key.
- ◆ Obtain a copy of the *vCenter Operations Manager vApp Deployment and Configuration Guide* at <http://www.vmware.com/support/pubs/vcops-pubs.html>.

To deploy the vApp for vCenter Operations Manager, refer to the *vCenter Operations Manager vApp Deployment and Configuration Guide*.

Procedure

1. Review the System Requirements.
2. Follow instructions in Installing vCenter Operations Manager.

When assigning the vCenter Operations Manager license, type the vCenter Operations Manager for EMC Storage license from the EMC Storage Analytics Software Key Card.

3. Conclude the installation with Verifying the vCenter Operations Manager Installation.

Installing the EMC Adapter and dashboards

Before you begin

Pre-requisites: Obtain the PAK file for the EMC Adapter.

Note

If using Internet Explorer, the installation file downloads as a ZIP file but functions the same way as the PAK file.

WARNING

Upgrading EMC Storage Analytics overwrites the standard dashboards. To customize a standard dashboard, clone it, rename it, and then customize it.

To install the adapter and dashboards:

Procedure

1. Save the PAK file in a temporary folder.
2. Start the vCenter Operations Manager administrative user interface in your web browser and log in as administrator.

For example, **`http://<vCOPs_ip_address>/admin`**

3. On the **Update** tab, click **Browse** to locate the adapter PAK file.
4. Click **Update**.

The status of the update process appears in the bottom pane.

Note

Installation of the PAK file can take several minutes or longer depending on the amount of metric data that already exists in the vCenter Operations Manager database. The vCenter Operations Manager will restart services following installation of the PAK file.

Adapter instances

The vCenter Operations Manager requires an adapter instance for each resource to be monitored. The instance specifies the type of adapter to use and the information needed to identify and access the resource.

With EMC Storage Analytics, the vCenter Operations Manager uses EMC Adapter instances to identify and access the resources, such as:

- ◆ Adapter instance for vCenter
- ◆ Adapter instance for the VNX File
- ◆ Adapter instance for the VNX Block
- ◆ Adapter instance for VMAX

The adapter instance for vCenter is a prerequisite for other adapter instances. If this adapter is not configured, other adapter instances will function normally but will not display visible connections between the VMware objects and the array objects.

Note

After adapter instances are created, the vCenter Operations Manager Collector requires several minutes to collect statistics, depending on the size of the storage array configuration. Large configurations can take up to 45 minutes to collect metrics and resources and update dashboards. This is a one-time event; future statistical collections run quickly.

Adding an EMC Adapter instance for vCenter

For users to traverse health trees from the virtual environment into the storage environment, EMC Storage Analytics requires you to install an EMC Adapter instance for vCenter. All storage system adapter instances require the EMC Adapter instance for vCenter, which you must add first.

To add an EMC Adapter instance for vCenter:

Procedure

1. Start the vCenter Operations Manager custom user interface and log in as admin.
For example in a web browser, type: **http://<vCOPs_ip_address>/vcops-custom**
2. Select **Environment > Configuration > Adapter Instances**.
3. Click the **Add New Adapter Instance** icon.

The **Add Adapter Instance** screen appears.

4. Set the following:

Collector	vCenter Operations Standard Server
Adapter Kind	EMC Adapter
Adapter Instance Name	Any descriptive name. For example, My vCenter .
Management IP	IP address of the vCenter server.
Array ID (optional)	This field must be blank for VMware vSphere connection type.
Connection Type	VMware vSphere

License (optional)	Leave blank. Not applicable for EMC Adapter instance for vCenter.
Log Level	<p>Configure log levels for each adapter instance. The four levels for logging information are ERROR, WARN, INFO, and DEBUG.</p> <p>ERROR The ERROR level logs only error conditions. The ERROR level provides the smallest amount of logging information.</p> <p>WARN The WARN level logs information when an operation completes successfully but there are issues with the operation.</p> <p>INFO The INFO level logs information about workflow. It describes how an operation occurs.</p> <p>DEBUG The DEBUG level logs all details related to an operation. This level is the highest level of logging. If logging is set to DEBUG, all other levels of logging information are displayed in the log file.</p>
Credential	Select any previously defined credentials for this storage system, otherwise click Add .

The **Add Credential** screen appears with the Adapter Kind set to `EMC Adapter`.

5. Set the following:

Credential kind	Password Credentials
Instance name	Any descriptive name. For example, My VMware Credentials .
Username	<p>Username that EMC Storage Analytics uses to connect to the VMware vCenter system.</p> <p>If a domain user is used, the format for the username is DOMAIN\USERNAME.</p>
Password	Password for the EMC Storage Analytics username on the VMware vCenter system.

6. Click **OK**.

The **Add Adapter Instance** screen reappears.

7. To test the adapter instance, click **Test**.

If the connection is correctly configured, a confirmation box appears.

8. Click **OK**.

The new adapter instance polls for data every 5 minutes by default. At every interval, the adapter instance will collect information about the VMware vSphere datastore and virtual machines with Raw Device Mapping (RDM). Consumers of the registered VMware service can access the mapping information.

To edit the polling interval, select **Environment > Environment Overview > Resource Kinds > EMC Adapter Instance > All Attributes**. Select the EMC Adapter instance and click the **Edit Resource** icon.

Adding EMC Adapter instances for your storage system

Before you begin

Pre-requisites:

- ◆ Install the EMC Adapter for vCenter
- ◆ Obtain the adapter license key for your storage system

Each storage system requires an adapter instance. All storage system adapter instances require the EMC Adapter instance for vCenter. Add the EMC Adapter instance for vCenter first. Then add the adapter instances for each storage system. Adapter instances are licensed per array.

Note

A VNX Unified array can use the same license for VNX File and VNX Block.

Procedure




1. Start the vCenter Operations Manager custom user interface and log in as administrator.

For example in a web browser, type: **http://<vCOPs_ip_address>/vcops-custom**

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

The **Manage Adapter Instances** screen appears.

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

Manage Adapter Instances	
Name	
Collector	-Please Select-
Adapter Kind	-Please Select-
Adapter Instances	
<div>    </div>	
Name	Collector
Http Post (vCenter Operations Standard Server)	vCenter Operations Standard Server
Container	vCenter Operations Standard Server

The **Add Adapter Instance** screen appears.

4. Set the following:

Field	Value to enter
Collector	vCenter Operations Standard Server
Adapter Kind	EMC Adapter
Adapter Instance Name	Any descriptive name. For example, My Storage System or the array ID.
License (optional)	License key required for the array. Verify that the license is for the array you want to monitor.
Log Level	<p>Configure log levels for each adapter instance. The four levels for logging information are ERROR, WARN, INFO, and DEBUG.</p> <p>ERROR The ERROR level logs only error conditions. The ERROR level provides the smallest amount of logging information.</p> <p>WARN The WARN level logs information when an operation completes successfully but there are issues with the operation.</p> <p>INFO The INFO level logs information about workflow. It describes how an operation occurs.</p> <p>DEBUG The DEBUG level logs all details related to an operation. This level is the highest level of logging. If logging is set to DEBUG, all other levels of logging information are displayed in the log file.</p>
Credential	Select any previously defined credentials for this storage system, otherwise, click Add .

Field	VNX Block	VNX File	VMAX
Management IP	Use the IP address of one Storage Processor (SP) in a single array. Do not add an adapter instance for each SP.	Use the IP address of the primary Control Station.	Use the IP address of the configured SMI-S Provider.
Array ID (optional)	Not applicable	Not applicable	Required with prefixed zeros. Example: 000195901003
Connection Type	VNX Block (use for VNX Block and CX4 arrays)	VNX File (use for VNX File/Unified models, VG gateways, and NS models)	VMAX (use for VMAX models)

The **Add Credential** screen appears with the Adapter Kind set to **EMC Adapter**.

5. Set the following:

Field	Value to enter
Adapter kind	EMC Adapter. Retain the setting.
Credential kind	Password Credentials.
Instance name	Any descriptive name. For example, Default Credentials .
Username	Username that EMC Storage Analytics uses to connect to the storage system. <ul style="list-style-type: none"> For VNX File, use the credentials of the Control Station. For VNX Block, use the credentials of the Storage Processors. For VMAX, use the credentials of an ECOM user with monitor or administrator privileges. The default user/password combination is admin/#1Password.
Password	Password for the EMC Storage Analytics username on the storage system.

6. Click **OK**.

The **Add Adapter Instance** screen reappears.

The screenshot shows the 'Add Adapter Instance' dialog box with the following configuration:

- Collector: vCenter Operations Standard Server
- Adapter Kind: EMC Adapter
- Adapter Instance Name: (empty)
- Management IP: (empty)
- Array ID (optional): (empty)
- Connection Type: VNX Block
- License (optional): (empty)
- Log Level: ERROR
- Credential: -Please Select--

Buttons at the bottom: Test, OK, Cancel.

7. Click **Test** to validate the values you entered.

If the adapter instance is correctly configured, a confirmation box appears.

NOTICE

Testing an adapter instance validates the values you entered. Failure to do this step causes the adapter instance to change to the red (warning) state if you enter invalid values and do not validate them.

8. To finish adding the adapter instance, click **OK**.

Editing EMC Adapter instances for your storage system

Before you begin

Pre-requisites:

- ◆ Install the EMC Adapter
- ◆ Configure the EMC Adapter instance for your storage system
- ◆ Obtain an adapter license key for your storage system

The EMC Adapter instances for storage systems require licenses. Adapter instances are licensed per storage array. A VNX Unified array can use the same license for VNX File and VNX Block.

Procedure

1. Start the vCenter Operations Manager custom user interface and log in as administrator.

For example in a web browser, type: `http://<vCOPs_ip_address>/vcops-custom`

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

The **Manage Adapter Instances** screen appears.

3. Select the row of an EMC Adapter instance (**Adapter Kind** is **EMC Adapter**), and click the **Edit Selected Adapter Instance** icon.



Adapter Instances		
Name	Collector	Adapter Kind
939612E2-E9F5-4A76-A550-F6F5164601B8-vin	vCenter Operations Standard Server	Infrastructure Navigator Adapter
PISA QA vCenter	vCenter Operations Standard Server	VMware Adapter
QA vCenter	vCenter Operations Standard Server	VMware Adapter
QA vCenter 2	vCenter Operations Standard Server	VMware Adapter
CIQAdapter (vCenter Operations Standard Server)	vCenter Operations Standard Server	CIQAdapter
VNX2 Block	vCenter Operations Standard Server	EMC Adapter

The **Edit Adapter Instance** screen appears.

4. Add the license from the EMC Storage Analytics Software Key Card. The EMC Adapter instance license key is issued for the storage system. Verify that the Management IP is for the same array model specified on the key card.

The screenshot shows the 'Edit Adapter Instance' dialog box with the following configuration:

Field	Value
Collector	vCenter Operations Standard Server
Adapter Kind	EMC Adapter
Adapter Instance Name	VNX2 Block
Management IP	10.245.17.199
Array ID (optional)	
Connection Type	VNX Block
License (optional)	
Log Level	DEBUG
Credential	Default VNX Block Credentials

Buttons: Test, OK, Cancel

5. To test the configuration, click **Test**.
If the adapter instance is correctly configured, a confirmation box appears.
6. To finish editing the adapter instance, click **OK**.

CHAPTER 3

EMC Storage Analytics Dashboards

This chapter contains the following topics.

- ◆ [Topology mapping](#).....30
- ◆ [EMC dashboards](#)..... 35

Topology mapping

Topology mapping is viewed and traversed graphically using vCenter Operations Manager health trees. The dashboards developed for EMC Storage Analytics utilize topology mapping to display resources and metrics.

EMC Storage Analytics establishes mappings between:

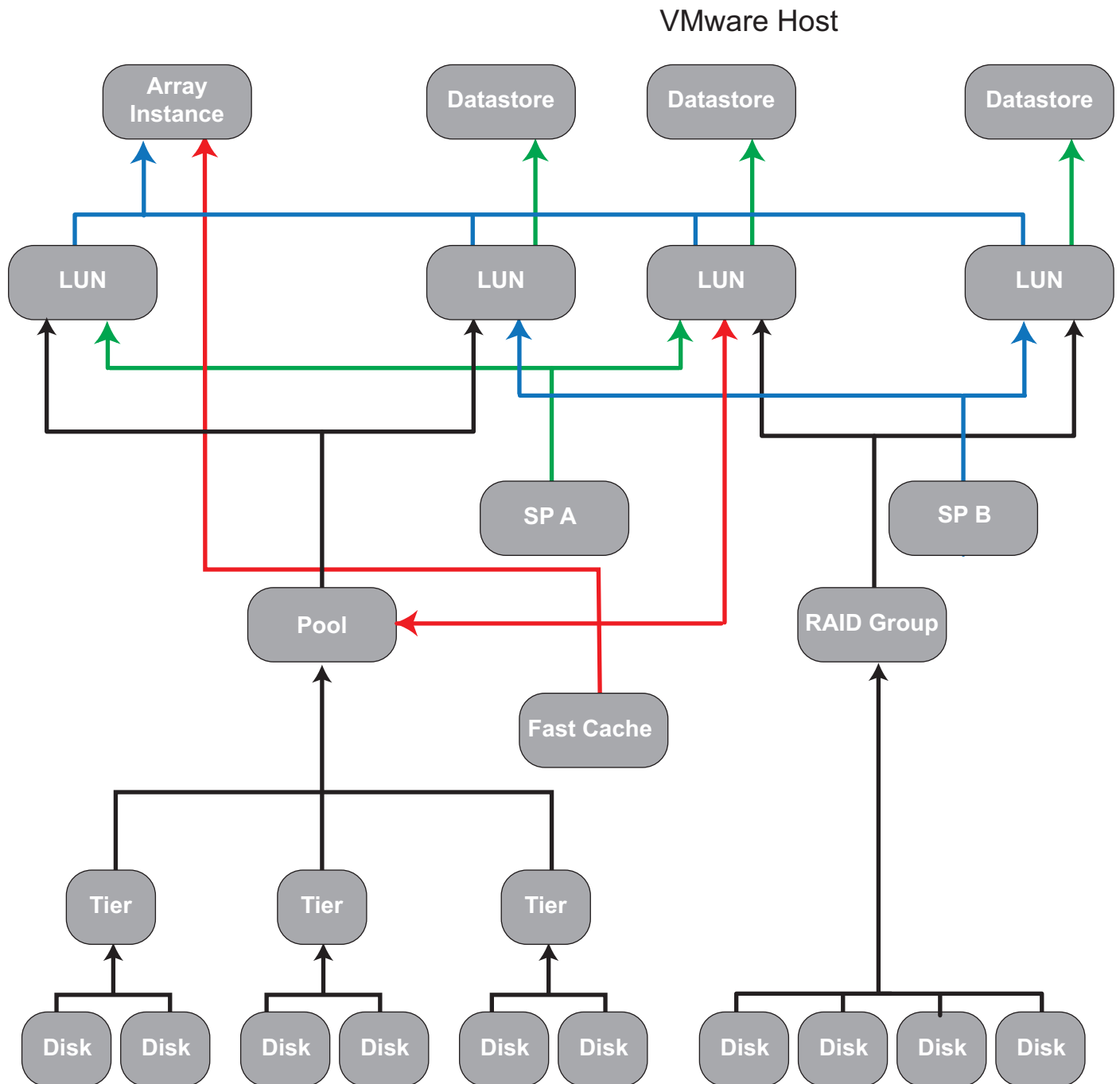
- ◆ Storage system components
- ◆ Storage system objects and vCenter objects

Topology mapping enables health scores and alerts from storage system components, such as storage processors and disks, to appear on affected vCenter objects, such as LUNs, datastores, and VMs. Topology mapping between storage system objects and vCenter objects uses a vCenter adapter instance.

VNX Block topology

EMC Storage Analytics implements the following topology for VNX Block.

