

EMC[®] Storage Analytics

Version 4.0

Installation and User Guide

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CHAPTER 1

Introduction

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Overview

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

vRealize Operations Manager presents data and analysis information in several ways:

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

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

The collector types are shown in [EMC Adapter architecture on page 9](#).

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

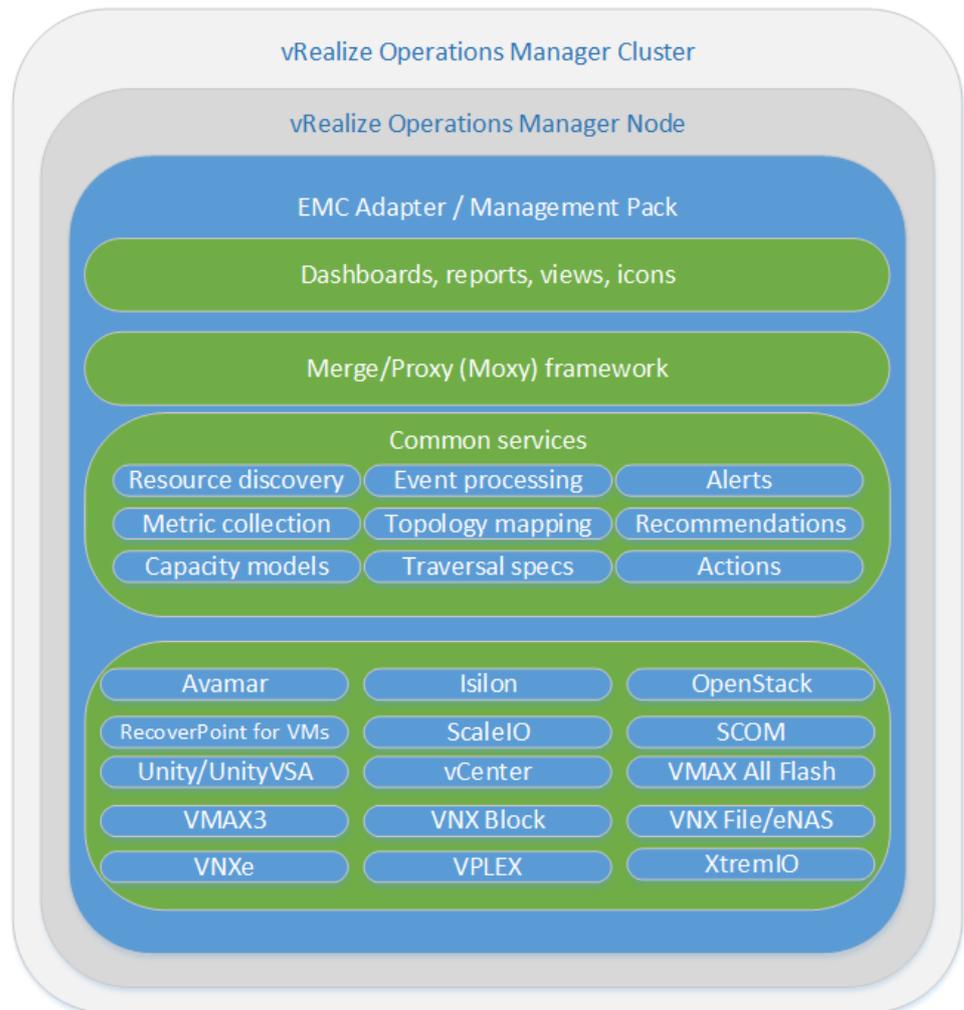
EMC Storage Analytics complies with VMware management pack certification requirements and has received the VMware Ready certification.

This version of EMC Storage Analytics supports the following EMC products:

- EMC Avamar®
- EMC Isilon®
- EMC RecoverPoint® for Virtual Machines
- EMC ScaleIO®
- EMC Unity™
- EMC UnityVSA™
- EMC VMAX® All Flash
- EMC VMAX3™
- EMC VNX® Block
- EMC VNX File/eNAS
- EMC VNXe3200™
- EMC VPLEX®
- EMC XtremIO®

Note

Unity dashboards, views, and reports are compatible with VNXe. If you upgrade from ESA 3.5, VNXe dashboards are visible. For new installations use the Unity versions of these items for VNXe.

Figure 1 EMC Adapter architecture**Note**

Refer to the [EMC Simple Support Matrix](#) for a list of supported product models.

References

This topic provides a list of documentation for reference.

VMware vRealize Operations Manager documentation

- *vRealize Operations Manager Release Notes* contains descriptions of known issues and workarounds.
- *vRealize Operations Manager vApp Deployment and Configuration Guide* explains installation, deployment, and management of vRealize Operations Manager.
- *vRealize Operations Manager User Guide* explains basic features and use of vRealize Operations Manager.
- *vRealize Operations Manager Customization and Administration Guide* describes how to configure and manage the vRealize Operations Manager custom interface.

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

EMC documentation

- *EMC Storage Analytics Release Notes* provides a list of the latest supported features, licensing information, and known issues.
- *EMC Storage Analytics Installation and User Guide* (this document) provides installation and licensing instructions, a list of resource kinds and their metrics, and information about storage topologies and dashboards.

Terminology

This topic contains a list of commonly used terms.

adapter

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

adapter instance

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

dashboard

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

health rating

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

icon

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

metric

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

resource

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

resource kind

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

widget

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

CHAPTER 2

Installation and Licensing

This chapter contains the following topics:

- [Installation overview](#) 14
- [Installation and operating requirements](#) 15
- [Installing vRealize Operations Manager](#) 18
- [Installing the EMC Adapter and dashboards](#) 19
- [Installing Navisphere CLI](#) 20
- [Adapter instances](#) 21

Installation overview

EMC Storage Analytics consists of the following installation packages:

- vRealize Operations Manager—Provides a view of all resources managed by vCenter, including EMC storage arrays
- EMC Adapter—Enables the collection of metrics from EMC resources. The adapter installation includes instructions for:
 - Installing the EMC Adapter and dashboards
 - Adding one or more EMC Adapter instances and applying license keys from EMC

Installation and upgrade options

Review the [Installation and operating requirements on page 15](#), and then refer to the instructions for one of the following options to install or upgrade your system.

Option	Instructions
Install VMware vRealize Operations Manager 6.2 and EMC Storage Analytics 4.0	<ul style="list-style-type: none"> • Installing vRealize Operations Manager on page 18 • Installing the EMC Adapter and dashboards on page 19 • Adding EMC Adapter instances for EMC products on page 26
Install EMC Storage Analytics 4.0 on a system running VMware vRealize Operations Manager 6.2	<ul style="list-style-type: none"> • Installing the EMC Adapter and dashboards on page 19 • Adding EMC Adapter instances for EMC products on page 26
Upgrade EMC Adapter 3.5 to EMC Storage Analytics 4.0 on a system running VMware vRealize Operations Manager 6.2	<ol style="list-style-type: none"> 1. Install a new instance of vRealize Operations Manager 6.2. See Installing vRealize Operations Manager on page 18. 2. Install EMC Storage Analytics 4.0 on vRealize Operations Manager 6.2. See Installing the EMC Adapter and dashboards on page 19 and Adding EMC Adapter instances for EMC products on page 26. 3. If you are using vCenter Operations Manager 5.8.x, migrate the data to the new vRealize Operations Manager 6.2 system. <hr/> <p>Note</p> <p>Refer to the <i>vRealize Operations Manager vApp Deployment and Configuration Guide</i> for information about migration-based upgrades to vRealize Operations Manager 6.2.</p>

License requirements

The following table lists the licensing requirements.

Note

EMC products are available for a 90-day trial from the installation date. To install software for trial, leave the license field blank.

Table 1 Required software licenses

Software	Required license	Notes
vRealize Operations Manager (Advanced or Enterprise)	VMware license for vRealize Operations Manager (Advanced or Enterprise)	
EMC Storage Analytics	EMC Storage Analytics electronic or physical license	If you purchase an electronic license for EMC Storage Analytics, you will receive a letter that directs you to an electronic licensing system to activate the software to which you are entitled. Otherwise, you will receive a physical license key.
EMC storage arrays	EMC license for your storage array	A 90-day trial for all supported products is available with EMC Storage Analytics. The 90-day trial provides the same features as licensed products, but after 90 days of usage, the adapter stops collecting data. You can add a license at any time.

Installation and operating requirements

Before installing the EMC Adapter, verify that these installation and operating requirements are satisfied.

Note

The [ESA space on the EMC Community Network](#) provides more information about installing and configuring EMC Storage Analytics.

EMC Adapter port assignments

Connection type	Data source	Protocol	Default port
Avamar	MCSDK API	HTTP SOAP	9443
Isilon	REST API	HTTPS	8080
Microsoft SCOM	SQL	TCP	1433
OpenStack	OpenStack Endpoint	HTTP	5000
RecoverPoint for Virtual Machines	REST API	HTTPS	443
ScaleIO	REST API	HTTPS	443
Unity/UnityVSA	REST API	HTTPS	443
VMAX	REST API	HTTPS	8443
VMware vSphere	vCenter Web Services SDK	HTTPS	443
VNX Block	Navisecli	TCP/SSL	443 or 2163
VNX File/eNAS	Control Station CLI	SSH	22
VNXe	REST API	HTTPS	443
VPLEX	REST API (topology)	HTTPS	443

Connection type	Data source	Protocol	Default port
	Vplexcli (metrics)	SSH	22
XtremIO	REST API	HTTPS	443

Supported vRealize Operations Manager versions

vRealize Operations Manager Advanced or Enterprise editions from VMware

Note

EMC Storage Analytics does not support vRealize Operations Manager Foundation and Standard editions.

Deploy the vApp for vRealize Operations Manager before installing the EMC Adapter. Check the *vRealize Operations Manager vApp Deployment and Configuration Guide* at <http://www.vmware.com/support/pubs> for system requirements pertaining to your version of vRealize Operations Manager.

Supported product models

See the [EMC Simple Support Matrix](#) for a complete list of supported product models.

Supported web browser

See the latest vRealize Operations Manager release notes for a list of supported browsers.

Isilon systems

EMC Storage Analytics uses REST APIs to interact with Isilon systems. Specify the Isilon Storage Administration web interface IP address (and port if you are not using the default port, 8080) to configure the Isilon collector.

ScaleIO systems

EMC Storage Analytics uses REST APIs to interact with ScaleIO systems. Specify the IP address and port of the ScaleIO Gateway to configure the ScaleIO collector.

Unity and UnityVSA systems

The EMC Adapter uses the REST API to collect configuration and metrics from Unity and UnityVSA systems. To configure a Unity or UnityVSA adapter instance, specify the Unisphere Management IP address and user credential that has the array Administrator role. Unity and UnityVSA adapter instances do not require that you input a license in the configuration wizard. The ESA license for the Unity and UnityVSA collector is tracked on the array side. In Unisphere, select **Settings** > **Software and Licenses** > **License Information** to ensure that the EMC Storage Analytics license is valid and current.

EMC Unisphere for VMAX

The EMC Adapter uses the Unisphere for VMAX REST API. Unisphere must be available on the network and accessible through a port specified at the end of the IP address (for example, 10.10.10.10:8443). In addition, all VMAX systems must be registered for performance data collection to work with ESA. For data collection only, the Unisphere user credentials for ESA must have PERF_MONITOR permissions and, for the ability to use actions, the user must have STORAGE_ADMIN permissions.

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 vRealize 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**).

VPlex File/eNAS systems

CLI commands issued on the Control Station direct the EMC Adapter to collect metrics from VNX File and eNAS systems. The Control Station requires an IP address that is reachable from the vRealize 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 the password credentials. Setting `nas_stig` to **On** limits direct access for root accounts, preventing the adapter instance from collecting metrics for VNX File and eNAS.

VNXe systems

The EMC Adapter uses REST API to collect configuration and metrics from VNXe systems. To configure a VNXe adapter instance, specify the Unisphere's Management IP address and user credential that has the array's Administrator role.

VPlex Adapter instance

Only one EMC Adapter instance is required for VPlex Local or VPlex Metro. You can monitor both clusters in a VPlex Metro by adding a single EMC Adapter instance for one of the clusters. Adding an EMC Adapter instance for each cluster in a VPlex Metro system introduces unnecessary stress on the system.

VPlex data migrations

EMC VPlex systems are commonly used to perform non-disruptive data migrations. When monitoring a VPlex system with EMC Storage Analytics, a primary function is to perform analytics of trends on the storage system. When swapping a back-end storage system on VPlex system, the performance and trends for the entire VPlex storage environment are impacted. Therefore, EMC recommends that you start a new EMC Storage Analytics baseline for the VPlex system after data migration. To start a new baseline:

1. Before you begin data migration, delete all resources associated with the existing EMC Storage Analytics VPlex adapter instance.
2. Remove the existing EMC Storage Analytics VPlex adapter instance by using the **Manage Adapter Instances** dialog.
3. Perform the data migration.
4. Create a new EMC Storage Analytics VPlex adapter instance to monitor the updated VPlex system.

Optionally, you can stop the VPlex adapter instance collects during the migration cycle. When collects are restarted after the migration, orphaned VPlex resources will appear in EMC Storage Analytics, but those resources will be unavailable. Remove the resources manually.

XtremIO

EMC Storage Analytics uses REST APIs to interact with XtremIO arrays. Users must specify the IP address of the XtremIO Management Server (XMS) when adding an EMC Adapter for XtremIO and the serial number of the XtremIO Cluster to monitor when adding an EMC Adapter instance for XtremIO.

If enhanced performance is required, administrators can configure the thread count for the XtremIO adapter instance. See [Configuring the thread count for an adapter instance on page 172](#).

Minimum OE requirements

See the [EMC Simple Support Matrix](#) for a complete list of minimum Operating Environment (OE) requirements for supported product models.

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 EMC SMI-S Provider. For example, to add an EMC Adapter for a VNX array, use a global account with an 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 (see information about authentication and authorization for ESXi and vCenter Server). Ensure that the adapter points to the vCenter server that is monitored by vRealize Operations Manager.

DNS configuration

To use the EMC Adapter, the vRealize Operations Manager vApp requires network connectivity to the storage systems to be monitored. DNS must be correctly configured on the vRealize 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. Failure to observe these practices may affect the collection of performance metrics and topology updates.

Installing vRealize Operations Manager

Before you begin

- Obtain the OVA installation package for vRealize Operations Manager from VMware or download it from [EMC Online Support](#).
- Obtain a copy of the *vRealize Operations Manager vApp Deployment and Configuration Guide* at <http://www.vmware.com/support/pubs>.

Refer to the *vRealize Operations Manager vApp Deployment and Configuration Guide* to deploy the vApp for vRealize Operations Manager.

Procedure

1. Review the system requirements.
2. Follow the instructions to install vRealize Operations Manager and use the VMware license that you received when prompted to assign the vRealize Operations Manager license.

3. Conclude the installation by following instructions to verify the vRealize Operations Manager installation.

Installing the EMC Adapter and dashboards

Before you begin

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

When you upgrade EMC Storage Analytics the standard EMC dashboards are overwritten. To customize a standard EMC dashboard, clone it, rename it, and then customize it.

To install the EMC Adapter and dashboards:

Procedure

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

For example, enter `https://<vROPs_ip_address>`.
3. Select **Administration** > **Solutions** and then click the Add (plus) sign to upload the PAK file.

A message similar to this one is displayed in the **Add Solution** window:

```
The .pak file has been uploaded and is ready to install.
pak file details
Name          EMC Adapter
Description   Manages EMC systems such as VNX, VMAX...
Version       4.0
```

4. Click **Next**, read the license agreement, and select the check box to indicate agreement. Click **Next** again.

Installation begins. Depending on your system's performance, the installation can take from 5 to 15 minutes to complete.

5. When the installation completes, click the **Finish** button.

The EMC Adapter appears in the list of installed solutions.

Installing Navisphere CLI

For VNX Block systems, the Navisphere CLI (naviseccli) must be installed in the Data Node that you assign to collect metrics for VNX. The `naviseccli-bin-xxx.rpm` is available in the ESA package.

Note

For vRealize Operations Manager 6.1 or later, the Navisphere CLI is automatically installed on all Data Nodes that are available during the initial installation. If you add more nodes in vRealize Operations Manager cluster after ESA is installed or if you are using vRealize Operations Manager 6.0 or earlier, use the following procedure to manually install the Navisphere CLI.

Install the CLI before you add the EMC Adapter instance to vRealize Operations Manager. If the CLI is not installed, errors could occur in scaled-out vCenter environments that consist of a Master Node and multiple Data Nodes. The CLI is automatically installed on the Master Node. However, because the Data Node collects metrics, the EMC Adapter might report errors if `naviseccli` is not installed.

Procedure

1. Enable Secure Shell (SSH) for both master and data nodes.
Refer to [Connecting to vRealize Operations Manager by using SSH on page 173](#) for instructions.
2. Extract the pak file by using decompression software such as WinZip.
3. Copy the `naviseccli-bin-<version>.rpm` file (for example, `naviseccli-bin-7.33.1.0.33-x64.rpm`) to a target directory in the data node. If you are using Windows, you can use WinSCP for the copy operation.
4. Establish a secure connection to the data node and change to the target directory.
5. Run this command: `rpm -i naviseccli-bin-<version>.rpm` where *<version>* is the appropriate version of the `naviseccli` utility for the node.
6. Repeat this procedure to install `naviseccli` in other nodes, as required.

Adapter instances

The vRealize 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 vRealize Operations Manager uses EMC Adapter instances to identify and access the resources. Supported adapter instances include:

- vCenter (prerequisite for other adapter instances)
- Avamar
- eNAS
- Isilon
- OpenStack
- RecoverPoint for Virtual Machines
- ScaleIO
- System Center Operations Manager (SCOM)
- Unity
- UnityVSA
- VMAX
- VNX File
- VNX Block
- VNXe
- VPLEX
- XtremIO

See the [EMC Simple Support Matrix](#) for a list of the supported models for each adapter instance and related Operating Environments (OEs).

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

Note

The [ESA space on the EMC Community Network](#) provides more information about installing and configuring EMC Storage Analytics.

After adapter instances are created, the vRealize Operations Manager Collector requires several minutes to collect statistics, depending on the size of the storage array. Large storage array configurations require 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

To view health trees for the storage environment from the virtual environment, you must install an EMC Adapter instance for vCenter. All storage system adapter instances require the EMC Adapter instance for vCenter, which you must add first. A separate instance is required for each vCenter monitored by the vRealize Operations Manager environment.

Procedure

1. In a web browser, type: `https://<vROps_ip_address>/vcops-web-ent` to start the vRealize Operations Manager custom user interface log in as an administrator.
2. Select **Administration > Solutions > EMC Adapter**, and then click the **Configure** icon.
The **Manage Solution** dialog box appears.
3. Click the **Add** icon to add a new adapter instance.
4. Configure the following **Adapter Settings** and **Basic Settings**:

Option	Description
Display Name	Any descriptive name, for example: My vCenter
Description	Optional description
Connection Type	VMware vSphere
License (optional)	Not applicable (must be blank) for EMC Adapter instance for vCenter
Management IP	IP address of the vCenter server
Array ID (optional)	Not applicable (must be blank) for VMware vSphere connection type

5. In the **Credential** field, select any previously defined credentials for this storage system; otherwise, click the **Add New** icon (+) and configure these settings:

Option	Description
Credential name	Any descriptive name, for example: My VMware Credentials
Username	Username that EMC Storage Analytics uses to connect to the VMware vRealize system Note If a domain user is used, the format for the username is DOMAIN \USERNAME.
Password	Password for the EMC Storage Analytics username

6. Click **OK**.
7. Configure the **Advanced Settings**, if they are required:

Collector	vRealize Operations Manager Collector
Log Level	Configure log levels for each adapter instance. The levels for logging information are ERROR, WARN, INFO, DEBUG, and TRACE.

The **Manage Solution** dialog box appears.

8. To test the adapter instance, click **Test Connection**.
If the connection is correctly configured, a confirmation box appears.
9. 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.

Note

To edit the polling interval, select **Administration > Environment Overview > EMC Adapter Instance**. Select the EMC Adapter instance you want to edit, and click the **Edit Object** icon.

Configuring the vCenter Adapter

After the vCenter Adapter is installed, use the following procedure to configure it manually.

Procedure

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

In a web browser, type `https://vROps_ip_address/vcops-webent` and type the password.

2. Select **Administration > Solutions**.
3. In the solutions list, select **VMware vSphere > vCenter Adapter**, and click the **Configure** icon.

The **Manage Solution** dialog box appears.

4. Click the **Add** icon.
5. In the **Manage Solution** dialog box, provide values for the following parameters:
 - Under **Adapter Settings**, type a name and optional description.
 - Under **Basic Settings**:
 - For **vCenter Server**, type the vCenter IP address.
 - For **Credential**, either select a previously defined credential or click the **Add** icon to add a new credential.
For a new credential, in the **Manage Credential** dialog box, type a descriptive name and the username and password for the vRealize system. If you use a domain username, the format is DOMAIN\USERNAME. Optionally, you can edit the credential using the **Manage Credential** dialog box. Click **OK** to close the dialog box.
 - Optionally, configure the **Advanced Settings**:
 - **Collector**: The vRealize Operations Manager Collector
 - **Auto Discovery**: True or False
 - **Process Change Events**: True or False
 - **Registration user**: The registration username used to collect data from vCenter Server.
 - **Registration password**: The registration password used to collect data from vCenter Server
6. Click **Test Connection**.
7. Click **OK** in the confirmation dialog box.

8. Click **Save Settings** to save the adapter.
9. Click **Yes** to force the registration.
10. Click **Next** to go through a list of questions to create a new default policy if required.

Adding an EMC Adapter instance for SCOM

The SCOM adapter collects the resource and topology information for the computers and virtual machines in a Microsoft Hyper-V environment. To view relationships between VNX resources and resources that are collected by the SCOM adapter, configure an EMC Adapter instance for SCOM.

Before you begin

- Install Hyper-V Management Pack Extensions 2012/2012 R2 in SCOM. The installation binary is available at <https://hypervmpe2012.codeplex.com>.
- Install the Management Pack for EMC storage systems (EMC Adapter) on vRealize Operations Manager.
- Install the Management Pack for SCOM on vRealize Operations Manager.
- Download the Hyper-V-enabled VNX Topology Dashboard from [ESA Dashboard Exchange](#). Import the dashboard into vRealize Operations Manager.
- Add your SCOM adapter instance in VMware SCOM MP.

Procedure

1. Open the EMC Adapter configuration dialog box.
2. For **Management IP**, type the IP address in this format: *<IP address of the SCOM server>.<<Port of the SQL Server instance that stores the SCOM data (default is 1433)>>{ <database name of the SQL Server that stores the SCOM data (default is OperationsManager)>}*
For example, 10.0.0.1:1433/OperationsManager
3. For **Collector Type**, type **Microsoft SCOM**.
4. For **Credential**, type the username and password to connect to SQL Server.
For Windows authentication, provide the domain name, for example *<domain_name>\<administrator_username>*.
5. Click **Test Connection**. If a "Driver not found" error appears, try again.
6. Verify that the connection is successful and click **Save**.

The SCOM adapter instance is added.

Adding an EMC Adapter instance for OpenStack

The OpenStack adapter collects the compute, storage, and network infrastructure information in the OpenStack environment. To view relationships between VNX resources and OpenStack resources, configure an EMC Adapter instance for OpenStack.

Before you begin

- Install the Management Pack for EMC storage systems (EMC Adapter) on vRealize Operations Manager.
- Install the vRealize Operations Manager pack for OpenStack.
- Configure a VMware OpenStack Adapter instance.

Procedure

1. In the configuration dialog box for the EMC Adapter, provide the following information:
 - **Management IP:** Type the url of the OpenStack Endpoint in this format: `[protocol://][IP_address][:port]`. Protocol can be `http` or `https`. The protocol defaults to `http` if omitted. The port defaults to 5000 if omitted.
For example: `192.168.1.2` defaults to `http://192.168.1.2:5000`
 - **Connection Type:** Select **OpenStack**.
 - **Credential:** Type the user name and password used to connect to the OpenStack Endpoint. The username format is `tenant:username`. Tenant defaults to **admin** if omitted.
2. Click **Test Connection**.
3. If a **Review and Accept Certificate** dialog box appears, review and click **OK** to accept the certificate.
4. Verify that the connection test is successful and click **Save**.

Results

The OpenStack adapter instance is added.

Adding EMC Adapter instances for EMC products

Before you begin

- Install the EMC Adapter for vCenter.
- Obtain the adapter license key (if required) for your EMC product.

Each EMC product requires an adapter instance. All EMC product adapter instances require the EMC Adapter instance for vCenter. Add the EMC Adapter instance for vCenter first. Then add the adapter instances for each EMC product. Adapter instances are licensed per product. Observe these exceptions and requirements:

- When adding an eNAS adapter instance, a license is not required.
- When adding a Unity adapter instance, the license is automatically checked through the array.
- A VNX Unified array can use the same license for VNX File and VNX Block.
- When adding a VNX File adapter instance, a license is required for the VNX File system.
- For VNX Block, to avoid a certificate error in case the main storage processor is down, test both storage processors for the VNX Block system to accept both certificates.
- Global Scope is required for VNX Block access.
- For VPLEX Metro, add an adapter instance for only one of the clusters (either one); this action enables you to monitor both clusters with a single adapter instance.
- For RecoverPoint for Virtual Machines, get the RecoverPoint model that is required for the license.

Procedure

1. In a web browser, type: `https://<vROps_ip_address>/vcops-web-ent` to start the vRealize Operations Manager custom user interface and log in as an administrator.
2. Select **Administration > Solutions > EMC Adapter** and click the **Configure** icon.
The **Manage Solution** dialog box appears.
3. Click the **Add** icon to add a new adapter instance.
4. Configure the following **Adapter Settings** and **Basic Settings**:

Display Name	A descriptive name, such as My Storage System or the array ID
Description	Optional description with more details
License (optional)	<p>License key (if required) for the array that you want to monitor (The license key for the adapter instance appears on the Right to Use Certificate that is delivered to you or through electronic licensing, depending on your order.)</p> <hr/> <p>Note</p> <p>If the license field is left blank, the adapter instance will run under a 90-day trial. When the 90 days expires, ESA will stop collecting metrics until a valid license is added to the adapter instance.</p>

5. Configure these settings based on the adapter instance for your product:

Supported product	Field: Connection Type	Field: Management IP	Field: Array ID (optional)
Avamar	Avamar	Use the IP address of the Avamar server where MCS is running.	Not applicable
eNAS	eNAS	Use the IP address of the primary Control station.	Not applicable
Isilon arrays	Isilon	If SmartConnect Zone is configured, use the SmartConnect zone name or IP address. Otherwise, use any node IP address.	
RecoverPoint for Virtual Machines	RecoverPoint for Virtual Machines	Use the IP address of the virtual RecoverPoint appliance.	Not applicable
ScaleIO arrays	ScaleIO	Use the IP address and port of the ScaleIO Gateway.	Not applicable
Unity	Unity	Use the IP address of the management server.	Not applicable
UnityVSA	UnityVSA	Use the IP address of the management server.	Not applicable
VMAX3 and VMAX All Flash	VMAX	Use the IPv4 or IPv6 address, and the port number of the configured EMC Unisphere for VMAX.	Required
VNX Block arrays	VNX Block	Use the IP address of one Storage Processor (SP) in a single array. Do not add an adapter instance for each SP.	Not applicable
VNX File and Unified models, VG2 and VG8 gateway models	VNX File	Use the IP address of the primary Control Station.	Not applicable
VNXe3200	VNXe	Use the IP address of the management server.	Not applicable
VPLEX Local or VPLEX Metro	VPLEX	Use the IP address of the management server. For a Metro cluster, use the IP address of either management server, but not both.	Not applicable
XtremIO	XtremIO	Use the IP address of the XMS that manages the XtremIO target cluster.	Use the serial number of the XtremIO target cluster.

6. In the **Credential** field, select any previously defined credentials for this product; otherwise, click the **Add New** icon and configure these settings:

Field	Value to enter
Credential name	A name for the credentials information.
Username	<p>Username that EMC Storage Analytics uses to connect to the EMC product.</p> <ul style="list-style-type: none"> For Avamar, use the credentials of the MCUser account, or another Avamar Administrator user. For Isilon, use the credentials of the OneFS storage administration server. For ScaleIO, use the credentials of the ScaleIO Gateway.

Field	Value to enter
	<ul style="list-style-type: none"> For RecoverPoint for Virtual Machines, use the credentials of the virtual RecoverPoint appliance. For Unity and UnityVSA, use the credentials of the management server. For VMAX, use the Unisphere user credentials. For data collection only, the Unisphere user credentials for ESA must have PERF_MONITOR permissions and, for the ability to use actions, the user must have STORAGE_ADMIN permissions. For VNX File or eNAS, use the credentials of the Control Station. For VNX Block, use the credentials of the Storage Processor. For VNXe, use the credentials of the management server. For VPLEX, use the credentials of the management server (for example, the service user). The default credentials are service/Mi@Dim7T. For XtremIO, use the XMS username.
Password	EMC product management password.

7. Click **OK**.

The **Manage Solution** dialog reappears.

8. If required, configure the following **Advanced Settings**:

Collector	Automatically select collector
Log Level	Configure log levels for each adapter instance. The levels for logging information are ERROR, WARN, INFO, DEBUG, and TRACE.

The **Manage Solution** dialog box appears.

9. Click **Test Connection** to validate the values you entered.

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

Note

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.

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

Editing EMC Adapter instances

Before you begin

- Install the EMC Adapter.
- Configure the EMC Adapter instance for your EMC product.
- Obtain an adapter license key for your product.

Adapter instances are licensed per product. For details, refer to [License requirements on page 14](#).

Procedure

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

For example in a web browser, type: `https://<vROps_ip_address>/vcops-web-ent`.

2. Select **Administration** > **Inventory Explorer** > **EMC Adapter Instance** .
3. Select the EMC adapter you want to edit and click the **Edit Object** icon.

The **Edit Object** dialog appears.

4. Edit the fields you need to change. See [Adding EMC Adapter instances for EMC products on page 26](#) for field descriptions.
5. Click **Test Connection** to verify the connection.
6. To finish editing the adapter instance, click **OK**.

CHAPTER 3

EMC Storage Analytics Dashboards

This chapter contains the following topics:

- [Topology mapping](#).....32
- [EMC dashboards](#)..... 47

Topology mapping

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

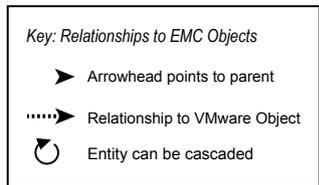
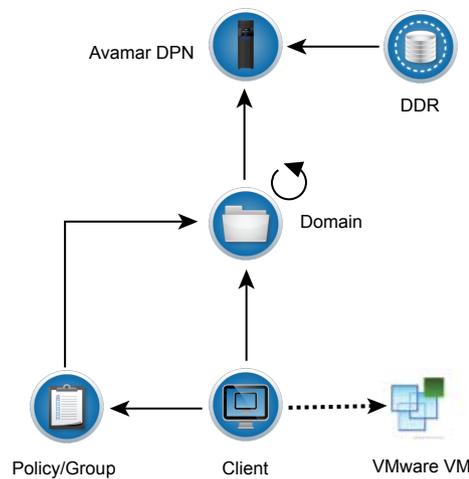
EMC Storage Analytics establishes mappings between:

- 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 virtual machines. Topology mapping between storage system objects and vCenter objects uses a vCenter adapter instance.

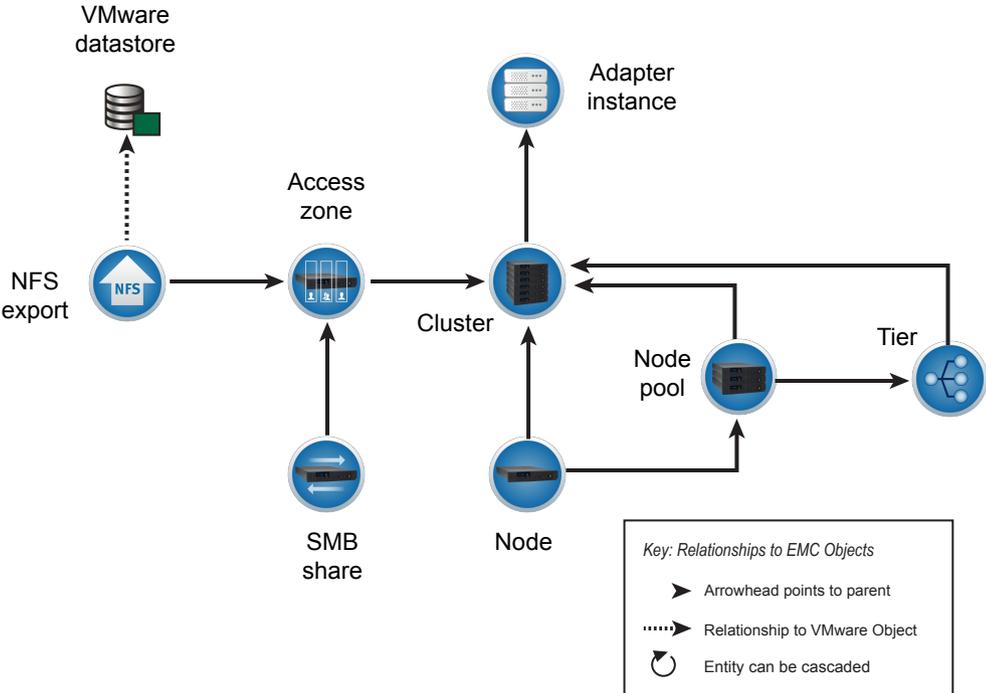
EMC Avamar topology

EMC Storage Analytics implements the following topology for Avamar.



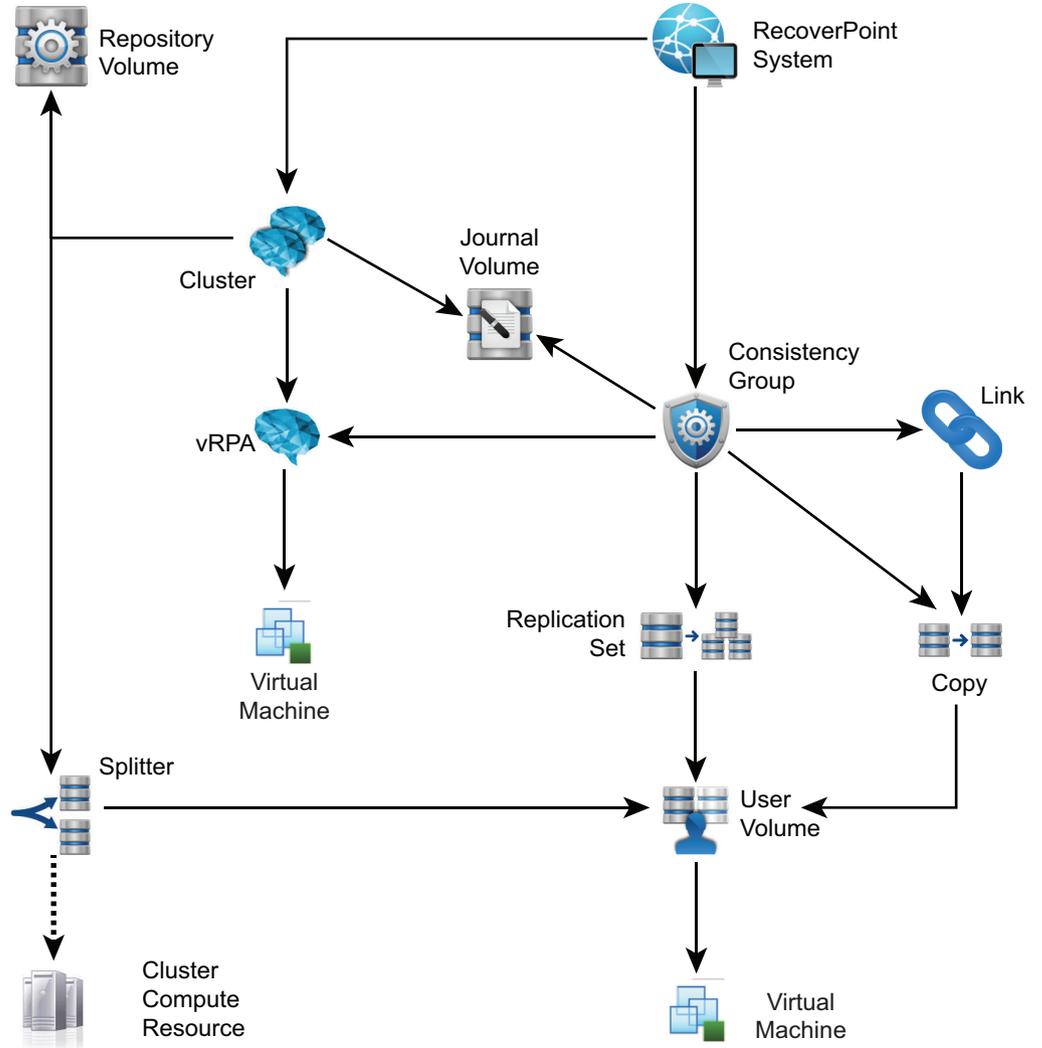
Isilon topology

EMC Storage Analytics implements the following topology for Isilon.



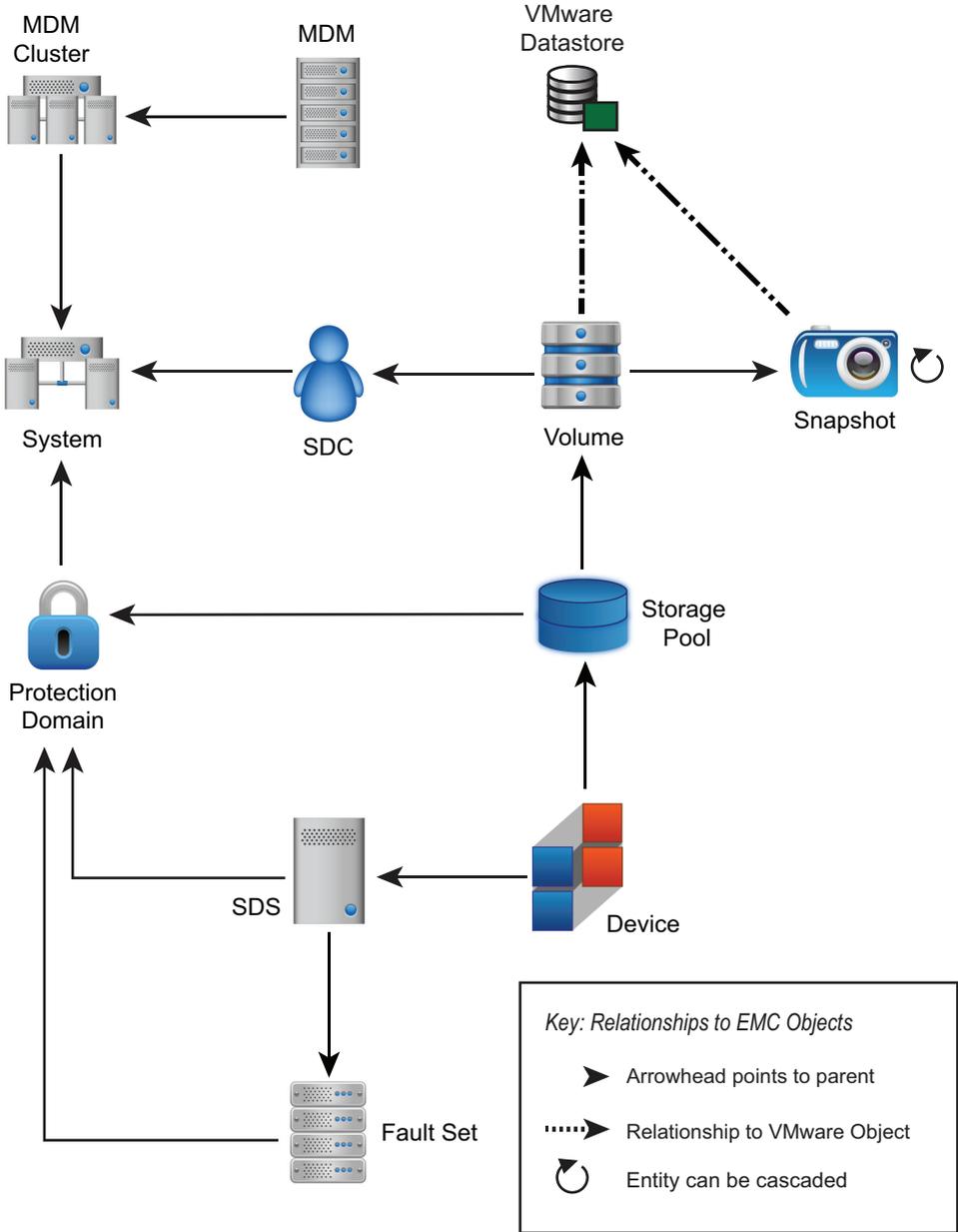
RecoverPoint for Virtual Machines topology

EMC Storage Analytics implements the following topology for RecoverPoint for Virtual Machines.



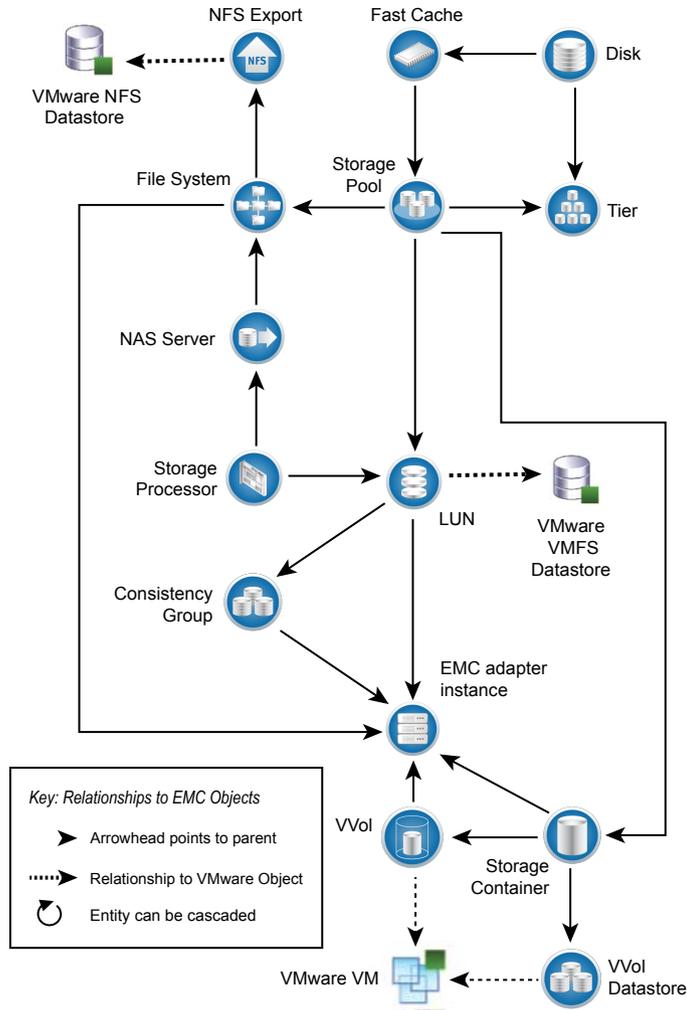
ScaleIO topology

EMC Storage Analytics implements the following topology for ScaleIO.



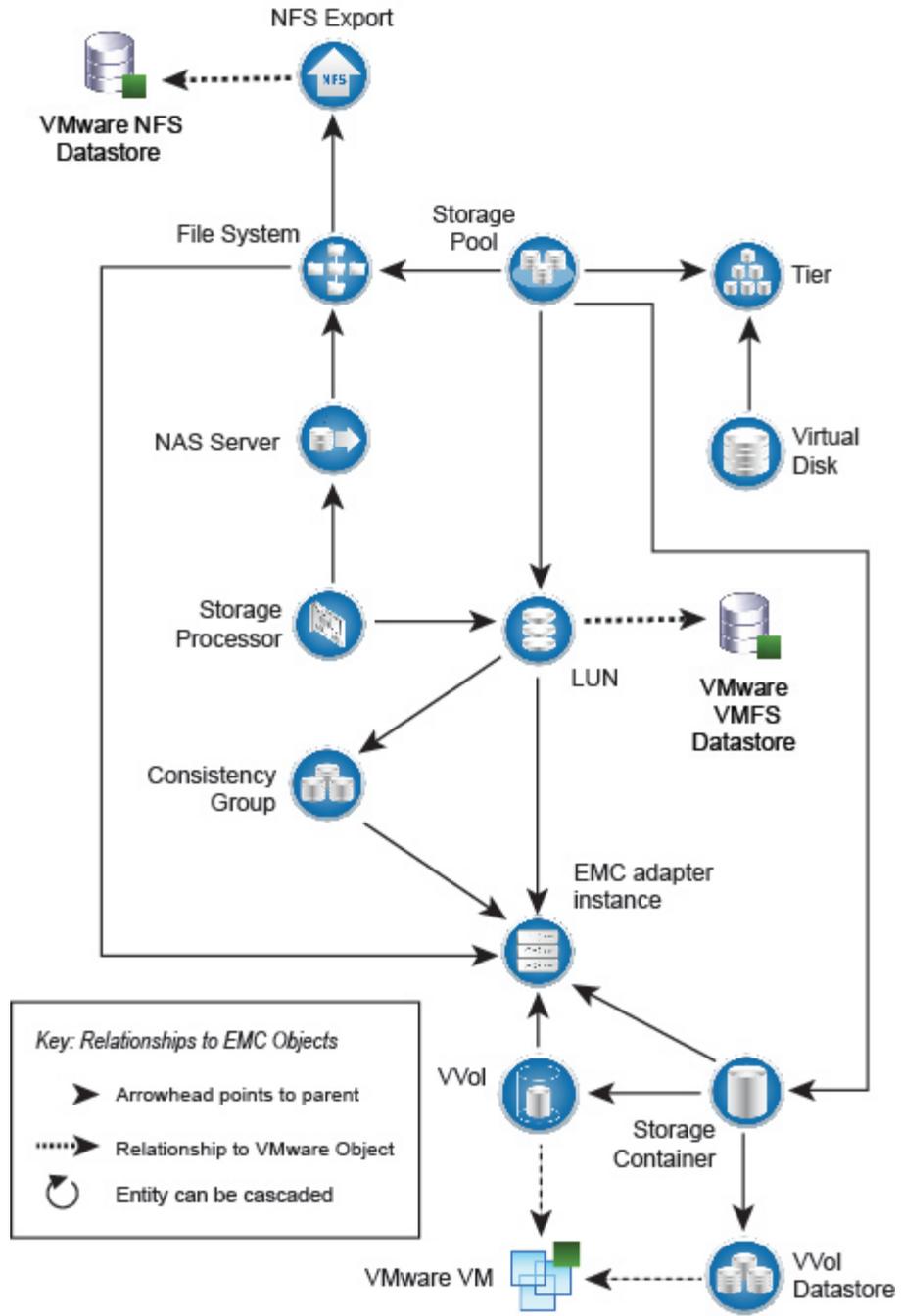
Unity topology

EMC Storage Analytics implements the following topology for Unity.



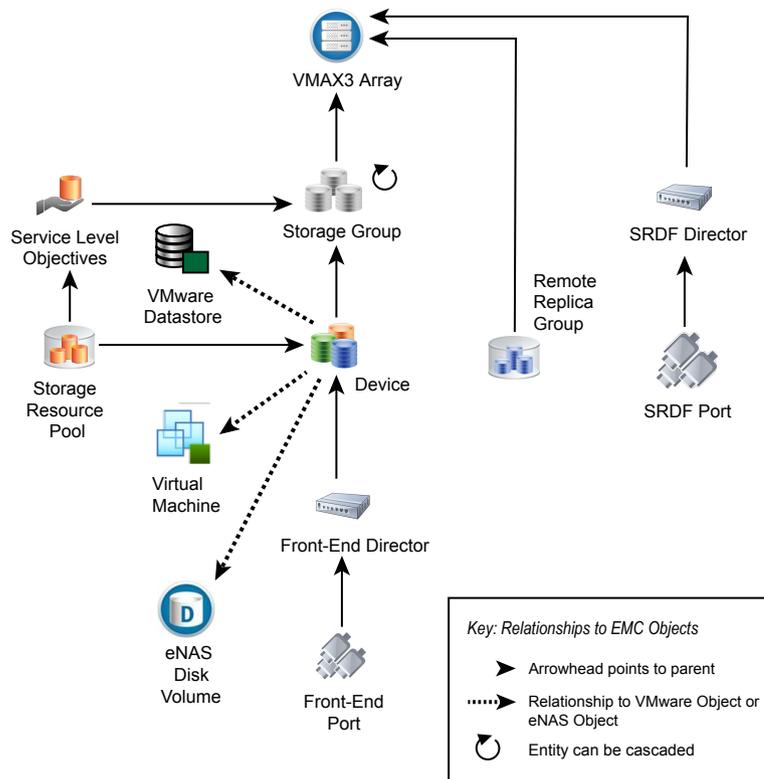
UnityVSA topology

EMC Storage Analytics implements the following topology for UnityVSA.



VMAX3 and VMAX All Flash topology

EMC Storage Analytics implements the following topology for VMAX.



VMAX3 and VMAX All Flash topology rules

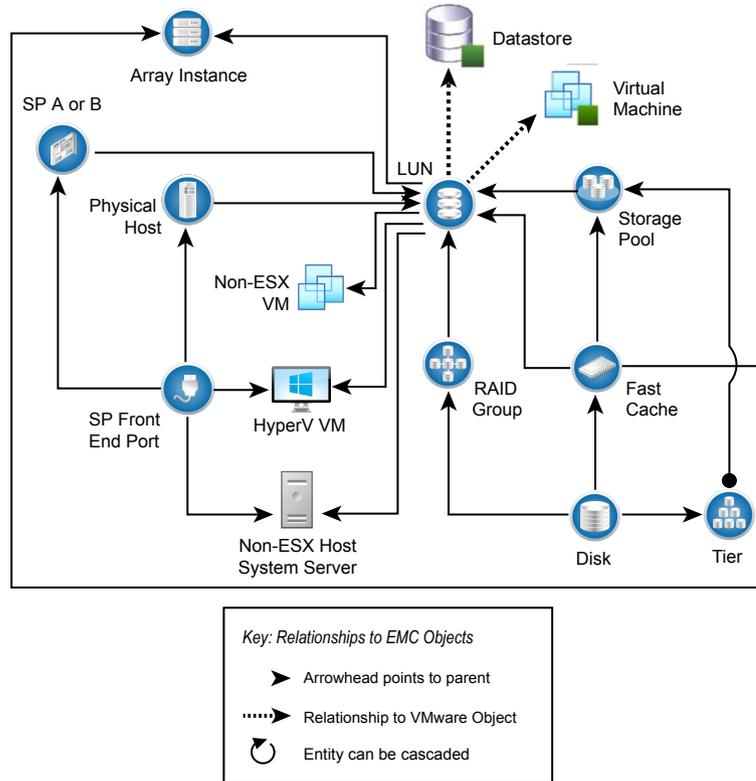
The following rules govern how objects are displayed in the VMAX topology dashboard and which metrics are collected for them:

- vRealize Operations Manager does not display devices that are unmapped and unbound.
- vRealize Operations Manager does not display devices that are mapped and bound but unused by VMware, VNX, eNAS, or VPLEX.
- If the corresponding EMC vSphere adapter instance is running on the same vRealize Operations Manager appliance, then the vRealize Operations Manager displays devices that are mapped, bound, and used by VMware datastores or RDMs.
- For supported models of VNX File Gateway systems, if the corresponding EMC VNX File or eNAS adapter instance is running on the same vRealize Operations Manager appliance, then the vRealize Operations Manager displays devices that are mapped, bound, and used by VNX File or eNAS Disk Volumes.
- A VMAX device is displayed when the corresponding VPLEX adapter instance is added.
- vRealize Operations Manager does not display Storage Groups with unmapped and unbound devices.

- vRealize Operations Manager displays Storage Groups that contain mapped and bound devices.

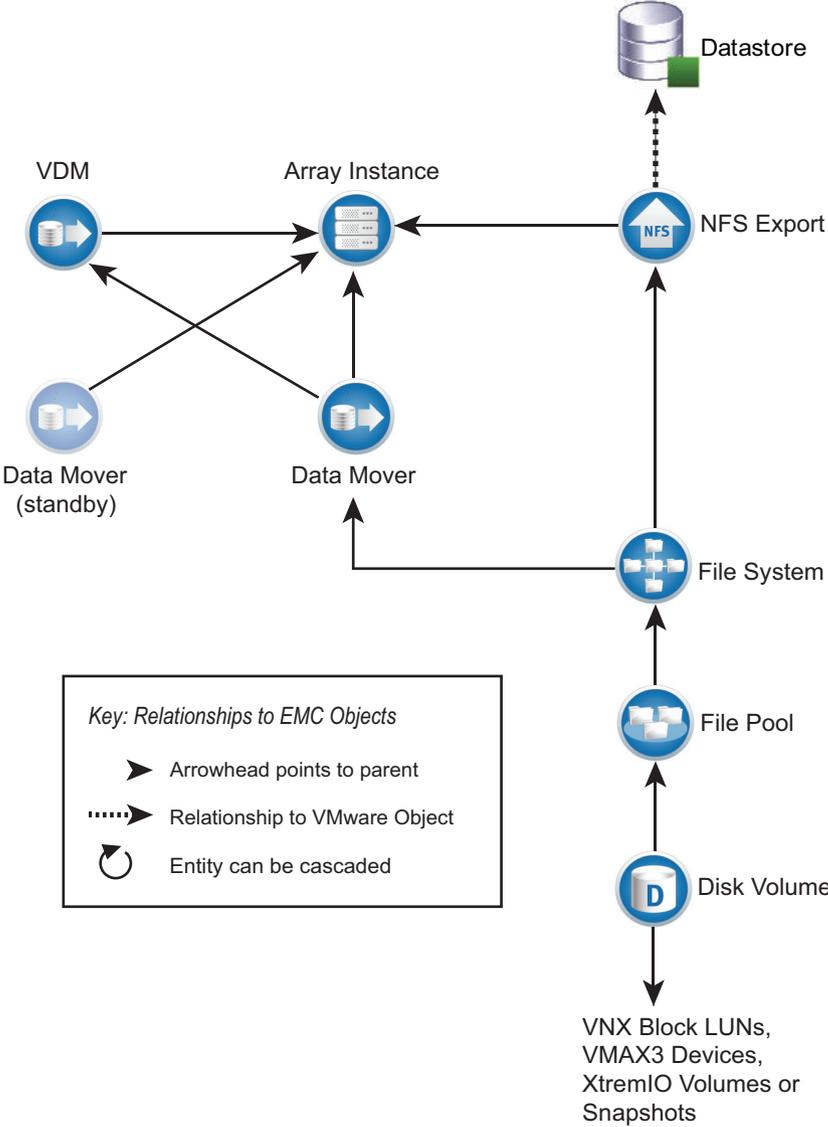
VNX Block topology

EMC Storage Analytics implements the following topology for VNX Block.



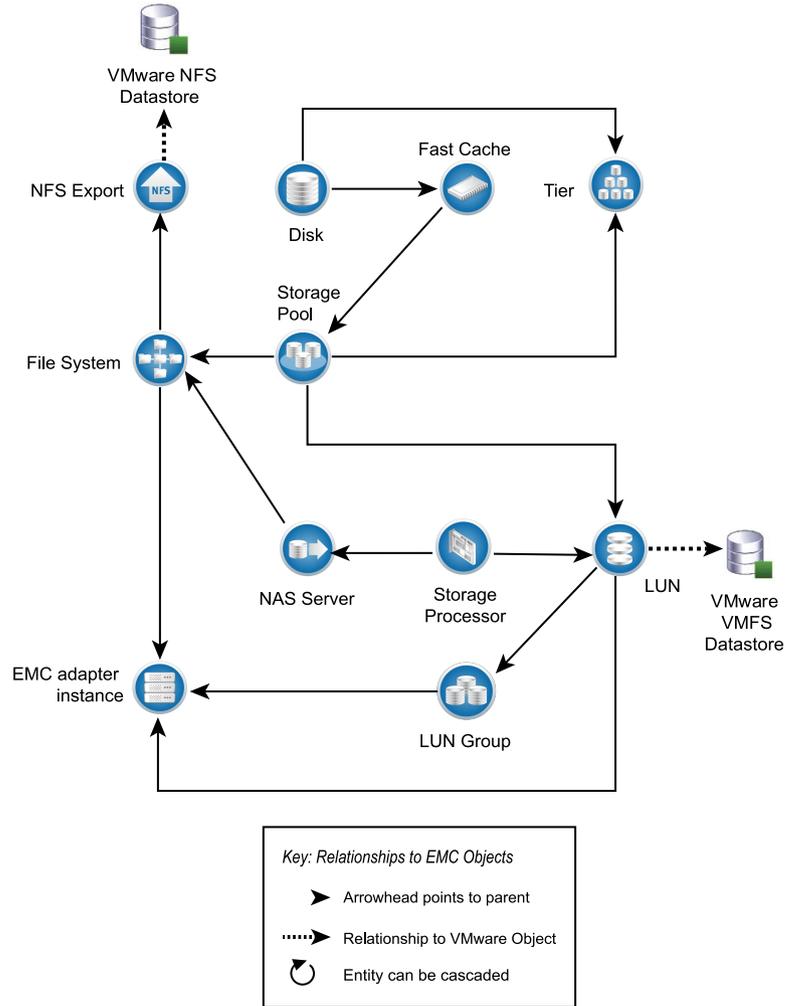
VNX File/eNAS topology

EMC Storage Analytics implements the following topology for VNX File and eNAS.