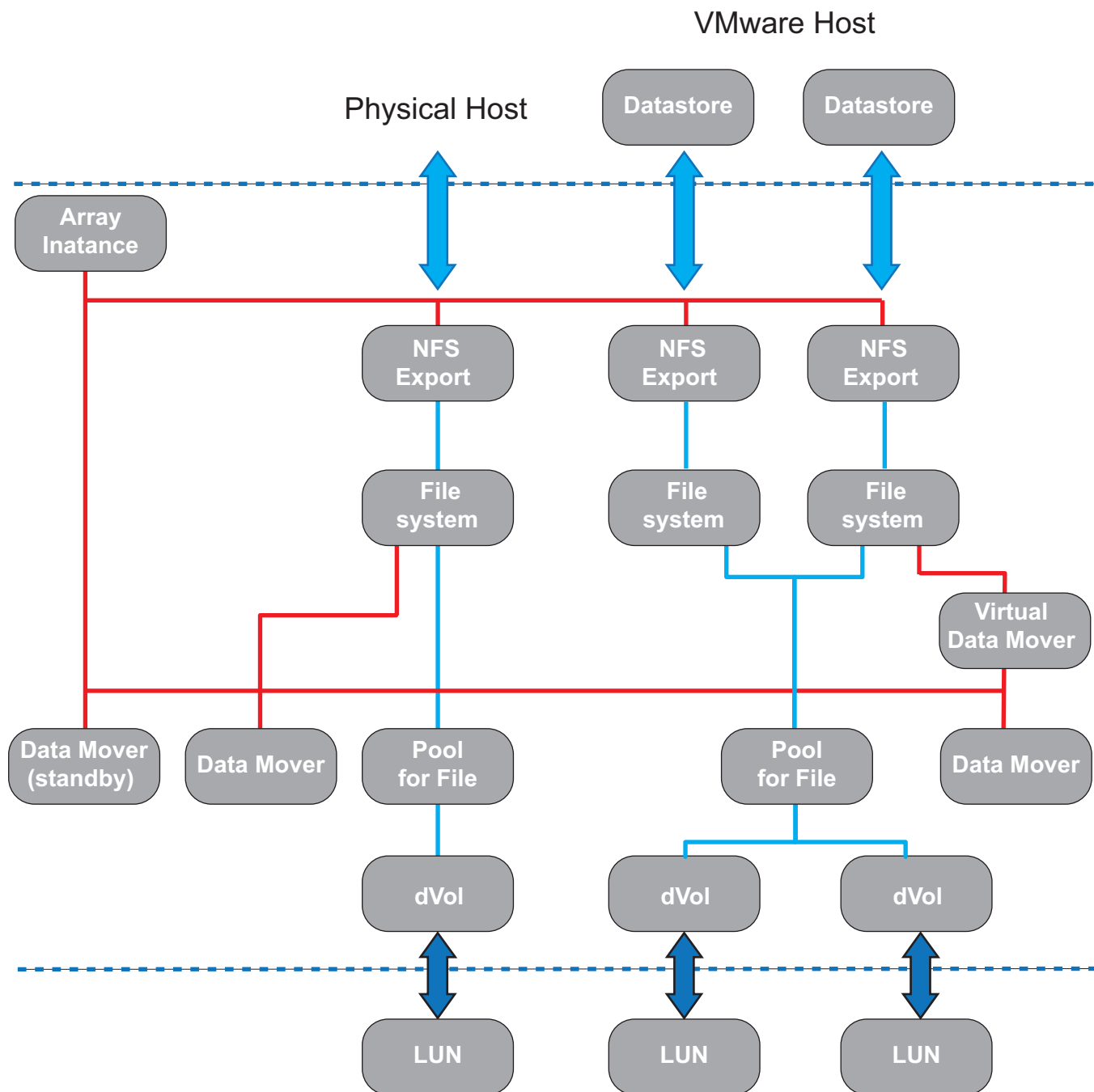
Figure 2 VNX Block topology



VNX File topology

EMC Storage Analytics implements the following topology for VNX File.

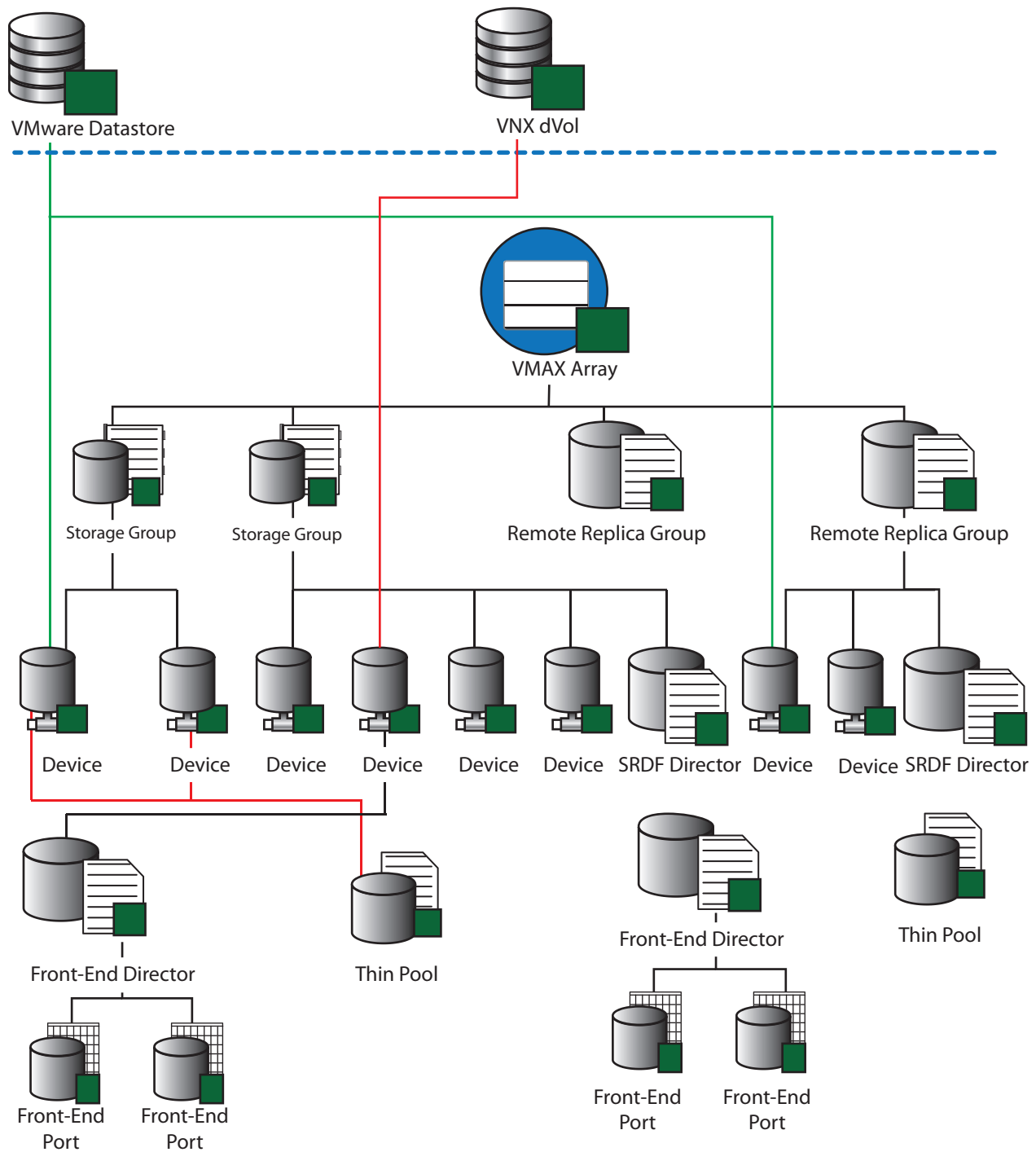
Figure 3 VNX File topology



VMAX topology

EMC Storage Analytics implements the following topology for VMAX.

Figure 4 VMAX topology



VMAX topology rules

The following rules govern how objects are displayed in the VMAX topology dashboard and which metrics are collected for them.

- ◆ vCenter Operations Manager does not display devices that are unmapped and unbound.
- ◆ vCenter Operations Manager does not display devices that are mapped and bound but unused by VMware or VNX. Performance metrics for these devices are aggregated into the parent Storage Group performance metrics.
- ◆ If the corresponding EMC vSphere adapter instance is running on the same vCenter Operations Manager appliance, then the vCenter Operations Manager displays devices that are mapped, bound, and used by VMware datastores or RDMS.
- ◆ If the corresponding EMC VNX File adapter instance is running on the same vCenter Operations Manager appliance, then the vCenter Operations Manager displays devices that are mapped, bound, and used by VNX File Disk Volumes.
- ◆ vCenter Operations Manager does not display Storage Groups with unmapped and unbound devices.
- ◆ vCenter Operations Manager displays Storage Groups that contain mapped and bound devices, and their metrics are aggregates of the member devices.

EMC dashboards

Use dashboards to view metrics.

The standard dashboards are delivered as templates - if a dashboard is accidentally deleted or changed, you can generate a new one. EMC Storage Analytics includes these EMC dashboards:

- ◆ Storage Topology
- ◆ Storage Metrics
- ◆ VNX Overview
- ◆ VMAX Overview
- ◆ Topology dashboards
- ◆ Metrics dashboards
- ◆ Top-N dashboards

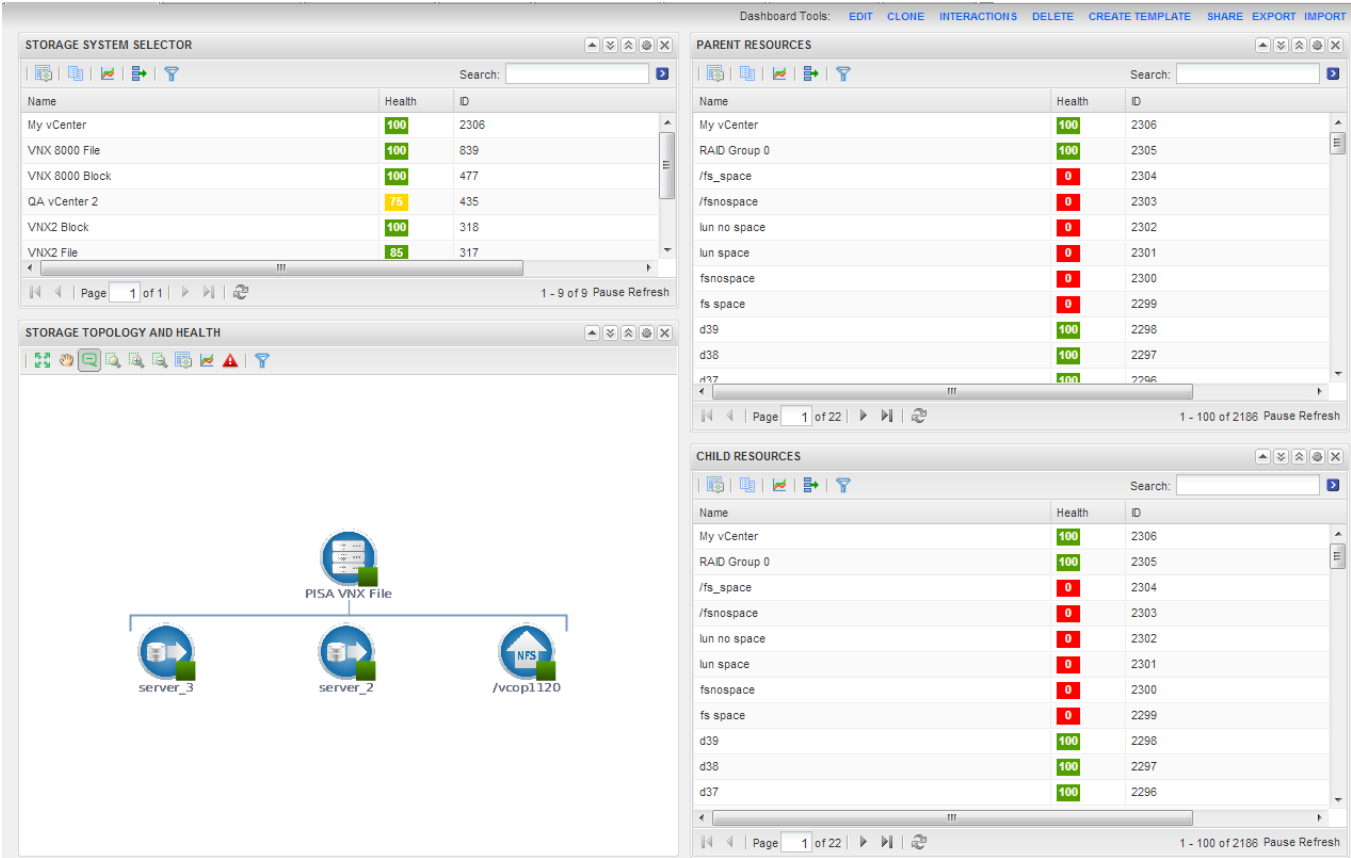
You can use the standard vCenter Operations Manager dashboard customization features to create additional dashboards that are based on your site requirements.

Storage Topology dashboard

The Storage Topology dashboard provides an entry point for viewing resources and relationships between storage and virtual infrastructure objects.

Click the Storage Topology tab. Details for every object in every widget are available by selecting the object and clicking the **Resource Detail** icon at the top of each widget circled in red in [Figure 5 on page 36](#).

Figure 5 Storage Topology dashboard



The Storage Topology dashboard contains the following widgets:

Storage System Selector

This Resource widget filters the EMC Adapter instances that are found in each storage system. To populate the Storage Topology and Health widget, select an instance name.

Storage Topology and Health

This **Health Tree** widget provides a navigable visualization of resources and virtual infrastructure resources. Single-click to select resources, or double-click to change the navigation focus. To populate the **Parent Resources** and **Child Resources** widgets, select a resource in this widget.

Parent resources

This widget lists the parent resources of the resource selected in the **Storage Topology and Health** widget.

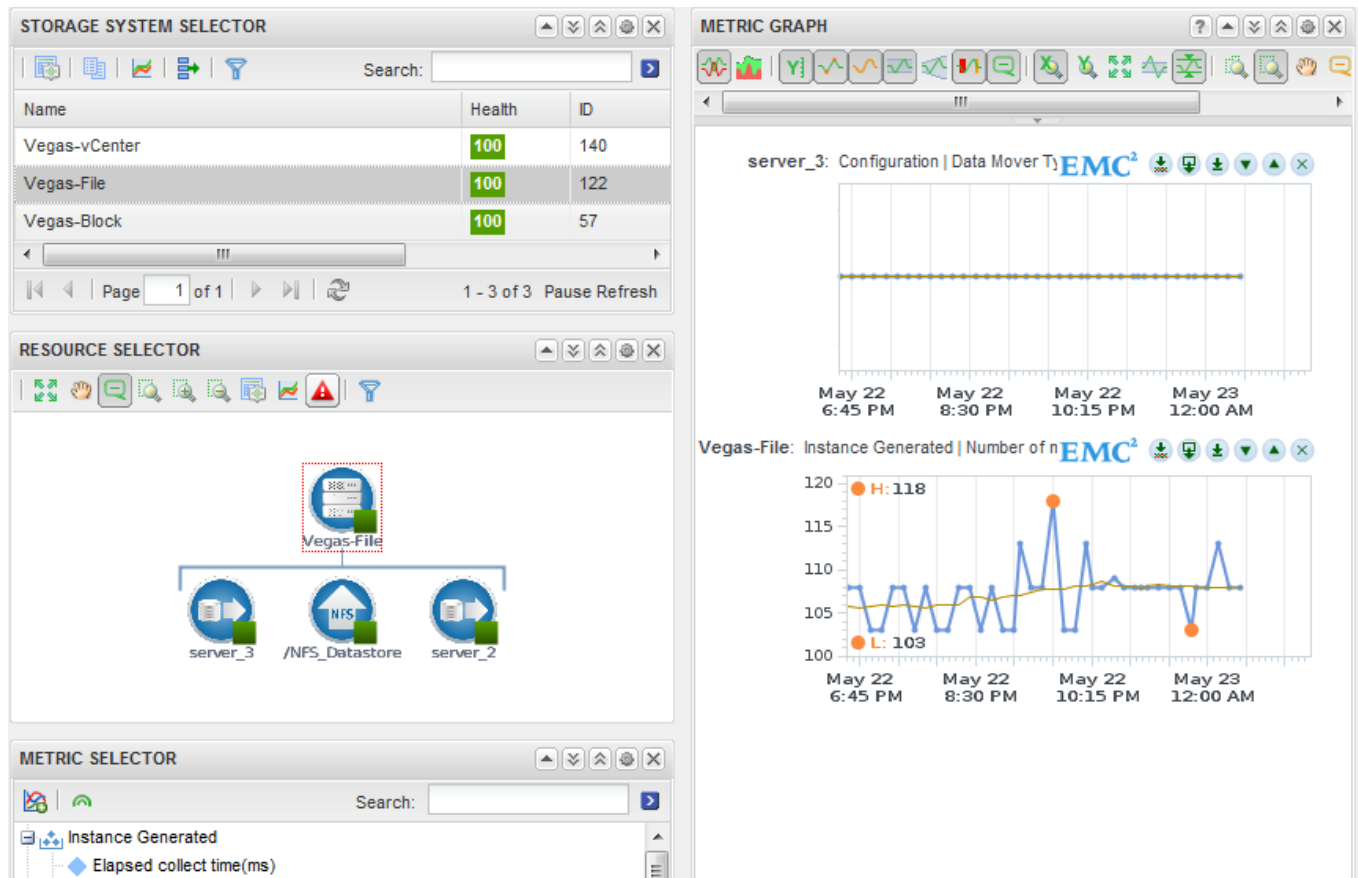
Child resources

This widget lists the child resources of the resource selected in the **Storage Topology and Health** widget.