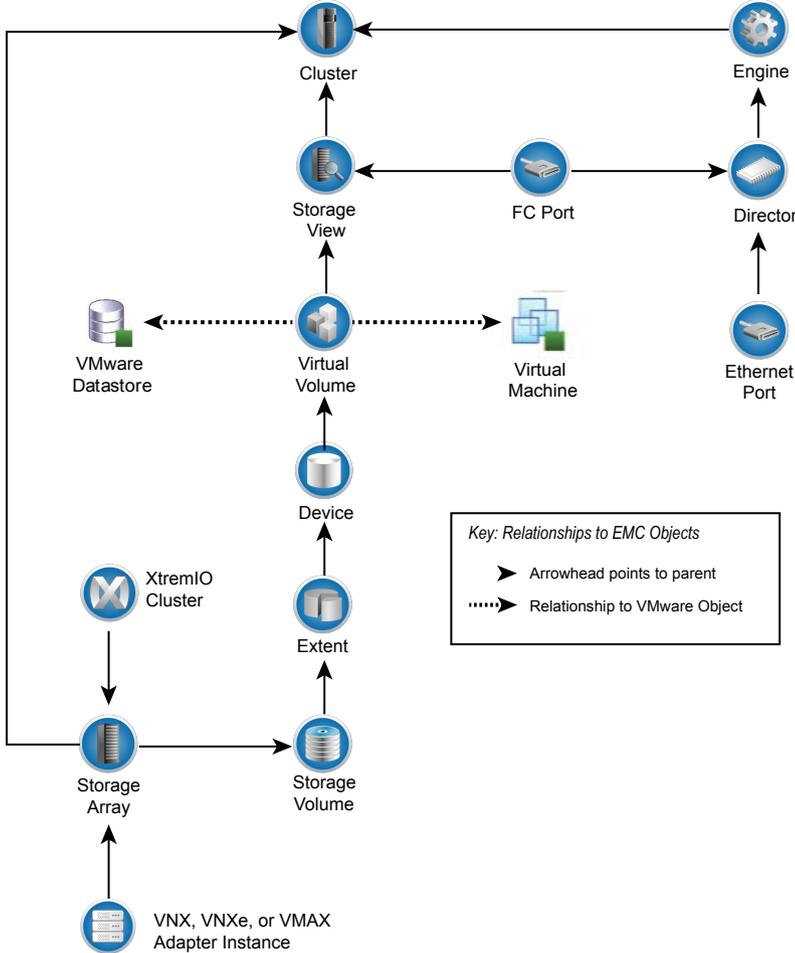
VNXe topology

EMC Storage Analytics implements the following topology for VNXe.



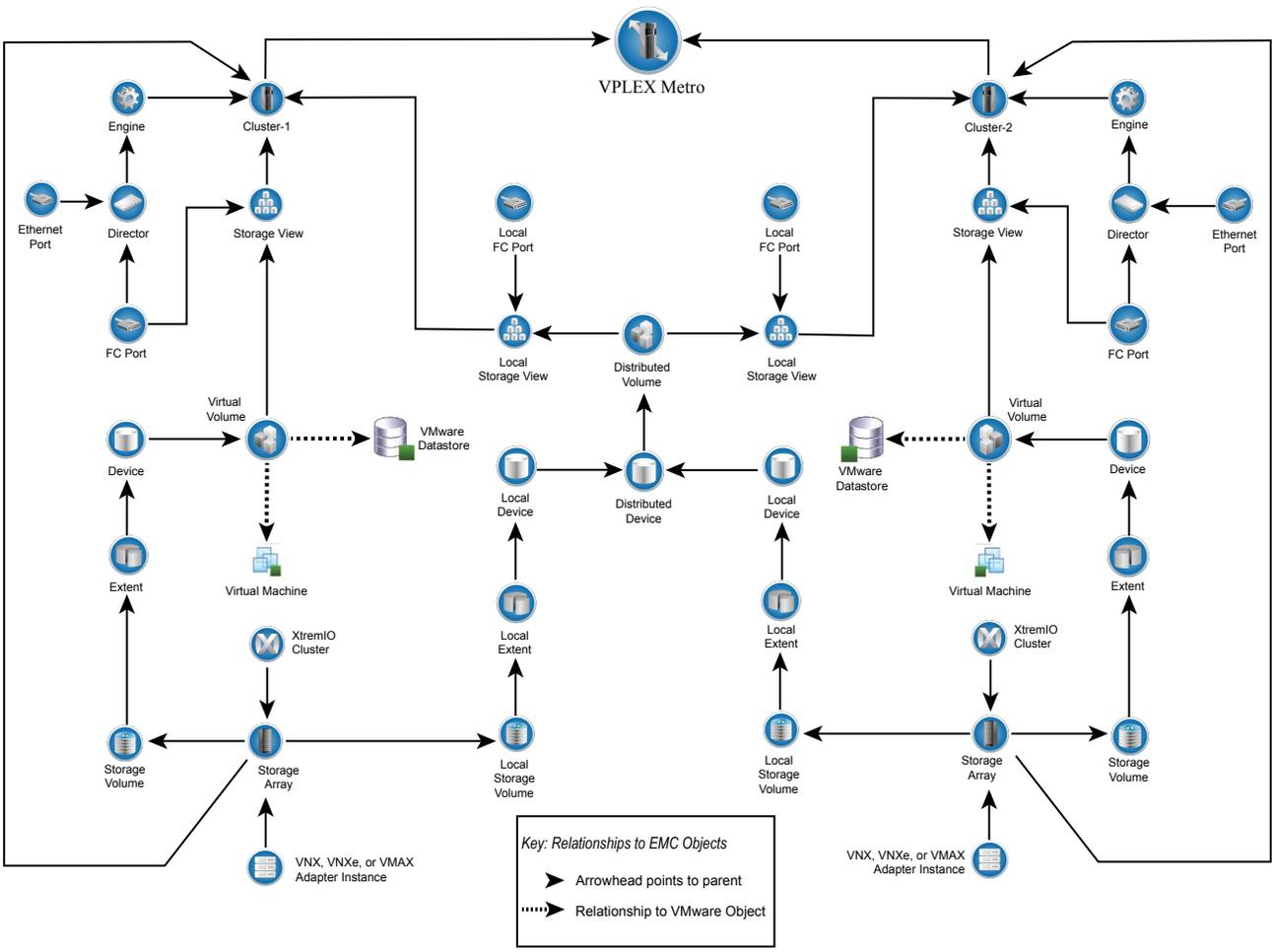
VPLEX Local topology

EMC Storage Analytics implements the following topology for VPLEX Local.



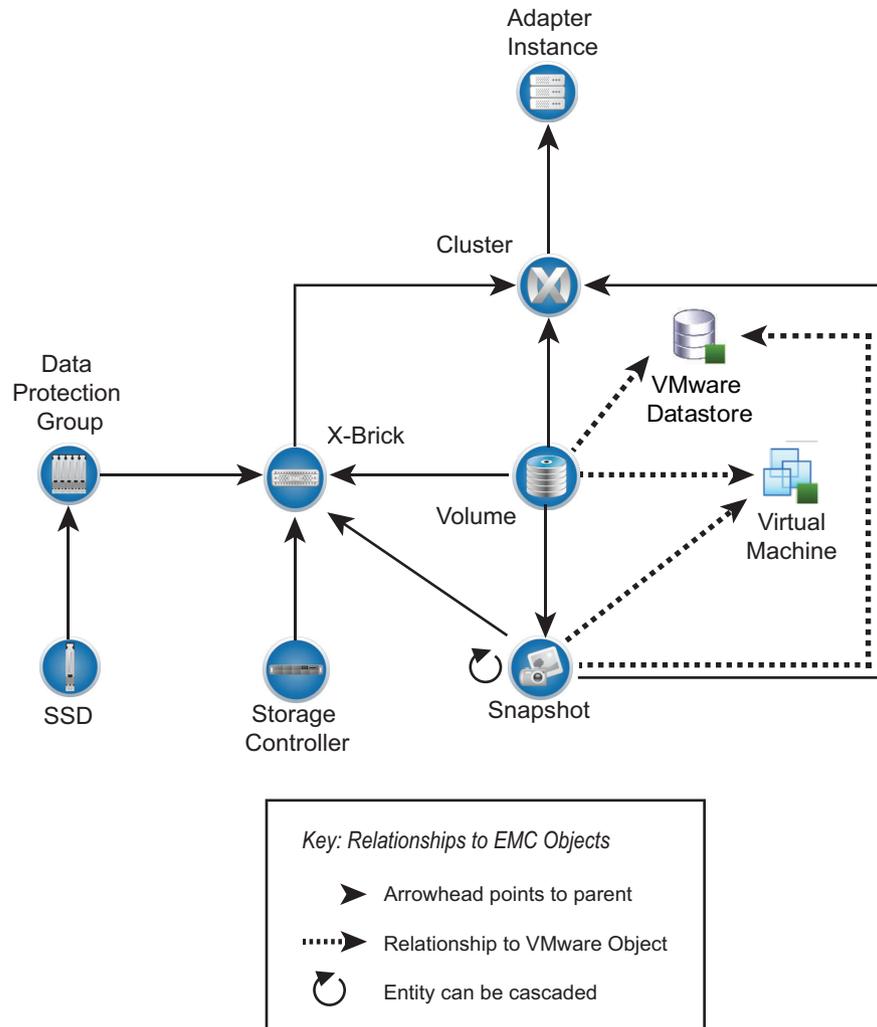
VPLEX Metro topology

EMC Storage Analytics implements the following topology for VPLEX Metro.



XtremIO topology

XtremIO implements the following topology for XtremIO.



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. [Table 2 on page 47](#) lists the EMC dashboards available for each EMC product.

Note

Unity dashboards are used for UnityVSA and VNXe.

Table 2 Dashboard-to-product matrix

Dashboard name	Avamar	Isilon	ScaleIO	VNX	Unity	VMAX	VPLEX	XtremIO	RecoverPoint for Virtual Machines
Storage Topology	---	X	X	X	X	X	X	X	X
Storage Metrics	---	X	X	X	X	X	X	X	X
<i><product_name></i> Overview	X	X	X	X	X	X	X	X	X
<i><product_name></i> Topology	X	X	X	X	X	X	X	---	---
<i><product_name></i> Metrics	X	X	X	X	X	X	---	X	X
Top-N <i><product_name></i>	---	X	---	X	X	---	---	X	X
<i><product_name></i> Performance	---	---	---	---	---	---	X	X	X
<i><product_name></i> Communication	---	---	---	---	---	---	X	---	---

You can use the standard vRealize Operations Manager dashboard customization features to create additional dashboards that are based on your site requirements (some restrictions may apply).

Note

eNAS dashboards are available on the Dashboard XChange. [Dashboard XChange on page 61](#) has more information.

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 **Object Detail** icon at the top of the widget.

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

Click the **Storage Metrics** tab to display resource and metrics for storage systems and view graphs of resource metrics.

The Storage Metrics dashboard contains the following widgets:

Storage System Selector

This Resource widget lists all configured EMC Adapter instances. Select an instance name to populate the **Resource Selector** widget.

Resource Selector

This **Health Tree** widget lists each resource associated with the adapter instance selected in the **Storage System Selector**. Select a resource to populate the **Metric Picker** widget.

Metric Picker

This widget lists all the metrics that are collected for the resource selected in the **Resource Selector** widget. You can use the search feature of this widget 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 Picker** widget. It enables you to display multiple metrics simultaneously in a single graph or in multiple graphs.

EMC overview dashboards

Click an EMC product Overview tab to display a single view of performance and capacity metrics for selected resources with configured adapter instances. Scoreboards and heat maps group the contents by adapter instance.

Overview dashboards use color to provide a high-level view of performance and capacity metrics for selected devices.

- For measurable metrics, colors range from green to shades of yellow and orange to red. You can change the tolerances mapped to these colors. Default values are listed in the following sections.

- Metrics with varied values that cannot be assigned a range show relative values from lowest (light blue or light green) to highest (dark blue or dark green). Because the range of values for relative metrics have no lower or upper limits, the numerical difference between light and dark blue or green can be very small.

EMC Avamar Overview dashboard

This dashboard displays heat maps for Client and Policy and scoreboards for DPN and DDR.

The following tables describe the dashboard items available for EMC Avamar.

Heat maps

Heat map	Metric
Client	Last changed (GB)
	Unintentionally Skipped Files
	Last Backup Date
	Last Backup Status
	Last Elapsed Time
	Overhead (GB)
Policy	Policy Client Count
	DDR Used Capacity

Scoreboards

Metric group	Scoreboard	Metric	Yellow	Orange	Red
DPN	Status	State Active Sessions (count) HFS Address License Expiration Scheduler Enabled			
	Capacity Data	Used Capacity (%) Protected Capacity (%) Total Capacity (GB)	70	80	90
	Success History (24 hrs)	Backup failures (Count)	1	2	3
		Restore failures (Count)	1	2	3
	Garbage Collection	Status Result Passes (Count) End Time Recovered (GB) Chunks Deleted (Count)			

Metric group	Scoreboard	Metric	Yellow	Orange	Red
	Performance History (24hrs)	Average Files Changed (Count) Average Files Unintentionally Skipped (Count) Average Overhead (GB)			
DDR	Status	File System Status Monitoring Status Default Replication Storage System			
	Capacity Data	Used Capacity (%) Protected Capacity (%) Total Capacity (GB)	70	80	90

Isilon Overview dashboard

The Isilon dashboard displays the following scoreboards. For each scoreboard and selected metric, the configured Isilon adapter is shown.

Scoreboard	Green	Yellow	Red
CPU Performance (% used)	0% in use		100% in use
Overall Cache Hit Rate			
Remaining Capacity (%)	> 20% available	10 – 20% available	0 – 10% available
Disk Operations Latency	0–20 ms	20 – 50 ms	> 50 ms
Number of Active Clients	0		1,500

RecoverPoint for VMs Overview dashboard

The following table describes the dashboard items available for RecoverPoint for VMs.

Heat map	Metric	Yellow	Orange	Red
RecoverPoint for VMs System	Number of clusters	n/a		
	Number of splitters	24	27	30
RecoverPoint Cluster	Number of consistency groups and	96	109	122
	Number of clusters	n/a		
	Number of protected Virtual Machine Disks (VMDKs)	n/a		
	Number of protected user volumes	n/a		
	Number of protected virtual machines for each RecoverPoint system	384	435	486
	Number of virtual RecoverPoint Appliances (vRPAs) for each cluster	8	n/a	1
Consistency Group	Displays all RecoverPoint for Virtual Machines consistency groups	Enabled	Disabled	Unknown

Heat map	Metric	Yellow	Orange	Red
Splitter	Number of vSphere ESX Clusters connected to a given splitters	n/a		
	Number of attached volumes	1536	1741	1946

ScaleIO Overview dashboard

The ScaleIO dashboard displays the following heat maps. For each heat map and selected metric, the configured ScaleIO adapter is shown.

Heat map	Description	Green	Yellow	Red
System	Displays the In Use Capacity metric	0 GB allocated	500 GB allocated	1000 GB allocated
Storage Pool	Displays the In Use Capacity metric for each ScaleIO Storage Pool grouped by ScaleIO System	0 GB allocated	500 GB allocated	1000 GB allocated
Device	Displays the In Use Capacity metric for each ScaleIO Device grouped by ScaleIO System and SDS associated with	0 GB allocated	500 GB allocated	1000 GB allocated

Heat map	Description	Light blue	Dark blue
Protection Domain	Displays the In Use Capacity metric for each ScaleIO Protection Domain grouped by ScaleIO System	0 GB allocated	>=1000 GB allocated
SDS	Displays the In Use Capacity metric for each SDS grouped by ScaleIO System and Protection Domain	0 GB allocated	>=1000 GB allocated
Fault Set	Displays the In Health% metric for each Fault Set	0%	100%

Unity Overview dashboard

The Unity Overview dashboard displays heat maps for Unity, UnityVSA, and VNXe.

Heat map	Metric	Description	Green	Red
CPU Performance		Displays the CPU Utilization, such as % busy, of each Storage Processor on each configured adapter instance	0% busy	100% busy
Pool capacity	Storage Pool Capacity Utilization		0% full	100% full
	Storage Pool Available Capacity		Largest available capacity	0 GB available
LUN Performance	LUN Read IO/s	Total reads for a particular LUN	Dark green = highest Light green = lowest	n/a
	LUN Write IO/s	Total writes for a particular LUN	Dark green = highest Light green = lowest	n/a

VMAX Overview dashboard

The following table describes the heat maps displayed on the VMAX Overview tab.

Note: Latency scales are based on average customer requirements. If they do not meet your particular requirements for latency, EMC recommends that you adjust the scale appropriately.

Heat map	Metric	Description	Green	Yellow	Red
SRP Usage	Total Managed Space (GB)		Dark blue = highest		
	Used Capacity (GB)		Light blue = lowest		
	Full (%)		0	50	100
Storage Group	Total Reads (IO/s)	Aggregate reads for all LUNs in the storage group	Dark blue = highest		
	Total Writes (IO/s)	Aggregate writes for all LUNs in the storage group	Light blue = lowest		
	Read Latency (ms)	Average read latency of all LUNs in the storage group	0 ms	20 ms	40 ms
	Write Latency (ms)	Average write latency of all LUNs in the storage group	0 ms	20 ms	40 ms
SRP Performance	Total Reads (IO/s)		Dark blue = highest		
	Total Writes (IO/s)		Light blue = lowest		
	Total Latency (ms)		0 ms	20 ms	40 ms
Front End Director	Total Bandwidth (MB/s)	Cumulative amount of data transferred over all ports of the front-end director	Dark blue = highest		
	Total Operations (IO/s)	Total number of operations taking place over all ports of a front-end director	Light blue = lowest		
SRDF Director	Total Bandwidth (MB/s)	Cumulative amount of data transferred over an SRDF director	Dark blue = highest		
	Total Writes (IO/s)	Total number of writes over an SRDF director	Light blue = lowest		
SRDF Groups	Devices in Session (count)	Number of devices in an SRDF session in the SRDF group	Dark blue = highest		
	Average Cycle Time (seconds)	An SRDF/A metric that provides the average elapsed time between data transfer cycles	Light blue = lowest		
	Writes (IO/s)	Number of writes per second on the devices in the SRDF group	Dark blue = highest		
	Writes (MB/s)	Number of megabytes per second sent from the SRDF group	Light blue = lowest		

VNX Overview dashboard

The VNX Overview dashboard displays the following heat maps.

Heat map	Metric	Description	Green	Red
CPU performance		The CPU utilization of each Storage Processor and Data Mover on each configured adapter instance	0% busy	100% busy
FAST cache performance	Read Cache Hit Ratio (%)	Number of FAST Cache read hits divided by the total number of read or write I/Os across all RG LUNs and Pools configured to use FAST Cache	High ratio	Low ratio
	Write Cache Hit Ratio (%)	Number of FAST Cache write hits divided by the total number of read or write I/Os across all RG LUNs and Pools configured to use FAST Cache	High ratio	Low ratio
Pool capacity	RAID Group Available Capacity		Largest available capacity	0 GB available
	Storage Pool Capacity Utilization		0% full	100% full
	Storage Pool Available Capacity		Largest available capacity	0 GB available
	File Pool Available Capacity		Largest available capacity	0 GB available
LUN and file system performance	LUN Utilization (%)	Percentage busy for all LUNs grouped by adapter instance	0% busy	100% busy
	LUN Latency (ms)	Latency values appear for RAID Group LUNs. Pool LUNs appear in white with no latency values reported.	0 ms latency	>= 20 ms latency
	LUN Read IO/s	Relative number of read I/O operations per second serviced by the LUN	Dark green = highest Light green = lowest	
	LUN Write IO/s	Relative number of write I/O operations per second serviced by the LUN	Dark green = highest Light green = lowest	
	File System Read IO/s	Relative number of read I/O operations per second serviced by the file system	Dark green = highest Light green = lowest	
	File System Write IO/s	Relative number of write I/O operations per second serviced by the file system	Dark green = highest Light green = lowest	

VPLEX Overview dashboard

The EMC VPLEX Overview dashboard displays the following widgets:

Note

Red, yellow, and orange colors correlate with the Health State or Operational Status of the object. Any Health State or Operational Status other than those listed below will show green (good). Also note that because vRealize Operations Manager expects numeric values, you cannot modify these widgets.

Widget	Description	Green	Yellow	Orange	Red
CPU Health	<p>Displays the CPU usage, as a percentage, for each director on the VPLEX system</p> <hr/> <p>Note</p> <p>Generally, a director should stay below 75% CPU usage. Correct an imbalance of CPU usage across directors by adjusting the amount of I/O to the busier directors; make this adjustment by modifying existing storage view configurations. Identify busier volumes and hosts and move them to less busy directors. Alternately, add more director ports to a storage view to create a better load balance across the available directors.</p>	0–75% usage	75–85% usage	85–95% usage	95–100% usage
Memory Health	Displays the memory usage, as a percentage, of each director on the VPLEX system	0–70% usage	70–80% usage	80–90% usage	90–100% usage
Front-End Latency - Read/Write	Displays read and write latency in ms for each Front-end Director	0–7 ms	7–11 ms	11–15 ms	> 15 ms
Front-End Operations	Displays the active and total operations (in counts/s) for each Front-end Director	n/a			

XtremIO Overview dashboard

The XtremIO Overview dashboard displays the following heat maps.

Heat map	Description
Cluster Data Reduction	<p>Displays the Data Deduplication Ratio and Compression Ratio of each cluster and the Data Reduction Ratio, which is the result of the combined Data Deduplication and Compression reduction on each cluster</p> <hr/> <p>Note</p> <p>Compression Ratio shows as blue if XtremIO version 2.4.1 is running.</p>
Cluster Efficiency	Displays the Thin Provisioning Savings (%) and the Total Efficiency of each cluster
Volume	Displays volumes in one of two modes: Total Capacity or Consumed Capacity. Select a volume to display its sparkline charts
Cluster	Displays, for each cluster, the Total Physical and Logical Capacity; Available Physical and Logical Capacity; and Consumed Physical and Logical Capacity.

Heat map	Description
Snapshot	Displays snapshots in one of two modes: Total Capacity or Consumed Capacity. Select a snapshot to display its sparkline charts
Data Reduction Ratio	As data enters the XtremIO system, in-line deduplication and compression reduce the amount of space needed to store the data. This widget provides a ratio showing the overall data reduction savings from both the data deduplication and data compression processes combined.

VPLEX Communication dashboard

Click the **VPLEX Communication** tab to view a collection of heat maps that provide a single view of the performance of the communication links for a VPLEX configuration.

The EMC VPLEX Communication dashboard displays two types of heat maps:

- Metrics with definitive measurements such as intra-cluster local COM latency (0–15 ms) are assigned color ranges from lowest (green) to highest (red).
- Metrics with varied values that cannot be assigned a range show relative values from lowest (light blue) to highest (dark blue).

Note

Latency scales are based on average customer requirements. If they do not meet your particular requirements for latency, EMC recommends that you adjust the scale appropriately. For VPLEX Metro, EMC recommends adjusting the scale based on your discovered WAN round-trip time.

Heat map	Metric	Description	Green	Red
Cluster-1 COM Latency	Average Latency (ms)	Intra-cluster local COM latency, which occurs within the rack and is typically fast (less than 1 msec)	0 ms	15 ms
Cluster-2 COM Latency				
WAN Link Usage (VPLEX Metro only)	Distributed Device Bytes Received (MB/s)	Total amount of traffic received for all distributed devices on a director	Light blue = lowest Dark blue = highest	
	Distributed Device Bytes Sent (MB/s)	Total amount of traffic sent for all distributed devices on a director		
	Distributed Device Rebuild Bytes Received (MB/s)	Total amount of rebuild/migration traffic received for all distributed devices on a director		
	Distributed Device Rebuild Bytes Sent (MB/s)	Total amount of rebuild/migration traffic sent for all distributed devices on a director		

VPLEX Performance dashboard

Click the **VPLEX Metrics** tab to view a collection of heat maps that provide a single view of the most important performance metrics for VPLEX resources.

The EMC VPLEX Performance dashboard displays two types of heat maps:

- Metrics with definitive measurements such as CPU usage (0–100%), response time latency (0–15 ms), or errors (0–5) are assigned color ranges from lowest (green) to highest (red).
- Metrics with varied values that cannot be assigned a range show relative values from lowest (light blue) to highest (dark blue).

Note

Latency scales are based on average customer requirements. If they do not meet your particular requirements for latency, EMC recommends that you adjust the scale appropriately.

Heat map	Metric	Description	Metric value
Front-end Bandwidth	Reads (MB/s)	Total reads for the storage volumes across the front-end ports on a director	Light blue = lowest Dark blue = highest
	Writes (MB/s)	Total writes for the storage volumes across the front-end ports on a director	
	Active Operations (Counts/s)	Number of active, outstanding I/O operations on the director's front-end ports	
Back-end Bandwidth	Reads (MB/s)	Total reads for the storage volumes across the back-end ports on a director	
	Writes (MB/s)	Total writes for the storage volumes across the back-end ports on a director	
	Active Operations (Counts/s)	Number of I/O operations per second through the director's back-end ports	
Back-end Errors	Resets (count/s)	LUN resets sent by VPLEX to a storage array LUN when it does not respond to I/O operations for over 20 seconds	Green = 0 errors Red = 5 or more errors
	Timeouts (count/s)	An I/O from VPLEX to a storage array LUN takes longer than 10 seconds to complete	
	Aborts (count/s)	An I/O from VPLEX to a storage array LUN is cancelled in transit. Resets indicate more serious problems than timeouts and aborts	
Front-end Latency	Read Latency (ms)	Average read latency for all virtual volumes across all front-end ports on a director	Green = 0 ms Red = 15 ms
	Write Latency (ms)	Average write latency for all virtual volumes across all front-end ports on a director Note For VPLEX Metro systems consisting primarily of distributed devices, the WAN round-trip time greatly affects the front-end write latency. See the COM Latency widgets and the WAN Link Usage widget in the VPLEX Communication dashboard.	
	Queued Operations (Counts/s)	Number of operations in the queue	
Virtual Volumes Latency	Read Latency (ms)	Average read latency for all virtual volumes on a director	Green = 0 ms Red = 15 ms
	Write Latency (ms)	Average write latency for all virtual volumes on a director	

Heat map	Metric	Description	Metric value
	Total Reads & Writes (Counts/s)	Virtual volume total reads and writes per director	
Storage Volumes Latency	Read Latency (ms)	Average read latency for all storage volumes on a director	Green = 0 ms Red = 15 ms
	Write Latency (ms)	Average write latency for all storage volumes on a director	

XtremIO Performance dashboard

The XtremIO Performance dashboard provides percent utilization of the Storage Controller CPUs, key volume, and SSD metrics and sparklines.

The XtremIO Performance dashboard displays two types of heat maps:

- Metrics with definitive measurements such as CPU usage (0–100%) are assigned color ranges from lowest (green) to highest (red).
- Metrics with varied values that cannot be assigned a range show relative values from lowest (light blue) to highest (dark blue).

Heat map	Metric	Notes
Storage Controllers	CPU 1 Utilization (%)	
	CPU 2 Utilization (%)	
Volume	Total Operations	Select a volume from this widget to display spark lines for it.
	Total Bandwidth	
	Total Latency	
	Unaligned (%)	
	Average Block Size	
SSD	Endurance Remaining	Select an SSD from this widget to display sparklines for it
	Disk Utilization	

RecoverPoint for VMs Performance dashboard

The RecoverPoint for VMs Performance dashboard provides a single view of the most important performance metrics for the resources.

The Performance dashboard displays two types of heat maps:

- Metrics with definitive measurements such as CPU usage (0–100%) are assigned color ranges from lowest (green) to highest (red).

- Metrics with varied values that cannot be assigned a range show relative values from lowest (light blue) to highest (dark blue).

Heat map	Description	Yellow	Orange	Red
Link Lag (%)	Percent of the current lag for the link and for protection		90%	100%
Consistency Group Protection Window	Current Protection Window (Hrs) shows the earliest point in hours for which RecoverPoint can roll back the consistency group's replica copy. Current Protection Window Ratio shows the ratio of the current protection window compared with the required protection window for the Consistency Group.			
vRPA CPU Utilization (%)	Percent utilization of virtual RecoverPoint Appliance (vRPA) CPUs	75%	85%	95%
Cluster	Performance for incoming writes (IOPS and KB/s) to clusters			
Consistency Group	Performance for incoming writes (IOPS and KB/s) to consistency groups			
vRPA	Performance for incoming writes (IOPS and KB/s) to vRPAs	75%	85%	95%

Topology dashboards

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

Click the **Topology** tab for the EMC Adapter instance you want to view.

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.

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 storage systems and allow the user to view graphs of resource metrics.

Click the **Metrics** tab for the EMC Adapter instance you want to view.

Available widgets for the metrics dashboards are as follows:

Resource Tree/Environment Overview

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/Metric Picker

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

Metric Graph/Metric Chart

This widget graphs the metrics you select in the **Metric Selector/Metric Picker** widget. You can display multiple metrics simultaneously in a single graph or in multiple graphs.

Resource Events (VNX/VNXe only)

The resource event widget shows a graph that illustrates the health of the selected object over a period of time. Object events are labeled on the graph. When you hover over or click a label, event details appear in a message box:

```
Id: 460
Start Time: May 23, 2014 4:30:52 AM
Cancel Time: May 23, 2014 4:38:28 AM
Trigger: Notification
Resource: Pool 0 (Storage Pool)
Details: FAST VP relocation completed.
```

The message box includes the event ID, start time, cancel time, trigger, resource name, and event details.

Top-N dashboards

Click a Top-N dashboard to view your top performing devices at a glance.

The Top-N dashboards are available for:

- Isilon
- Unity
- UnityVSA
- VNX
- VNXe
- XtremIO
- RecoverPoint for Virtual Machines

Top performing devices 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 change the number of objects in your top performer list.

Isilon

By default, a Top-N dashboard shows the top 10 devices in the following categories across your Isilon system.

- Top-10 Active Nodes (24h) by number of active clients
- Top-10 CPU % Usage
- Top-10 Disk Throughput Rate In by Write (MB/s)
- Top-10 Disk Throughput Rate Out by Read (MB/s)
- Top-10 Overall Cache Hit Rate (24 hr) (Bytes/s)
- Top-10 L1 Cache Hit Rate (24 hr) (MB/s)
- Top-10 L2 Cache Hit Rate (24 hr) (MB/s)
- Top-10 L3 Cache Hit Rate (24 hr) (MB/s)

Unity, UnityVSA, VNX, and VNXe

By default, a Top-N dashboard shows the top five devices in the following categories across your VNX, Unity, UnityVSA, or VNXe systems:

- Top-5 by Read (IOPS)
- Top-5 by Write (IOPS)
- Top-5 by Read (MB/s)
- Top-5 by Write (MB/s)
- Top-5 by Consumed Capacity

XtremIO

By default, a Top-N dashboard shows the top 10 devices in the following categories across your XtremIO system.

- Top-10 by Read (IOPS)
- Top-10 by Write (IOPS)
- Top-10 by Read Latency (usec)
- Top-10 by Write (usec)
- Top-10 by Read Block Size (KB)
- Top-10 by Write Block Size (KB)
- Top-10 by Total Capacity (GB)

RecoverPoint for Virtual Machines

By default, a Top-N dashboard shows the top 10 devices in the following categories across RecoverPoint for Virtual Machine systems:

- Top-10 vRPAs by Incoming Writes (IO/s) (24h)
- Top-10 vRPAs by Incoming Writes (KB/s) (24h)
- Top-10 Clusters by Incoming Writes (IO/s) (24h)
- Top-10 Clusters by Incoming Writes (KB/s) (24h)
- Top-10 Consistency Groups by Incoming Writes (IO/s) (24h)
- Top-10 Consistency Groups by Incoming Writes (KB/s) (24h)

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 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 provides these 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

The EMC Storage Analytics Dashboard XChange is available at <https://community.emc.com/community/products/storage-analytics>. Note that there are XChange Zones for supported platforms.

CHAPTER 4

Resource Kinds and Metrics

This chapter contains the following topics:

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Avamar metrics

EMC Storage Analytics provides Avamar metrics for DPN, DDR, Domain, Policy, and Client. The following tables show the metrics available for each resource.

Note

ESA does not monitor replication domain or client resources.

DPN metrics

Metric Group	Metric	Description
General	HFS Address (String)	(Hash File System address) The hostname or IP address that backup clients use to connect to this Avamar server
	License Expiration (String)	Calendar date on which this server's licensing expires
	Scheduler Enabled (String)	True or False
	Active Sessions (Count)	Number of active Avamar sessions
Status	State	<p>Status of the node. One of the following values:</p> <ul style="list-style-type: none"> • Online—The node is functioning correctly. • Read-Only—This status occurs normally as background operations are performed and when backups have been suspended. • Time-Out—MCS could not communicate with this node. • Unknown—Node status cannot be determined. • Offline—The node has experienced a problem. If ConnectEMC has been enabled, a Service Request (SR) is logged. Go to EMC Online Support to view existing SRs. Search the knowledgebase for Avamar Data Node offline solution esg112792. • Full Access—Normal operational state for an Avamar server. All operations are allowed. • Admin—The Avamar server is in an administrative state in which the Avamar server and root user can read and write data; other users are only allowed to read data. • Admin Only—The Avamar server is in an administrative state in which the Avamar server or root user can read or write data; other users are not allowed access. • Admin Read-Only—The Avamar server is in an administrative read-only state in which the Avamar server or root user can read data; other users are not allowed access. • Degraded—The Avamar server has experienced a disk failure on one or more nodes. All operations are allowed, but immediate action should be taken to fix the problem. • Inactive—Avamar Administrator was unable to communicate with the Avamar server. • Node Offline—One or more Avamar server nodes are in an OFFLINE state. • Suspended—Avamar Administrator was able to communicate with the Avamar server, but normal operations have been temporarily suspended.

Metric Group	Metric	Description
		<ul style="list-style-type: none"> Synchronizing—The Avamar server is in a transitional state. It is normal for the server to be in this state during startup and for short periods of time during maintenance operations.
Garbage Collection	Status	Idle or Processing
	Result	OK or Error code
	Start Time	Time format is: "January 1, 1970, 00:00:00 GMT."
	End Time	Time format is: "January 1, 1970, 00:00:00 GMT."
	Passes	
	Recovered (GB)	
	Chunks Deleted	
	Index Stripes	
	Index Stripes Processed	
Capacity	Total Capacity (GB)	
	Used Capacity (GB)	
	Used Capacity (%)	This value is derived from the largest Disk Utilization value on the Avamar tab in the Server Monitor, and therefore represents the absolute maximum Avamar server storage utilization. Actual utilization across all modules, nodes, and drives might be slightly lower.
	Protected Capacity (GB)	
	Protected Capacity (%)	Percent of client data in proportion to total capacity that has been backed up (protected) on this server
	Free Capacity (GB)	
	Free Capacity (%)	
Success history (last 24 hours)	Successful Backups (Count)	
	Successful Backups (%)	
	Failed Backups (Count)	
	Successful Restores (Count)	
	Successful Restores (%)	
	Failed Restores (Count)	
Job Performance History (averages last 24 hours)	Backup Average Elapse Time	
	Backup Average Size (GB)	
	Average Scanned (GB)	
	Average Changed (GB)	

Metric Group	Metric	Description
	Average Files Scanned (Count)	
	Average Files Changed (Count)	
	Average Files Unintentionally Skipped (Count)	
	Average Sent (GB)	
	Average Reduced By Compression (GB)	
	Average Intentionally Excluded (GB)	
	Average Unintentionally Skipped (GB)	
	Average Modified & Sent (GB)	
	Average Modified & Not Sent (GB)	
	Average Overhead (GB)	

DDR metrics

Metric Group	Metric	Description
Capacity	Total Capacity (GB)	
	Used Capacity (%)	
	Used Capacity (GB)	
	Free Capacity (GB)	
	Free Capacity (%)	
	Protected Capacity (GB)	
	Protected Capacity (%)	
General	Hostname	IP or FQDN of the DDR
	DDOS Version	Data Domain Operating System version
	Serial Number	Disk serial number
	Target for Avamar Checkpoint Backups	
	Model Number	
	Default replication storage system	

Metric Group	Metric	Description
	Maximum Streams	The maximum number of Data Domain system streams that Avamar can use at any one time to perform backups and restores. This number is configured for the Data Domain system when you add the system to the Avamar configuration.
	Maximum Streams Limit	
	User Name	
	SNMP Community	
	SNMP Trap Port	
Status	File System Status	
	Monitoring Status	

Domain metrics

Metric group	Metric
General	Description
	Contact
	Directory
	Email
	Location
	Phone

Policy metrics

Metric group	Metric
General	Encryption Method
	Override Schedule
	Auto Proxy Mapping
	Client Count
	Enabled
	Domain
	Dataset
Schedule	Recurrence
	Days of Week
	Hours of Day
	Next Run Time
	Terminate Date

Metric group	Metric
Retention	Name
	Expiration Date
	Duration

Client metrics

Metric group	Metric
General	Description
Latest operation	Start Time
	End Time
	Status
	Elapsed Time
	Type
	Description
	Expiration Time
	Retention Tag
	Size (GB)
	Job Bytes Scanned
	Job Bytes Changed
	Number
	Job Bytes Excluded Intentionally
	Job Bytes Modified & Sent
	Job Bytes Modified & Not Sent
	Job Bytes Skipped Unintentionally
	Job Bytes Overhead
	Job Files Changed (Count)
Job Files Skipped Unintentionally (Count)	

Isilon metrics

EMC Storage Analytics provides metrics for Isilon clusters and nodes.

Note

Only the resource kinds with associated metrics are shown. Performance metrics that cannot be calculated are not displayed.

Cluster metrics

Metric group	Metric	Description
Summary	CPU % Use	Average CPU usage for all nodes in the monitored cluster
	Number of Total Jobs	Total number of active and inactive jobs on the cluster
	Number of Active Jobs	Total number of active jobs on the cluster
Capacity	Total Capacity (TB)	Total cluster capacity in terabytes
	Remaining Capacity (TB)	Total unused cluster capacity in terabytes
	Remaining Capacity (%)	Total unused cluster capacity in percent
	User Data Including Protection (TB)	Amount of storage capacity that is occupied by user data and protection for that user data
	Snapshots Usage (TB)	Amount of data occupied by snapshots on the cluster
Deduplication	Deduplicated Data > Physical (GB)	Amount of data that has been deduplicated on the physical cluster
	Deduplicated Data > Logical (GB)	Amount of data that has been deduplicated on the logical cluster
	Space Saved > Physical (GB)	Amount of physical space that deduplication has saved on the cluster
	Space Saved > Logical (GB)	Amount of logical space that deduplication has saved on the cluster
Performance	Disk Operations Rate > Read Operations	Average rate at which the disks in the cluster are servicing data read change requests
	Disk Operations Rate > Write Operations	Average rate at which the disks in the cluster are servicing data write change requests
	Pending Disk Operations Latency (ms)	Average amount of time disk operations spend in the input output scheduler
	Disk Throughput Rate > Read Throughput (MB/s)	Total amount of data being read from the disks in the cluster
	Disk Throughput Rate > Write Throughput (MB/s)	Total amount of data being written to the disks in the cluster
Cache	L1 Cache Hits (MB/s)	Amount of requested data that was available from the L1 cache
	L2 Cache Hits (MB/s)	Amount of requested data that was available from the L2 cache
	L3 Cache Hits (MB/s)	Amount of requested data that was available from the L3 cache
	Overall Cache Hit Rate (MB/s)	Amount of data requests that returned hits

Node metrics

Metric group	Metric	Description
Summary	CPU % Use	Average percentage of the total available node CPU capacity used for this node
	Number of Active Clients	Number of unique client addresses generating protocol traffic on the monitored node
	Number of Connected Clients	Number of unique client addresses with established TCP connections to the node
	Number of Total Job Workers	Number of active and assigned workers on the node

Metric group	Metric	Description
Performance	Deadlock File System Event Rate	Number of file system deadlock events that the file system is processing per second
	Locked File System Event Rate	Number of file lock operations occurring in the file system per second
	Blocking File System Event Rate	Number of file blocking events occurring in the file system per second
	Average Operations Size (MB)	Average size of the operations or transfers that the disks in the node are servicing
	Contended File System Event Rate	Number of file contention events, such as lock contention or read/write contention, occurring in the file system per second
	File System Event Rate	Number of file system events, or operations, (such as read, write, lookup, or rename) that the file system is servicing per second
	Disk Operations Rate > Read Operations	Average rate at which the disks in the node are servicing data read requests
	Disk Operations Rate > Write Operations	Average rate at which the disks in the node are servicing data write requests
	Average Pending Disk Operations Count	Average number of operations or transfers that are in the processing queue for each disk in the node
	Disk Throughput Rate > Read Operations	Total amount of data being read from the disks in the node
	Disk Throughput Rate > Write Operations	Total amount of data being written to the disks in the node
	Pending Disk Operation Latency (ms)	Average amount of time that disk operations spend in the input/output scheduler
	Disk Activity (%)	Average percentage of time that disks in the node spend performing operations instead of sitting idle
	Protocol Operations Rate	Total number of requests that were originated by clients for all file data access protocols
	Slow Disk Access Rate	Rate at which slow (long-latency) disk operations occur
External Network	External Network Errors > In	Number of incoming errors generated for the external network interfaces
	External Network Errors > Out	Number of outgoing errors generated for the external network interfaces
	External Network Packets Rate > In	Total number of packets that came in through the external network interfaces in the monitored node
	External Network Packets Rate > Out	Total number of packets that went out through the external network interfaces in the monitored node
	External Network Throughput Rate > In (MB/s)	Total amount of data that came in through the external network interfaces in the monitored node
	External Network Throughput Rate > Out (MB/s)	Total amount of data that went out through the external network interfaces in the monitored node
Cache	Average Cache Data Age	Average amount of time data has been in the cache
	L1 Data Prefetch Starts (Bytes/s)	Amount of data that was requested from the L1 prefetch
	L1 Data Prefetch Hits (Bytes/s)	Amount of requested data that was available in the L1 prefetch

Metric group	Metric	Description
	L1 Data Prefetch Misses (Bytes/s)	Amount of requested data that did not exist in the L1 prefetch
	L1 Cache Starts (Bytes/s)	Amount of data that was requested from the L1 cache
	L1 Cache Hits (Bytes/s)	Amount of requested data that was available in the L1 cache
	L1 Cache Misses (Bytes/s)	Amount of requested data that did not exist in the L1 cache
	L1 Cache Waits (Bytes/s)	Amount of requested data that existed in the L1 cache but was not available because the data was in use
	L2 Data Prefetch Starts (Bytes/s)	Amount of data that was requested from the L2 prefetch
	L2 Data Prefetch Hits (Bytes/s)	Amount of requested data that was available in the L2 prefetch
	L2 Data Prefetch Misses (Bytes/s)	Amount of requested data that did not exist in the L2 prefetch
	L2 Cache Starts (Bytes/s)	Amount of data that was requested from the L2 cache
	L2 Cache Hits (Bytes/s)	Amount of requested data that was available in the L2 cache
	L2 Cache Misses (Bytes/s)	Amount of requested data that did not exist in the L2 cache
	L2 Cache Waits (Bytes/s)	Amount of requested data that existed in the L2 cache but was not available because the data was in use
	L3 Cache Starts (Bytes/s)	The amount of data that was requested from the L3 cache
	L3 Cache Hits (Bytes/s)	Amount of requested data that was available in the L3 cache
	L3 Cache Misses (Bytes/s)	Amount of requested data that did not exist in the L3 cache
	L3 Cache Waits (Bytes/s)	Amount of requested data that existed in the L3 cache but was not available because the data was in use
	Overall Cache Hit Rate (Bytes/s)	Amount of data requests that returned hits
	Overall Cache Throughput Rate (Bytes/s)	Amount of data that was requested from cache

ScaleIO metrics

EMC Storage Analytics provides ScaleIO metrics for System, Protection Domain, Device, SDS, Storage pool, Snapshot, MDM cluster, MDM, SDC, Fault Set, and Volume.

Note

Only the resource kinds with associated metrics are shown. Most performance metrics with values of zero are not displayed.

The following table shows the metrics available for each resource kind.

Table 3 ScaleIO metrics

Metric	System	Protection Domain	Device	SDS	Storage pool	Snapshot	MDM cluster	MDM	SDC	Fault Set	Volume
Maximum Capacity (GB)	X	X	X	X	X						
Used Capacity (GB)	X	X	X	X	X						

Table 3 ScaleIO metrics (continued)

Metric	System	Protection Domain	Device	SDS	Storage pool	Snapshot	MDM cluster	MDM	SDC	Fault Set	Volume
Spare Capacity Allocated (GB)	X	X	X	X	X						
Thin Used Capacity (GB)	X	X	X	X	X						
Thick Used Capacity(GB)	X	X	X	X	X						
Protected Capacity(GB)	X	X	X	X	X						
Snap Used Capacity(GB)	X	X	X	X	X						
Unused Capacity (GB)	X	X	X	X	X						
Used Capacity (%)	X	X	X	X	X						
Thin Used Capacity (%)	X	X	X	X	X						
Thick Used Capacity (%)	X	X	X	X	X						
Protected Capacity (%)	X	X	X	X	X						
Snap Used Capacity (%)	X	X	X	X	X						
Total Reads (MB/s)	X	X	X	X	X	X			X		X
Total Writes (MB/s)	X	X	X	X	X	X			X		X
Average Read IO size (MB)		X	X	X	X	X			X		X
Average Write IO Size (MB)		X	X	X	X	X			X		X
Size (GB)						X					
Total Read IO/s						X			X		X
Total Write IO/s						X			X		X
MDM Mode (String)							X				
State (String)							X				
Name (String)								X		X	

RecoverPoint for Virtual Machines metrics

EMC Storage Analytics provides RecoverPoint for Virtual Machines metrics for Cluster, Consistency Group, Copy, Journal Volume, Link, Virtual RecoverPoint Appliance (vRPA), RecoverPoint for Virtual Machines System, Replication Set, Repository Volume, Splitter, and User Volume.

This section contains RecoverPoint for Virtual Machines metrics for the following resource kinds:

RecoverPoint metrics for Cluster

Metric Group	Metric	Additional Information
Performance	Incoming Writes (IO/s)	Sum of incoming cluster writes from all child vRPAs
	Incoming Writes (MB/s)	Sum of incoming cluster throughput from all child vRPAs
Summary	Number of Consistency Groups	Sum of all child vRPA consistency groups
	Number of Protected VMDKs	Sum of user volumes that the cluster protects on all virtual machines, including replica virtual machines
	Number of Protected VMs	Sum of virtual machines, including replica virtual machines, that the cluster protects
	Number of vRPAs	Sum of all child vRPAs

RecoverPoint metrics for Consistency Group

Metric Group	Metric	Additional Information
Performance	Incoming Writes (IO/s)	Sum of incoming consistency group writes per second
	Incoming Writes (MB/s)	Sum of incoming consistency group writes throughput
Status	Enabled	Boolean value that indicates the consistency group is enabled
Protection	Current Protection Window (Hrs)	The farthest time in hours for which RecoverPoint can roll back the consistency group's replica copy
	Current Protection Window Ratio	Ratio of the current protection window for the consistency group's replica copy as compared with your required protection window

RecoverPoint metrics for Copy

Metric Group	Metric	Additional Information
Protection	Current Protection Window (Hrs)	The farthest time in hours for which RecoverPoint can roll back the replica copy
	Current Protection Window Ratio	Ratio of current protection window for the replica copy as compared with your required protection window
Status	Active	Boolean value indicates if the copy is active
	Enabled	Boolean value indicates if the copy is enabled
	Regulated	Boolean value indicates if the copy is regulated
	Removable	Boolean value indicates if the copy is removable

Metric Group	Metric	Additional Information
	Role	Role of the copy, which is retrieved from the role of the consistency group copy settings
	Suspended	Boolean value indicates if the copy is suspended

RecoverPoint metrics for Journal Volume

Metric Group	Metric	Additional Information
Capacity	Capacity (GB)	Size of journal volume in GB

RecoverPoint metrics for Link

Metric Group	Metric	Additional Information
Configuration	RPO	The allowed maximum for lag times of consistency group copies
	RPO Type	The set type of RPOs to measure
Status	Current Compression Ratio	The compression ratio through the link
	Current Lag	Current lag time between the copy and production
	Current Lag Type	The type set to measure the current lag time
	Is In Compliance	Exists only with consistency groups in asynchronous replication mode; a yes-no value that indicates if the current lag is in compliance with the RPO
Protection	Current Lag (%)	Exists only with consistency groups in asynchronous replication mode; indicates current lag ratio as compared with RPO

RecoverPoint metrics for virtual RecoverPoint Appliance (vRPA)

Metric Group	Metric	Additional Information
Performance	CPU Utilization (%)	CPU usage of vRPAs Note Utilization values appear as decimals (not percentages). Values can range from 0.0 to 1.0, with a value of 1.0 indicating 100%.
	Incoming Writes (IO/s)	Incoming application writes per second
	Incoming Writes (MB/s)	Incoming application writes for throughput
Summary	Summary	Number of consistency groups

RecoverPoint metrics for RecoverPoint for Virtual Machines System

Metric Group	Metric	Additional Information
Summary	Number of RecoverPoint Clusters	Sum of all the clusters in the RecoverPoint system
	Number of Splitters	Sum of all the splitters in the RecoverPoint system

RecoverPoint metrics for Replication Set

Metric Group	Metric	Additional Information
Capacity	Capacity (GB)	Size of the user volume in GB that the replication set is protecting

RecoverPoint metrics for Repository Volume

Metric Group	Metric	Additional Information
Capacity	Capacity (GB)	Size of repository volume in GB

RecoverPoint metrics for Splitter

Metric Group	Metric	Additional Information
Summary	Number of Volumes Attached	Number of volumes attached to the splitter
	Number of ESX Clusters Connected	Number of clusters connecting to the splitter

RecoverPoint metrics for User Volume

Metric Group	Metric	Additional Information
Capacity	Capacity (GB)	Size of user volume
Status	Role	Role of the copy to which the user volume belongs

Unity and UnityVSA metrics

EMC Storage Analytics provides Unity and UnityVSA metrics for Array, Disk, FAST Cache, File System, LUN, Storage Pool, Tier, VVol, and Virtual Disk, and Storage Processor. Only the resource kinds with associated metrics are shown.

Unity and UnityVSA metrics for EMC Adapter Instance (array)

- Elapsed collect time (ms)
- New metrics in each collect call
- New resources in each collect call
- Number of down resources
- Number of metrics collected
- Number of resources collected

Unity and UnityVSA metrics for Disk, FAST Cache, File System, LUN, Storage Pool, Tier, VVol, Virtual Disk

Metric group	Metric	Disk	FAST Cache ¹	File System	LUN	Storage Pool	Tier	VVol	Virtual Disk ²
Capacity	Size (GB)	X							X
	Available Capacity (GB)		X	X		X	X	X	
	Capacity/Total capacity (GB)			X	X			X	
	Consumed Capacity (GB)			X	X	X	X	X	
	Full (%)			X		X	X		
	Max Capacity (GB)								
	Thin Provisioning			X					
	Subscribed (%)					X			
	User Capacity (GB)					X	X		
Configuration	State	X							X
	RAID type		X				X		
	FAST Cache					X			
	Disk Count						X		
Performance	Busy (%)	X			X	X			
	Reads (IO/s)	X		X	X			X	
	Reads (MB/s)	X		X	X			X	
	Total Latency (ms)	X			X			X	

Metric group	Metric	Disk	FAST Cache ¹	File System	LUN	Storage Pool	Tier	Wvol	Virtual Disk ²
	Writes (IO/s)	X		X	X			X	
	Writes (MB/s)	X		X	X			X	
	Queue Length	X			X				
	Total (IO/s)							X	
	Total (MB/s)							X	
	Data to Move Down (GB)						X		
	Data to Move Up (GB)						X		
	Data to Move Within (GB)						X		

¹ Applies to Unity only

² Applies to UnityVSA only

Unity and UnityVSA metrics for Storage Processor

Metric group	Metric
Cache	Dirty Cache Pages (MB)
	Read Cache Hit Ratio (%)
	Write Cache Hit Ratio (%)
Network	CIFS Reads (IOPS)
	CIFS Reads (MB/s)
	CIFS Writes (IOPS)
	CIFS Writes (MB/s)
	Network In Bandwidth (MB/s)
	Network Out Bandwidth (MB/s)
	NFS Reads (IOPS)
	NFS Reads (MB/s)
	NFS Writes (IOPS)
	NFS Writes (MB/s)
Network > NFSv2	Read Calls/s
	Read Errors/s
	Read Response Time (ms)
	Reads (IOPS)
	Write Calls/s
	Write Errors/s
	Write Response Time (ms)

Metric group	Metric
	Writes (IOPS)
Network > NFSv3 Network > NFSv4	Access Calls/s
	Access Errors/s
	Access Response Time (ms)
	GetAttr Calls/s
	GetAttr Errors/s
	GetAttr Response Time (ms)
	Lookup Calls/s
	Lookup Errors/s
	Lookup Response Time (ms)
	Read Calls/s
	Read Errors/s
	Read Response Time (ms)
	Reads (IOPS)
	SetAttr Calls/s
	SetAttr Errors/s
	SetAtt Response Time (ms)
	Write Calls/s
	Write Errors/s
	Write Response Time (ms)
	Writes (IOPS)
Network > SMB1	Close Average Response Time (ms)
	Close Calls/s
	Close Max Response Time (ms)
	NTCreateX Average Response Time (ms)
	NTCreateX Calls/s
	NTCreateX Max Response Time (ms)
	Reads (IOPS)
	Reads (MB/s)
	ReadX Average Response Time (ms)
	ReadX Calls/s
	ReadX Max Response Time (ms)
	Trans2Prim Average Response Time (ms)
	Trans2Prim Calls/s

Metric group	Metric
	Trans2Prim Max Response Time (ms)
	Writes (IOPS)
	Writes (MB/s)
	WriteX Average Response Time (ms)
	WriteX Calls/s
	WriteX Max Response Time (ms)
Network > SMB2	Close Average Response Time (ms)
	Close Calls/s
	Close Max Response Time (ms)
	Create Average Response Time (ms)
	Create Calls/s
	Create Max Response Time (ms)
	Flush Average Response Time (ms)
	Flush Calls/s
	Flush Max Response Time (ms)
	Ioctl Average Response Time (ms)
	Ioctl Calls/s
	Ioctl Max Response Time
	Queryinfo Average Response Time (ms)
	Queryinfo Calls/s
	Queryinfo Max Response Time (ms)
	Read Average Response Time (ms)
	Read Calls/s
	Read Max Response Time (ms)
	Reads (IOPS)
	Reads (MB/s)
	Write Average Response Time (ms)
	Write Calls/s
	Write Max Response Time (ms)
	Writes (IOPS)
	Writes (MB/s)
Performance	Busy (%)
	Reads (IOPS)
	Reads (MB/s)

Metric group	Metric
	Writes (IOPS)
	Writes (MB/s)

VMAX metrics

EMC Storage Analytics provides metrics for Device, Front-End Director, Front-End Port, Remote Replica Group, SRDF Director, Storage Group, Storage Resource Pool, and SLO.

Table 4 VMAX metrics for resource kinds

Metric	Device	Front-end director	Front-end port	Remote replica group	SRDF director	Storage group	Storage resource pool	SLO
Read Latency (ms)						X		
Reads (IO/s)		X			X	X	X	
Reads (MB/s)						X	X	
Total Bandwidth (MB/s)		X	X		X	X	X	
Total Capacity (GB)	X					X		
Total Operations (IO/s)		X	X		X	X	X	
Used Capacity (GB)	X					X		
Write Latency (ms)						X		
Writes (IO/s)		X		X	X	X	X	
Writes (MB/s)				X		X	X	
Total Hits (IO/s)		X				X		
Average Cycle Time (s)				X				
Delta Set Extension Threshold				X				
Devices in Session (count)				X				
HA Repeat Writes (counts/s)				X				
Minimum Cycle Time (s)				X				
Busy (%)					X			
SRDFA Writes (IO/s)					X			
SRDFA Writes (MB/s)					X			
SRDFS Writes (IO/s)					X			
SRDFS Writes (MB/s)					X			
Full (%)							X	
Total Managed Space							X	
Total Latency (ms)							X	
Compliance								X

VNX Block metrics

EMC Storage Analytics provides VNX Block metrics for Array, Disk, FAST Cache, Pool LUN, RAID Group, RAID Group LUN, SP Front-end Port, Storage Pool, Storage Processor, and Tier.

The following table shows the metrics available for each resource kind.

Metric	Array	Disk	FAST Cache	Pool LUN	RAID group	RAID group LUN	SP Front-end port	Storage pool	Storage processor	Tier
Elapsed collect time (ms)	X									
New metrics in each collect call (count)	X									
New resources in each collect call (count)	X									
Number of down resources	X									
Number of metrics collected	X									
Number of resources collected	X									
Busy (%)		X		X		X			X	
Capacity (GB)		X								
Hard Read Errors (Count)		X								
Hard Write Errors (Count)		X								
LUN Count		X								
Queue Length		X		X		X				
Read Size (MB)		X		X		X			X	
Reads (IOPS)		X		X		X	X		X	
Reads (MB/s)		X		X		X	X		X	
Total Latency (ms)		X		X		X				
Total Operations (IOPS)		X		X		X	X		X	
Total Bandwidth (MB/s)		X		X		X	X		X	
Write Size (MB)		X		X		X			X	

Metric	Array	Disk	FAST Cache	Pool LUN	RAID group	RAID group LUN	SP Front-end port	Storage pool	Storage processor	Tier
Writes (IOPS)		X		X		X	X		X	
Writes (MB/s)		X		X		X	X		X	
Current Operation			X					X		
Current Operation Status			X					X		
Current Operation Complete (%)			X							
Dirty (%)			X							
Flushed (MB)			X							
Mode			X							
RAID Type			X							X
Read Cache Hit Ratio (%)			X					X	X	
Read Cache Hits (Hits/s)			X							
Read Cache Misses (Misses/s)			X							
Size (GB)			X							
Write Cache Hit Ratio (%)			X						X	
Write Cache Hits (Hits/s)			X							
Write Cache Misses (Misses/s)			X							
Average Busy Queue Length				X		X				
Capacity Tier Distribution (%)				X						
Consumed Capacity (GB)				X				X		X
Explicit trespasses (Count)				X						
Extreme Performance Tier Distribution (%)				X						
Implicit trespasses (Count)				X						
Initial Tier				X						

Metric	Array	Disk	FAST Cache	Pool LUN	RAID group	RAID group LUN	SP Front-end port	Storage pool	Storage processor	Tier
Performance Tier Distribution (%)				X						
Read Cache State				X		X			X	
Service Time (ms)				X		X				
Tiering Policy				X						
User Capacity (GB)				X	X	X				X
Write Cache State				X		X			X	
Available Capacity (GB)					X			X		X
Defragmented (%)					X					
Disk Count					X					X
Free Continuous Group of Unbound Segments (GB)					X					
Full (%)					X					
LUN Count					X					
Max Disks					X					
Max LUNs					X					
Raw Capacity (GB)					X					
Queue Full Count							X	X		
Auto Tiering								X		
Auto-Tiering State								X		
Data Movement Completed (GB)								X		
Data to Move Down (GB)								X		
Data to Move Up (GB)								X		
Data to Move Within (GB)								X		
Deduplicated LUNs Shared Capacity (GBs)								X		
Deduplication and Snapshot Savings (GBs)								X		
Deduplication Rate								X		

Metric	Array	Disk	FAST Cache	Pool LUN	RAID group	RAID group LUN	SP Front-end port	Storage pool	Storage processor	Tier
Dirty Cache Pages (%)									X	
Dirty Cache Pages (MB)									X	
Read Cache Size (MB)									X	
Write Cache Flushes (MB/s)									X	
Write Cache Size (MB)									X	
Higher Tier (GB)										X
Lower Tier (GB)										X
Subscribed (%)										X

VNX File/eNAS metrics

EMC Storage Analytics provides VNX File metrics for Array, Data Mover (includes Virtual Data Mover), dVol, File Pool, and File System.