Storage Metrics dashboard

The Storage Metrics dashboard displays resource and metrics for storage systems and allows the user to view graphs of resource metrics.

Figure 6 Storage Metrics dashboard



The Storage Metrics dashboard contains the following widgets:

Storage System Selector

This Resource widget lists all configured EMC Adapter instances. To populate the **Resource Selector** widget, select an instance name.

Resource Selector

This Health Tree widget lists each resource associated with the adapter instance selected in the **Storage System Selector**. To populate the **Storage System Selector** widget, select a resource.

Metric Selector

This widget lists all the metrics that are collected for the resource selected in the **Resource Selector** widget. The search feature of this widget allows users to locate specific objects. Double-click a metric to create a graph of the metric in the **Metric Graph** widget.

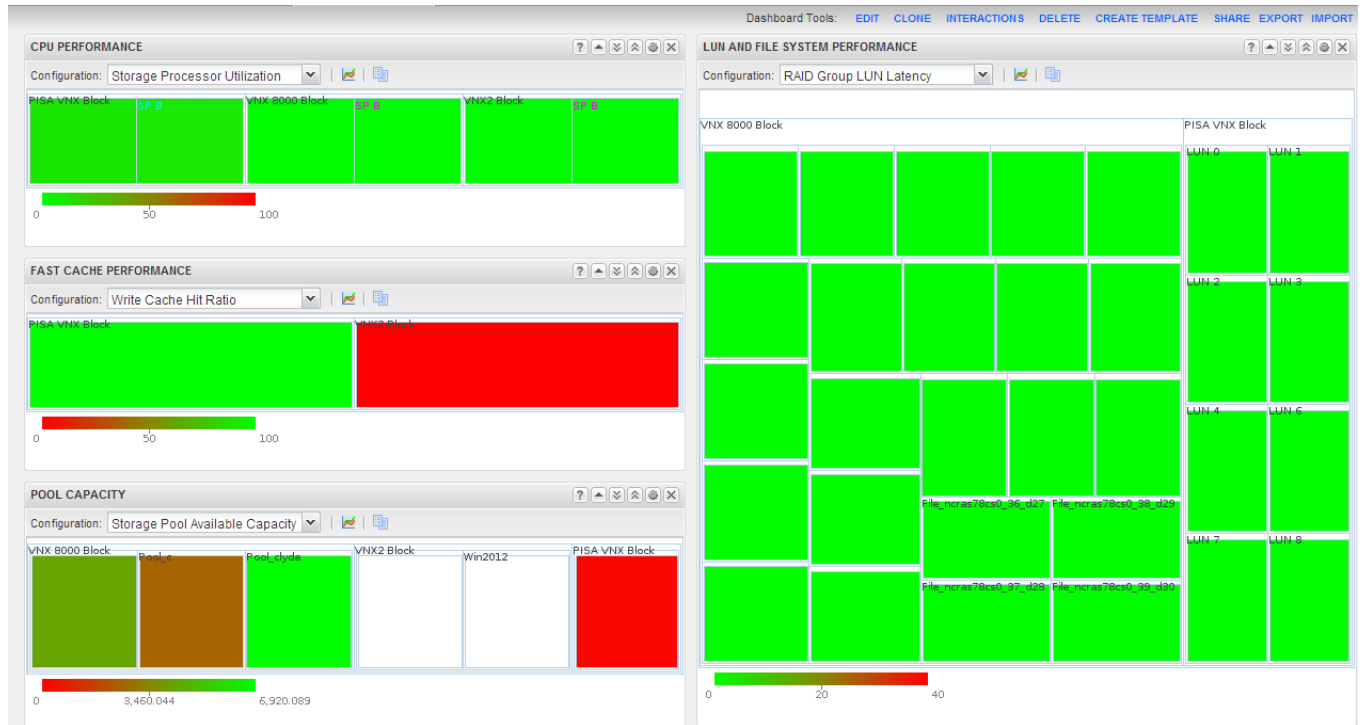
Metric Graph

This widget graphs the metrics selected in the **Metric Selector** widget. Display multiple metrics simultaneously in a single graph or in multiple graphs.

VNX Overview dashboard

This collection of heat maps provides a single view of the performance and capacity for all VNX resources with configured adapter instances. Heat maps on this dashboard group the contents by adapter instance.

Figure 7 VNX Overview dashboard



The VNX Overview dashboard displays the following heat maps:

CPU performance

This displays the CPU Utilization, such as % busy, of each Storage Processor and Data Mover on each configured adapter instance. The color of the heat map entries shows % busy:

- ◆ Green indicates 0% busy.
- ◆ Red indicates 100% busy.

FAST cache performance

This has two modes: Read Hit Ratio and Write Hit Ratio. To select the mode, use the Configuration menu. The Read/Write Cache Hit Ratio (%) is the number of FAST Cache read or write hits divided by the total number of read or write I/Os across all RG LUNs and Pools configured to use FAST Cache. The color of the heat map entries shows hit ratios:

- ◆ Green indicates a high FAST Cache hit ratio.
- ◆ Red indicates a low FAST Cache hit ratio. A low value on an idle array is acceptable.
- ◆ Grey indicates that there is no FAST Cache present on the VNX systems identified by the adapter instances and a Heat Map not configured message appears with the heat map.

Pool capacity

This has four modes: RAID Group Available Capacity, Storage Pool Capacity Utilization, Storage Pool Available Capacity, and File Pool Available Capacity.

In Capacity Utilization mode, the color of the heat map entries shows the value of the % full metric for all non-RAID Group storage pools:

- ◆ Green indicates 0% full.
- ◆ Red indicates 100% full.

In Available Capacity mode, the color of the heap map entries shows the value of the Available Capacity (GB) metric:

- ◆ Green indicates the largest available capacity on any storage pool for any of the configured adapter instances.
- ◆ Red indicates 0 GB available.

LUN and file system performance

This has several modes.

In LUN Utilization mode, the color of the heat map entries show the % busy metric for all LUNs grouped by adapter instance:

- ◆ Green indicates 0% busy.
- ◆ Red indicates 100% busy.

In RAID Group LUN Latency mode, the color of the heat map entries shows the value of the Latency (ms) metric:

- ◆ Green indicates 0 ms latency.
- ◆ Red indicates 20 ms or greater latency and is configurable.

Latency values appear for RAID Group LUNs. Pool LUNS appear in white with no latency values reported.

In LUN Read IOPS mode, the color of the heat map entries shows the relative number of read IO operations per second serviced by the LUN. The color ranges from light green to dark green. Dark green indicates the highest number of read IO operations per second serviced by any LUN listed in the heat map.

In LUN Write IOPS mode, the color of the heat map entries shows the relative number of write IO operations per second serviced by the LUN. The color ranges from light green to dark green. Dark green indicates the highest number of write IO operations per second serviced by any LUN listed in the heat map.

In File System Read IOPS mode, the color of the heat map shows the relative number of read IO operations per second serviced by the file system. The color ranges from light green to dark green. Dark green indicates the highest number of read IO operations per second serviced by any file system listed in the heat map.

In File System Write IOPS mode, the color of the heat map entries shows the relative number of write IO operations per second serviced by the file system. The color ranges from light green to dark green. Dark green indicates the highest number of write IO operations per second serviced by any file system listed in the heat map.

VMAX Overview dashboard

This collection of heat maps provides 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.

Figure 8 VMAX Overview



The VMAX Overview dashboard displays the following heat maps. For each heat map and selected metric, the configured VMAX Adapter is shown:

Thin Pool Usage

This heat map displays the Percent Allocated metric. Percent Allocated displays the allocated capacity in each thin pool. The color of the heat map entries ranges from green to red and corresponds to the percent allocated as follows:

- ◆ Green indicates that 0% of the thin pool is allocated.
- ◆ Yellow indicates that 50% of the thin pool is allocated.
- ◆ Red indicates that 100% of the thin pool is allocated.

Storage Group

This has four modes: Total Reads (IO/s), Total Writes (IO/s), Read Latency (ms), and Write Latency (ms).

Total Reads and Writes represent the aggregate reads or writes for all LUNs in the storage group. Write and Read Latency is the average write or read latency of all LUNs in the storage group.

For Total Reads and Writes, the color of the heat map entries shows the relative number of total reads or writes across all the storage groups. The color ranges from light blue to dark blue. Dark blue indicates the storage group(s) with the highest number of total reads or writes while light blue indicates the lowest. Because the range of values for total reads or writes has no lower or upper limits, the numerical difference between light and dark blue may be very small.

For Write and Read Latency, the color of the heat map entries is based on a scale of latency from 0 to 40ms. This scale is based on average customer requirements and may not represent a customer's particular requirements for latency. In such cases,

EMC recommends adjusting the scale appropriately. The color of the heat map entries ranges from green to red as follows:

- ◆ Green indicates a latency of 0ms.
- ◆ Yellow indicates a latency of 20ms.
- ◆ Red indicates a latency of 40ms.

LUN Performance

This has four modes: Reads (IO/s), Writes (IO/s), Read Latency (ms), and Write Latency (ms).

Reads and Writes represent the total reads or writes for a particular LUN. Read and Write Latency is the average read or write latency of all LUNs in the storage group.

For Reads and Writes the color of the heat map entries shows the relative number of reads or writes across all the LUNs. The color ranges from light blue to dark blue. Dark blue indicates the LUN(s) with the highest number of reads or writes while light blue indicates the lowest. Because the range of values for reads or writes has no lower or upper limits, the numerical difference between light and dark blue may be very small.

For Read and Write Latency the color of the heat map entries ranges from green to red and is based on a scale of latency from 0 to 40ms. This scale is based on average customer requirements and may not represent a customer's particular requirements for latency. In such cases EMC recommends adjusting the scale appropriately. The color of the heat map entries range from green to red as follows:

- ◆ Green indicates a latency of 0ms.
- ◆ Yellow indicates a latency of 20ms.
- ◆ Red indicates a latency of 40ms.

Front End Director

This has two modes: Total Bandwidth (MB/s) and Total Operations (IO/s).

Total Bandwidth is the cumulative amount of data transferred over all ports of the front-end director. Total Operations is the total number of operations taking place over all ports of a front-end director.

The color of the heat map entries is the same for both metrics. It shows the relative total bandwidth or relative total number of operations, depending on the selected metric. The color ranges from light blue to dark blue. Dark blue indicates the front-end director(s) with the highest number of total operations or the greatest total bandwidth, depending on the selected metric. Light blue indicates the lowest number of operations or the least total bandwidth. Because the range of values for operations or bandwidth has no lower or upper limits, the numerical difference between light and dark blue may be very small.

SRDF Director

This has two modes: Total Bandwidth (MB/s) and Total Writes (IO/s).

Total Bandwidth is the cumulative amount of data transferred over an SRDF director. Total Writes is the total number of writes over an SRDF director.

The color of the heat map entries is the same for both metrics. It shows the relative total bandwidth or relative total number of writes, depending on the selected metric. The color ranges from light blue to dark blue. Dark blue indicates the SRDF director(s) with the highest number of total writes or the greatest total bandwidth, depending on the selected metric. Light blue indicates the lowest number of writes or the least total bandwidth. Because the range of values for bandwidth or writes

has no lower or upper limits, the numerical difference between light and dark blue may be very small.

SRDF Groups

This has four modes: Devices in Session (count), Average Cycle Time (ms), Writes (IO/s), and Writes (MB/s).

Devices in Session represents the number of devices in an SRDF session in the SRDF group. The Average Cycle Time is an SRDF/A metric that provides the average elapsed time between data transfer cycles. Writes (IO/s) represents the number of writes per second on the devices in the SRDF group. Writes (MB/s) represents the number of megabytes per second sent from the SRDF group.

The color of the heat map entries is the same for all metrics. It shows the relative devices in session, average cycle time, total bandwidth, or the relative number of writes, depending on the selected metric. The color ranges from light blue to dark blue. Dark blue indicates the SRDF group(s) with the highest number of one of these metrics and light blue indicates the lowest number of one of these metrics. Because the range of values has no lower or upper limits, the numerical difference between light and dark blue may be very small.

Topology dashboards

The topology dashboards provide an entry point for viewing resources and relationships between storage and virtual infrastructure objects for VNX and VMAX adapter instances.

Click the **VNX Topology** or **VMAX Topology** tab, depending on the EMC adapter instance you installed. Details for every object in every widget are available by selecting the object and clicking the **Resource Detail** icon at the top of each widget as shown.