VNX File/eNAS metrics for Array

- Elapsed collect time (ms)
- New metrics in each collect call
- New resources in each collect call
- Number of down resources
- Number of metrics collected
- Number of resources collected

VNX File/eNAS metrics for Data Mover

Metric Group	Metric
Cache	Buffer Cache Hit Ratio (%)
	DNLC Hit Ratio (%)
	Open File Cache Hit Ratio (%)
Configuration	Type
CPU	Busy (%)
Disk	Reads (MB/s)
	Total Bandwidth (MB/s)
	Writes (MB/s)
Network	CIFS Average Read Size (KB)
	CIFS Average Write Size (KB)
	CIFS Reads (IOPS)
	CIFS Reads (MB/s)
	CIFS Total Operations (IOPS)
	CIFS Total Bandwidth (MB/s)
	CIFS Writes (IOPS)
	CIFS Writes (MB/s)
	NFS Average Read Size (Bytes)
	NFS Average Write Size (Bytes)
	NFS Reads (IOPS)
	NFS Reads (MB/s)
	NFS Total Bandwidth (MB/s)
	NFS Total Operations (IOPS)
	NFS Writes (IOPS)

Metric Group	Metric
	NFS Writes (MB/s)
	Network In Bandwidth (MB/s)
	Network Out Bandwidth (MB/s)
	Total Network Bandwidth (MB/s)
Network > NFSv2, NFSv3, and NFSv4	Read Calls/s
	Read Errors/s
	Read Response Time (ms)
	Write Calls/s
	Write Errors/s
	Write Response Time (ms)
Network > NFSv3	Access Calls/s
	Access Errors/s
	Access Response Time (ms)
	GetAttr Calls/s
	GetAttr Errors/s
	GetAttr Response Time (ms)
	Lookup Calls/s
	Lookup Errors/s
	Lookup Response Time (ms)
	SetAttr Calls/s
	SetAttr Errors/s
	SetAttr Response Time (ms)
Network > NFSv4	Close Calls/s
	Close Errors/s
	Close Response Time (ms)
	Compound Calls/s
	Compound Errors/s
	Compound Response Time (ms)
	Open Calls/s
	Open Errors/s
	Open Response Time (ms)
Network > SMB1	Close Average Response Time (ms)
	Close Calls/s
	Close Max Response Time (ms)

Metric Group	Metric
	NTCreateX Average Response Time (ms)
	NTCreateX Calls/s
	NTCreateX Max Response Time (ms)
	ReadX Average Response Time (ms)
	ReadX Calls/s
	ReadX Max Response Time (ms)
	Trans2Prim Average Response Time (ms)
	Trans2Prim Calls/s
	Trans2Prim Max Response Time (ms)
	WriteX Average Response Time (ms)
	WriteX Calls/s
	WriteX Max Response Time (ms)
	Network > SMB2
Close Calls/s	
Close Max Response Time (ms)	
Flush Average Response Time (ms)	
Flush Calls/s	
Flush Max Response Time (ms)	
Create Average Response Time (ms)	
Create Calls/s	
Create Max Response Time (ms)	
IOCTL Average Response Time (ms)	
IOCTL Calls/s	
IOCTL Max Response Time (ms)	
Queryinfo Average Response Time (ms)	
Queryinfo Calls/s	
Queryinfo Max Response Time (ms)	
Read Average Response Time (ms)	
Read Calls/s	
Read Max Response Time (ms)	
Write Average Response Time (ms)	
Write Calls/s	
Write Max Response Time (ms)	

VNX File/eNAS metrics for dVol, File pool, and File system

Metric	dVol	File pool	File system	Note
Average Read Size (Bytes)	X		X	
Average Write Size (Bytes)	X		X	
Average Completion Time (ms/call)	X			
Average Service Time (ms/call)	X			
Available Capacity (GB)		X	X	
Capacity (GB)	X	X	X	
Consumed Capacity (GB)		X	X	
Max Capacity (GB)			X	If automatic extension is enabled, the file system automatically extends to this maximum size when the high water mark is reached. The default value for the high water mark is 90 percent.
Full (%)			X	
IO Retries (IO/s)	X			
Queue Length	X			
Reads (IO/s)	X		X	
Reads (MB/s)	X		X	
Total Operations (IO/s)	X			
Total Bandwidth (MB/s)	X		X	
Utilization (%)	X			
Writes (IO/s)	X		X	
Writes (MB/s)	X		X	
Thin Provisioning			X	True 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.
Read IO Ratio (%)			X	
Write IO Ratio (%)			X	
Read Requests (Requests/s)			X	
Write Requests (Requests/s)			X	

VNXe metrics

EMC Storage Analytics provides VNXe metrics for Array, Disk, FAST Cache, File System, LUN, Storage Pool, Tier, VVol, and Virtual Disk, and Storage Processor. Only the resource kinds with associated metrics are shown.

- Elapsed collect time (ms)
- New metrics in each collect call
- New resources in each collect call
- Number of down resources
- Number of metrics collected
- Number of resources collected

VNXe metrics for Disk, FAST Cache, File System, LUN, Storage Pool, Tier, Virtual Disk

Metric group	Metric	Disk	FAST Cache	File System	LUN	Storage Pool	Tier
Capacity	Size (GB)	X					
	Available Capacity (GB)		X	X		X	X
	Capacity/Total capacity (GB)			X	X		
	Consumed Capacity (GB)			X	X	X	X
	Full (%)			X		X	X
	Thin Provisioning			X			
	Subscribed (%)					X	
	User Capacity (GB)					X	X
Configuration	State	X					
	RAID type		X				X
	FAST Cache					X	
	Disk Count						X
Performance	Busy (%)	X					
	Reads (IO/s)	X			X		
	Reads (MB/s)	X			X		
	Total Latency (ms)	X					
	Writes (IO/s)	X			X		
	Writes (MB/s)	X			X		
	Queue Length				X		
	Data to move Down (GB)						X
	Data to move Up (GB)						X

Metric group	Metric	Disk	FAST Cache	File System	LUN	Storage Pool	Tier
	Data to move Within (GB)						X
	Disk Count						X

VNXe metrics for Storage Processor

Metric Group	Metric
Cache	Dirty Cache Pages (MB)
	Read Cache Hit Ratio (%)
	Write Cache Hit Ratio (%)
Network	CIFS Reads (IOPS)
	CIFS Reads (MB/s)
	CIFS Writes (IOPS)
	CIFS Writes (MB/s)
	Network In Bandwidth (MB/s)
	Network Out Bandwidth (MB/s)
	NFS Reads (IOPS)
	NFS Reads (MB/s)
	NFS Writes (IOPS)
	NFS Writes (MB/s)
Network > NFSv2	Read Calls/s
	Read Errors/s
	Read Response Time (ms)
	Reads (IOPS)
	Write Calls/s
	Write Errors/s
	Write Response Time (ms)
	Writes (IOPS)
Network > NFSv3	Access Calls/s
	Access Errors/s
	Access Response Time (ms)
	GetAttr Calls/s
	GetAttr Errors/s
	GetAttr Response Time (ms)
	Lookup Calls/s

Metric Group	Metric
	Lookup Errors/s
	Lookup Response Time (ms)
	Read Calls/s
	Read Errors/s
	Read Response Time (ms)
	Reads (IOPS)
	SetAttr Calls/s
	SetAttr Errors/s
	SetAtt Response Time (ms)
	Write Calls/s
	Write Errors/s
	Write Response Time (ms)
	Writes (IOPS)
	Network > SMB1
Close Calls/s	
Close Max Response Time (ms)	
NTCreateX Average Response Time (ms)	
NTCreateX Calls/s	
NTCreateX Max Response Time (ms)	
Reads (IOPS)	
Reads (MB/s)	
ReadX Average Response Time (ms)	
ReadX Calls/s	
ReadX Max Response Time (ms)	
Trans2Prim Average Response Time (ms)	
Trans2Prim Calls/s	
Trans2Prim Max Response Time (ms)	
Writes (IOPS)	
Writes (MB/s)	
WriteX Average Response Time (ms)	
WriteX Calls/s	
WriteX Max Response Time (ms)	
Network > SMB2	
	Close Calls/s

Metric Group	Metric
	Close Max Response Time (ms)
	Create Average Response Time (ms)
	Create Calls/s
	Create Max Response Time (ms)
	Flush Average Response Time (ms)
	Flush Calls/s
	Flush Max Response Time (ms)
	ioctl Average Response Time (ms)
	ioctl Calls/s
	ioctl Max Response Time
	Queryinfo Average Response Time (ms)
	Queryinfo Calls/s
	Queryinfo Max Response Time (ms)
	Read Average Response Time (ms)
	Read Calls/s
	Read Max Response Time (ms)
	Reads (IOPS)
	Reads (MB/s)
	Write Average Response Time (ms)
	Write Calls/s
	Write Max Response Time (ms)
	Writes (IOPS)
	Writes (MB/s)
Performance	Busy (%)
	Reads (IOPS)
	Reads (MB/s)
	Writes (IOPS)
	Writes (MB/s)

VPLEX metrics

EMC Storage Analytics provides VPLEX metrics for Cluster, Director, Distributed Device, Engine, Ethernet Port, Extent, FC Port, Local Device, Storage Array, Storage View, Storage Volume, Virtual Volume, and VPLEX Metro.

VPLEX metrics for Cluster

Metric group	Metric	Description
Status	Cluster Type	Local or Metro.
Status	Health State	<p>Possible values include:</p> <ul style="list-style-type: none"> • OK - Cluster is functioning normally. • Degraded - Cluster is not functioning at an optimal level. This may indicate non-functioning remote virtual volumes, unhealthy devices or storage volumes, suspended devices, conflicting director count configuration values, or out-of-date devices. • Unknown - VPLEX cannot determine the cluster's health state, or the state is invalid. • Major failure - Cluster is failing and some functionality may be degraded or unavailable. This may indicate complete loss of back-end connectivity. • Minor failure - Cluster is functioning, but some functionality may be degraded. This may indicate one or more unreachable storage volumes. • Critical failure - Cluster is not functioning and may have failed completely. This may indicate a complete loss of back-end connectivity.
Status	Operational Status	<p>During transition periods, the cluster moves from one operational state to another. Possible values include:</p> <ul style="list-style-type: none"> • OK - Cluster is operating normally. • Cluster departure - One or more of the clusters cannot be contacted. Commands affecting distributed storage are refused. • Degraded - Cluster is not functioning at an optimal level. This may indicate non-functioning remote virtual volumes, unhealthy devices or storage volumes, suspended devices, conflicting director count configuration values, or out-of-date devices. • Device initializing - If clusters cannot communicate with each other, then the distributed-device will be unable to initialize. • Device out of date - Child devices are being marked fully out of date. Sometimes this occurs after a link outage. • Expelled - Cluster has been isolated from the island either manually (by an administrator) or automatically (by a system configuration setting). • Shutdown - Cluster's directors are shutting down. • Suspended exports - Some I/O is suspended. This could be result of a link failure or loss of a director. Other states might indicate the true problem. The VPLEX might be waiting for you to confirm the resumption of I/O. • Transitioning - Components of the software are recovering from a previous incident (for example, the loss of a director or the loss of an inter-cluster link).
Capacity	Exported Virtual Volumes	Number of exported virtual volumes.

Metric group	Metric	Description
	Exported Virtual Volumes (GB)	Gigabytes of exported virtual volumes.
	Used Storage Volumes	Number of used storage volumes.
	Used Storage Volumes (GB)	Gigabytes of used storage volumes.
	Unused Storage Volumes	Number of unused storage volumes.
	Unused Storage Volumes (GB)	Gigabytes of unused storage volumes.

VPLEX metrics for Director

Metric Group	Metric	Description
CPU	Busy (%)	Percentage of director CPU usage
Status	Operational Status	<p>Possible values include:</p> <ul style="list-style-type: none"> • OK - Functioning normally • Degraded - May be out-of-date compared to its mirror • Unknown - Cannot determine the health state, or the state is invalid • Error - VPLEX has marked the object as hardware-dead • Starting - Not yet ready • Lost-communication - Object is unreachable
Storage Volumes	Read Latency (ms)	Average read latency in milliseconds
	Write Latency (ms)	Average write latency in milliseconds
Virtual Volumes	Read Latency (ms)	Average read latency in milliseconds
	Reads (MB/s)	Number of bytes read per second
	Total Reads and Writes (counts/s)	Total number of reads and writes per second
	Write Latency (ms)	Average write latency in milliseconds
	Writes (MB/s)	Number of bytes written per second
Memory	Memory Used (%)	Percentage of memory heap usage by the firmware for its accounting on the director. This value is not the percentage of cache pages in use for user data
Front-end Director	Aborts (counts/s)	Number of aborted I/O operations per second through the director's front-end ports
	Active Operations (counts)	Number of active, outstanding I/O operations on the director's front-end ports
	Compare and Write Latency (ms)	Average time, in milliseconds, that it takes for VAAI CompareAndWrite request to complete on the director's front-end ports
	Operations (counts/s)	Number of I/O operations per second through the director's front-end ports

Metric Group	Metric	Description
	Queued Operations (counts)	Number of queued, outstanding I/O operations on the director's front-end ports
	Read Latency (ms)	Average time, in milliseconds, that it takes for read requests to complete on the director's front-end ports. Total time it takes VPLEX to complete a read request
	Reads (counts/s)	Number of read operations per second on the director's front-end ports
	Reads (MB/s)	Number of bytes per second read from the director's front-end ports
	Write Latency (ms)	Average time, in milliseconds, that it takes for write requests to complete on the director's front-end ports. Total time it takes VPLEX to complete a write request
	Writes (counts/s)	Number of write operations per second on the director's front-end ports
	Writes (MB/s)	Number of bytes per second written to the director's front-end ports
Back-end Director	Aborts (counts/s)	Number of aborted I/O operations per second on the director's back-end ports
	Operations (counts/s)	Number of I/O operations per second through the director's back-end ports
	Reads (counts/s)	Number of read operations per second by the director's back-end ports
	Reads (MB/s)	Number of bytes read per second by the director's back-end ports
	Resets (counts/s)	Number of LUN resets issued per second through the director's back-end ports. LUN resets are issued after 20 seconds of LUN unresponsiveness to outstanding operations.
	Timeouts (counts/s)	Number of timed out I/O operations per second on the director's back-end ports. Operations time out after 10 seconds
	Writes (MB/s)	Number of bytes written per second by the director's back-end ports
COM Latency	Average Latency (ms)	Average time, in milliseconds, that it took for inter-director WAN messages to complete on this director to the specified cluster in the last 5-second interval
	Maximum Latency (ms)	Maximum time, in milliseconds, that it took for an inter-director WAN message to complete on this director to the specified cluster in the last 5-second interval
	Minimum Latency (ms)	Minimum time, in milliseconds, that it took for an inter-director WAN message to complete on this director to the specified cluster in the last five-second interval
WAN Link Usage	Distributed Device Bytes Received (MB/s)	Number of bytes of distributed-device traffic per second received on the director's WAN ports
	Distributed Device Bytes Sent (MB/s)	Number of bytes of distributed-device traffic per second sent on the director's WAN ports
	Distributed Device Rebuild Bytes Received (MB/s)	Number of bytes of distributed-device, rebuild/migration traffic per second received on the director's WAN ports
	Distributed Device Rebuild Bytes Sent (MB/s)	Number of bytes of distributed-device rebuild/migration per second traffic sent on the director's WAN ports
FC WAN COM	Bytes Received (MB/s)	Number of bytes of WAN traffic per second received on this director's Fibre Channel port
	Bytes Sent (MB/s)	Number of bytes of WAN traffic per second sent on this director's Fibre Channel port
	Packets Received (counts/s)	Number of packets of WAN traffic per second received on this director's Fibre Channel port

Metric Group	Metric	Description
	Packets Sent (counts/s)	Number of packets of WAN traffic per second sent on this director's Fibre Channel port
IP WAN COM	Average Latency (ms)	Average time, in milliseconds, that it took for inter-director WAN messages to complete on this director's IP port in the last 5-second interval
	Bytes Received (MB/s)	Number of bytes of WAN traffic per second received on this director's IP port
	Bytes Sent (MB/s)	Number of bytes of WAN traffic per second sent on this director's IP port
	Maximum Latency (ms)	Maximum time, in milliseconds, that it took for an inter-director WAN message to complete on this director's IP port in the last five-second interval
	Minimum Latency (ms)	Minimum time, in milliseconds, that it takes for an inter-director WAN message to complete on this director's IP port in the last five-second interval
	Packets Received (counts/s)	Number of packets of WAN traffic per second received on this director's IP port
	Packets Resent (counts/s)	Number of WAN traffic packets re-transmitted per second that were sent on this director's IP port
	Packets Sent (counts/s)	Number of packets of WAN traffic per second sent on this director's IP port
	Received Packets Dropped (counts/s)	Number of WAN traffic packets dropped per second that were received on this director's IP port
	Sent Packets Dropped (counts/s)	Number of WAN traffic packets dropped per second that were sent on this director's IP port

VPLEX metrics for Distributed Device

Metric Group	Metric	Description
Capacity	Capacity (GB)	Capacity in gigabytes
Status	Health State	Possible values include: <ul style="list-style-type: none"> • OK - Functioning normally • Degraded - May be out-of-date compared to its mirror • Unknown - Cannot determine the health state, or the state is invalid • Non-recoverable error - May be out-of-date compared to its mirror, or VPLEX cannot determine the health state • Critical failure - VPLEX has marked the object as hardware-dead
	Operational Status	Possible values include: <ul style="list-style-type: none"> • OK - Functioning normally • Degraded - May be out-of-date compared to its mirror • Unknown - Cannot determine the health state, or the state is invalid • Error - VPLEX has marked the object as hardware-dead • Starting - Not yet ready • Lost-communication - Object is unreachable

Metric Group	Metric	Description
	Service Status	<p>Possible values include:</p> <ul style="list-style-type: none"> • Cluster unreachable - VPLEX cannot reach the cluster; the status is unknown • Need resume - The other cluster detached the distributed device while it was unreachable. Distributed device needs to be manually resumed for I/O to resume at this cluster. • Need winner - All clusters are reachable again, but both clusters had detached this distributed device and resumed I/O. You must pick a winner cluster whose data will overwrite the other cluster's data for this distributed device. • Potential conflict - Clusters have detached each other resulting in a potential for detach conflict. • Running - Distributed device is accepting I/O • Suspended - Distributed device is not accepting new I/O; pending I/O requests are frozen. • Winner-running - This cluster detached the distributed device while the other cluster was unreachable, and is now sending I/O to the device.

VPLEX metrics for Engine

Metric Group	Metric	Description
Status	Health State	<p>Possible values include:</p> <ul style="list-style-type: none"> • OK - Functioning normally • Degraded - May be out-of-date compared to its mirror • Unknown - Cannot determine the health state, or the state is invalid • Non-recoverable error - May be out-of-date compared to its mirror, or VPLEX cannot determine the health state • Critical failure - VPLEX has marked the object as hardware-dead
	Operational Status	<p>Possible values include:</p> <ul style="list-style-type: none"> • OK - Functioning normally • Degraded - May be out-of-date compared to its mirror • Unknown - Cannot determine the health state, or the state is invalid • Error - VPLEX has marked the object as hardware-dead • Starting - Not yet ready • Lost-communication - Object is unreachable

VPLEX metrics for Ethernet Port

Metric Group	Metric	Description
Status	Operational Status	<p>Possible values include:</p> <ul style="list-style-type: none"> • OK - Functioning normally • Degraded - May be out-of-date compared to its mirror

Metric Group	Metric	Description
		<ul style="list-style-type: none"> • Unknown - Cannot determine the health state, or the state is invalid • Error - VPLEX has marked the object as hardware-dead • Starting - Not yet ready • Lost-communication - Object is unreachable

VPLEX metrics for Extent Device

Metric Group	Metric	Description
Capacity	Capacity (GB)	Capacity in gigabytes
Status	Health State	Possible values include: <ul style="list-style-type: none"> • OK - The extent is functioning normally • Degraded - The extent may be out-of-date compared to its mirror (applies only to extents that are part of a RAID 1 device) • Unknown - VPLEX cannot determine the extent's operational state, or the state is invalid • Non-recoverable error - The extent may be out-of-date compared to its mirror (applies only to extents that are part of a RAID 1 device), and/or the health state cannot be determined
	Operational Status	Possible values include: <ul style="list-style-type: none"> • OK - The extent is functioning normally • Degraded - The extent may be out-of-date compared to its mirror (applies only to extents that are part of a RAID 1 device) • Unknown - VPLEX cannot determine the extent's operational state, or the state is invalid • Starting - The extent is not yet ready

VPLEX metrics for Fibre Channel Port

Metric Group	Metric	Description
Status	Operational Status	Possible values include: <ul style="list-style-type: none"> • OK - Functioning normally • Degraded - May be out-of-date compared to its mirror • Unknown - Cannot determine the health state, or the state is invalid • Error - VPLEX has marked the object as hardware-dead • Starting - Not yet ready • Lost-communication - Object is unreachable

VPLEX metrics for Local Device

Metric Group	Metric	Description
Capacity	Capacity (GB)	Capacity in gigabytes
Status	Health State	<p>Possible values include:</p> <ul style="list-style-type: none"> • OK - Functioning normally • Degraded - May be out-of-date compared to its mirror • Unknown - Cannot determine the health state, or the state is invalid • Non-recoverable error - May be out-of-date compared to its mirror, or VPLEX cannot determine the health state • Critical failure - VPLEX has marked the object as hardware-dead
	Operational Status	<p>Possible values include:</p> <ul style="list-style-type: none"> • OK - Functioning normally • Degraded - May be out-of-date compared to its mirror • Unknown - Cannot determine the health state, or the state is invalid • Error - VPLEX has marked the object as hardware-dead • Starting - Not yet ready • Lost-communication - Object is unreachable
	Service Status	<p>Possible values include:</p> <ul style="list-style-type: none"> • Cluster unreachable - VPLEX cannot reach the cluster; the status is unknown • Need resume - The other cluster detached the distributed device while it was unreachable. Distributed device needs to be manually resumed for I/O to resume at this cluster. • Need winner - All clusters are reachable again, but both clusters had detached this distributed device and resumed I/O. You must pick a winner cluster whose data will overwrite the other cluster's data for this distributed device. • Potential conflict - Clusters have detached each other resulting in a potential for detach conflict. • Running - Distributed device is accepting I/O • Suspended - Distributed device is not accepting new I/O; pending I/O requests are frozen • Winner-running - This cluster detached the distributed device while the other cluster was unreachable, and is now sending I/O to the device.

VPLEX metrics for Storage Array

Metric Group	Metric	Description
Capacity	Allocated Storage Volumes	Number of allocated storage volumes
	Allocated Storage Volumes (GB)	Gigabytes of allocated storage volumes
	Used Storage Volumes	Number of used storage volumes
	Used Storage Volumes (GB)	Gigabytes of used storage volumes

VPLEX metrics for Storage View

Metric Group	Metric	Description
Capacity	Virtual Volumes (GB)	Gigabytes of virtual volumes
Status	Operational Status	Possible values include: <ul style="list-style-type: none"> • OK - Functioning normally • Degraded - May be out-of-date compared to its mirror • Unknown - Cannot determine the health state, or the state is invalid • Error - VPLEX has marked the object as hardware-dead • Starting - Not yet ready • Lost-communication - Object is unreachable

VPLEX metrics for Storage Volume

Metric Group	Metric	Description
Capacity	Capacity (GB)	Capacity in gigabytes
Status	Health State	Possible values include: <ul style="list-style-type: none"> • OK - The storage volume is functioning normally • Degraded - The storage volume may be out-of-date compared to its mirror • Unknown - Cannot determine the health state, or the state is invalid • Non-recoverable error - May be out-of-date compared to its mirror, or VPLEX cannot determine the health state • Critical failure - VPLEX has marked the object as hardware-dead
	Operational Status	Possible values include: <ul style="list-style-type: none"> • OK - Functioning normally • Degraded - May be out-of-date compared to its mirror (This state applies only to a storage volume that is part of a RAID 1 Metadata Volume) • Unknown - Cannot determine the health state, or the state is invalid • Error - VPLEX has marked the object as hardware-dead • Starting - Not yet ready • Lost-communication - Object is unreachable

VPLEX metrics for Virtual Volume

Metric Group	Metric	Description
Capacity	Capacity (GB)	Capacity in gigabytes
Locality	Locality	Possible values include: <ul style="list-style-type: none"> • Local - The volume is local to the enclosing cluster • Remote - The volume is made available by a different cluster than the enclosing cluster, and is accessed remotely

Metric Group	Metric	Description
		<ul style="list-style-type: none"> • Distributed - The virtual volume has or is capable of having legs at more than one cluster
Status	Health State	<p>Possible values include:</p> <ul style="list-style-type: none"> • OK - Functioning normally • Unknown - Cannot determine the health state, or the state is invalid • Major failure - One or more of the virtual volume's underlying devices is out-of-date, but will never rebuild • Minor failure - One or more of the virtual volume's underlying devices is out-of-date, but will rebuild
	Operational Status	<p>Possible values include:</p> <ul style="list-style-type: none"> • OK - Functioning normally • Degraded - The virtual volume may have one or more out-of-date devices that will eventually rebuild • Unknown - VPLEX cannot determine the virtual volume's operational state, or the state is invalid • Error - One or more of the virtual volume's underlying devices is hardware-dead • Starting - Not yet ready • Stressed - One or more of the virtual volume's underlying devices is out-of-date and will never rebuild
	Service Status	<p>Possible values include:</p> <ul style="list-style-type: none"> • Running - I/O is running • Inactive - The volume is part of an inactive storage-view and is not visible from the host • Unexported - The volume is unexported • Suspended - I/O is suspended for the volume • Cluster-unreachable - Cluster is unreachable at this time • Need-resume - Issue re-attach to resume after link has returned

VPLEX metrics for VPLEX Metro

Metric Group	Metric	Description
Status	Health State	<p>Possible values include:</p> <ul style="list-style-type: none"> • OK - Cluster is functioning normally • Degraded - Cluster is not functioning at an optimal level. This may indicate non-functioning remote virtual volumes, unhealthy devices or storage volumes, suspended devices, conflicting director count configuration values, or out-of-date devices. • Unknown - VPLEX cannot determine the cluster's health state, or the state is invalid • Major failure - Cluster is failing and some functionality may be degraded or unavailable. This may indicate complete loss of back-end connectivity.

Metric Group	Metric	Description
		<ul style="list-style-type: none"> • Minor failure - Cluster is functioning, but some functionality may be degraded. This may indicate one or more unreachable storage volumes. • Critical failure - Cluster is not functioning and may have failed completely. This may indicate a complete loss of back-end connectivity.
	Operational Status	<p>During transition periods, the cluster moves from one operational state to another. Possible values include:</p> <ul style="list-style-type: none"> • OK - Cluster is operating normally • Cluster departure - One or more of the clusters cannot be contacted. Commands affecting distributed storage are refused. • Degraded - Cluster is not functioning at an optimal level. This may indicate non-functioning remote virtual volumes, unhealthy devices or storage volumes, suspended devices, conflicting director count configuration values, or out-of-date devices. • Device initializing - If clusters cannot communicate with each other, then the distributed-device will be unable to initialize. • Device out of date - Child devices are being marked fully out of date. Sometimes this occurs after a link outage. • Expelled - Cluster has been isolated from the island either manually (by an administrator) or automatically (by a system configuration setting). • Shutdown - Cluster's directors are shutting down. • Suspended exports - Some I/O is suspended. This could be result of a link failure or loss of a director. Other states might indicate the true problem. The VPLEX might be waiting for you to confirm the resumption of I/O. • Transitioning - Components of the software are recovering from a previous incident (for example, the loss of a director or the loss of an inter-cluster link).

VPLEX metrics for Distributed Device

Metric Group	Metric	Description
Capacity	Capacity (GB)	Capacity in gigabytes
Status	Health State	<p>Possible values include:</p> <ul style="list-style-type: none"> • OK - Functioning normally • Degraded - May be out-of-date compared to its mirror • Unknown - Cannot determine the health state, or the state is invalid • Non-recoverable error - May be out-of-date compared to its mirror, or VPLEX cannot determine the health state • Critical failure - VPLEX has marked the object as hardware-dead
	Operational Status	<p>Possible values include:</p> <ul style="list-style-type: none"> • OK - Functioning normally • Degraded - May be out-of-date compared to its mirror • Unknown - Cannot determine the health state, or the state is invalid • Error - VPLEX has marked the object as hardware-dead

Metric Group	Metric	Description
		<ul style="list-style-type: none"> • Starting - Not yet ready • Lost-communication - Object is unreachable
	Service Status	<p>Possible values include:</p> <ul style="list-style-type: none"> • Cluster unreachable - VPLEX cannot reach the cluster; the status is unknown • Need resume - The other cluster detached the distributed device while it was unreachable. Distributed device needs to be manually resumed for I/O to resume at this cluster. • Need winner - All clusters are reachable again, but both clusters had detached this distributed device and resumed I/O. You must pick a winner cluster whose data will overwrite the other cluster's data for this distributed device. • Potential conflict - Clusters have detached each other resulting in a potential for detach conflict. • Running - Distributed device is accepting I/O • Suspended - Distributed device is not accepting new I/O; pending I/O requests are frozen. • Winner-running - This cluster detached the distributed device while the other cluster was unreachable, and is now sending I/O to the device.

VPLEX metrics for Engine

Metric Group	Metric	Description
Status	Health State	<p>Possible values include:</p> <ul style="list-style-type: none"> • OK - Functioning normally • Degraded - May be out-of-date compared to its mirror • Unknown - Cannot determine the health state, or the state is invalid • Non-recoverable error - May be out-of-date compared to its mirror, or VPLEX cannot determine the health state • Critical failure - VPLEX has marked the object as hardware-dead
	Operational Status	<p>Possible values include:</p> <ul style="list-style-type: none"> • OK - Functioning normally • Degraded - May be out-of-date compared to its mirror • Unknown - Cannot determine the health state, or the state is invalid • Error - VPLEX has marked the object as hardware-dead • Starting - Not yet ready • Lost-communication - Object is unreachable

VPLEX metrics for Ethernet Port

Metric Group	Metric	Description
Status	Operational Status	Possible values include:

Metric Group	Metric	Description
		<ul style="list-style-type: none"> • OK - Functioning normally • Degraded - May be out-of-date compared to its mirror • Unknown - Cannot determine the health state, or the state is invalid • Error - VPLEX has marked the object as hardware-dead • Starting - Not yet ready • Lost-communication - Object is unreachable

VPLEX metrics for Extent Device

Metric Group	Metric	Description
Capacity	Capacity (GB)	Capacity in gigabytes
Status	Health State	Possible values include: <ul style="list-style-type: none"> • OK - The extent is functioning normally • Degraded - The extent may be out-of-date compared to its mirror (applies only to extents that are part of a RAID 1 device) • Unknown - VPLEX cannot determine the extent's operational state, or the state is invalid • Non-recoverable error - The extent may be out-of-date compared to its mirror (applies only to extents that are part of a RAID 1 device), and/or the health state cannot be determined
	Operational Status	Possible values include: <ul style="list-style-type: none"> • OK - The extent is functioning normally • Degraded - The extent may be out-of-date compared to its mirror (applies only to extents that are part of a RAID 1 device) • Unknown - VPLEX cannot determine the extent's operational state, or the state is invalid • Starting - The extent is not yet ready

VPLEX metrics for Fibre Channel Port

Metric Group	Metric	Description
Status	Operational Status	Possible values include: <ul style="list-style-type: none"> • OK - Functioning normally • Degraded - May be out-of-date compared to its mirror • Unknown - Cannot determine the health state, or the state is invalid • Error - VPLEX has marked the object as hardware-dead • Starting - Not yet ready • Lost-communication - Object is unreachable

VPLEX metrics for Local Device

Metric Group	Metric	Description
Capacity	Capacity (GB)	Capacity in gigabytes
Status	Health State	Possible values include: <ul style="list-style-type: none"> • OK - Functioning normally • Degraded - May be out-of-date compared to its mirror • Unknown - Cannot determine the health state, or the state is invalid • Non-recoverable error - May be out-of-date compared to its mirror, or VPLEX cannot determine the health state • Critical failure - VPLEX has marked the object as hardware-dead
	Operational Status	Possible values include: <ul style="list-style-type: none"> • OK - Functioning normally • Degraded - May be out-of-date compared to its mirror • Unknown - Cannot determine the health state, or the state is invalid • Error - VPLEX has marked the object as hardware-dead • Starting - Not yet ready • Lost-communication - Object is unreachable
	Service Status	Possible values include: <ul style="list-style-type: none"> • Cluster unreachable - VPLEX cannot reach the cluster; the status is unknown • Need resume - The other cluster detached the distributed device while it was unreachable. Distributed device needs to be manually resumed for I/O to resume at this cluster. • Need winner - All clusters are reachable again, but both clusters had detached this distributed device and resumed I/O. You must pick a winner cluster whose data will overwrite the other cluster's data for this distributed device. • Potential conflict - Clusters have detached each other resulting in a potential for detach conflict. • Running - Distributed device is accepting I/O • Suspended - Distributed device is not accepting new I/O; pending I/O requests are frozen • Winner-running - This cluster detached the distributed device while the other cluster was unreachable, and is now sending I/O to the device.

VPLEX metrics for Storage Array

Metric Group	Metric	Description
Capacity	Allocated Storage Volumes	Number of allocated storage volumes
	Allocated Storage Volumes (GB)	Gigabytes of allocated storage volumes
	Used Storage Volumes	Number of used storage volumes

Metric Group	Metric	Description
	Used Storage Volumes (GB)	Gigabytes of used storage volumes

VPLEX metrics for Storage View

Metric Group	Metric	Description
Capacity	Virtual Volumes (GB)	Gigabytes of virtual volumes
Status	Operational Status	<p>Possible values include:</p> <ul style="list-style-type: none"> • OK - Functioning normally • Degraded - May be out-of-date compared to its mirror • Unknown - Cannot determine the health state, or the state is invalid • Error - VPLEX has marked the object as hardware-dead • Starting - Not yet ready • Lost-communication - Object is unreachable

VPLEX metrics for Storage Volume

Metric Group	Metric	Description
Capacity	Capacity (GB)	Capacity in gigabytes
Status	Health State	<p>Possible values include:</p> <ul style="list-style-type: none"> • OK - The storage volume is functioning normally • Degraded - The storage volume may be out-of-date compared to its mirror • Unknown - Cannot determine the health state, or the state is invalid • Non-recoverable error - May be out-of-date compared to its mirror, or VPLEX cannot determine the health state • Critical failure - VPLEX has marked the object as hardware-dead
	Operational Status	<p>Possible values include:</p> <ul style="list-style-type: none"> • OK - Functioning normally • Degraded - May be out-of-date compared to its mirror (This state applies only to a storage volume that is part of a RAID 1 Metadata Volume) • Unknown - Cannot determine the health state, or the state is invalid • Error - VPLEX has marked the object as hardware-dead • Starting - Not yet ready • Lost-communication - Object is unreachable

VPLEX metrics for Virtual Volume

Metric Group	Metric	Description
Capacity	Capacity (GB)	Capacity in gigabytes

Metric Group	Metric	Description
Locality	Locality	<p>Possible values include:</p> <ul style="list-style-type: none"> • Local - The volume is local to the enclosing cluster • Remote - The volume is made available by a different cluster than the enclosing cluster, and is accessed remotely • Distributed - The virtual volume has or is capable of having legs at more than one cluster
Status	Health State	<p>Possible values include:</p> <ul style="list-style-type: none"> • OK - Functioning normally • Unknown - Cannot determine the health state, or the state is invalid • Major failure - One or more of the virtual volume's underlying devices is out-of-date, but will never rebuild • Minor failure - One or more of the virtual volume's underlying devices is out-of-date, but will rebuild
	Operational Status	<p>Possible values include:</p> <ul style="list-style-type: none"> • OK - Functioning normally • Degraded - The virtual volume may have one or more out-of-date devices that will eventually rebuild • Unknown - VPLEX cannot determine the virtual volume's operational state, or the state is invalid • Error - One or more of the virtual volume's underlying devices is hardware-dead • Starting - Not yet ready • Stressed - One or more of the virtual volume's underlying devices is out-of-date and will never rebuild
	Service Status	<p>Possible values include:</p> <ul style="list-style-type: none"> • Running - I/O is running • Inactive - The volume is part of an inactive storage-view and is not visible from the host • Unexported - The volume is unexported • Suspended - I/O is suspended for the volume • Cluster-unreachable - Cluster is unreachable at this time • Need-resume - Issue re-attach to resume after link has returned

VPLEX metrics for VPLEX Metro

Metric Group	Metric	Description
Status	Health State	<p>Possible values include:</p> <ul style="list-style-type: none"> • OK - Cluster is functioning normally • Degraded - Cluster is not functioning at an optimal level. This may indicate non-functioning remote virtual volumes, unhealthy devices or storage volumes,

Metric Group	Metric	Description
		<p>suspended devices, conflicting director count configuration values, or out-of-date devices.</p> <ul style="list-style-type: none"> • Unknown - VPLEX cannot determine the cluster's health state, or the state is invalid • Major failure - Cluster is failing and some functionality may be degraded or unavailable. This may indicate complete loss of back-end connectivity. • Minor failure - Cluster is functioning, but some functionality may be degraded. This may indicate one or more unreachable storage volumes. • Critical failure - Cluster is not functioning and may have failed completely. This may indicate a complete loss of back-end connectivity.
	Operational Status	<p>During transition periods, the cluster moves from one operational state to another. Possible values include:</p> <ul style="list-style-type: none"> • OK - Cluster is operating normally • Cluster departure - One or more of the clusters cannot be contacted. Commands affecting distributed storage are refused. • Degraded - Cluster is not functioning at an optimal level. This may indicate non-functioning remote virtual volumes, unhealthy devices or storage volumes, suspended devices, conflicting director count configuration values, or out-of-date devices. • Device initializing - If clusters cannot communicate with each other, then the distributed-device will be unable to initialize. • Device out of date - Child devices are being marked fully out of date. Sometimes this occurs after a link outage. • Expelled - Cluster has been isolated from the island either manually (by an administrator) or automatically (by a system configuration setting). • Shutdown - Cluster's directors are shutting down. • Suspended exports - Some I/O is suspended. This could be result of a link failure or loss of a director. Other states might indicate the true problem. The VPLEX might be waiting for you to confirm the resumption of I/O. • Transitioning - Components of the software are recovering from a previous incident (for example, the loss of a director or the loss of an inter-cluster link).

XtremIO metrics

EMC Storage Analytics provides XtremIO metrics for Cluster, Data Protection Group, Snapshot, SSD, Storage Controller, Volume, and X-Brick.

XtremIO metrics for Cluster

Metric Group	Metric
Capacity	Deduplication Ratio
	Compression Ratio
	Total Efficiency

Metric Group	Metric
	Thin Provision Savings (%)
	Data Reduction Ratio
Capacity > Physical	Available Capacity (TB)
	Remaining Capacity (%)
	Used Capacity (%)
	Consumed Capacity (TB)
	Total Capacity (TB)
Capacity > Volume	Available Capacity (TB)
	Consumed Capacity (TB)
	Total Capacity (TB)
Performance	Total Bandwidth (MB/s)
	Total Latency (ms)
	Total Operations (IO/s)
Performance > Read Operations	Read Bandwidth (MB/s)
	Read Latency (ms)
	Reads (IO/S)
Performance > Write Operations	Writes (MB/s)
	Write Bandwidth (MB/s)
	Write Latency (ms)
Status	Health State

XtremIO metrics for Data Protection Group

Metric Group	Metric
Performance	Average SSD Utilization (%)

XtremIO metrics for Snapshot

Metric Group	Metric
Capacity	Consumed Capacity in XtremIO (GB)— Consumed capacity in gigabytes without "zeroed" space
	Consumed Capacity in VMware (GB)— Consumed capacity in gigabytes, including "zeroed" space

Metric Group	Metric
	<p>Note</p> <p>This metric is available only when a datastore is built on top of the snapshot. The value of the metric is the consumed datastore capacity, which might not be the same as the consumed snapshot capacity.</p>
	Total Capacity (GB)
Performance	Average Block Size (KB)
	Total Bandwidth (MB/s)
	Total Latency (usec)
	Total Operations (IOPS)
	Unaligned (%)
Performance > Read Operations	Average Block Size (KB)
	Average Small Reads (IOPS)
	Average Unaligned Reads (IOPS)
	Read Bandwidth (MB/s)
	Read Latency (usec)
	Reads (IOPS)
Performance > Write Operations	Average Block Size (KB)
	Average Small Writes (IOPS)
	Average Unaligned Writes (IOPS)
	Write Bandwidth (MB/s)
	Write Latency (usec)
	Writes (IOPS)
Tag	Configuration

XtremIO metrics for SSD

Metric Group	Metric
Capacity	Disk Utilization (%)
Endurance	Endurance Remaining (%)

XtremIO metrics for Storage Controller

Metric Group	Metric
Configuration	Encrypted
Performance	CPU 1 Utilization (%)
	CPU 2 Utilization (%)

Metric Group	Metric
Status	Health State

XtremIO metrics for Volume

Metric Group	Metric
Capacity	Consumed Capacity in XtremIO (GB)
	Consumed Capacity in VMware (GB)
	Total Capacity (GB)
Performance	Average Block Size (KB)
	Total Bandwidth (MB/s)
	Total Latency (usec)
	Total Operations (IOPS)
	Unaligned (%)
Performance > Read Operations	Average Block Size (KB)
	Average Small Reads (IOPS)
	Average Unaligned Reads (IOPS)
	Read Bandwidth (MB/s)
	Read Latency (usec)
	Reads (IOPS)
Performance > Write Operations	Average Block Size (KB)
	Average Small Writes (IOPS)
	Average Unaligned Writes (IOPS)
	Write Bandwidth (MB/s)
	Write Latency (usec)
	Writes (IOPS)
Tag	Configuration

XtremIO metrics for X-Brick™

Metric Group	Metric
X-Brick	Reporting

CHAPTER 5

Views and Reports

This chapter contains the following topics:

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- [Isilon views and reports](#)..... 115
- [ScaleIO views and reports](#)..... 117
- [VMAX views and reports](#)..... 118
- [VNX, VNXe, and Unity/UnityVSA views and reports](#)..... 120
- [XtremIO views and reports](#).....128

eNAS views and reports

The eNAS report includes all views and can be exported in CSV and PDF formats.

You can create views and reports for the following eNAS components.

Component	Metric
Data Mover (In Use)	Avg. CPU Busy (%)
	Max CPU Busy (%)
	Avg. Total Network Bandwidth (MB/s)
	Max Total Network Bandwidth (MB/s)
	Type (String)
dVol (In Use)	Capacity (GB)
	Avg. Average Service Time (ms/call)
	Max Average Service Time (ms/call)
	Avg. Utilization (%)
	Max Utilization (%)
	Avg. Total Operations (IO/s)
	Max Total Operations (IO/s)
	Avg. Total Bandwidth (MB/s)
	Max Total Bandwidth (MB/s)
File Pool (In Use)	Consumed Capacity (GB)
	Available Capacity (GB)
	Total Capacity (GB)
File system	Total Capacity (GB)
	Allocated Capacity (GB)
	Consumed Capacity (GB)
	Available Capacity (GB)
	Avg. Total Operations (IO/s)
	Max Total Operations (IO/s)
	Avg. Total Bandwidth (MB/s)
	Max Total Bandwidth (MB/s)

Isilon views and reports

You can create views and reports for Isilon components. The report name is Isilon Report, which contains all the following views:

Component	Metric group	Metric
Isilon Cluster Performance	Summary	CPU Usage (%)
		Number of Active Jobs
	Node External Network	External Throughput Rate (In, MB/s)
		External Throughput Rate (Out, MB/s)
	Node Performance	Protocol Operations Rate
	Node Summary	Connected Clients
	Cluster Summary	Active Jobs
		Inactive Jobs
Node Summary	Job Workers	
Isilon Cache Performance	Node Cache	Overall Cache Hit Rate (MB/s)
		Overall Cache Throughput Rate (MB/s)
		Average Cache Data Age (s)
		L1 Cache Starts (MB/s)
		L1 Cache Hits (MB/s)
		L1 Cache Misses (MB/s)
		L1 Cache Waits (MB/s)
		L1 Cache Prefetch Starts (MB/s)
		L1 Cache Prefetch Hits (MB/s)
		L1 Cache Prefetch Misses (MB/s)
Isilon Cluster Capacity	Cluster Capacity	Total Capacity (TB)
		Remaining Capacity (TB)
		Remaining Capacity (%)
		User Data Including Protection (TB)
		Snapshot Usage (TB)
Isilon Cluster Deduplication	Cluster Deduplication	Deduplicated Data (Logical, GB)
		Deduplicated Data (Physical, GB)
		Saved Data (Logical, GB)
		Saved Data (Physical, GB)
Isilon Disk Performance	Node Performance	Protocol Operations Rate
		Disk Activity (%)

Component	Metric group	Metric
		Disk Operations Rate (Read)
		Disk Operations Rate (Write)
		Average Disk Operation Size (MB)
		Average Pending Disk Operations Count
		Slow Disk Access Rate
Isilon File System Performance	Node Performance	File System Events Rate
		Deadlock File System Events Rate
		Locked File System Events Rate
		Contended File System Events Rate
		Blocking File System Events Rate
Isilon Network Performance	Node External Network	External Network Throughput Rate (In, MB/s)
		External Network Throughput Rate (Out, MB/s)
		External Network Packets Rate (In, MB/s)
		External Network Packets Rate (Out, MB/s)
		External Network Errors (In, MB/s)
		External Network Errors (Out, MB/s)
Isilon Node Performance	Node Summary	CPU Usage (%)
	Node External Network	External Throughput Rate (In, MB/s)
		External Throughput Rate (Out, MB/s)
	Node Performance	Disk Activity (%)
		Disk Throughput Rate (Read)
		Disk Throughput Rate (Write)
		Disk Operations Rate (Read)
		Disk Operations Rate (Write)
		Protocol Operations Rate
		Slow Disk Access Rate
	Node Summary	Active Clients
		Connected Clients
		Pending Disk Operations Latency (ms)

ScaleIO views and reports

You can create views and reports for the following ScaleIO components:

Component	Metric
ScaleIO Volume	Number of Child Volumes (Count)
	Number of Descendant Volumes (Count)
	Number of Mapped SDCs (Count)
	Volume Size (GB)
	Average Read I/O Size (MB)
	Average Write I/O Size (MB)
	Total Read IO/s
	Total Write IO/s
	Total Reads (MB/s)
	Total Writes (MB/s)
ScaleIO Protection Domain	Maximum Capacity (GB)
	Protected Capacity (GB)
	Snap Used Capacity (GB)
	Thick Used Capacity (GB)
	Thin Used Capacity (GB)
	Unused Capacity (GB)
	Used Capacity (GB)
	Average Read I/O Size (MB)
	Average Write I/O Size (MB)
	Total Read IO/s
	Total Write IO/s
	Total Reads (MB/s)
	Total Writes (MB/s)
ScaleIO SDC	Number of Mapped Volumes (Count)
	Total Mapped Capacity (GB)
	Average Read I/O Size (MB)
	Average Write I/O Size (MB)
	Total Read IO/s
	Total Write IO/s
	Total Read (MB/s)
	Total Write (MB/s)

Component	Metric
ScaleIO SDS	Maximum Capacity (GB)
	Snap Used Capacity (GB)
	Thick Used Capacity (GB)
	Thin Used Capacity (GB)
	Unused Capacity (GB)
	Used Capacity (GB)
	Average Read IO Size (MB)
	Average Write IO Size (MB)
	Total Read IO/s
	Total Write IO/s
	Total Read (MB/s)
	Total Write (MB/s)

Note

The MDM list view does not contain component-specific metrics.

VMAX views and reports

VMAX reports consist of multiple component list views with the supported VMAX metrics. The reports can be exported in CSV and PDF formats.

You can create the following views and reports:

Metric	SRDF Report	VMAX3 Report
Device		X
Front-End Director		X
Front-End Port		X
Storage Group		
Remote Replica Group	X	
SRDF Director	X	
SRDF Port	X	
SLO		X
Storage Group		X
Storage Resource Pool		X

The metrics available for each component are listed in the following table.

Metric	Storage Group	Device	Front-End Director	Front-End Port	SRDF Director	Remote Replica Group	Storage Resource Pool
Total Capacity (GB)	X	X					X
Current Size (GB)	X	X					X
Used Capacity (GB)	X	X					X
Usable Capacity (GB)	X	X					X
Workload (%)	X	X					X
Under Used (%)	X	X					X
Reads IO/s	X		X		X		X
Reads MB/s	X						X
Writes IO/s	X		X		X	X	X
Writes MB/s	X					X	X
Total Operations IO/s	X		X	X	X		X
Total Bandwidth MB/s	X			X	X		
Full (%)		X					X
Total Bandwidth IO/s			X				
Total Hits IO/s			X				
Tier1 Percent in Policy (%)							
Tier2 Percent in Policy (%)							
Tier3 Percent in Policy (%)							
Tier4 Percent in Policy (%)							
% Busy					X		
SRDFA Writes IO/s					X		
SRDFA Writes MB/s					X		
SDRFS Writes IO/s					X		
SDRFS Writes MB/s					X		
Avg. Cycle Time (seconds)						X	
Delta Set Extension Threshold (integer)						X	
Devices in Session (count)						X	
HA Repeat Writes (count/s)						X	
Minimum Cycle Time (seconds)						X	

Note

The current list views of SRDF Port and SLO do not contain any component-specific metrics.

VNX, VNXe, and Unity/UnityVSA views and reports

You can create views and reports for VNX and Unity resources. Several predefined views and templates are also available.

Report templates

Note

VNXe storage objects are contained in Unity views and reports.

The predefined report templates consist of several list views under the adapter instance, as shown in the following table.

Metric	VNX Block Report	VNX File Report	Unity/UnityVSA /VNXe Report
Alerts	X	X	X
Storage Pool (in use)	X		X
RAID Group (in use)	X		
LUN	X		X
Disk (in use)	X		X
SP Front-End Port	X		
Data Mover (in use)		X	
File Pool (in use)		X	
File System		X	X
dVol (in use)		X	

Predefined views

The following sections describe the available predefined views:

- [Alerts on page 121](#)
- [VNX Data Mover on page 121](#)
- [VNX File System on page 122](#)
- [VNX File Pool on page 120](#)
- [VNX dVol on page 122](#)
- [VNX LUN on page 123](#)
- [VNX Tier on page 123](#)
- [VNX FAST Cache on page 123](#)
- [VNX Storage Pool on page 124](#)
- [VNX Disk on page 124](#)
- [VNX Storage Processor on page 125](#)

- [VNX Storage Processor Front End Port on page 125](#)
- [VNX RAID Group on page 125](#)
- [Unity File System on page 125](#)
- [Unity LUN on page 126](#)
- [Unity Tier on page 126](#)
- [Unity Storage Pool on page 126](#)
- [Unity Disk on page 127](#)
- [Unity Storage Processor on page 127](#)

Alerts

Alert definitions apply to all resources.

Metric	Description
Criticality level	The criticality level of the alert—Warning, Immediate, or Critical
Object name	Name of the impacted object
Object kind	Resource kind of the impacted object
Alert impact	Impacted badge (Risk, Health, or Efficiency) of the alert
Start time	Start time of the alert

VNX Data Mover

Metric group	Metric	Description		
CPU	Busy (%)	VNX Data Mover CPU busy trend		
Network	NFS Reads (MB/s)	VNX Data Mover NFS bandwidth trend		
	NFS Writes (MB/s)			
	NFS Total Bandwidth (MB/s)			
	Network	In Bandwidth (MB/s)	VNX Data Mover network bandwidth trend	
		Out Bandwidth (MB/s)		
		Total Bandwidth (MB/s)		
		Network	NFS Reads (IO/s)	VNX Data Mover NFS IOPS trend
			NFS Writes (IO/s)	
			NFS Total Operations (IO/s)	
CPU	% Busy - Average	VNX Data Mover (in use)		
	% Busy - Max			
Network	Total Network Bandwidth - Average (MB/s)			
	Total Network Bandwidth - Max (MB/s)			
Configuration	Data Mover Type			

VNX File System

Metric group	Metric	Description
Performance	Total Operations (IO/s)	VNX file system IOPS trend
	Reads (IO/s)	
	Writes (IO/s)	
	Total Bandwidth (MB/s)	VNX file system bandwidth trend
	Reads (MB/s)	
	Writes (MB/s)	
Capacity	Consumed Capacity (GB)	VNX file system capacity trend
	Total Capacity (GB)	
Capacity	Total Capacity (GB)	VNX file system List
	Allocated Capacity (GB)	
	Consumed Capacity (GB)	
	Available Capacity (GB)	
Performance	Avg. Total Operations (IO/s)	
	Max Total Operations (IO/s)	
	Avg. Total Bandwidth (MB/s)	
	Max Total Bandwidth (MB/s)	

VNX File Pool

Metric group	Metric	Description
Capacity	Consumed Capacity (GB)	VNX file pool capacity trend
	Total Capacity (GB)	
Capacity	Available Capacity (GB)	VNX file pool (in use) list
	Consumed Capacity (GB)	
	Total Capacity (GB)	

VNX dVol

Metric group	Metric	Description
Performance	Utilization (%)	VNX dVol utilization trend
Performance	Total Operations (IO/s)	VNX dVol IOPS trend
	Reads (IO/s)	
	Writes (IO/s)	
Performance	Total Bandwidth (MB/s)	VNX dVol bandwidth trend
	Reads (MB/s)	
	Writes (MB/s)	

Metric group	Metric	Description
Capacity	Capacity (GB)	VNX dVol (in use) list
Performance	Avg. Average Service Time (uSec/call)	
	Max Average Service Time (uSec/call)	
	Avg. Utilization (%)	
	Max Utilization (%)	
	Avg. Total Operations (IO/s)	
	Max Total Operations (IO/s)	
	Avg. Total Bandwidth (MB/s)	
	Max Total Bandwidth (MB/s)	

VNX LUN

Metric group	Metric	Description
Performance	Total Operations (IO/s)	VNX LUN IOPS trend
	Reads (IO/s)	
	Writes (IO/s)	
Performance	Total Bandwidth (MB/s)	VNX LUN bandwidth trend
	Reads (MB/s)	
	Writes (MB/s)	
Performance	Total Latency (ms)	VNX LUN total latency trend
Performance	Avg. Total Operations (IO/s)	VNX LUN list
	Max Total Operations (IO/s)	
	Avg. Total Bandwidth (MB/s)	
	Max Total Bandwidth (MB/s)	
	Avg. Total Latency (ms)	
	Max Total Latency (ms)	
Capacity	Total Capacity (GB)	

VNX Tier

Metric group	Metric	Description
Capacity	Consumed Capacity (GB)	VNX Tier capacity trend
	Total Capacity (GB)	

VNX FAST Cache

Metric group	Metric	Description
Performance	Read Cache Hit Ratio (%)	VNX FAST Cache hit ratio trend

Metric group	Metric	Description
	Write Cache Hit Ratio (%)	

VNX Storage Pool

Metric group	Metric	Description
Capacity	Consumed Capacity (GB)	VNX storage pool capacity trend
	Total Capacity (GB)	
Capacity	Available Capacity (GB)	VNX storage pool (in use) List
	Consumed Capacity (GB)	
	Full (%)	
	Subscribed (%)	
Configuration	LUN Count	

VNX Disk

Metric group	Metric	Description
Performance	Total Operations (IO/s)	VNX disk IOPS trend
	Reads (IO/s)	
	Writes (IO/s)	
Performance	Total Bandwidth (MB/s)	VNX disk bandwidth (MB/s) trend
	Reads (MB/s)	
	Writes (MB/s)	
Performance	Total Latency (ms)	VNX disk Total Latency (ms) trend
Performance	Busy (%)	VNX disk busy (%) trend
Capacity	Capacity (GB)	VNX disk (in use) List
Performance	Avg. Total Operations (IO/s)	
	Max Total Operations (IO/s)	
	Avg. Total Bandwidth (MB/s)	
	Max Total Bandwidth (MB/s)	
	Avg. Total Latency (ms)	
	Max Total Latency (ms)	
	Avg. Busy (%)	
Max Busy (%)		
Configuration	Type	

VNX Storage Processor

Metric group	Metric	Description
CPU	CPU Busy (%)	VNX storage processor CPU busy trend
Disk	Disk Total Operations (IO/s)	VNX storage processor disk IOPS trend
	Disk Reads (IO/s)	
	Disk Writes (IO/s)	
Disk	Disk Total Bandwidth (MB/s)	VNX storage processor disk bandwidth trend
	Disk Reads (MB/s)	
	Disk Writes (MB/s)	

VNX Storage Processor Front End Port

Metric group	Metric	Description
Performance	Total Operations (IO/s)	VNX SP front end port IOPS trend
	Reads (IO/s)	
	Writes (IO/s)	
Performance	Total Bandwidth (MB/s)	VNX SP front end port bandwidth trend
	Reads (MB/s)	
	Writes (MB/s)	
Performance	Avg. Total Operations (IO/s)	VNX SP front end port List
	Max Total Operations (IO/s)	
	Avg. Total Bandwidth (MB/s)	
	Max Total Bandwidth (MB/s)	

VNX RAID Group

Metric group	Metric	Description
Capacity	Available Capacity (GB)	VNX RAID group (in use) list
	Total Capacity (GB)	
	Full (%)	
Configuration	Disk Count	
	LUN Count	
	Max Disks	
	Max LUNs	

Unity File System

Metric group	Metric	Description
Capacity	Consumed Capacity (GB)	Unity file system capacity trend

Metric group	Metric	Description
	Total Capacity (GB)	
Capacity	Total Capacity (GB)	Unity file system List
	Allocated Capacity (GB)	
	Consumed Capacity (GB)	
	Available Capacity (GB)	

Unity LUN

Metric group	Metric	Description
Performance	Reads (IO/s)	Unity LUN IOPS trend
	Writes (IO/s)	
Performance	Reads (MB/s)	Unity LUN bandwidth trend
	Writes (MB/s)	
Capacity	Total Capacity (GB)	Unity LUN List
Performance	Avg. Reads (IO/s)	
	Max Reads (IO/s)	
	Avg. Writes (IO/s)	
	Max Writes (IO/s)	
	Avg. Reads (MB/s)	
	Max Reads (MB/s)	
	Avg. Writes (MB/s)	
	Max Writes (MB/s)	

Unity Tier

Metric group	Metric	Description
Capacity	Consumed Capacity (GB)	Unity tier capacity trend
	Total Capacity (GB)	

Unity Storage Pool

Metric group	Metric	Description
Capacity	Consumed Capacity (GB)	Unity storage pool capacity trend
	Total Capacity (GB)	
Capacity	Consumed Capacity (GB)	Unity storage pool (in use) List
	Total Capacity (GB)	
	Full (%)	
	Subscribed (%)	

Unity Disk

Metric group	Metric	Description
Performance	Reads (IO/s)	Unity disk IOPS trend
	Writes (IO/s)	
Performance	Reads (MB/s)	Unity disk bandwidth
	Writes (MB/s)	
Performance	Busy (%)	Unity disk busy trend
Capacity	Size (GB)	Unity disk (in use) list
Performance	Avg. Reads (IO/s)	
	Max Reads (IO/s)	
	Avg. Writes (IO/s)	
	Max Writes (IO/s)	
	Avg. Reads (MB/s)	
	Max Reads (MB/s)	
	Avg. Writes (MB/s)	
	Max Writes (MB/s)	
	Avg. Busy (%)	
	Max Busy (%)	
Configuration	Type	

Unity Storage Processor

Metric group	Metric	Description
Performance	Busy (%)	Unity storage processor busy trend
Performance	Reads (IO/s)	Unity storage processor IOPS trend
	Writes (IO/s)	
Performance	Reads (MB/s)	Unity storage processor bandwidth trend
	Writes (MB/s)	
Network	NFS Reads (IO/s)	Unity storage processor NFS IOPS trend
	NFS Writes (IO/s)	
Network	NFS Reads (MB/s)	Unity storage processor NFS bandwidth trend
	NFS Writes (MB/s)	

XtremIO views and reports

The XtremIO report includes all views and can be exported in CSV and PDF formats.