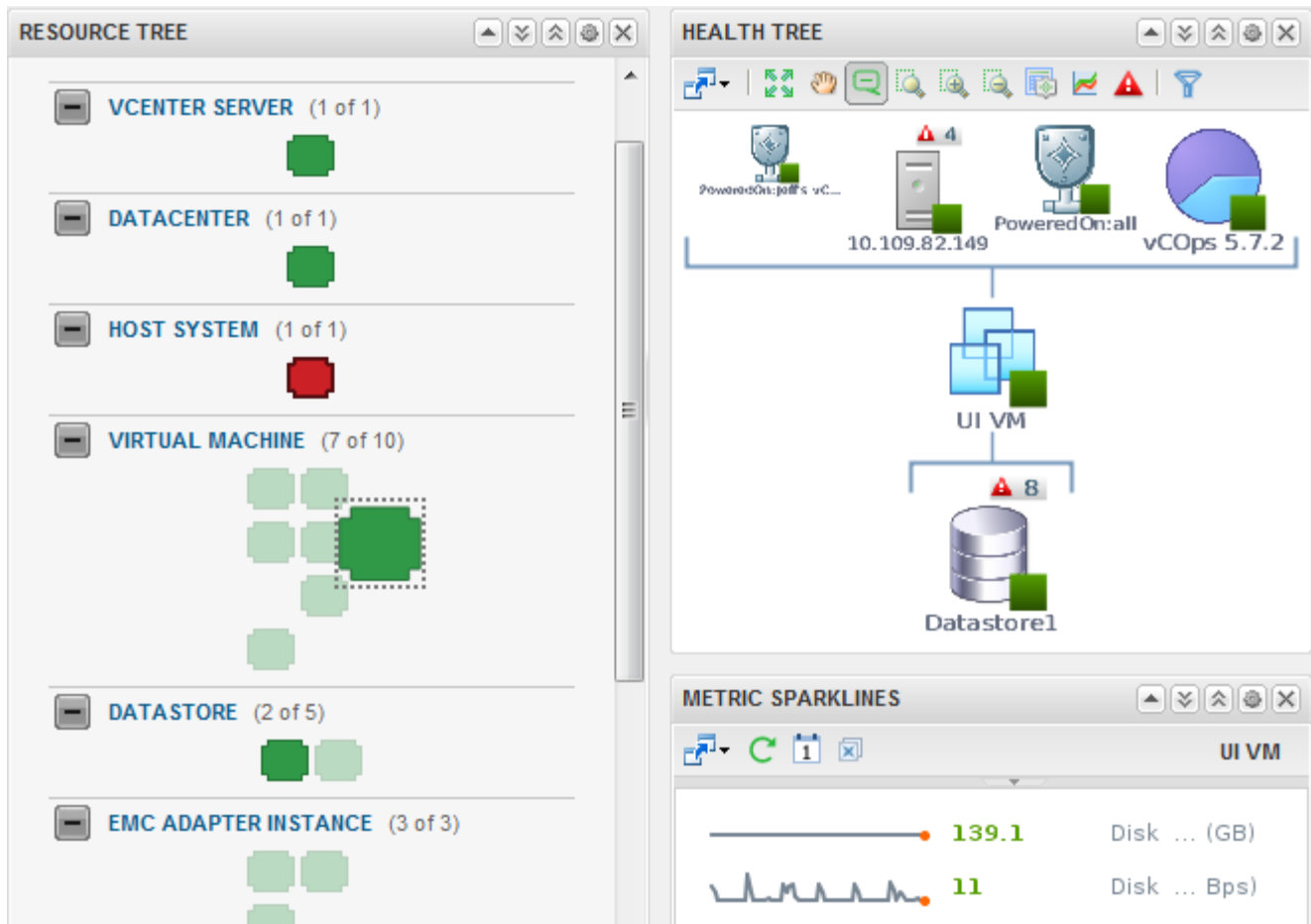
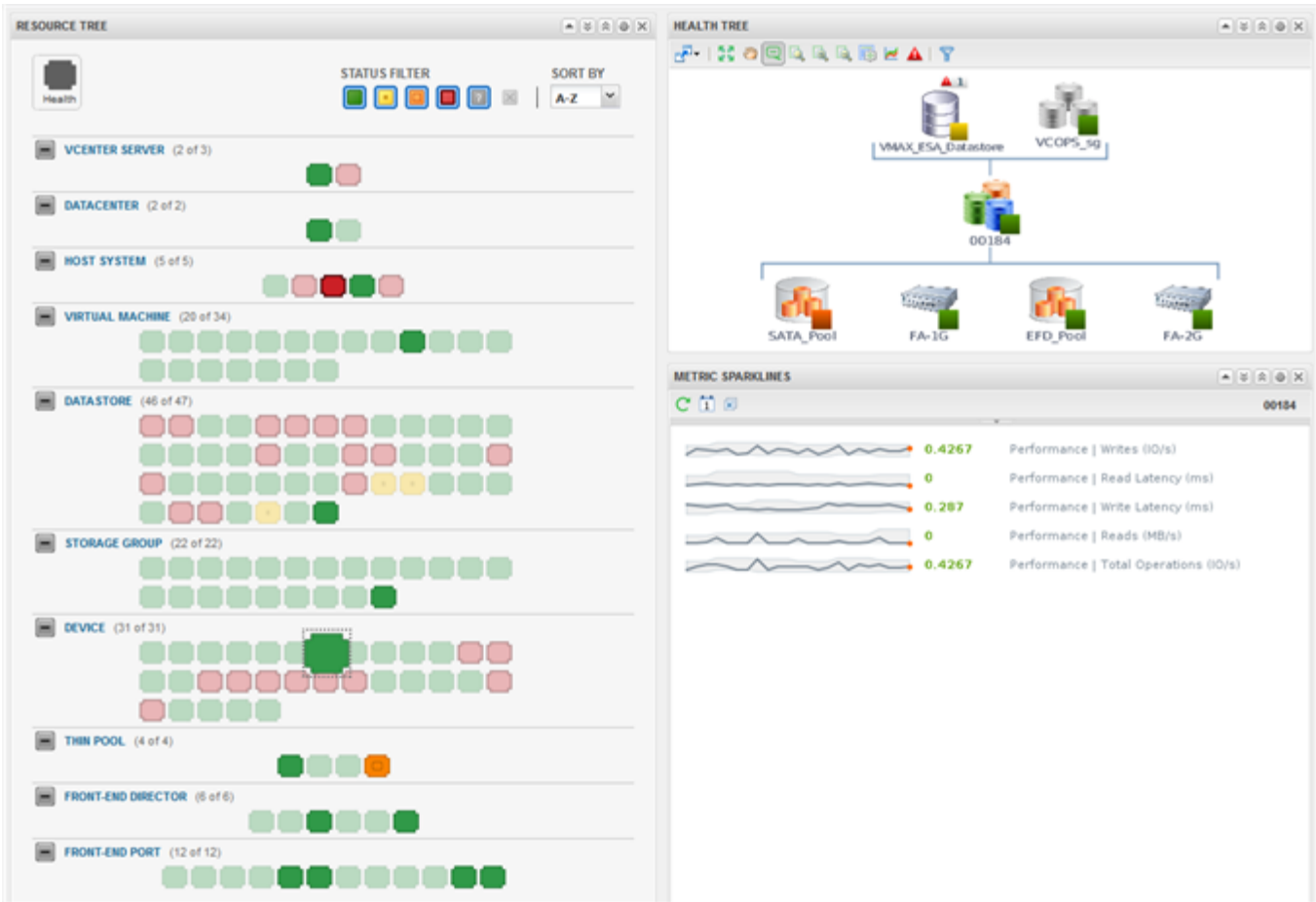
Figure 9 Example of VNX Topology dashboard

Figure 10 Example of VMAX Topology dashboard



The topology dashboards contain the following widgets:

Resource Tree

This widget shows the end-to-end topology and health of resources across vSphere and storage domains. You can configure the hierarchy that is shown by changing the widget settings; changing these settings does not alter the underlying object relationships in the database. Select any resource in this widget to view related resources in the stack.

Health Tree

The **Health Tree** widget provides a navigable visualization of resources that have parent or child relationships to the resource you select in the **Resource Tree** widget. Single-click to select resources, or double-click to change the navigation focus.

Metric Sparklines

This widget shows sparklines for the metrics of the resource you select in the **Resource Tree** widget.

Metrics dashboards

The metrics dashboards display resources and metrics for VNX or VMAX storage systems and allows the user to view graphs of resource metrics.

Figure 11 Example of VNX Metrics dashboard

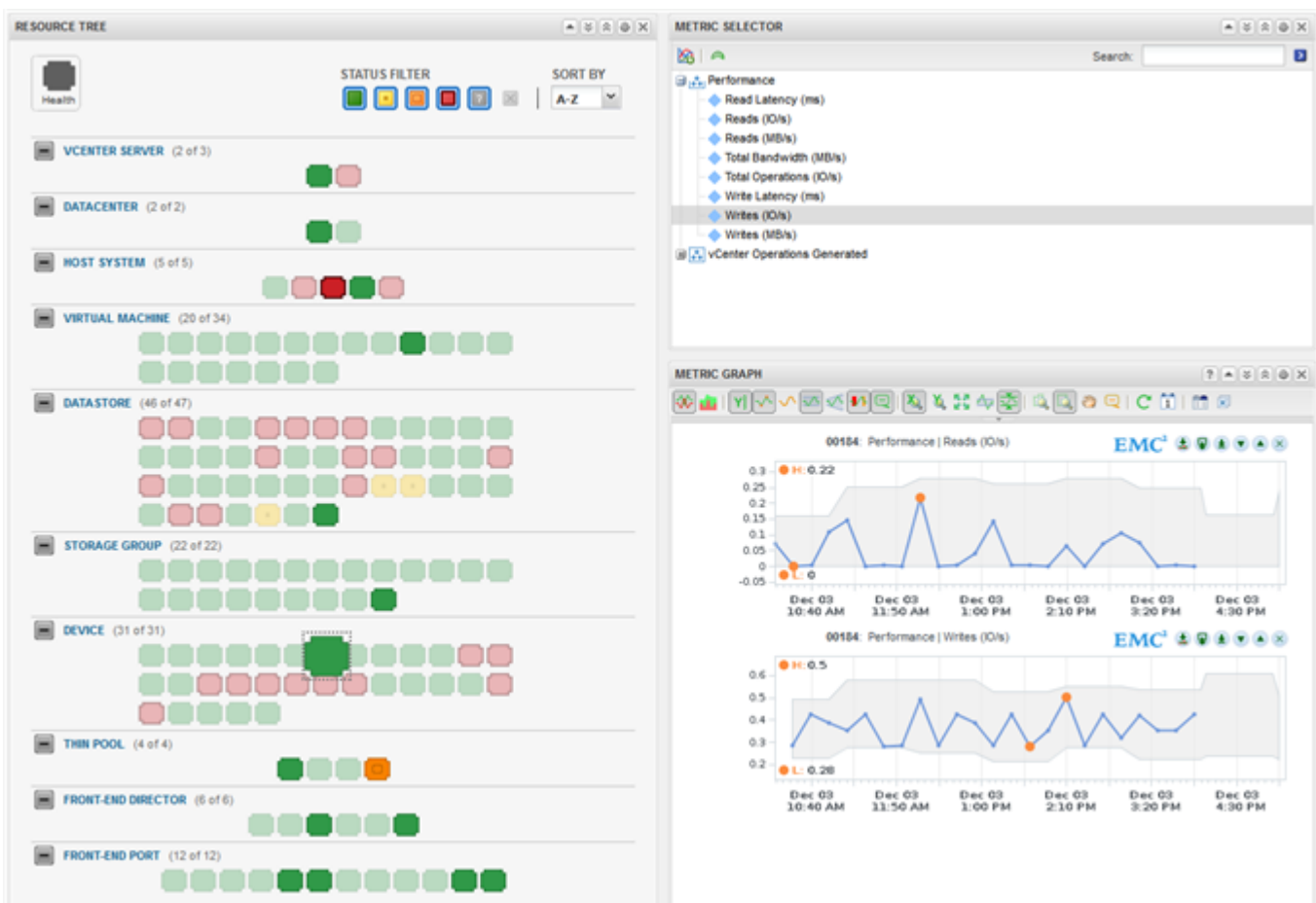
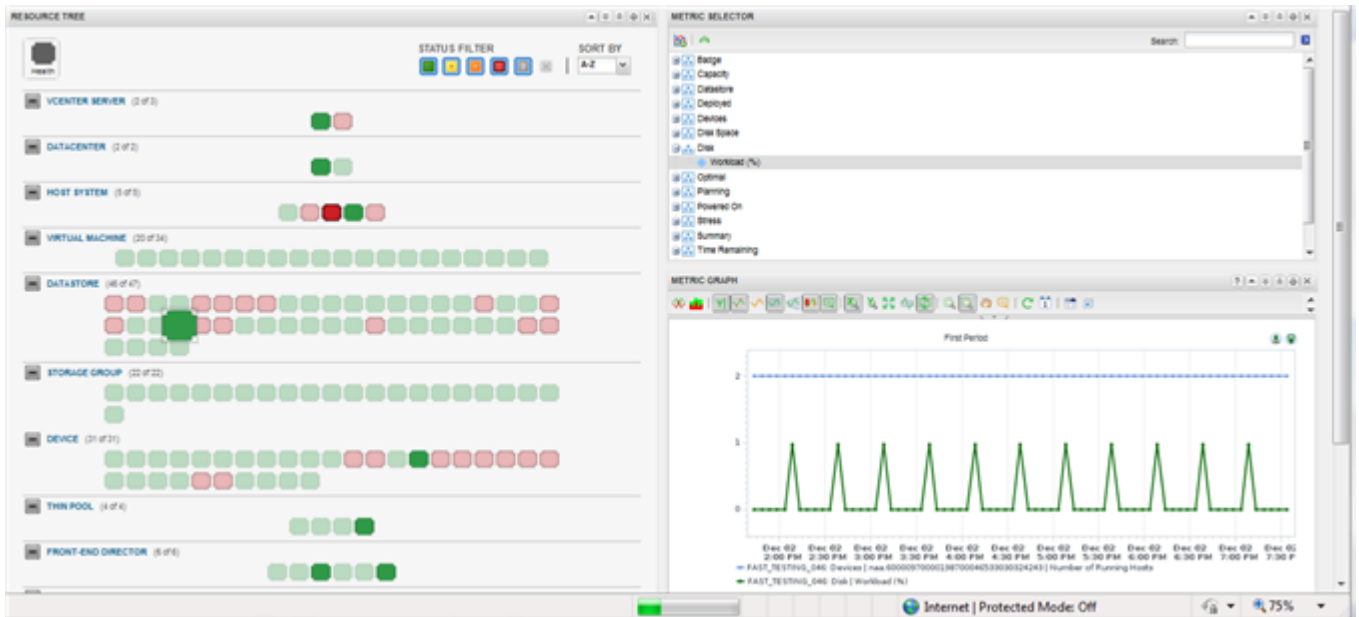


Figure 12 Example of VMAX Metrics dashboard

The metrics dashboards contain the following widgets:

Resource Tree

This widget shows the end-to-end topology and health of resources across vSphere and storage domains. You can configure the hierarchy that is shown by changing the widget settings; changing these settings does not alter the underlying object relationships in the database. Select any resource in this widget to view related resources in the stack.

Metric Selector

This widget lists all the metrics that are collected for the resource you select in the **Resource Tree** widget. Double-click a metric to create a graph of the metric in the **Metric Graph** widget.

Metric Graph

This widget graphs the metrics you select in the **Metric Selector** widget. Display multiple metrics simultaneously in a single graph or in multiple graphs.

Top-N dashboards

Top-N dashboards enable you to view your top performers at a glance. The number of objects in your top performer list is configurable. Top-N dashboards are available for VNX and VMAX systems as shown in these examples.

Figure 13 Example of VMAX Top-5 Devices

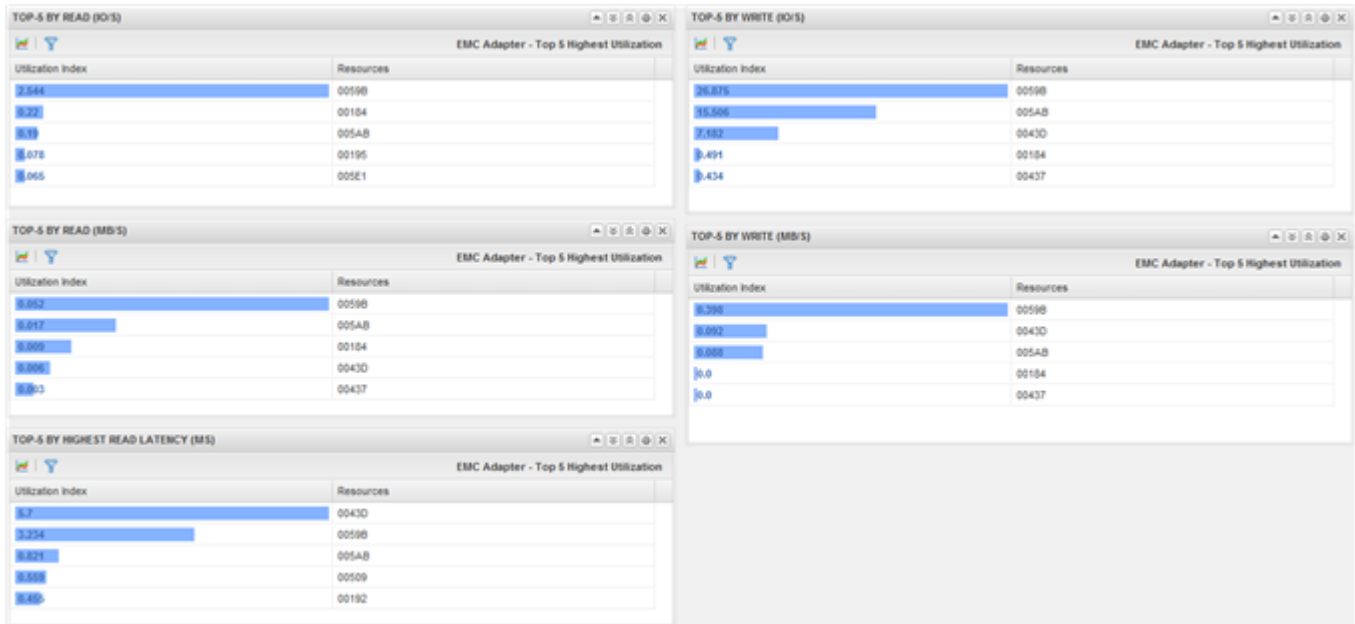


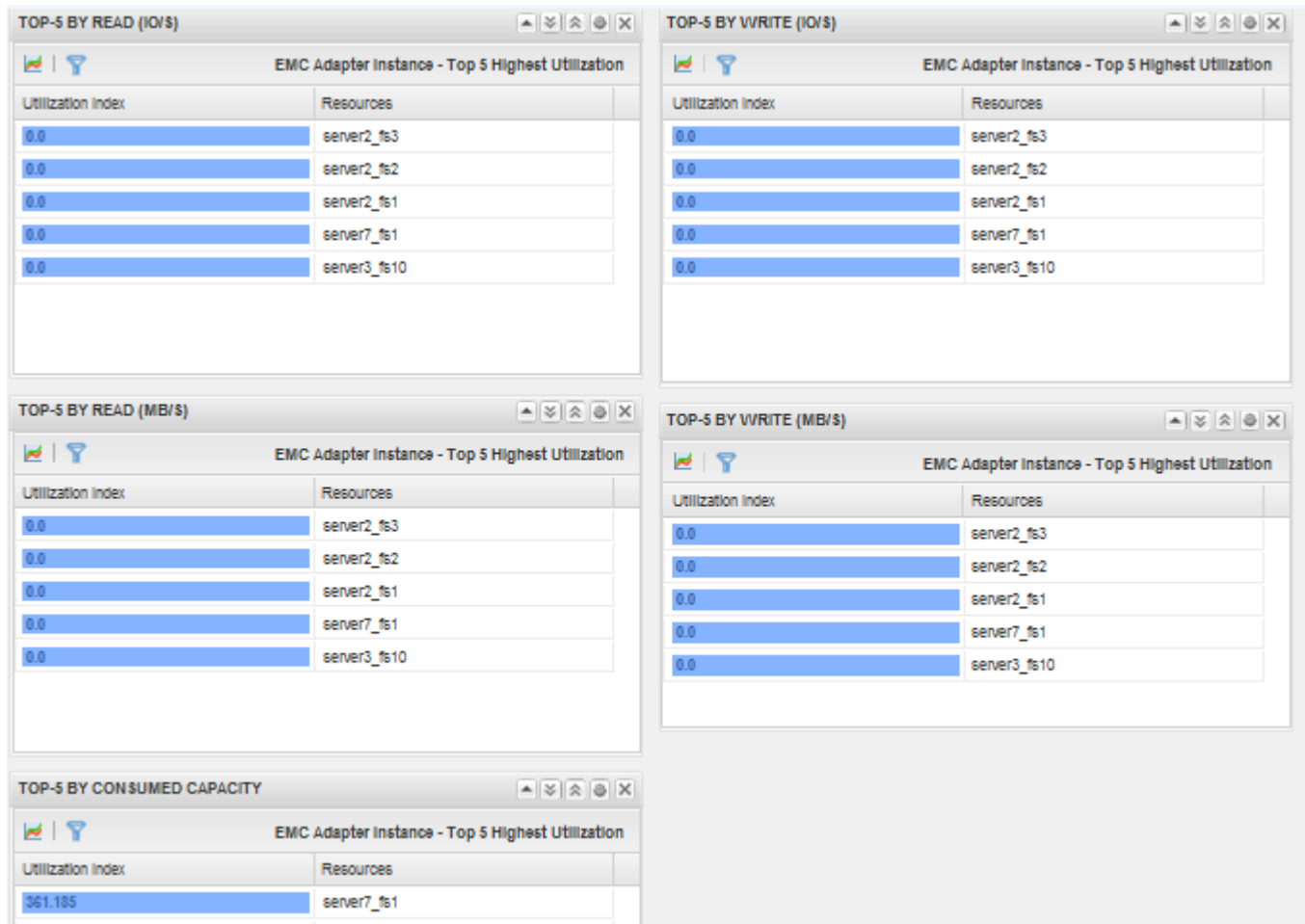
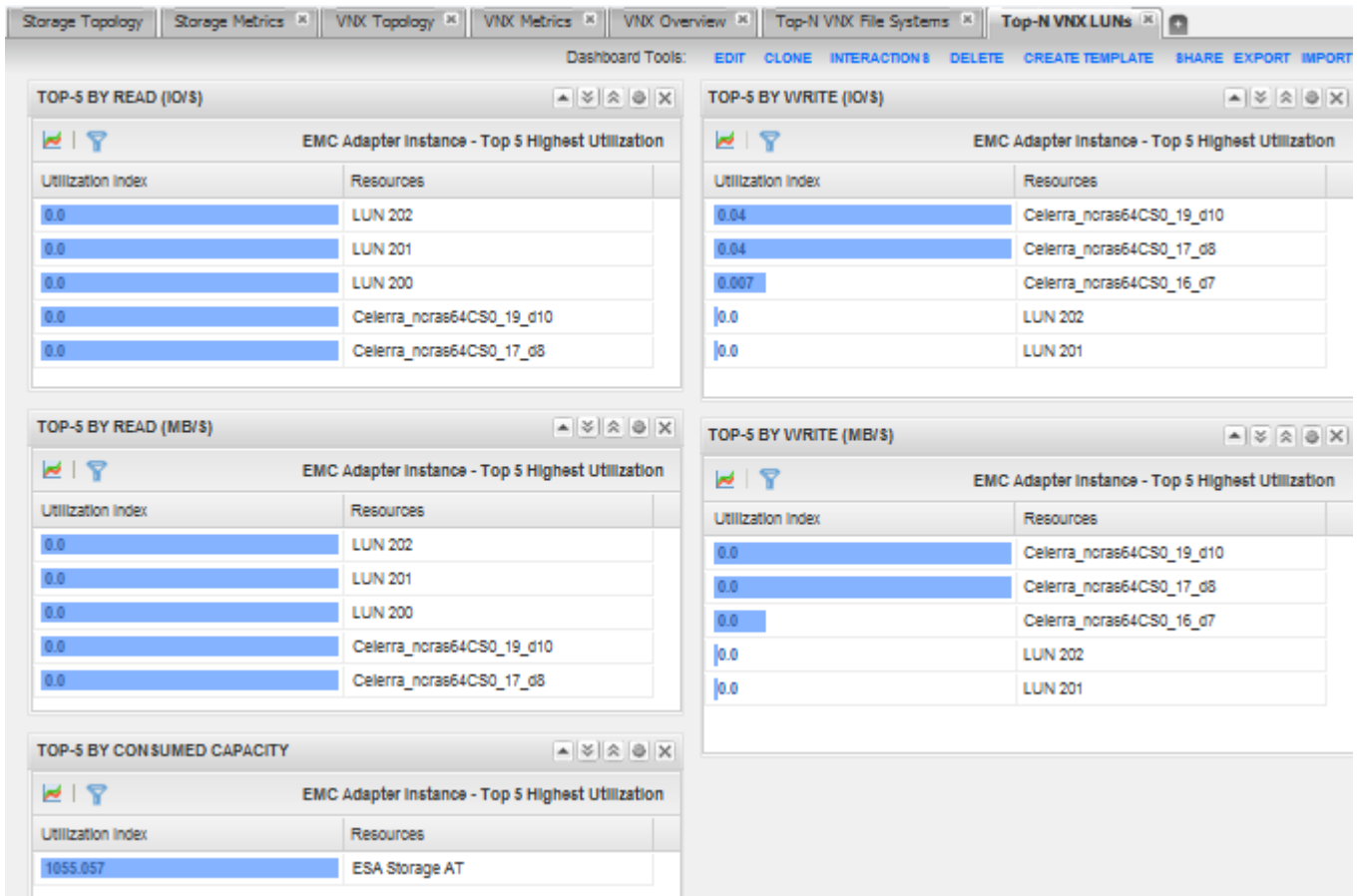
Figure 14 Example of Top-5 VNX File Systems

Figure 15 Example of Top-5 VNX LUNs



By default, the dashboard shows the top 5 devices in the following categories across all of your VNX or VMAX systems:

- ◆ Top-5 by Read (IO/s)
- ◆ Top-5 by Write (IO/s)
- ◆ Top-5 by Read (MB/s)
- ◆ Top-5 by Write (MB/s)
- ◆ Either:
 - Top-5 by Read Latency (ms) for VMAX Top-5 Devices dashboard
 - Top-5 by Consumed Capacity for Top-5 VNX LUNs or Top-5 VNX File Systems dashboards

Top performers are selected based on the current value of the associated metric that you configured for each widget. You can change the time period.

You can also configure each widget on the dashboard to show more than 5 top performers in your environment.

Dashboard XChange

The Dashboard XChange is a user community page for users to exchange EMC Storage Analytics custom dashboards.

EMC Storage Analytics provides a set of default dashboards that provide you with a variety of functional views into your storage environment. EMC Storage Analytics also enables you to create custom dashboards that allow you to visualize collected data according to your own requirements. The Dashboard XChange is an extension of that feature that enables you to:

- ◆ Export custom dashboards to the Dashboard XChange to benefit a wider EMC Storage Analytics community
- ◆ Import custom dashboards from the Dashboard XChange to add value to your own environment

The Dashboard XChange, hosted on the EMC Community Network, will also host dashboards designed by EMC to showcase widget functions that may satisfy a particular use-case in your environment. You can import these dashboards into your existing environment to enhance the functionality offered by EMC Storage Analytics. You can also edit imported dashboards to meet the specific requirements of your own storage environment.

The Dashboard XChange, shown in [Figure 16 on page 52](#), provides the following resources to assist you in creating custom dashboards:

- ◆ How-to video that shows how to create custom dashboards
- ◆ Best practices guide that provides detailed guidelines for dashboard creation
- ◆ Slide show that demonstrates how to import dashboards from or export them to the Dashboard XChange

Figure 16 Dashboard XChange



The EMC Storage Analytics Dashboard XChange is available at <https://community.emc.com/community/connect/esa>. Note that there are XChange Zones for Unified (VNX) and VMAX.

CHAPTER 4

Resource Kinds and Metrics

This chapter contains the following topics.

◆ Resource Kinds	54
◆ VNX Block metrics	55
◆ VNX File metrics	63
◆ VMAX metrics	69

Resource Kinds

Metrics collected in the vCenter Operations Manager are grouped by Resource Kind.

Resource Kinds for VNX Block

EMC Storage Analytics includes the following Resource Kinds for VNX Block:

- ◆ EMC Adapter Instance
- ◆ Storage Processor
- ◆ FAST Cache
- ◆ Pool LUN
- ◆ RAID Group LUN
- ◆ RAID Group
- ◆ Storage Pool
- ◆ Tier
- ◆ Disk

Resource Kinds for VNX File

EMC Storage Analytics includes the following Resource Kinds for VNX File:

- ◆ EMC Adapter Instance
- ◆ Data Mover
- ◆ Virtual Data Mover
- ◆ dVol
- ◆ NFS Export
- ◆ File Pool
- ◆ File System

Resource Kinds for VMAX

- ◆ EMC Adapter Instance
- ◆ Storage Group
- ◆ Device
- ◆ Thin Pool
- ◆ Front-End Director
- ◆ Front-End Port
- ◆ Remote Replica Group
- ◆ SRDF Director

VNX Block metrics

EMC Storage Analytics includes the following metrics for VNX Block with one table for each Resource Kind.

Table 2 VNX Block metrics for Array

Metric	Additional information
Elapsed collect time (ms)	Time elapsed during the collection.
New metrics in each collect call	Number of new metrics per collection.
New resources in each collect call	Number of new resources per collection.
Number of down resources	Number of down resources for this adapter instance.
Number of metrics collected	Number of metrics collected by this adapter instance.
Number of resources collected	Number of resources collected by this adapter instance.

Table 3 VNX Block metrics for Storage Processor

Metric	Additional information
Writes (IO/s)	The number of writes per second at the time when the SP is polled. that is passed through the SP per second. Smaller requests usually result in a higher write throughput than larger requests.
Writes (MB/s)	The average write request size in megabytes that passes through the SP per second. Larger requests usually result in higher bandwidth than smaller requests.
Reads (IO/s)	The average number of host read requests that is passed through the SP per second. Smaller requests usually result in a higher read throughput than larger requests.
Reads (MB/s)	The average amount of host read data in megabytes that is passed through the SP per second. Larger requests usually result in a higher bandwidth than smaller requests.
Busy (%)	The percentage of time during which the SP is serving requests. When the SP becomes the bottleneck, the utilization will be at or close to 100%. And increase in workload will have no further impact on the SP throughput, but the I/O response time will start increasing more aggressively.
Write Cache Flushes (MB/s)	The average amount of data in megabytes that was written from the write cache to the disks per second. The value is a measure of back-end activity.
Dirty Cache Pages (%)	The amount of dirty cache pages by percentage. This metric is for 1st generation VNX models (see Supported VNX series (1st generation) on page 16 for list of supported VNX models).
Dirty Cache Pages (MB)	The amount of dirty cache pages in megabytes. This metric is for 2nd generation VNX models (see Supported VNX series

Table 3 VNX Block metrics for Storage Processor (continued)

Metric	Additional information
	(2nd generation) on page 16 for list of supported VNX models).
Read Cache Size (MB)	The size of the read cache in megabytes. This metric is only for 1st generation VNX models (see Supported VNX series (1st generation) on page 16 for list of supported VNX models).
Read Cache State	The enabled or disabled state of the read cache.
Write Cache Size (MB)	The size of the write cache in megabytes. This metric is only for 1st generation VNX models (see Supported VNX series (1st generation) on page 16 for list of supported VNX models).
Write Cache State	The enabled or disabled state of the write cache.
Read Cache Hit Ratio (%)	The ratio of read requests that the SP Cache satisfied without requiring any disk access versus the total number of read requests.
Write Cache Hit Ratio (%)	The ratio of write requests that the SP Cache satisfied without requiring any disk access versus the total number of write requests.

Table 4 VNX Block metrics for FAST Cache

Metric	Additional information
Current Operation	Creating or Destroying .
Current Operation Status	If there is a current FAST Cache operation in progress such as destroying or creating, this displays the percentage complete.
Mode	Read/Write.
RAID Type	The RAID Type of FAST Cache.
Size (GB)	The capacity of FAST Cache.
Dirty (%)	Appears in the Performance > SPA and Performance > SPB metric groups. Percentage of write cache pages owned by the SP that contain data that has not yet been flushed out to the FAST Cache.
Flushed (MB)	Appears in the Performance > SPA and Performance > SPB metric groups. The average amount of data in megabytes that was written from the write cache to the FAST Cache.
Read Cache Hit Ratio (%)	The ratio of read requests that the FAST Cache satisfied without requiring any disk access versus the total number of read requests. The higher the ratio the better the read performance.
Read Cache Hits (Hits/s)	Average number of read requests per second that were satisfied by the FAST Cache without requiring any disk access. Read requests that are not FAST Cache hits are read misses.

Table 4 VNX Block metrics for FAST Cache (continued)

Metric	Additional information
Read Cache Misses (Misses/s)	Average number of read requests per second that required one or multiple disk accesses.
Write Cache Hit Ratio (%)	The ratio of write requests that the FAST Cache satisfied without requiring any disk access versus the total number of write requests. The higher the ratio the better the write performance.
Write Cache Hits (Hits/s)	Average number of write requests per second that were satisfied by the FAST Cache without requiring any disk access. Write requests that are not FAST Cache hits are write misses.
Write Cache Misses (Misses/s)	Average number of write requests per second that required one or multiple disk accesses.
Current Operation Complete (%)	If there is a current FAST Cache operation in progress such as destroying or creating, this displays the percentage complete.

Table 5 VNX Block metrics for Pool LUN

Metric	Additional information
Performance Tier Distribution (%)	The distribution (%) of the Performance Tier.
Extreme Performance Tier Distribution (%)	The distribution (%) of the Extreme Performance Tier.
Capacity Tier Distribution (%)	The distribution (%) of the Capacity Tier.
Tiering Policy	The tiering policy of this Pool LUN.
Initial Tier	The initial tier that was used for initial placement of the new LUN.
Consumed Capacity (GB)	The amount of space consumed in the pool by the LUN plus overhead.
User Capacity (GB)	The amount of space consumed in the pool by the LUN.
Busy (%)	Appears in the Performance > SPA and Performance > SPB metric groups. The fraction of an observation period during which a LUN has any outstanding requests. When the LUN becomes the bottleneck, the utilization is at or near 100%. However, since the I/Os can be serviced by multiple disks, an increase in workload may still result in a higher throughput.
Queue Depth	The length of the LUN queue.
Read Cache State	The enabled or disabled state of the read cache.
Write Cache State	The enabled or disabled state of the write cache.
Reads (IO/s)	The average number of host read requests that is passed through the LUN per second. Smaller requests usually result in a higher read throughput than larger requests.

Table 5 VNX Block metrics for Pool LUN (continued)

Metric	Additional information
Reads (MB/s)	The average amount of host read data in Mbytes that is passed through the LUN per second. Larger requests usually result in a higher bandwidth than smaller requests.
Writes (IO/s)	The average number of host write requests that is passed through the LUN per second. Smaller requests usually result in a higher write throughput than larger requests.
Writes (MB/s)	The average amount of host write data in Mbytes that is passed through the LUN per second. Larger requests usually result in higher bandwidth than smaller requests.
Explicit trespasses	Appears in the Performance > SPA and Performance > SPB metric groups. Number of trespasses since the last poll. Default polling cycle is 5 minutes. Occurs as a result of an external command from a user or the failover software. When an SP receives this command, LUN ownership is transferred to that SP.
Implicit trespasses	Appears in the Performance > SPA and Performance > SPB metric groups. Number of trespasses since the last poll. Default polling cycle is 5 minutes. Occurs as a result of software controls within the storage system. An implicit trespass occurs when the amount of I/O transferred across the non-optimal path exceeds the optimal path I/O by a specified threshold.
Total Latency (ms)	The average time, in milliseconds, that a request to this LUN is outstanding, including its waiting time.