You can create views and reports for the following XtremIO components:

Component	Metric group	Metric
XtremIO cluster capacity consumption	n/a	Available Capacity (TB, physical)
		Consumed Capacity (TB, physical)
		Total Capacity (TB, physical)
		Available Capacity (TB, volume)
		Consumed Capacity (TB, volume)
		Total Capacity (TB, volume)
XtremIO health state	n/a	Cluster health state
		Storage Controller Health State
XtremIO LUN	Volume Performance:Read Operations Read Bandwidth	Read Bandwidth (MB/s)
	Volume Performance:Read Operations Read Latency	Read Latency (ms)
	Volume Performance:Read Operations Reads	Reads (IO/s)
	Volume Performance:Write Operations Write Bandwidth	Write Bandwidth (MB/s)
	Volume Performance:Write Operations Write Latency	Write Latency (ms)
	Volume Performance:Write Operations Write	Write (IO/s)
	Volume Performance Total Bandwidth	Total Bandwidth (MB/s)
	Volume Performance Total Latency	Total Latency (ms)
	Volume Performance Total Operations	Total operations (IO/s)
	Volume Capacity Consumed Capacity in VMware	Consumed Capacity in VMware (GB)
	Volume Capacity Consumed Capacity in XtremIO	Consumed Capacity in XtremIO (GB)
	Volume Capacity Total Capacity	Total Capacity (GB)
		Summary (Min, Max, Average)
XtremIO performance	Cluster Performance:Read Operations Read Bandwidth	Read Bandwidth (MB/s)
	Cluster Performance:Read Operations Read Latency	Read Latency (ms)
	Cluster Performance:Read Operations Reads	Reads (IO/s)
	Cluster Performance:Write Operations Write Bandwidth	Write Bandwidth (MB/s)
	Cluster Performance:Write Operations Write Latency	Write Latency (ms)
	Cluster Performance:Write Operations Write	Write (IO/s)
	Cluster Performance Total Bandwidth	Total Bandwidth (MB/s)
	Cluster Performance Total Latency	Total Latency (ms)
	Cluster Performance Total Operations	Total Operations (IO/s)

Component	Metric group	Metric
	Storage Controller Performance CPU 1 Utilization	CPU 1 Utilization (%)
	Storage Controller Performance CPU 2 Utilization	CPU 2 Utilization (%)
		Summary (Max, Min, Average)
XtremIO storage efficiency	Cluster Capacity Deduplication Ratio	Deduplication Ratio
	Cluster Capacity Compression Ratio	Compression Ratio
	Cluster Capacity Thin Provision Savings	Thin provision Savings (%)
	SSD Endurance Endurance Remaining	SSD endurance Remaining (%)
	SSD Capacity Disk Utilization	Disk Utilization (%)
	Average	Summary

CHAPTER 6

Remedial Actions on EMC Storage Systems

This chapter contains the following topics:

- Remedial actions overview 132
- Changing the service level objective (SLO) for a VMAX3 storage group 132
- Changing the tier policy for a File System 132
- Changing the tier policy for a LUN 133
- Extending file system capacity 133
- Enabling performance statistics for VNX Block 133
- Enabling FAST Cache on Unity and VNXe storage pools 134
- Enabling FAST Cache on a VNX Block storage pool 134
- Expanding LUN capacity 134
- Migrating a VNX LUN to another storage pool 134
- Rebooting a Data Mover on VNX storage 135
- Rebooting a VNX storage processor 135
- Extending volumes on EMC XtremIO storage systems 135

Remedial actions overview

Various remedial actions are available in vRealize Operations Manager, depending on the storage system. The **Actions** menu is available on the storage system's resource page, and remedial actions can also be initiated from the details page for an alert.

For these actions to be available, ensure that the Management Pack for EMC storage systems (EMC Adapter) is installed and the EMC Adapter instances are configured.

Other requirements:

- The EMC Adapter instances require the use of Admin credentials on the storage array.
- The vRealize Operations Manager user must have an Admin role that can access the **Actions** menu.

Changing the service level objective (SLO) for a VMAX3 storage group

This action is available from the Actions menu when a VMAX3 storage group is selected.

Procedure

1. From the summary page of a VMAX3 storage group, click **Actions** > **Change SLO**.
2. In the **Change SLO** dialog box, provide the following information:

Option	Description
New SLO	New SLO for the storage group
New Workload	New workload type for the storage group

3. Click **OK**.

Results

The SLO for the storage group is changed.

Changing the tier policy for a File System

This action is available in the **Actions** menu when you select a File System on the **Summary** tab.

Procedure

1. From the File System's **Summary** page, click **Actions** > **Change File System Tiering Policy**.
2. In the dialog box, select a tiering policy and click **Begin Action**.

Results

The policy is changed. You can check the status under **Recent Tasks**.

Changing the tier policy for a LUN

This action is available from the **Actions** menu when a Unity, UnityVSA, VNX, or VNXe LUN is selected on the **Summary** tab.

Procedure

1. From the **Summary** tab of a supported storage system LUN, click **Action > Change Tiering Policy**.
2. In the **Change Tiering Policy** dialog box, select a tiering policy and click **Begin Action**.

Results

The policy is changed. You can check the status under **Recent Tasks**.

Extending file system capacity

This action is available from the **Actions** menu when a file system is selected or under a recommended action when a file system's used capacity is high.

Procedure

1. Do one of the following:
 - Select a file system and click **Actions > Extend File System**.
 - From the alert details window for a file system, click **Extend File System**.
2. In the **Extend File System** dialog box, type a number in the **New Size** text box, and then click **OK**.
3. Click **OK** in the status dialog box.

Results

The file system size is increased and the alert (if present) is cancelled.

Enabling performance statistics for VNX Block

This action is available only as a recommended action when an error or warning occurs on a VNX Block array. It is never available from the vRealize Operations Manager **Actions** menu.

Procedure

1. From the **Summary** page of the VNX Block array that reports an error or warning, click **Enable Statistics**.
2. In the **Enable Statistics** dialog box, click **OK**.

Results

You can confirm the action by checking the **Message** column under **Recent Tasks**.

Enabling FAST Cache on Unity and VNXe storage pools

This action is available from the **Actions** menu when a Unity or VNXe storage pool is selected and FAST Cache is enabled and configured.

Procedure

1. Under Details for the storage pool, select **Actions** > **Configure FAST Cache**.
2. In the **Configure FAST Cache** dialog box, click **Begin Action**.

Results

FAST Cache is enabled. You can check the status under **Recent Tasks**.

Enabling FAST Cache on a VNX Block storage pool

This action is available from the **Actions** menu when a VNX Block storage pool is selected or as a recommended action when FAST Cache is configured and available.

Procedure

1. Select the **Summary** tab for a VNX Block storage pool.
2. Do one of the following:
 - From the **Actions** menu, select **Enable FAST Cache**.
 - Under **Recommendations**, click **Configure FAST Cache**.
3. In the **Configure FAST Cache** dialog box, click **OK**.

Results

FAST Cache is enabled. You can check the status under **Recent Tasks**.

Expanding LUN capacity

This action is available from the **Actions** menu when a Unity, UnityVSA, VNX, or VNXe LUN is selected.

Procedure

1. Select a LUN for a supported storage system.
2. Under **Actions**, click **Expand**.
3. Type the new size and select the size qualifier.
4. Click **Begin Action**.

Results

The LUN is expanded. You can check the status under **Recent Tasks**.

Migrating a VNX LUN to another storage pool

This action is available from the vRealize Operations Manager **Actions** menu.

Procedure

1. From the **Summary** page of the VNX LUN, click **Actions** > **Migrate**.

2. In the **Migrate** dialog box, provide the following information:
 - **Storage Pool Type:** Select **Pool** or **RAID Group**.
 - **Storage Pool Name:** Type the name of the pool to migrate to.
 - **Migration Rate:** Select **Low**, **Medium**, **High**, or **ASAP**.
3. Click **OK**.

Results

The LUN is migrated.

Rebooting a Data Mover on VNX storage

This action is available from the **Actions** menu when a VNX Data Mover is selected or under a recommended action when the health state of the Data Mover has an error.

Procedure

1. Do one of the following:
 - Select a VNX Data Mover and click **Actions > Reboot Data Mover**.
 - From the alert details window for a VNX Data Mover, click **Reboot Data Mover**.
2. In the **Reboot Data Mover** dialog box, click **OK**.

Results

The Data Mover is restarted and the alert is cancelled.

Rebooting a VNX storage processor

This action is available from the **Actions** menu on the **Summary** tab for the storage processor or as a recommendation when the storage processor cannot be accessed.

Procedure

1. Do one of the following:
 - On the **Summary** tab for the storage processor, click **Actions > Reboot Storage Processor**.
 - Under **Recommendations**, click **Reboot Storage Processor**.
2. In the **Reboot Storage Processor** dialog box, click **Begin Action**.

Results

The storage processor is restarted. This could take several minutes. You can check the status under **Recent Tasks**.

Extending volumes on EMC XtremIO storage systems

You can extend XtremIO volumes manually or configure a policy to extend them automatically when used capacity is high.

- If you have not configured an automated policy, you can extend a volume manually. Refer to [Extending XtremIO volumes manually on page 136](#).
- To configure a policy that automatically extends an XtremIO volume when capacity becomes high, refer to [Configuring an extend volume policy for XtremIO on page 136](#).

Configuring an extend volume policy for XtremIO

You can set a policy that automatically extends an XtremIO volume when capacity becomes high.

Procedure

1. In the vRealize Operations Manager main menu, click **Administration** > **Policies**.
Default Policy appears under **Active Policies**.
2. Select **Policy Library**, select **Edit the Default Policy**.
3. In the left panel, select **Alert/System Definitions**.
4. Under **Alert Definitions**, select **Capacity used in the volume is high**.
5. In the **Automate** column, select **Local**, and then click **Save**.

Results

When **Capacity used in the volume is high** is triggered, the volume will be extended automatically.

Extending XtremIO volumes manually

Use this procedure when you have not configured an automated policy.

This action is available from the **Actions** menu when an XtremIO volume is selected or under a recommended action when a volume's used capacity is high.

Procedure

1. Do one of the following:
 - Select an XtremIO volume and click **Actions** > **Extend Volume**.
 - From the alert details window for an XtremIO volume, click **Extend Volume**.
2. In the **Extend Volume** dialog box, type a number in the **New Size** text box, and then click **OK**.
3. Click **OK** in the status dialog box.

Results

The volume size is increased and the alert (if present) is cancelled.

CHAPTER 7

Troubleshooting

This chapter contains the following topics:

- [Badges for monitoring resources](#)..... 138
- [Navigating inventory trees](#)..... 138
- [Symptoms, alerts, and recommendations for EMC Adapter instances](#)..... 139
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Badges for monitoring resources

This topic describes the use of vRealize Operations Manager badges to monitor EMC Storage Analytics resources.

vRealize Operations Manager enables you to analyze capacity, workload, and stress of supported resource objects. vRealize Operations Manager badges are available for these EMC products: VNX Block, VNX File, Unity, and VMAX.

The badges include:

Workload

The **Workload** badge defines the current workload of a monitored resource. It displays a breakdown of the workload based on supported metrics.

Stress

The **Stress** badge is similar to the **Workload** badge but defines the workload over a period of time. The **Stress** badge displays one-hour time slices over the period of a week. The color of each slice reflects the stress status of the resource.

Capacity

The **Capacity** badge displays the percentage of a resource that is currently consumed and the remaining capacity for the resource.

Note

Depending on the resource and supported metrics, full capacity is sometimes defined as 100% (for example, Busy %). Full capacity can also be defined by the maximum observed value (for example, Total Operations IO/s).

Time Remaining

This badge is calculated from the **Capacity** badge and estimates when the resource will reach full capacity.

The badges are based on a default policy that is defined in vRealize Operations Manager for each resource kind.

Navigating inventory trees

This topic describes how to navigate vRealize Operations Manager inventory trees for EMC resource objects.

Navigating inventory trees in vRealize Operations Manager can help you to troubleshoot problems you encounter with EMC resources.

Note

vRealize Operations Manager inventory trees are available for these EMC products: VNX Block, VNX File, Unity, and VMAX.

Procedure

1. Log into vRealize Operations Manager.
2. Open the **Environment Overview**.
3. Locate **Inventory Trees**.

4. Click the tree name to view its nodes. Click > to expand the list to view objects under the selected node.

Symptoms, alerts, and recommendations for EMC Adapter instances

This topic describes the symptoms, alerts, and recommendations that are displayed in vRealize Operations Manager for EMC Adapter instances.

Note

You can view symptoms, alerts, and recommendations in vRealize Operations Manager for these EMC products: RecoverPoint for Virtual Machines, Unity, UnityVSA, VMAX, VNX Block, VNX File, VNXe, VPLEX, and XtremIO.

You can view symptoms, alerts, and recommendations for EMC Adapter instances through the vRealize Operations Manager GUI. EMC Storage Analytics generates the alerts, which appear with other alerts that VMware generates. EMC Storage Analytics defines the alerts, symptoms, and recommendations for resources that the EMC Adapter instance monitors. You can view the symptoms, alerts, and recommendations in these vRealize Operations Manager windows.

Home dashboard

The vRealize Operations Manager home page dashboard displays EMC Storage Analytics symptoms, alerts, and recommendations along with VMware-generated alerts. You can view health, risk, and efficiency alerts, listed in order of severity.

Alerts Overview

You can view EMC Storage Analytics alerts along with VMware-generated alerts in the **Alerts Overview** window. In this view, vRealize Operations Manager groups the alerts in health, risk, and efficiency categories.

Alert Details

This vRealize Operations Manager view displays detailed properties of a selected alert. Properties include title, description, related resources, type, subtype, status, impact, criticality, and alert start time. This view also shows the symptoms that triggered the alert as well as recommendations for responding to the alert.

Summary

In the **Summary** view for resource details, vRealize Operations Manager displays the alerts for the selected resource. It also displays alerts for the children of the selected resource, which affect the badge color of the selected resource.

Symptom definition

You can find symptom definitions for EMC Storage Analytics-generated alerts in the **Definitions Overview** (configuration page). Each definition includes the resource kind, metric key, and lists EMC Adapter as the **Adapter Kind**.

Recommendations

You can find the recommendation descriptions for EMC Storage Analytics-generated alerts in the **Recommendations Overview** (configuration page).

Alert definition

You can find alert definitions for EMC Storage Analytics-generated alerts in the **Alert Definitions Overview** (configuration page). Each definition includes the resource kind, type of alert, criticality, and impact (health, risk, or efficiency alert).

Event correlation

Event correlation enables users to correlate alerts with the resources that generate them.

Event correlation is available for:

- VNX Block
- VNX File

EMC Adapter instances registered with the vRealize Operations Manager monitor events on select resources. These events appear as alerts in vRealize Operations Manager. The events are associated with the resources that generate them and aid the user in troubleshooting problems that may occur.

vRealize Operations Manager manages the life cycle of an alert and will cancel an active alert based on its rules. For example, vRealize Operations Manager may cancel an alert if EMC Storage Analytics no longer reports it.

vRealize Operations Manager-generated events influence the health score calculation for select resources. For example, in the **RESOURCE:DETAILS** pane for a selected resource, vRealize Operations Manager-generated events that contribute to the health score appear as alerts.

vRealize Operations Manager only generates events and associates them with the resources that triggered them. vRealize Operations Manager determines how the alerts appear and how they affect the health scores of the related resources.

Note

When a resource is removed, vRealize Operations Manager automatically removes existing alerts associated with the resource, and the alerts no longer appear in the user interface.

Viewing all alerts

This procedure shows you how to view a list of all the alerts in the vRealize Operations Manager system.

Procedure

1. Log into the vRealize Operations Manager user interface.
2. From the vRealize Operations Manager menu, select **ALERTS > ALERTS OVERVIEW**.
A list of alerts appears in the **ALERTS OVERVIEW** window.
3. (Optional) To refine your search, use the tools in the menu bar. For example, select a start and end date or enter a search string.
4. (Optional) To view a summary of information about a specific alert, select the alert and double-click it.

The **ALERT SUMMARY** window appears and provides reason, impact, and root cause information for the alert.

Enabling XtremIO alerts

The following alerts for XtremIO Volume and Snapshot metrics out of range are disabled by default to align with XMS default settings:

- Average Small Reads (IO/s)
- Average Small Writes (IO/s)
- Average Unaligned Reads (IO/s)
- Average Unaligned Writes (IO/s)

Use the following procedure to enable alerts.

Procedure

1. Select **Administration** > **Policies** > **Policy Library** > **Default Policy**
2. Select **Edit** > **6. Alert/Symptom Definitions**.
3. For each alert that you want to enable, under **State**, select **Enable Local**.
4. Click **Save**.

Finding resource alerts

An alert generated by EMC Storage Analytics is associated with a resource. This procedure shows you how to find an alert for a specific resource.

Procedure

1. Log into the vRealize Operations Manager user interface.
2. Select the resource from one of the dashboard views.

The number that appears on the alert icon represents the number of alerts for this resource.
3. Click the **Show Alerts** icon on the menu bar to view the list of alerts for the resource.

Alert information for the resource appears in the popup window.

Locating alerts that affect the health score for a resource

This procedure shows how to locate an alert that affects the health score of a resource.

Different types of alerts can contribute to the health score of a resource, but a resource with an abnormal health score might not have triggered the alert. For example, the alert might be triggered by a parent resource. To locate an alert that affects the health score of a resource:

Procedure

1. Log into the vRealize Operations Manager user interface.
2. View the **RESOURCE DETAIL** window for a resource that shows an abnormal health score.

Events that contributed to the resource health score appear in the **ROOT CAUSE RANKING** pane.
3. Click an event to view the event details and investigate the underlying cause.

List of alerts and notifications

EMC Storage Analytics generates the listed events when the resources are queried.

This section provides the following information:

- [Isilon alerts on page 143](#)
- [ScaleIO alerts on page 143](#)
- [Unity and VNXe alerts on page 145](#)
- [VMAX alerts on page 147](#)
- [VNX Block alerts on page 148](#)
- [VNX Block notifications on page 152](#)
- [VNX File alerts on page 154](#)
- [VNX File notifications on page 156](#)
- [VPLEX alerts on page 160](#)
- [XtremIO alerts on page 163](#)
- [RecoverPoint alerts on page 164](#)

Isilon alerts

Alerts are available for Isilon 8.0 and later. Alert messages are collected from REST API.

Table 5 Cluster alert messages

Alert Message	Badge	Severity	Type/ID
Allocation error detected.	Risk	Warning	800010002
System is running out of file descriptors.			800010006

Table 6 Node alert messages

Alert Message	Badge	Severity	Type/ID
CPU 0 about to throttle due to temperature.	Risk	Warning	900020026
CPU 1 about to throttle due to temperature.			900020027
CPU throttling	Health		900020035
Internal network <i>interface</i> link down.	Efficiency		200020003
External network link down.			200020005
Node <i>integer</i> offline.	Health	Critical	200010001
The snapshot reserve space is nearly full (<i>value</i> % used).	Risk	Info	600010005

ScaleIO alerts

Table 7 System alerts

Metric	Badge	Severity	Condition
Used Capacity	Risk	Critical	> 95
		Warning	>85
Thick Used Capacity		Critical	> 95
		Warning	>85
Thin Used Capacity		Critical	> 95
		Warning	>85
Snap Used Capacity		Critical	> 95
		Warning	>85

Table 8 Protection Domain alerts

Metric	Badge	Severity	Condition
Status	Health	Critical	No Active
Used Capacity	Risk	Critical	> 95
		Warning	>85
Thick Used Capacity		Critical	> 95
		Warning	>85

Table 8 Protection Domain alerts (continued)

Metric	Badge	Severity	Condition
Thin Used Capacity		Critical Warning	> 95 >85
Snap Used Capacity		Critical Warning	> 95 >85

Table 9 Device/Disk alerts

Metric	Badge	Severity	Condition
Status	Health	Critical -> Error, Info -> {Remove, Pending}	
Used Capacity	Risk	Critical Warning	> 95 >85
Spare Capacity Allocated		Critical Warning	> 95 >85
Thick Used Capacity		Critical Warning	> 95 >85
Thin Used Capacity		Critical Warning	> 95 >85
Protected Capacity		Critical Warning	> 95 >85

Table 10 SDS alerts

Metric	Badge	Severity	Condition
Status	Health	Critical	Disconnected
Used Capacity	Risk	Critical Warning	> 95 >85
Thick Used Capacity		Critical Warning	> 95 >85
Thin Used Capacity		Critical Warning	> 95 >85
Protected Capacity Note: Not available from REST API		Critical Warning	> 95 >85
Snap Used Capacity		Critical Warning	> 95 >85

Table 11 Storage Pool alerts

Metric	Badge	Severity	Condition
Status	Health	Critical	Degraded capacity

Table 11 Storage Pool alerts (continued)

Metric	Badge	Severity	Condition
Note Not available from REST API		Warning	Unreachable capacity
		Warning	Unavailable unused capacity
		Warning	Extremely unbalanced
		Warning	Unbalanced
Used Capacity	Risk	Critical	> 95
		Warning	>85
Thick Used Capacity		Critical	> 95
		Warning	>85
Thin Used Capacity		Critical	> 95
	Warning	>85	
Protected Capacity		Critical	> 95
		Warning	>85
Snap Used Capacity		Critical	> 95
		Warning	>85

Table 12 SDC alerts

Metric	Badge	Severity	Condition
State	Health	Critical	Disconnected

Table 13 MDM Cluster alerts

Metric	Badge	Severity	Condition
State	Health	Critical	Not clustered
			Clustered degraded
			Clustered tie breaker down
			Clustered degraded tie breaker down

Unity, UnityVSA, and VNXe alerts

Table 14 Unity, UnityVSA, and VNXe alerts

Resource kind	Metric	Badge	Severity	Condition	Message summary
Disk	Total Latency (ms)	Risk	Critical	> 75	Disk total latency (ms) is high.
			Immediate	> 50	
			Warning	> 25	
	State	Health	Critical	Includes "critical"	This disk is reporting a problem.
			Immediate		

Table 14 Unity, UnityVSA, and VNXe alerts (continued)

Resource kind	Metric	Badge	Severity	Condition	Message summary
			Warning		
			Info		
Tier	Full (%)	Risk	Info	> 95	Consumed capacity (%) of this tier is high.
Storage Pool	Full (%)	Risk	Critical	> 90	Consumed capacity (%) of this storage pool is high.
			Immediate	> 85	
	State	Efficiency	Info	< 5	Consumed capacity (%) of this storage pool is low.
		Health	Critical	Includes "critical"	This storage pool is reporting a problem.
			Immediate		
			Warning		
			Info		
SP (Storage Processor)	CIFS SMBv1 Read Response (ms)	Risk	Critical	> 75	CIFS SMBv1 average read response time(ms) is high.
			Immediate	> 50	
			Warning	> 25	
	CIFS SMBv1 Write Response (ms)	Risk	Critical	> 75	
			Immediate	> 50	
			Warning	> 25	
	CIFS SMBv2 Read Response (ms)	Risk	Critical	> 75	CIFS SMBv2 average read response time(ms) is high.
			Immediate	> 50	
			Warning	> 25	
	CIFS SMBv2 Write Response (ms)	Risk	Critical	> 75	
			Immediate	> 50	
			Warning	> 25	
	NFS v3 Read Response (ms)	Risk	Critical	> 75	NFSv3 average read response time (ms) is high.
			Immediate	> 50	
			Warning	> 25	
	NFS v3 Write Response (ms)	Risk	Critical	> 75	
			Immediate	> 50	
			Warning	> 25	

Table 14 Unity, UnityVSA, and VNXe alerts (continued)

Resource kind	Metric	Badge	Severity	Condition	Message summary
	State	Health	Critical	Includes "critical"	This storage processor is reporting a problem.
			Immediate		
			Warning		
			Info		
LUN	State	Health	Critical	Condition includes critical	This LUN is reporting a problem.
			Immediate		
			Warning		
			Info		
File System	State	Health	Critical	Condition includes critical	This file system is reporting a problem.
			Immediate		
			Warning		
			Info		
NAS Server	State	Health	Critical	Condition includes critical	This NAS Server is reporting a problem.
			Immediate		
			Warning		
			Info		

VMAX alerts

The Wait Cycle is 1 for all these VMAX alerts.

Table 15 VMAX alerts

Resource kind	Symptom	Badge	Severity	Condition	Message
Device	VmaxDevice_percent_full98.0	Risk	Critical	> 98	Device available capacity is low.
	VmaxDevice_percent_full95.0	Risk	Immediate	> 95	Device available capacity is low.
SRP (VMAX3 Storage Resource Pool)	VmaxSRPStoragePool_percent_full98.0	Risk	Critical	> 98	Storage resource pool available capacity is low.
	VmaxSRPStoragePool_percent_full95.0	Risk	Immediate	> 95	Storage resource pool available capacity is low.
SLO	Compliance	Risk	Warning	is MARGINAL	SLO compliance status needs attention.

Table 15 VMAX alerts (continued)

Resource kind	Symptom	Badge	Severity	Condition	Message
			Critical	is CRITICAL	SLO compliance status needs attention.

VNX Block alerts

Table 16 VNX Block alerts

Resource kind	Metric	Badge	Severity	Condition	Message summary	
Storage Pool	Full (%)	Risk	Critical	> 90	Capacity used in this storage pool is very high.	
			Immediate	> 85	Capacity used in this storage pool is very high.	
		Efficiency	Info	< 5	Capacity used in this storage pool is low.	
	Subscribed (%)	Risk	Info	>100	This storage pool is oversubscribed.	
	State	Health	Critical	Offline	Offline	This storage pool is offline.
				Faulted	Faulted	This storage pool is faulted.
				Expansion Failed	Expansion Failed	This storage pool's expansion failed.
				Cancel Expansion Failed	Cancel Expansion Failed	The cancellation of this storage pool's expansion failed.
				Verification Failed	Verification Failed	The verification of this storage pool failed.
				Initialize Failed	Initialize Failed	The initialization of this storage pool failed.
				Destroy Failed	Destroy Failed	The destruction of this storage pool failed.
			Warning	Offline and Recovering	Offline and Recovering	This storage pool is offline and recovering.
			Critical	Offline and Recovery Failed	Offline and Recovery Failed	The recovery of this offline storage pool failed.
			Warning	Offline and Verifying	Offline and Verifying	This storage pool is offline and verifying.
			Critical	Offline and Verification Failed	Offline and Verification Failed	This storage pool is offline and verification failed.
				Faulted and Expanding	Faulted and Expanding	This storage pool is faulted and expanding.
Faulted and Expansion Failed				Faulted and Expansion Failed	This expansion of this storage pool failed.	
Faulted and Cancelling Expansion	Faulted and Cancelling Expansion	This storage pool is faulted and is cancelling an expansion.				