Table 6 VNX Block metrics for RAID Group LUN

Metric	Additional information
Total Latency (ms)	The average time in milliseconds, that it takes for one request to pass through the LUN, including any waiting time. The higher the queue length for a LUN, the more requests are waiting in its queue, thus increasing the average latency of a single request. For a given workload, queue length and response time are directly proportional.
Read Cache State	The enabled or disabled state of the read cache.
Write Cache State	The enabled or disabled state of the write cache.
Reads (IO/s)	The average number of host read requests that is passed through the LUN per second. Smaller requests usually result in a higher read throughput than larger requests.
Reads (MB/s)	The average amount of host read data in Mbytes that is passed through the LUN per second. Larger requests usually result in a higher bandwidth than smaller requests.

Table 6 VNX Block metrics for RAID Group LUN (continued)

Metric	Additional information
Writes (IO/s)	The average number of host write requests that is passed through the LUN per second.
Writes (MB/s)	The average amount of host write data in Mbytes that is passed through the LUN per second.
Queue Depth	The length of the LUN queue.
User Capacity	The amount of space available in the RAID Group LUN.
Busy (%)	Appears in the Performance > SPA and Performance > SPB metric groups. The fraction of an observation period during which a LUN has any outstanding requests. When the LUN becomes the bottleneck, the utilization is at or near 100%. However, since the I/Os can be serviced by multiple disks, an increase in workload may still result in a higher throughput.

Table 7 VNX Block metrics for RAID Group

Metric	Additional information
Full (%)	Percentage of total capacity that is consumed.
User Capacity (GB)	The amount of space available in the RAID Group.
Raw Capacity (GB)	The total amount of space available in the RAID Group prior to RAID protection.
Available Capacity (GB)	The remaining free capacity of this RAID Group.
Free Continuous Group of Unbound Segments (GB)	Size in GB of the largest continuous span of free space in the RAID Group. LUNs must fit into a contiguous span of free space.
Disk Count	Number of disks in this RAID Group.
LUN Count	Number of LUNs in this RAID Group.
Max Disks	Maximum number of disks allowed for this RAID Group.
Max LUNs	Maximum number of LUNs allowed for this RAID Group.
Defragmented (%)	When a defragment operation in progress, this displays the percentage complete.

Table 8 VNX Block metrics for Storage Pool

Metric	Additional information
Available Capacity (GB)	Capacity available for use in this Storage Pool.
Consumed Capacity (GB)	Capacity used in this Storage Pool.
Disk Type	Type of disks in this Storage Pool.
Current Operation	Displays the current operation in the pool.
Current Operation Complete (%)	If there is a thin pool operation in progress such as a re-balance, this displays the percentage complete.
Current Operation State	Displays the current operation state.
Current Operation Status	Displays additional descriptive information for the current state of the thin pool.
FAST Cache	The enabled or disabled state of the FAST Cache for this Storage Pool.
Full (%)	Percentage of total capacity that is consumed.
Subscribed (%)	Percentage of total capacity that is subscribed.
Threshold (%)	Threshold as percentage of total capacity.
Oversubscribed (GB)	How much the Storage Pool is oversubscribed.
Disk Count	Number of disks consumed by this Storage Pool.
LUN Count	Number of LUNs hosted by this Storage Pool.
Auto-Tiering	Shows if auto-tiering is scheduled.
Relocation Status	Relocation is active or inactive.
Relocation Type	Scheduled or manual relocation.
Relocation Rate	Rate at which relocation occurs.
Relocation Start Time	Start time for the relocation.
Relocation Stop Time	Stop time for the relocation.
Schedule Duration Remaining	If using scheduled relocation, this displays the remaining time for the relocation.
Auto-Tiering State	The enabled or disabled state of auto-tiering.
Data Movement Completed (GB)	Amount of data that has been moved up or down.
Data to Move Up (GB)	Amount of data that is going to be moved up.
Data to Move Down (GB)	Amount of data that is going to be moved down.
Data to Move Within (GB)	Amount of data to move within tiers.
Estimated Time to Complete	Estimated time to complete the data relocation.
Deduplication State	The deduplication state can take any of these values: <ul style="list-style-type: none"> • Idle (No deduplicated LUNs) • Idle (No deduplicated LUNs) - Faulted • Pending

Table 8 VNX Block metrics for Storage Pool (continued)

Metric	Additional information
	<ul style="list-style-type: none"> • Pending - Faulted • Running (% complete, GB remaining) • Running - Faulted (% complete, GB remaining) • Paused • Paused - Faulted
Tiering Policy	<p>With FAST VP enabled, tiering policy can take any of these values:</p> <ul style="list-style-type: none"> • Start High then Auto-Tier (recommended) • Auto Tier • Highest Available Tier • Lowest Available Tier • No Data Movement <p>With FAST VP disabled, tiering policy can be:</p> <ul style="list-style-type: none"> • Optimize for Pool Performance (default) • Highest Available Tier • Lowest Available Tier
Initial Tier	Initial tier can be any of the values available for Tiering Policy (above).
Deduplication Rate	Rate of deduplication.
Deduplicated LUNs Shared Capacity (GBs)	Shared capacity of deduplicated LUNs.
Deduplication and Snapshot Savings (GBs)	Capacity savings through deduplication and Snapshots.

Table 9 VNX Block metrics for Tier

Metric	Additional information
RAID Type	Type of RAID applied to the tier.
Disk Count	Number of disks in the tier.
Higher Tier (GB)	Amount of data targeted for higher tiers.
Lower Tier (GB)	Amount of data targeted for lower tiers.
Available Capacity (GB)	Capacity still available for use.
Consumed Capacity (GB)	Used capacity.
User Capacity (GB)	Free capacity for users.
Subscribed (%)	Percentage of tier that is subscribed.

Table 10 VNX Block metrics for Disk

Metric	Additional information
Capacity (GB)	Total capacity of the disk.
LUN Count	Total number of LUNs that the disk is serving.
State	Current state of the disk.
Hard Read Errors	Number of hard read errors.
Hard Write Errors	Number of hard write errors.
Reads (IO/s)	The average number of read requests from the disk per second.
Reads (MB/s)	The average amount of data read from the disk in Mbytes per second.
Writes (IO/s)	The average number of write requests to the disk per second.
Writes (MB/s)	The average amount of data written to the disk in Mbytes per second.
Busy (%)	The percentage of time during which the disk is servicing any requests.
Total Latency (ms)	The average time, in milliseconds, that it takes for one request to pass through the disk, including any waiting time.
Queue Depth	The average number of requests within a polling interval that are waiting to be serviced by the disk, including the one currently in service.

VNX File metrics

EMC Storage Analytics includes the following metrics for VNX File with one table for each Resource Kind.

Table 11 VNX File metrics for Array

Metric	Additional information
Elapsed collect time (ms)	Amount of elapsed time for the collection.
New metrics in each collect call	Number of new metrics per collection.
New resources in each collect call	Number of new resources per collection.
Number of down resources	Number of down resources for this adapter instance.
Number of metrics collected	Number of metrics collected by this adapter instance.
Number of resources collected	Number of resources collected by this adapter instance.

Table 12 VNX File metrics for Data Mover

Metric	Description	Additional information
Type	Data Mover type. The value can be Active (for the primary Data Mover), Standby, or VDM.	-
Busy (%)	CPU utilization percentage during this interval.	-
DNLC Hit Ratio (%)	Directory Name Lookup Cache (DNLC) hit ratio percentage used for pathname resolution logic.	-
Open File Cache Hit Ratio (%)	Open File Cache Hit ratio percentage.	-
Buffer Cache Hit Ratio (%)	Buffer Cache Hit ratio percentage.	-
Reads (MB/s)	Storage in Mbytes received from all server-storage interfaces.	-
Writes (MB/s)	Storage in Mbytes sent to all server-storage interfaces.	-
Total Bandwidth (MB/s)	The total bandwidth for the Data Mover.	-
NFS Reads (IO/s)	NFS read operations per second.	-
NFS Writes (IO/s)	NFS write operations per second.	-
NFS Reads (MB/s)	NFS read data response in Mbytes per second.	-
NFS Writes (MB/s)	NFS write data response in Mbytes per second.	-

Table 12 VNX File metrics for Data Mover (continued)

Metric	Description	Additional information
NFS Average Read Size (Bytes)	Average size of data read.	-
NFS Average Write Size (Bytes)	Average size of data written.	-
Network In Bandwidth (MB/s)	Network in bandwidth. Megabytes received per second.	-
Network Out Bandwidth (MB/s)	Network out bandwidth. Megabytes sent per second.	-
Read Calls/s	Read calls per second	These metrics appear in the Network > NFSv2, NFSv3, and NFSv4 metric groups.
Read Errors/s	Read errors per second	
Read Response Time (ms)	Total read response time	
Write Calls/s	Write calls per second	
Write Errors/s	Write errors per second	
Write Response Time (ms)	Total write response time	
GetAttr Calls/s	Get file attributes (GetAttr) per second	These metrics appear in the Network > NFSv3 metric group.
GetAttr Errors/s	GetAttr errors per second	
GetAttr Response Time (ms)	Total response time for GetAttr	
SetAttr Calls/s	Set file attributes (SetAttr) per second	
SetAttr Errors/s	SetAttr errors per second	
SetAttr Response Time (ms)	Total response time for SetAttr	
Lookup Calls/s	Lookup calls per second	
Lookup Errors/s	Lookup errors per second	
Lookup Response Time (ms)	Total lookup response time	
Access Calls/s	Access calls per second	
Access Errors/s	Access errors per second	
Access Response Time (ms)	Total access response time	
Open Calls/s	Open calls per second	These metrics appear in the Network > NFSv4 metric group.
Open Errors/s	Open errors per second	
Open Response Time (ms)	Total open response time	

Table 12 VNX File metrics for Data Mover (continued)

Metric	Description	Additional information
Close Calls/s	Close calls per second	
Close Errors/s	Close errors per second	
Close Response Time (ms)	Total close response time	
Compound Calls/s	Compound calls per second	
Compound Errors/s	Compound errors per second	
Compound Response Time (ms)	Total compound response time	
CIFS Reads (IO/s)	IOs per second for CIFS reads	These metrics appear in the Network metric group.
CIFS Reads (MB/s)	Megabytes per second for CIFS reads	
CIFS Average Read Size (KB)	Average CIFS read size	
CIFS Writes (IO/s)	IOs per second for CIFS writes	
CIFS Writes (MB/s)	Megabytes per second for CIFS writes	
CIFS Average Write Size (KB)	Average CIFS write size	
ReadX Calls/s	ReadX calls per second	These metrics appear in the Network > SMB1 metric group.
ReadX Max Response Time (ms)	ReadX maximum response time	
ReadX Average Response Time (ms)	Average response time for ReadX	
WriteX Calls/s	WriteX calls per second	
WriteX Max Response Time (ms)	WriteX maximum response time	
WriteX Average Response Time (ms)	WriteX average response time	
NTCreateX Calls/s	NTCreateX calls per second	
NTCreateX Max Response Time (ms)	NTCreateX maximum response time	
NTCreateX Average Response Time (ms)	NTCreateX average response time	
Close Calls/s	Close calls per second	
Close Max Response Time (ms)	Close maximum response time	
Close Average Response Time (ms)	Close average response time	

Table 12 VNX File metrics for Data Mover (continued)

Metric	Description	Additional information
Trans2Prim Calls/s	Trans2Prim calls per second	These metrics appear in the Network > SMB2 metric group.
Trans2Prim Max Response Time (ms)	Trans2Prim maximum response time	
Trans2Prim Average Response Time (ms)	Trans2Prim average response time	
Create Calls/s	Create calls per second	
Create Max Response Time (ms)	Create maximum response time	
Create Average Response Time (ms)	Create average response time	
Close Calls/s	Close calls per second	
Close Max Response Time (ms)	Close maximum response time	
Close Average Response Time (ms)	Close average response time	
Flush Calls/s	Flush calls per second	
Flush Max Response Time (ms)	Flush maximum response time	
Flush Average Response Time (ms)	Flush average response time	
Read Calls/s	Read calls per second	
Read Max Response Time (ms)	Read maximum response time	
Read Average Response Time (ms)	Read average response time	
Write Calls/s	Write calls per second	
Write Max Response Time (ms)	Write maximum response time	
Write Average Response Time (ms)	Write average response time	
Ioctl Calls/s	IO Control (IOCTL) calls per second	
Ioctl Max Response Time (ms)	IO Control maximum response time	
Ioctl Average Response Time (ms)	IO Control average response time	
Queryinfo Calls/s	Query information calls per second	

Table 12 VNX File metrics for Data Mover (continued)

Metric	Description	Additional information
Queryinfo Max Response Time (ms)	Query information maximum response time	
Queryinfo Average Response Time (ms)	Query information average response time	

Table 13 VNX File metrics for dVol

Metric	Additional information
Capacity (GB)	Total capacity of the disk volume.
Average Read Size (Bytes)	Average size of data read.
Average Write Size (Bytes)	Average size of data written.
Average Completion Time (μSec/call)	Average time for completion of an I/O.
Average Service Time (μSec/call)	Average service time for successful completion of I/O without retries and queuing delays.
IO Retries (IO/s)	Number of I/O retries per second.
Queue Depth	Length of disk queue
Reads (IO/s)	Number of read operations on the disk per second.
Reads (MB/s)	Mbytes read from the disk per second.
Total Operations (IO/s)	Number of I/O operations on the disk volume per second.
Total Bandwidth (MB/s)	Total bandwidth of the disk volume.
Utilization (%)	Percentage time that disk has been utilized.
Writes (IO/s)	Number of write operations on the disk per second.
Writes (MB/s)	Mbytes written to the disk per second.

Table 14 VNX File metrics for File Pool

Metric	Additional information
Capacity (GB)	Total capacity of the file pool.
Consumed Capacity (GB)	Consumed capacity of the file pool.
Available Capacity (GB)	Capacity still available for use.

Table 15 VNX File metrics for File System

Metric	Additional information
Capacity (GB)	Total space available for storage of user data (does not include metadata).
Consumed Capacity (GB)	Consumed capacity of the File System.

Table 15 VNX File metrics for File System (continued)

Metric	Additional information
Available Capacity (GB)	Capacity still available for use.
Thin Provisioning	<code>True</code> indicates that the file system is enabled for virtual provisioning, an option that can only be used with automatic file system extension. Combining automatic file system extension with virtual provisioning allows growth of the file system gradually and as needed. When virtual provisioning is enabled, NFS and CIFS clients receive reports for either the virtual maximum file system size or real file system size, whichever is larger.
Max Capacity (GB)	If automatic extension is enabled, the file system will automatically extend to this maximum size when the high water mark is reached. The default value for the high water mark is 90 percent.
Read Requests (Requests/s)	Read operations per second in the interval.
Write Requests (Requests/s)	Write operations per second in the interval.
Reads (MB/s)	Read data response in Mbytes per second.
Writes (MB/s)	Write data response in Mbytes per second.
Average Read Size (Bytes)	Average size of data read.
Average Write Size (Bytes)	Average size of data written.
Reads (IO/s)	The average read operations per second.
Writes (IO/s)	The average write operations per second.
Read IO Ratio (%)	Percentage of total IOs that are read IOs.
Write IO Ratio (%)	Percentage of total IOs that are write IOs.

VMAX metrics

EMC Storage Analytics includes the following metrics for VMAX with one table for each Resource Kind.

Table 16 VMAX metrics for Storage Group

Metric	Definition
Reads (IO/s)	The number of read operations performed each second by the storage group.
Writes (IO/s)	The number of write operations performed each second by the storage group.
Reads (MB/s)	The cumulative number of MBs read per second by the storage group.
Writes (MB/s)	The cumulative number of MBs written per second by the storage group.
Total Operations (IO/s)	The total reads and writes performed each second by the storage group.
Read Latency (ms)	The average time it took the Symmetrix array to serve one Read IO for this storage group.
Write Latency (ms)	The average time it took the Symmetrix array to serve one Write IO for this storage group.
Total Latency (ms)	The average time it took the Symmetrix array to serve one IO for this storage group.
Total Bandwidth (MB/s)	The total number of MBs sent and received per second by the storage group.

Table 17 VMAX metrics for Device

Metric	Definition
Reads (IO/s)	The number of Read operations performed each second on the device.
Writes (IO/s)	The total number of Write IO operations performed each second by the Symmetrix volume (LUN).
Reads (MB/s)	The cumulative number of MBs read per second from the device.
Writes (MB/s)	The cumulative number of MBs written per second to the device.
Total Bandwidth (MB/s)	The total number of read and write MBs performed each second on the device.
Total Operations (IO/s)	The total reads and writes performed each second on the device.
Read Latency (ms)	The average time it took the Symmetrix array to serve one Read IO for this device.
Write Latency (ms)	The average time it took the Symmetrix array to serve one Write IO for this device.

Table 18 VMAX metrics for Thin Pool

Metric	Definition
Total Capacity (GB)	The total thin pool capacity.
Allocated Capacity (GB)	The allocated thin pool capacity.
Used Capacity (GB)	The used thin pool capacity.
Full (%)	The percent that the thin pool has been allocated.

Table 19 VMAX metrics for Front-End Director

Metrics	Definition
Total Operations (IO/s)	The total reads and writes the front-end director processes per second.
Reads (IO/s)	The total read operations the front-end director processes per second.
Writes (IO/s)	The total write operations the front-end director processes per second.
Total Hits (IO/s)	The total number of requests that were immediately serviced from cache.
Total Bandwidth (MB/s)	The total number of MBs sent and received per second by the director.

Table 20 VMAX metrics Front-End Port

Metrics	Definition
Total Operations (IO/s)	The total reads and writes the front-end port processes per second.
Total Bandwidth (MB/s)	The number of MBs transferred per second.

Table 21 VMAX metrics SRDF Director

Metrics	Definition
Total Operations (IO/s)	The total reads and writes the SRDF director processes per second.
Reads (IO/s)	The total read operations the SRDF director processes per second.
Writes (IO/s)	The total write operations the SRDF director processes per second.
Total Bandwidth (MB/s)	The total number of MBs sent and received per second by the RDF director.

Table 22 VMAX metrics Remote Replica Group

Metrics	Definition
Minimum Cycle Time (ms)	The setting for the minimum number of seconds for a cycle.
Average Cycle Time (ms)	The average time it takes for each cycle to complete.
Delta Set Extension Threshold	The percent of write pendings before DSE activates.

Table 22 VMAX metrics Remote Replica Group (continued)

Metrics	Definition
Devices in Session (count)	The number of devices in the group.
Writes (IO/s)	The number of write IOs coming in for the volumes in this session.
Writes (MB/s)	The total number of MBs sent per second by the group.
HA Repeat Writes (counts/s)	Writes to a slot already in the active cycle. Total host adapter repeat writes, measured in write commands to SRDF/A volumes only. This counter helps estimate the cache locality of reference, i.e., how much cache is saved by the re-writes. This does not give any indication to the bandwidth locality of reference.

CHAPTER 5

Troubleshooting

This chapter contains the following topics.

◆ Launching Unisphere	74
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◆ Error handling and event logging	75
◆ Editing the Collection Interval for a resource	78
◆ Frequently Asked Questions - General	79
◆ Frequently Asked Questions for VNX	83
◆ Frequently Asked Questions for VMAX	85

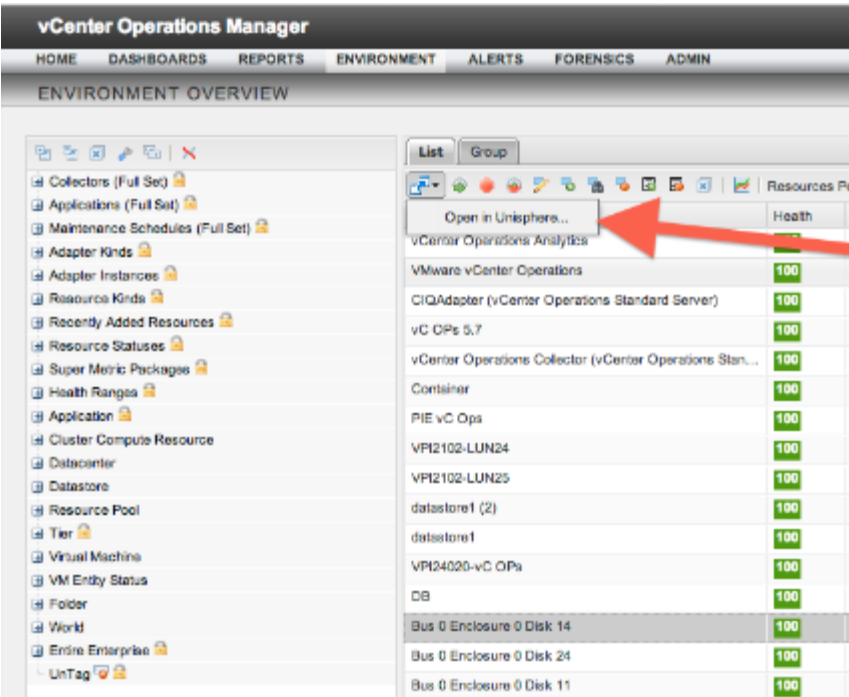
Launching Unisphere

EMC Storage Analytics provides metrics that enable you to assess the health of monitored resources. If the metrics for VNX Block or VNX File resources indicate that you need to troubleshoot those resources, EMC Storage Analytics provides a way to launch Unisphere on the VNX array in context. Select the resource and click the launch icon as shown in the example in [Figure 17 on page 74](#). The launch icon is available on most widgets.

Note

This feature requires a fresh installation of the EMC Adapter (not an upgrade) and vCenter Operations Manager 5.7.1 or later. You must select the VNX Block or VNX File object to launch Unisphere. There is no Unisphere launch capability for VMAX objects.

Figure 17 Example of launching to Unisphere



Installation logs

This topic lists the log files to which errors in the EMC Storage Analytics installation are written.

Errors in the EMC Storage Analytics installation are written to log files in the following directory on the UI VM of the vCenter Operations Manager:

```
/var/log/emc
```

Log files in this directory follow the naming convention:
install-2012-12-11-10:54:19.log.

Use a text editor to view the installation log files.

Error handling and event logging

Errors in the EMC Storage Analytics operation are written to log files on the Analytics VM of the vCenter Operations Manager.

Error logs are available in the `/data/vcops/log` directory. This directory contains the vCenter Operations Manager logs.

Adapter logs (including adapters other than the EMC Adapter) are in `/data/vcops/log/adapters`.

Logs for each EMC Adapter instance are in folders under `/data/vcops/log/adapters/EmcAdapter`. For example, if you have five EMC Adapter instances, a directory appears for each of them.

Log files in this directory follow this naming convention: `VNX_File-131.log.9`.

The log filename begins with the name of the EMC Adapter instance (for example, `VNX_Block` or `EmcAdapter`). Filenames beginning with `EmcAdapter` are common to all connectors. The number that follows the EMC Adapter instance name is the adapter instance ID, which corresponds to a VMware internal ID. The last number in the filename indicates the roll-over increment; the lowest number represents the most recent log. Each roll-over is 10 MB, and ten roll-overs are possible.

View logs relating to EMC Storage Analytics operation in the vCenter Operations Manager GUI. Create and download a support bundle used for troubleshooting.

Viewing error logs

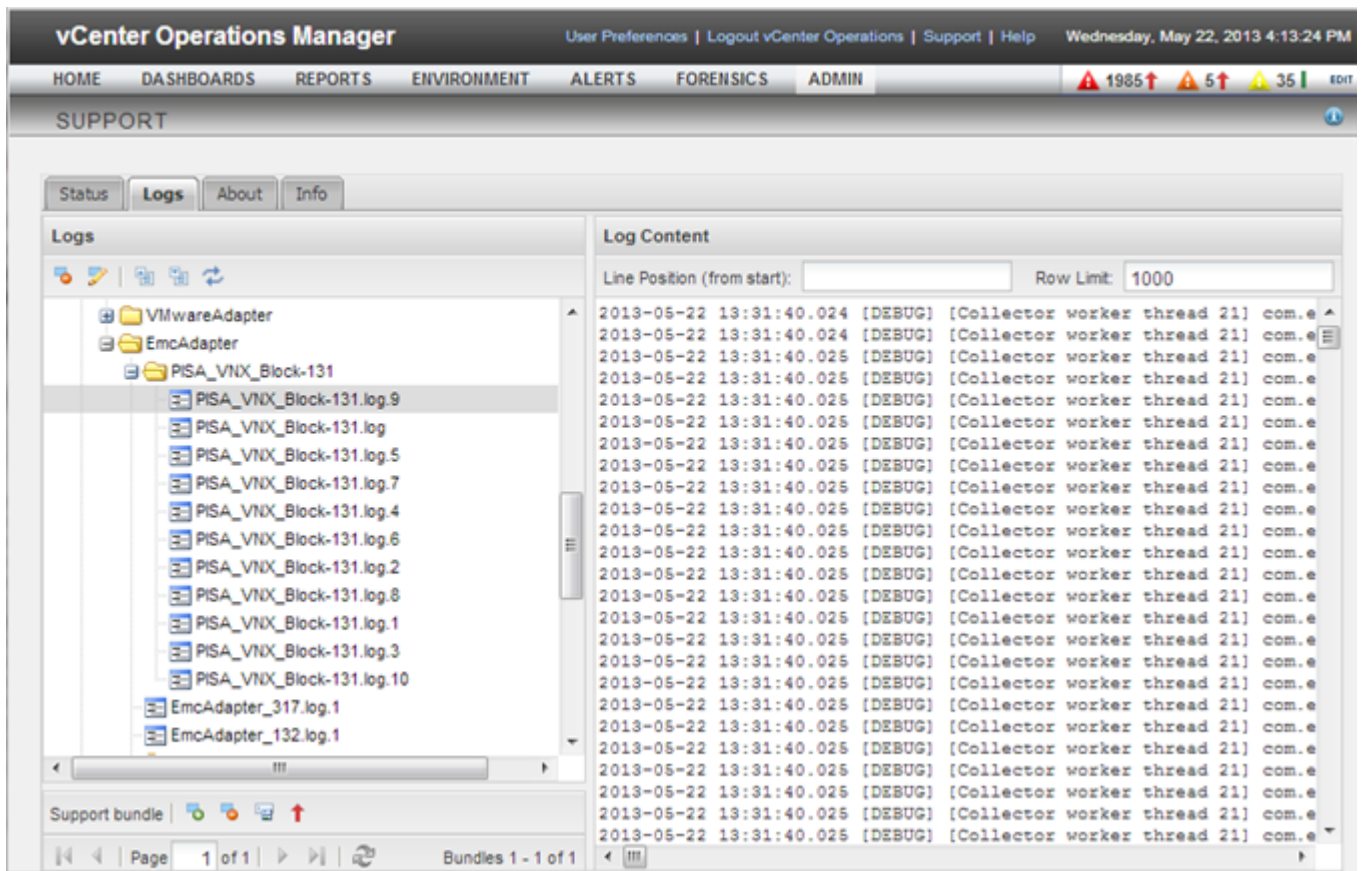
EMC Storage Analytics enables you to view error log files for each adapter instance.

Procedure

1. Start the vCenter Operations Manager custom user interface and log in as administrator.
For example in a web browser, type: `http://<vCOPs_ip_address>/vcops-custom`
2. Select **Admin** > **Support**. Select the **Logs** tab.
3. Expand the vCenter Operations Collector. Select **vCenter Operations Collector** > **adapters** > **EmcAdapter**. Log files appear under the **EmcAdapter** folder and are separated for each adapter instance. Double-click a log entry in the log tree.

Entries appear in the **Log Content window**.

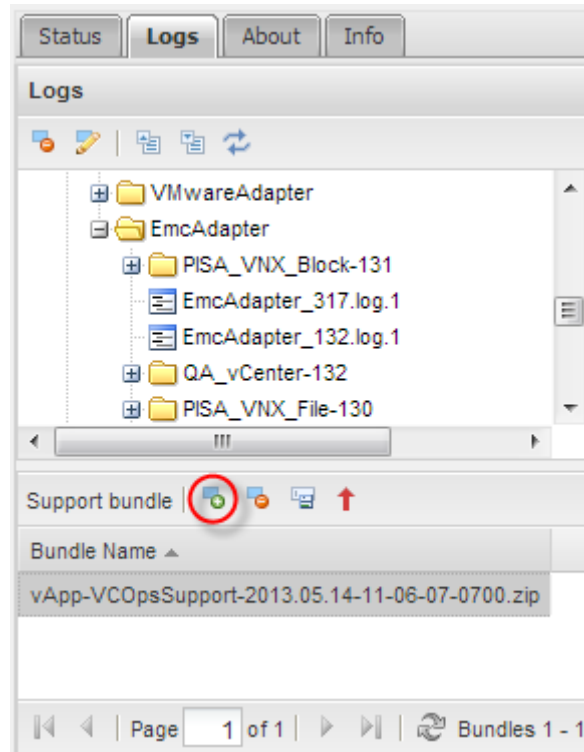
Figure 18 Log Content



Creating and downloading a support bundle

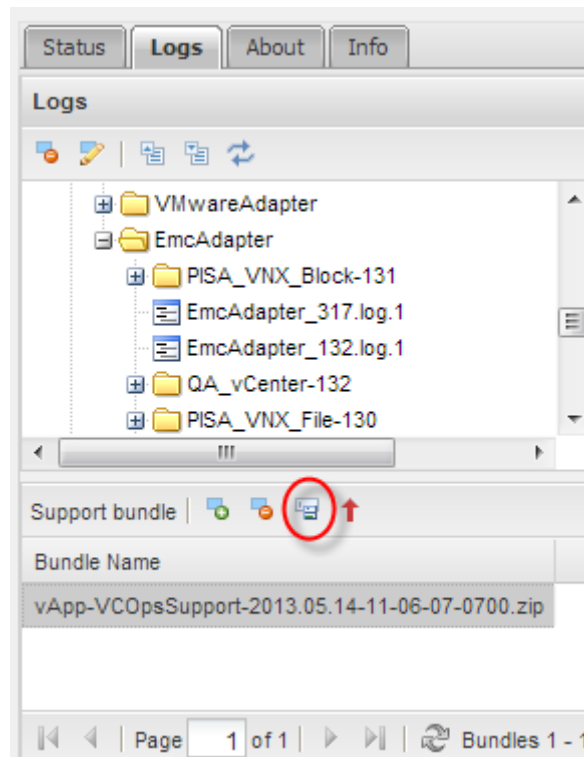
Procedure

1. On the **Logs** tab, for **Support bundle**, click the **Create Support Bundle** icon.



The bundle encapsulates all necessary logs.

2. Select the bundle name and click the **Download Bundle** icon.



Editing the Collection Interval for a resource

From the vCenter Operations Manager UI, you can edit the Collection Interval for a resource.

The screenshot shows the 'Resource Management' dialog box. The 'Resource name' field contains 'PISA VNX Block'. The 'Resource description' field is empty. The 'Collector' is set to 'vCenter Operations Standard Server'. The 'Adapter Kind' is 'EMC Adapter'. The 'Resource kind' is 'EMC Adapter Instance'. The 'Management IP' is '10.13.240.132'. The 'Connection Type' is 'VNX Block'. The 'License (optional)' field is empty. The 'Credential' is 'Default VNX Block Credentials'. The 'Attribute package' is 'All Attributes'. The 'Super Metric Package' is '--Please Select--'. The 'Collection Interval (Minutes)' is '5'. The 'Dynamic Thresholding' is 'Enabled'. The 'Early Warning Smart Alert' is 'Enabled'. The 'Maintenance Schedule' is '--Please Select--'. There are 'Add Edit Clear' links next to the 'Attribute package', 'Super Metric Package', and 'Maintenance Schedule' fields. The 'OK' and 'Cancel' buttons are at the bottom right.

The interval time is 5 minutes by default. Changing this time will affect the frequency of collection times for the VNX Block and VNX File metrics, but the EMC Adapter will only recognize the change if the resource is the EMC Adapter instance. This is normal vCenter Operations Manager behavior.

Instructions on configuring Resource Management settings are provided in the vCenter Operations Manager online help.

Frequently Asked Questions - General

How does a trial license work?

A 90-day trial license is provided for each platform that EMC Storage Analytics supports (for example, NS960). The 90-day trial license provides the same features as a permanent license, but after 90 days, the adapter stops collecting data. You can add a permanent license at any time during or after the trial period.

How do health scores work?

Health scores measure how normal a resource is acting and grades it on a scale of 0-100. A health score of 100 indicates normal behavior while a lower health score indicates that the resource is acting abnormally. The resource may not be in an unhealthy state but there is an abnormality. Health scores are calculated by a proprietary algorithm which account for several factors including thresholds and historical statistics. vCenter Operations Manager may take up to 30 days to gather enough information to determine what is considered normal in your environment. Until then, you may not see any changes in your health scores.

How many arrays can I add?

It is difficult to arrive the exact number of arrays you can add because the scale limits depend on the number of monitored objects and the metrics applied to them. When you deploy vCenter Operations Manager 5.8 and EMC Storage Analytics 2.1 in full profile mode, it can support up to 15,000 objects and up to 5 million metrics. Examples of objects are File Systems, NFS Exports, LUNs, Storage Pools, and Disks. For more details, refer to *vCenter Operations Manager 5.8 Release Notes* at <http://www.vmware.com/support/vcops/doc/vcops-571-vapp-release-notes.html>.

I deleted a resource. Why does it still appear in the vCenter Operations Manager?

vCenter Operations Manager will not delete any resources automatically because it retains historical statistics and topology information that may be important to the user. To remove the resource, delete it on the **Environment Overview** page.

What does the blue question mark in the health score indicate?

The blue question mark indicates that vCenter Operations Manager was unable to poll that resource. It will retry during the next polling interval.

What does it mean when a resource has a health score of 0?

This indicates that the resource is either down or not available.

Why are my EMC Adapter instances marked down after upgrading to the latest version of the EMC Adapter?

EMC Adapter instances require a license to operate. Edit your EMC Adapter instances to add license keys obtained from EMC. Select **Environment Overview > Configuration > Adapter Instances**.

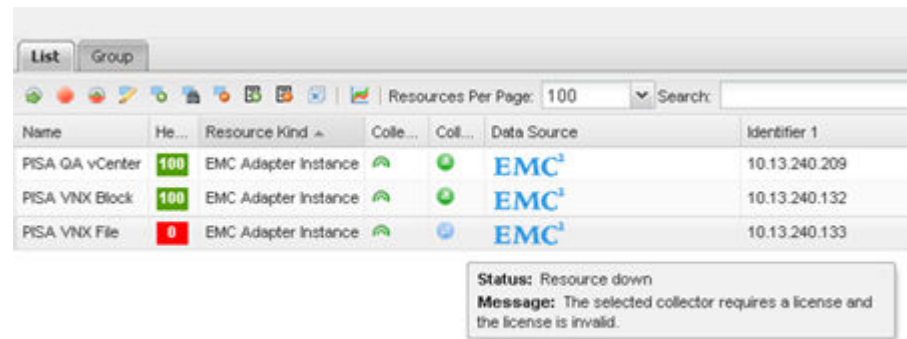
I have added license keys for EMC Adapter instances. Why are my resources still marked down?

License keys are specific to the model for which the license was purchased. Verify that you are using the correct license key for the adapter instance. You can also click the **Test** button to test the configuration after editing adapter instances.

I have multiple EMC Adapter instances for my storage systems, and I have added license keys for each of them. Why are they still marked down?

After adding a license, click the **Test** button to test the configuration and validate the license key. If you saved the configuration without performing a test and the license is invalid, the adapter instance will be marked down. To verify that a valid license exists, select **Environment Overview**. The list that appears shows the license status.

Figure 19 Status shows: Resource down



What is the difference between vCenter Operations Manager 5.8 from VMware and vCenter Operations Manager included with EMC Storage Analytics?

vCenter Operations Manager included with EMC Storage Analytics is based on vCenter Operations Manager 5.8 (Advanced edition) from VMware. However, EMC Storage Analytics is restricted to storage view. For vCenter resources such as virtual machines, you can only see storage or disk related metrics.

How is the detailed view of vCenter resources affected in EMC Storage Analytics?

Any changes in the disk system affects the health of vCenter resources such as virtual machines, but EMC Storage Analytics does not show changes in other subsystems. Metrics for other subsystems will either show 'No Data' or '?'.

Figure 20 Workload shows: No Data

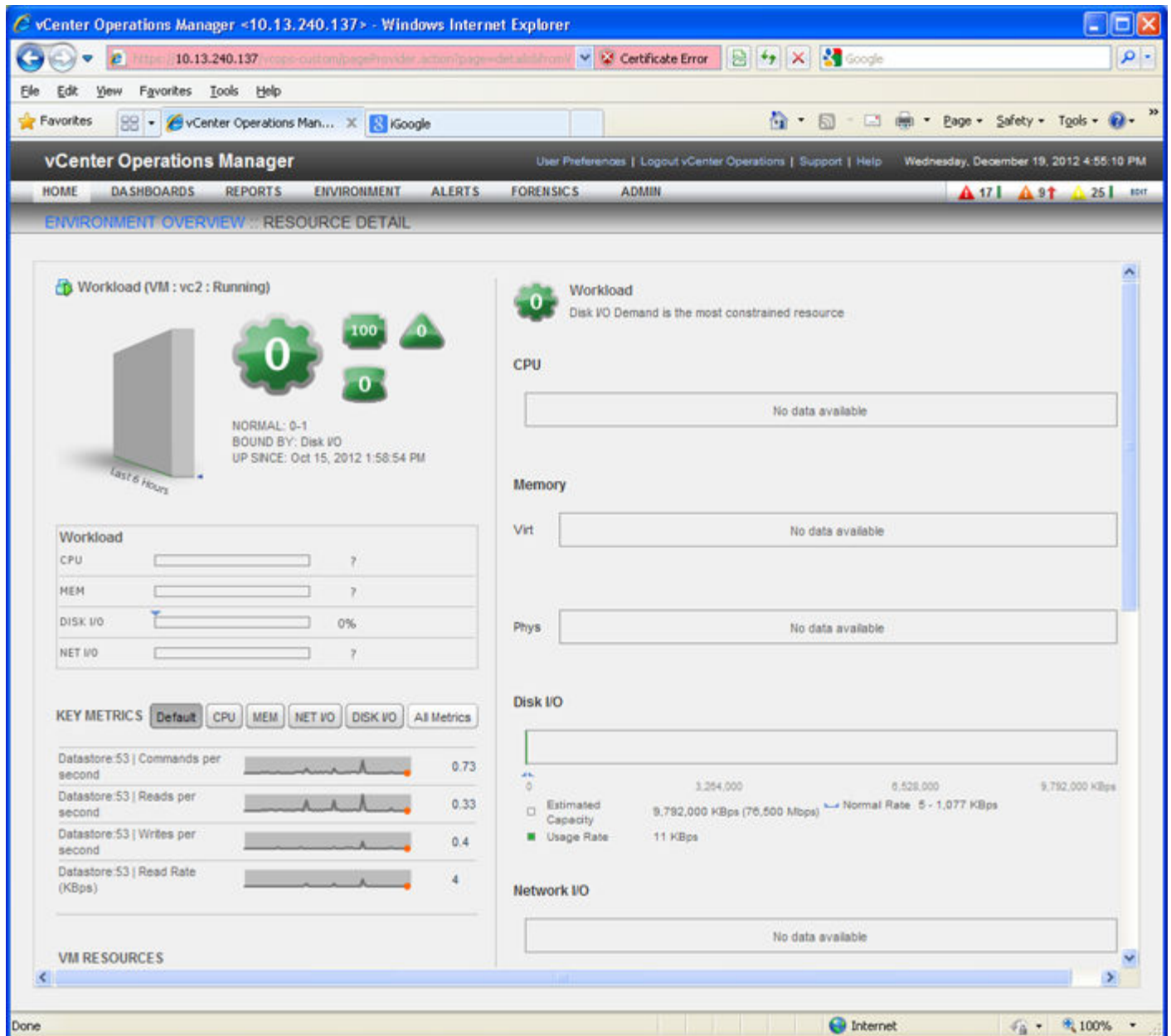
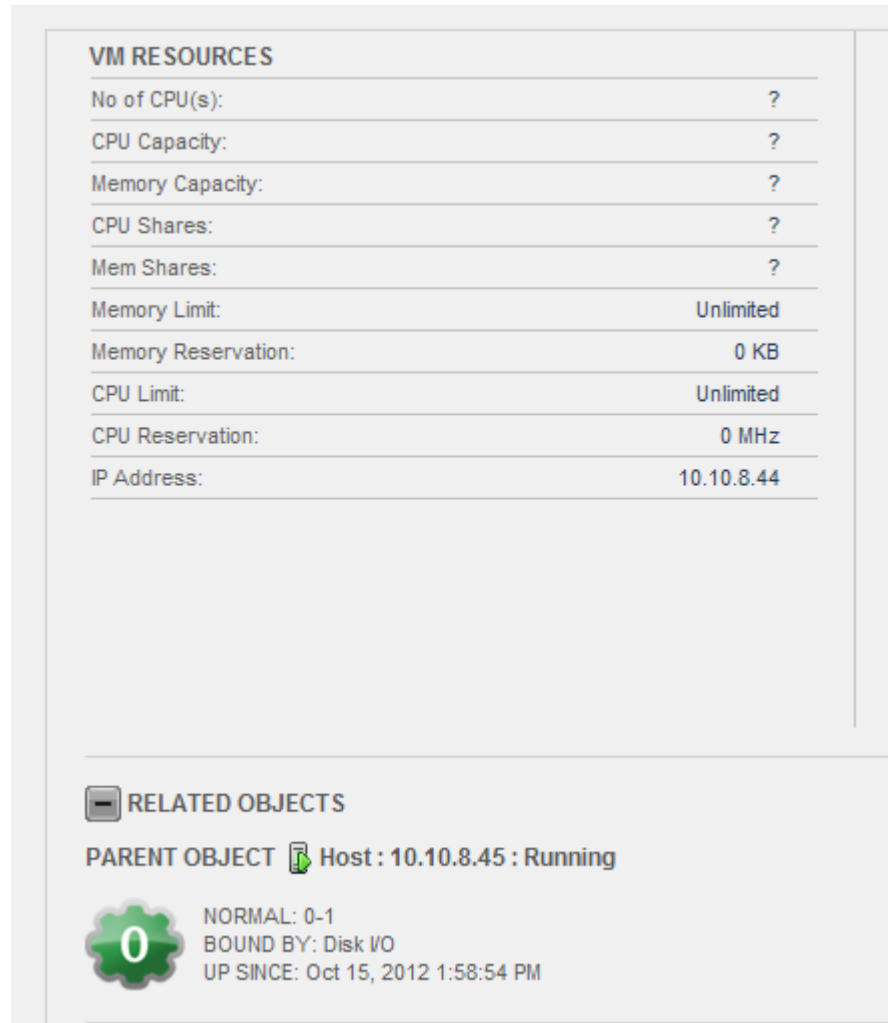


Figure 21 VM Resources shows: ?



Can I see relationships between my vCenter and EMC storage resources?

Yes. Relationships between resources are not affected and you can see a top to bottom view of the virtual and storage infrastructures if the two are connected.

What if I want to see metrics for other subsystems instead of 'No Data' or '??'?

To view metrics for other subsystems, upgrade from vCenter Operations Manager for EMC Storage to the vCenter Operations Manager 5.8 Advanced edition. No upgrade is required for the EMC Adapter.

Frequently Asked Questions for VNX

Which VNX arrays does EMC Storage Analytics support?

It supports first- and second-generation VNX platforms. Support for CX4 covers CX4-120, CX4-240, CX4-480, and CX4-960 platforms. Supported NS series includes NS120, NS240, and NS960 platforms. A complete list of the supported models in each of these series is available in [Installation requirements on page 16](#).

Will EMC Storage Analytics continue to collect VNX statistics if the primary SP or CS goes down?

Storage Analytics will continue to collect statistics through the secondary Storage Processor if the primary Storage Processor goes down. EMC Storage Analytics will automatically collect metrics from the secondary Control Station in the event of a Control Station failover. Note that the credentials on the secondary Control Station must match the credentials on the primary Control Station.

Does the Unisphere Analyzer for VNX need to be running to collect metrics?

No. VNX Block metrics are gathered through navisecli commands and VNX File metrics are gathered through CLI commands. However, statistics logging must be enabled on each storage processor (SP) on VNX Block, and statistics logging will have a performance impact on the array. No additional services are required for VNX File.

How does the FAST Cache heatmap work?

The FAST Cache heatmaps are based on the FAST Cache read and write hit ratios. This heatmap will turn red if these ratios are low because that indicates that FAST Cache is not being utilized efficiently. These heatmaps will turn green when FAST Cache is servicing a high percentage of I/O.

I purchased a license for the model of the VNX array that I plan to monitor. When I configure the adapter instance for VNX File, why does an "invalid license" error message appear?

Control Station may not be reporting the correct model or the array. Log into Control Station and check the array model with the command: `/nas/sbin/model`. Verify that the array model returned matches the model on the Right to Use certificate.

After a Control Station failover, why is the VNX File adapter instance marked down and why does metric collection stop?

The failover may have been successful, but the new Control Station may not be reporting the correct model of the array. This results in a failure to validate the license and all data collection stops. Log into Control Station and check the array model with the command: `/nas/sbin/model`. If the model returned does not match the actual model of the array, Primus case emc261291 in the EMC Knowledgebase provides possible solutions.

The disk utilization metric is not visible for my VNX Block array. Why not?

The disk utilization metric is not supported on VNX arrays running a VNX Block OE earlier than Release 32. Upgrade to VNX Block OE Release 32 or later to see this metric in vCenter Operations Manager.

I am unable to successfully configure an EMC Adapter instance for VNX File when using a user with read-only privileges. Why does this happen?

A user with administrative privileges is required while configuring an EMC Adapter instance for VNX File arrays running an OE earlier than 7.1.56.2. Upgrade to VNX File OE 7.1.56.2 or later to be able to configure an adapter instance using a user with read-only privileges.

The user LUNs on my VNX Block vault drives are not reporting performance metrics. Why not?

Performance metrics are not supported for user LUNs on vault drives. Place user LUNs on drives other than vault drives.

Frequently Asked Questions for VMAX

I deleted a VMAX adapter, but all the dependent objects still remain in vCenter Operations Manager. Why?

Deleting a VMAX adapter instance does not remove its dependent objects. The objects enter an unknown state (blue) but retain their historical metrics. If desired, delete the objects from the **Environment Overview** page.

If I test a VMAX connection and it fails, how do I know which field is wrong?

Unfortunately, the only field that produces a unique message when it is wrong is the license number field. If any other field is wrong, the user is informed the connection was not successful. To resolve the issue, verify all the other fields are correct. Remove any white spaces after the end of the values.

Why is my VMAX array showing as red rather than blue (unknown) just after adding it?

If the array is red, the SMI-S may be down or there may be an incorrect parameter in the adapter configuration. Return to the adapter instance configuration and test the configured instance. If it fails, verify all fields are correct. Determine if the SMI-S server is running and can recognize the VMAX array that you are configuring.

All my configured VMAX adapter instances changed to red. Why?

This usually happens when the SMI-S Provider is unavailable or there is a clock synchronization problem. This might be network-related or application-related. The SMI-S Provider may have reached the connection limit if the network IP is available. Look for errors in the cimom.log file on the SMI-S box similar to:

26-Mar-2013 05:47:59.817 -900-E- WebServer: The webserver hits its connection limit, closing connection.

Follow the steps in the *SMI-S Provider Release Notes* to increase the count.

A message next to the array will indicate a clock synchronization problem if a problem exists.

Can I modify or delete the VMAX Overview (or another) dashboard?

Yes, the environment can be customized to suit the needs of the user. Rename the dashboard so that it is not overwritten during an upgrade.

I received the following error when I attempted to modify the VNX Overview dashboard although I have only VMAX arrays:



Is this a problem?

No, this is a generic error that VMware produces when you attempt to modify a component you do not have.

Why do some of the boxes appear white in the VMAX Overview dashboard?

While the metrics are being gathered for an adapter instance, some of the heat maps in the dashboard may be white. This is normal. Another reason the boxes may appear white is that the adapter itself or an individual resource (e.g. a VMAX device) has been deleted, but the resources remain until they are removed from the **Environment Overview** page.

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