Table 16 VNX Block alerts (continued)

Resource kind	Metric	Badge	Severity	Condition	Message summary
				Faulted and Cancel Expansion Failed	This storage pool is faulted and the cancellation of the expansion failed.
				Faulted and Verifying	This storage pool is faulted and verifying.
				Faulted and Verification Failed	This storage pool is faulted and verification failed.
				Unknown	The status of this storage pool is unknown.
FAST Cache	State	Health	Info	Enabling	FAST Cache is enabling.
			Warning	Enabled_Degraded	The status of this storage pool is unknown.
			Info	Disabling	FAST Cache is disabling.
			Warning	Disabled	FAST Cache is created but disabled.
			Critical	Disabled_Faulted	FAST Cache is faulted.
			Critical	Unknown	The state of FAST Cache is unknown.
Tier	Subscribed (%)	Risk	Info	> 95	Consumed capacity (%) of this tier is high.
Storage Processor	Busy (%)	Risk	Warning	> 90	Storage processor utilization is high.
			Info	> 80	Storage processor utilization is high.
	Read Cache Hit Ratio (%)	Efficiency	Info	< 50	Storage processor read cache hit ratio is low.
	Dirty Cache Pages (%)	Efficiency	Critical	> 95	Storage processor dirty cache pages is high.
			Info	< 10	Storage processor dirty cache pages is high.
	Write Cache Hit Ratio (%)	Efficiency	Warning	> 20	Storage processor write cache hit ratio is low.
			Info	< 25	Storage processor write cache hit ratio is low.
	N/A	Health	Critical	N/A	Storage processor could not be reached by CLI.
RAID Group	Full (%)	Risk	Info	> 90	RAID group capacity used is high.
		Efficiency	Info	< 5	RAID group capacity used is low.
	State	Health	Critical	Invalid	The status of this RAID group is invalid.
			Info	Explicit_Remove	This RAID group is explicit remove.
			Info	Expanding	This RAID group is expanding.
			Info	Defragmenting	This RAID group is defragmenting.

Table 16 VNX Block alerts (continued)

Resource kind	Metric	Badge	Severity	Condition	Message summary
			Critical	Halted	This RAID group is halted.
			Info	Busy	This RAID group is busy.
			Critical	Unknown	This RAID group is unknown.
Disk	Busy (%)	Risk	Critical	> 95	Disk utilization is high.
			Immediate	> 90	Disk utilization is high.
			Warning	> 85	
			Info	> 75	
	Hard Read Error (count)	Health	Critical	> 10	Disk has read error.
			Immediate	> 5	Disk has read error.
			Warning	> 0	Disk has read error.
	Hard Write Error (count)	Health	Critical	> 75	Disk has write error.
			Immediate	And	Disk has write error.
			Warning	Total IO/s > 1	Disk has write error.
	Response Time (ms)	Risk	Critical	> 75	Disk average response time (ms) is in range.
				And	N/A
				Total IO/s > 1	Disk is not idle.
			Immediate	75 >= x > 50	Disk average response time (ms) is in range.
				And	N/A
				Total IO/s > 1	Disk is not idle.
			Warning	50 >= x > 25	Disk average response time (ms) is in range.
				And	N/A
				Total IO/s > 1	Disk is not idle.
	State	Health	Critical	Removed	This disk is removed.
				Faulted	The disk is faulted.
Unsupported				The disk is unsupported.	
Unknown				The disk is unknown.	
Info			Powering up	The disk is powering up.	
			Unbound	The disk is unbound.	
Warning			Rebuilding	The disk is rebuilding.	
Info			Binding	The disk is binding.	

Table 16 VNX Block alerts (continued)

Resource kind	Metric	Badge	Severity	Condition	Message summary
			Info	Formatting	The disk is formatting.
			Warning	Equalizing	The disk is equalizing.
			Info	Unformatted	The disk is unformatted.
				Probation	The disk is in probation
			Warning	Copying to Hot Spare	The disk is copying to hot spare.
N/A		Critical	N/A	Disk failure occurred.	
LUN	Service Time (ms)	Risk	Critical	> 25	LUN service time (ms) is in range.
				And	N/A
				Total IO/s > 1	LUN is not idle.
			Immediate	> 25	LUN service time (ms) is in range.
				And	N/A
				Total IO/s > 1	LUN is not idle.
			Warning	> 25	LUN service time (ms) is in range.
				And	N/A
				Total IO/s > 1	LUN is not idle.
	Latency (ms)	Risk	Critical	75 >= x > 50	LUN total latency (ms) is in range.
				And	N/A
				Total IO/s > 1	LUN is not idle.
			Immediate	75 >= x > 50	LUN total latency (ms) is in range.
				And	N/A
				Total IO/s > 1	LUN is not idle.
			Warning	50 >= x > 25	LUN total latency (ms) is in range.
				And	N/A
				Total IO/s > 1	LUN is not idle.
	State	Health	Critical	Device Map Corrupt	This LUN's device map is corrupt.
				Faulted	This LUN is faulted.
				Unsupported	This LUN is unsupported.
				Unknown	This LUN is unknown.
			Info	Binding	This LUN is binding.
			Warning	Degraded	This LUN is degraded.
Info			Transitioning	This LUN is transitioning.	
Info			Queued	This LUN is queued.	

Table 16 VNX Block alerts (continued)

Resource kind	Metric	Badge	Severity	Condition	Message summary
			Critical	Offline	This LUN is offline.
Port	N/A	Health	Info	N/A	Link down occurred.
				N/A	The port is not in use.
			Warning	N/A	Link down occurred.
			Info	N/A	The port is not in use.
Fan and Power Supply	N/A	Health	Critical	N/A	Device (FAN or Power Supply) is having problem. Device state is "empty."
			Warning	N/A	Device (FAN or Power Supply) is having problem. Device state is "unknown."
			Critical	N/A	Device (FAN or Power Supply) is having problem. Device state is "removed."
				N/A	Device (FAN or Power Supply) is having problem. Device state is "faulted."
				N/A	Device (FAN or Power Supply) is having problem. Device state is "missing."
Array	N/A	Health	Warning	N/A	Statistics logging is disabled.
				N/A	Performance data won't be available until it is enabled.

VNX Block notifications

Table 17 VNX Block notifications

Category	Resource kind	Message
Failures	Disk	Disk failure occurred.
	SP Front-end Port	Link down occurred.
Background Event	Disk	Disk rebuilding started.
		Disk rebuilding completed.
		Disk zeroing started. Note: This alert is not available for 1st generation models.
		Disk zeroing completed. Note: This alert is not available for 1st generation models.
	LUN	LUN migration queued.
		LUN migration completed.
		LUN migration halted.
		LUN migration started.

Table 17 VNX Block notifications (continued)

Category	Resource kind	Message	
	EMC Adapter Instance	Fast VP relocation resumed. Note: This alert is not available for 1st generation models.	
		Fast VP relocation paused. Note: This alert is not available for 1st generation models.	
	Storage Pool	Fast VP relocation started.	
		Fast VP relocation stopped.	
		Fast VP relocation completed.	
	Storage Processor	SP boot up.	
		SP is down. Note: This alert is not available for 1st generation models.	
	FAST Cache	FAST Cache started.	
	Configuration	Storage Pool	Storage Pool background initialization started.
			Storage Pool background initialization completed.
LUN		LUN creation started.	
		LUN creation completed.	
		Snapshot<snapshot name>creation completed.	
EMC Adapter Instance		SP Write Cache was disabled.	
		SP Write Cache was enabled. Note: This alert is not available for 1st generation models.	
		Non-Disruptive upgrading started.	
		Non-Disruptive upgrading completed.	
LUN		Deduplication on LUN was disabled. Note: This alert is not available for 1st generation models.	
		Deduplication on LUN was enabled. Note: This alert is not available for 1st generation models.	
Storage Pool		Deduplication on Storage Pool paused. Note: This alert is not available for 1st generation models.	
		Deduplication on Storage Pool resumed. Note: This alert is not available for 1st generation models.	
LUN		Compression on LUN started.	
		Compression on LUN completed.	
		Compression on LUN was turned off.	

VNX File alerts

Table 18 VNX File alerts

Resource kind	Metric	Badge	Severity	Condition	Message summary
File Pool	Full (%)	Risk	Critical	> 90	Capacity consumed of the file pool is high.
			Immediate	> 85	
		Efficiency	Info	< 5	Capacity consumed of the file pool is low.
Disk Volume	Request Comp. Time (µs)	Risk	Critical	> 25,000	dVol's average request completion time is high.
			Immediate	> 15,000	
			Warning	> 10,000	
	Service Comp. Time (µs)	Risk	Critical	> 25,000	
			Immediate	> 15,000	
			Warning	> 10,000	
File System	Full (%)	Risk	Critical	> 90	Capacity consumed of this file system is high.
			Immediate	> 85	
		Efficiency	Info	< 5	
Data Mover	NFS v2 Read Response (ms)	Risk	Critical	> 75	NFS v2 average read response time is high.
			Immediate	> 50	
			Warning	> 25	
	NFS v2 Write Response (ms)	Risk	Critical	> 75	NFS v2 Average write response time is high.
			Immediate	> 50	
			Warning	> 25	
	NFS v3 Read Response (ms)	Risk	Critical	> 75	NFS v3 average read response time is high.
			Immediate	> 50	
			Warning	> 25	
	NFS v3 Write Response (ms)	Risk	Critical	> 75	NFS v3 average write response time is high.
			Immediate	> 50	
			Warning	> 25	
	NFS v4 Read Response (ms)	Risk	Critical	> 75	NFS v4 average read response time is high.
			Immediate	> 50	

Table 18 VNX File alerts (continued)

Resource kind	Metric	Badge	Severity	Condition	Message summary	
			Warning	> 25		
	NFS v4 Write Response (ms)	Risk	Critical	> 75	NFS v4 average write response time is high.	
			Immediate	> 50		
			Warning	> 25		
	CIFS SMBv1 Read Response (ms)	Risk	Critical	> 75	CIFS SMB v1 average read response time is high.	
			Immediate	> 50		
			Warning	> 25		
	CIFS SMBv1 Write Response (ms)	Risk	Critical	> 75	CIFS SMB v1 average write response time is high.	
			Immediate	> 50		
			Warning	> 25		
	CIFS SMBv2 Read Response (ms)	Risk	Critical	> 75	CIFS SMB v2 average read response time is high.	
			Immediate	> 50		
			Warning	> 25		
	CIFS SMBv2 Write Response (ms)	Risk	Critical	> 75	CIFS SMB v2 average write response time is high.	
			Immediate	> 50		
			Warning	> 25		
	State	Health	Info	Offline	Data Mover is powered off.	
			Error	Disabled		Data Mover will not reboot.
				Out_of_service		Data Mover cannot provide service. (For example, taken over by its standby)
			Warning	Boot_level=0		Data Mover is powered up.
						Data Mover is booted to BIOS.
						Data Mover is booted to DOS.

Table 18 VNX File alerts (continued)

Resource kind	Metric	Badge	Severity	Condition	Message summary
					DART is loaded and initializing.
					DART is initialized.
			Info		Data Mover is controlled by control station.
			Error	Fault/Panic	Data Mover has faulted.
				Online	Data Mover is inserted and has power, but not active or ready.
				Slot_empty	There is no Data Mover in the slot.
				Unknown	Cannot determine the Data Mover state.
				Hardware misconfigured	Data Mover hardware is misconfigured.
				Hardware error	Data Mover hardware has error.
				Firmware error	Data Mover firmware has error.
Data Mover firmware is updating.					

VNX File notifications

Table 19 VNX File notifications

Category	Resource kind	Message
Control Station Events	Array	The NAS Command Service daemon is shutting down abnormally. (MessageID:<ID>)
		The NAS Command Service daemon is shutting down abnormally. (MessageID:<ID>)
		The NAS Command Service daemon is shut down completely.
		The NAS Command Service daemon is forced to shut down. (MessageID:<ID>)
	Data Mover	Warm reboot is about to start on this data mover.
		Unable to warm reboot this data mover. Cold reboot has been performed.
	EMC Adapter instance	AC power has been lost. VNX storage system will be powered down in<value>seconds. (MessageID:<ID>)(timeout_wait)
		AC power is restored and back on.

Table 19 VNX File notifications (continued)

Category	Resource kind	Message
	File system	Automatic extension failed. Reason: Internal error. COMMAND:<value>, ERROR:<value>, STAMP:<value>(MessageID:<ID>)(COMMAND, DM_EVENT_STAMP, ERROR)
		Automatic extension started.
		Automatic extension failed. Reason: File system has reached the maximum size. STAMP:<value>(MessageID: <ID>) (DM_EVENT_STAMP)
		Automatic extension failed. Reason: Percentage used could not be determined. STAMP:<value>(MessageID:<ID>) (DM_EVENT_STAMP)
		Automatic extension failed. Reason: Filesystem size could not be determined. STAMP:<value>(MessageID:<ID>) (DM_EVENT_STAMP)
		Automatic extension failed. Reason: Available space could not be determined. STAMP:<value>(MessageID:<ID>) (DM_EVENT_STAMP)
		Automatic extension failed. Reason: File system is not RW mounted. STAMP:<value>(MessageID:<ID>) (DM_EVENT_STAMP)
		Automatic extension failed. Reason: Insufficient available space. STAMP:<value>(MessageID:<ID>) (DM_EVENT_STAMP)
		Automatic extension failed. Reason: Available pool size could not be determined. STAMP:<value>(MessageID:<ID>) (DM_EVENT_STAMP)
		Automatic extension failed. Reason: Slice flag could not be determined. STAMP:<value>(MessageID:<ID>) (DM_EVENT_STAMP)
		Automatic extension failed. Reason: Available space is not sufficient for minimum size extension. STAMP:<value>(MessageID:<ID>) (DM_EVENT_STAMP)
		Automatic extension failed. Reason: Maximum filesystem size could not be determined. STAMP:<value>(MessageID:<ID>) (DM_EVENT_STAMP)
		Automatic extension failed. Reason: High Water Mark (HWM) could not be determined. STAMP:<value>(MessageID:<ID>) (DM_EVENT_STAMP)
		Forced automatic extension started.
		Automatic extension ended.
		Automatic extension ended. The filesystem is now at its maximum size limit.
		Forced automatic extension is cancelled. The requested extension size is less than the high water mark (HWM) set for the filesystem.
		The filesystem's available storage pool size will be used as the extension size instead of the requested size.
		Automatic extension completed.
		Forced automatic extension completed. The file system is at the maximum size.
		Automatic extension failed. Reason: Volume ID could not be determined. STAMP:<value>(MessageID:<ID>) (DM_EVENT_STAMP)
Automatic extension failed. Reason: Storage system ID could not be determined. STAMP:<value>(MessageID:<ID>) (DM_EVENT_STAMP)		

Table 19 VNX File notifications (continued)

Category	Resource kind	Message
		Automatic extension failed. Reason: Filesystem is spread across multiple storage systems. STAMP:<value>(MessageID:<ID>) (DM_EVENT_STAMP)
		Automatic extension failed. STAMP:<value>(MessageID: <ID>) (DM_EVENT_STAMP)
	EMC Adapter instance	The JServer is not able to start. VNX File System statistics will be impacted. (MessageID:<ID>)
	File system	Filesystem is using<value>of its<value><value>capacity. (condition, cap_setting, prop_name)
	File system	Filesystem has<value>of its<value><value>capacity available. (condition, cap_setting, prop_name)
	File pool	Storage pool is using<value>of its <value><value>capacity (condition, cap_setting)
	File pool	Storage pool has<value>of its<value>capacity available. (condition, cap_setting)
	File system	Filesystem is using<value>of the maximum allowable file system size (16 TB). (condition)
	File system	Filesystem has<value>of the maximum allowable file system size (16 TB). (condition)
	File system	Filesystem is using<value>of the maximum storage pool capacity available. (condition)
	File system	Filesystem has <value> of the maximum storage pool capacity available. (condition)
	File system	Filesystem will fill its<value><value>capacity on<value>. (cap_setting, prop_name, sdate)
	File pool	Storage pool will fill its<value>capacity on<value>. (cap_setting, sdate)
	File system	Filesystem will reach the 16 TB file system size limit on<value>. (sdate)
	File system	Filesystem will fill its storage pool's maximum capacity on<value>. (sdate)
	Data Mover	Data Mover is using<value>of its<value>capacity. (stat_value, stat_name)
	File pool	Storage usage has crossed threshold value<value>and has reached to<value>. (threshold, pool_usage_percentage)
	File pool	Storage usage has crossed threshold value<value>and has reached to<value>. (threshold, pool_usage_percentage)
	File system	Filesystem has filled its<value><value>capacity. (cap_setting, prop_name)
	File pool	Storage pool has filled its<value>capacity. (cap_setting)
	File system	Filesystem has almost filled its<value><value>capacity. (cap_setting, prop_name)
	File pool	Storage pool has almost filled its<value>capacity. (cap_setting)
	File system	Filesystem is using<value>of its current node capacity. (condition)
Dart Events	Data Mover	The SCSI HBA<value>is operating normally. (hbano)

Table 19 VNX File notifications (continued)

Category	Resource kind	Message
		The SCSI HBA<value>has failed. (MessageID:<ID>) (hban0)
		The SCSI HBA<value>is inaccessible. (MessageID:<ID>) (hban0)
	File system	Filesystem has encountered a critical fault and is being unmounted internally. (MessageID:<ID>)
		Filesystem has encountered a corrupted metadata and filesystem operation is being fenced. (MessageID:<ID>)
		Filesystem usage rate<value>% crossed the high water mark threshold<value>%. Its size will be automatically extended. (currentUsage, usageHWM)
		Filesystem is full.
	EMC Adapter instance	Power Supply A in Data Mover Enclosure was removed.
		Power Supply A in Data Mover Enclosure is OK.
		Power Supply A in Data Mover Enclosure failed:<value>(MessageID:<ID>) (details)
		Power Supply B in Data Mover Enclosure was installed.
		Power Supply B in Data Mover Enclosure was removed.
		Power Supply B in Data Mover Enclosure is OK.
		Power Supply B in Data Mover Enclosure failed:<value>(MessageID:<ID>) (details)
		One or more fans in Fan Module 1 in Data Mover Enclosure failed. (MessageID:<ID>)
		One or more fans in Fan Module 2 in Data Mover Enclosure failed. (MessageID:<ID>)
		One or more fans in Fan Module 3 in Data Mover Enclosure failed. (MessageID:<ID>)
		Multiple fans in Data Mover Enclosure failed. (MessageID:<ID>)
		All Fan Modules in Data Mover Enclosure are in OK status.
		Power Supply A in Data Mover Enclosure is going to shut down due to overheating. (MessageID:<ID>)
		Power Supply B in Data Mover Enclosure is going to shut down due to overheating. (MessageID:<ID>)
		Both Power Supplies in Data Mover Enclosure are going to shut down due to overheating. (MessageID:<ID>)
		Power Supply A in Data Mover Enclosure was installed.
	Data Mover	DNS server<value>is not responding. Reason:<value>(MessageID:<ID>) (serverAddr, reason)
		Network device<value>is down. (MessageID:<ID>) (deviceName)
	File system	Automatic fsck is started via Data Mover<value>. Filesystem may be corrupted. (MessageID:<ID>) (DATA_MOVER_NAME)
		Manual fsck is started via Data Mover<value>. (DATA_MOVER_NAME)

Table 19 VNX File notifications (continued)

Category	Resource kind	Message
		Automatic fsck succeeded via Data mover<value>. (DATA_MOVER_NAME)
		Manual fsck succeeded via Data mover<value>. (DATA_MOVER_NAME)
		Automatic fsck failed via Data mover<value>. (DATA_MOVER_NAME)
		Manual fsck failed via Data mover<value>. (DATA_MOVER_NAME)

VPLEX alerts

Table 20 VPLEX alerts

Resource kind	Message	Badge	Recommendation	Severity	Condition
Cluster	VPLEX cluster is having a problem.	Health	Check the health state of your VPLEX cluster. Ignore this alert if the health state is expected.	Critical	VPLEX cluster health state is "major-failure."
					VPLEX cluster health state is "critical-failure."
				Immediate	VPLEX cluster health state is "unknown."
				Warning	VPLEX cluster health state is "minor-failure."
VPLEX cluster health state is "degraded."					
FC Port	FC port is having a problem.	Health	Check the operational status of your FC port. Ignore this alert if the operational status is expected.	Critical	FC port operational status is "error."
					FC port operational status is "lost-communication."
				Immediate	FC port operational status is "unknown."
				Warning	FC port operational status is "degraded."
FC port operational status is "stopped."					
Ethernet Port	Ethernet port is having a problem.	Health	Check the operational status of your Ethernet port. Ignore this alert if the operational status is expected.	Critical	Ethernet port operational status is "error."
					Ethernet port operational status is "lost-communication."
				Immediate	Ethernet port operational status is "unknown."
				Warning	Ethernet port operational status is "degraded."
Ethernet port operational status is "stopped."					

Table 20 VPLEX alerts (continued)

Resource kind	Message	Badge	Recommendation	Severity	Condition
Local Device	Local device is having a problem.	Health	Check the health state of your local device. Ignore this alert if the health state is expected.	Critical	Local device health state is "major-failure."
					Local device health state is "critical-failure."
				Immediate	Local device health state is "unknown."
				Warning	Local device health state is "minor-failure."
Local device health state is "degraded."					
Storage View	Storage view is having a problem.	Health	Check the operational status of your storage view. Ignore this alert if the operational status is expected.	Critical	Storage view operational status is "error."
				Warning	Storage view operational status is "degraded."
					Storage view operational status is "stopped."
Storage Volume	Storage volume is having a problem.	Health	Check the health state of your storage volume. Ignore this alert if the health state is expected.	Critical	Storage volume health state is "critical-failure."
				Immediate	Storage volume health state is "unknown."
				Warning	Storage volume health state is "non-recoverable-error."
					Storage volume health state is "degraded."
Virtual Volume	Virtual volume is having a problem.	Health	Check the health state of your virtual volume. Ignore this alert if the health state is expected.	Critical	Virtual volume health state is "critical-failure."
					Virtual volume health state is "major-failure."
				Immediate	Virtual volume health state is "unknown."
				Warning	Virtual volume health state is "minor-failure."
					Virtual volume health state is "degraded."
VPLEX Metro	VPLEX metro is having a problem.	Health	Check the health state of your VPLEX metro. Ignore this alert if the health state is expected.	Critical	VPLEX metro health state is "critical-failure."
					VPLEX metro health state is "major-failure."
				Immediate	VPLEX metro health state is "unknown."

Table 20 VPLEX alerts (continued)

Resource kind	Message	Badge	Recommendation	Severity	Condition
				Warning	VPLEX metro health state is "minor-failure."
					VPLEX metro health state is "degraded."
Distributed Device	Distributed device is having a problem.	Health	Check the health state of your distributed device. Ignore this alert if the health state is expected.	Critical	Distributed device health state is "critical-failure."
					Distributed device health state is "major-failure."
				Immediate	Distributed device health state is "unknown."
				Warning	Distributed device health state is "minor-failure."
					Distributed device health state is "non-recoverable-error."
					Distributed device health state is "degraded."
Engine	Engine is having a problem.	Health	Check the operational status of your engine. Ignore this alert if the health state is expected.	Critical	Engine operational status is "error."
					Engine operational status is "lost-communication."
				Immediate	Engine operational status is "unknown."
				Warning	Engine operational status is "degraded."
Director	Director is having a problem.	Health	Check the operational status of your director. Ignore this alert if the health state is expected.	Critical	Director operational status is "critical-failure."
					Director operational status is "major-failure."
				Immediate	Director operational status is "unknown."
				Warning	Director operational status is "minor-failure."
					Director operational status is "degraded."
Extent	Extent is having a problem.	Health	Check the health state of your extent. Ignore this alert if the health state is expected.	Critical	Extent health state is "critical-failure."
				Immediate	Extent health state is "unknown."
				Warning	Extent health state is "non-recoverable-error."
					Extent health state is "degraded."

Table 20 VPLEX alerts (continued)

XtremIO alerts

The Wait Cycle is 1 for all these XtremIO alerts.

Table 21 XtremIO alerts based on external events

Resource kind	Message	Badge	Recommendation	Severity	Condition
Cluster	XtremIO cluster is having a problem.	Health	Check the state of your XtremIO cluster. Ignore this alert if the state is expected.	Critical	XtremIO cluster health state is "failed."
				Warning	XtremIO cluster health state is "degraded."
					XtremIO cluster health state is "partial fault."
Storage Controller	Storage controller is having problem.	Health	Check the state of your storage controller. Ignore this alert if the state is expected.	Critical	Storage controller health state is "failed."
				Warning	Storage controller health state is "degraded."
					Storage controller health state is "partial fault."

Table 22 XtremIO alerts based on metrics

Resource kind	Message	Badge	Severity	Condition	Recommendation
Cluster SSD	Consumed Capacity Ratio (%) is high.	Health	Warning	Consumed Capacity Ratio (%) \geq 60	1. Free capacity from cluster 2. Extend capacity of cluster
	Subscription Ratio is high.			Subscription Ratio \geq 5	1. Unsubscribe capacity from cluster 2. Extend capacity of cluster
	Physical capacity used in the cluster is high.	Risk		Consumed capacity \geq 90%	Migrate the volume to another cluster.
	Physical capacity used in the cluster is low.	Efficiency		Consumed capacity \leq 5%	Cluster is not fully utilized. Possible waste.
	Endurance Remaining (%) is low.	Health		Endurance Remaining (%) \leq 10	Replace SSD
Volume	Average Small Reads (IO/s) is out of normal range.*	Health	Warning	Average Small Read Ratio \geq 20	Check the status of the volume.
	Average Small Writes (IO/s) is out of normal range.*			Average Small Write Ratio \geq 20	Check the status of the volume.

Table 22 XtremIO alerts based on metrics (continued)

Resource kind	Message	Badge	Severity	Condition	Recommendation
	Average Unaligned Reads (IO/s) is out of normal range.*			Average Unaligned Read Ratio \geq 20	Check the status of the volume.
	Average Unaligned Writes (IO/s) is out of normal range.*			Average Unaligned Write Ratio \geq 20	Check the status of the volume.
	Capacity used in the volume is high.	Risk		Consumed capacity \geq 90%	Extend the capacity of the volume.
	Capacity used in the volume is low.	Efficiency		Consumed capacity \leq 5%	Volume is not fully utilized. Possible waste.
Snapshot	Average Small Reads (IO/s) is out of normal range.*	Health	Warning	Average Small Read Ratio \geq 20	Check the status of the snapshot.
	Average Small Writes (IO/s) is out of normal range.*			Average Small Write Ratio \geq 20	Check the status of the snapshot.
	Average Unaligned Reads (IO/s) is out of normal range.*			Average Unaligned Read Ratio \geq 20	Check the status of the snapshot.
	Average Unaligned Writes (IO/s) is out of normal range.*			Average Unaligned Write Ratio \geq 20	Check the status of the snapshot.

* Alerts for these metrics are disabled by default to align with the XMS defaults. You can enable them using the procedure in [Enabling XtremIO alert settings on page 141](#).

RecoverPoint alerts

Cancel cycle and Wait cycle for these alerts is 1.

Table 23 RecoverPoint for Virtual Machines alerts based on message event symptoms

Resource kind	Message summary	Badge	Severity	Event message	Recommendation
Consistency group	Problem with RecoverPoint consistency group.	Health	Critical	RecoverPoint consistency group state is unknown.	Check the status of the consistency group.
			Warning	RecoverPoint consistency group is disabled.	
Copy	Problem with RecoverPoint copy.	Health	Critical	RecoverPoint copy state is unknown.	Check the status of the copy.
			Warning	RecoverPoint copy state is disabled.	
vPRA	Problem with vPRA	Health	Critical	vRPA status is down.	Check the status of the vPRA.
			Warning	vRPA status is removed for maintenance.	

Table 23 RecoverPoint for Virtual Machines alerts based on message event symptoms (continued)

Resource kind	Message summary	Badge	Severity	Event message	Recommendation
			Immediate	vRPA status is unknown.	

Table 24 List of RecoverPoint for Virtual Machines alerts based on metrics

Resource kind	Message summary	Metric and criteria	Badge	Severity	Recommendation
vRPA	Problem with vRPA.	vRPA CPU Utilization (%) >95	Health	Warning	Check the status of the vRPA.
Consistency group	Consistency group protection window limit has been exceeded.	Consistency group protection window ratio < 1			Protection window limit has been exceeded.
	Lag limit has been exceeded.	Link Lag (%) > 95			Lag limit has been exceeded.
RecoverPoint for Virtual Machines system	Number of splitters is reaching upper limit.	RecoverPoint System Number of splitters > 30	Risk	Information	Consider adding another RecoverPoint for Virtual Machines system.
Cluster	Number of consistency groups per cluster is reaching upper limit.	RecoverPoint cluster number of consistency groups > 122			Consider adding another RecoverPoint cluster.
	Number of vRPAs per cluster is reaching upper limit.	RecoverPoint cluster number of vRPAs > 8			Consider adding another RecoverPoint cluster.
	Number of protected virtual machines per cluster is reaching upper limit.	RecoverPoint cluster number of protected virtual machines > 285			Consider adding another RecoverPoint cluster.
	Number of protected volumes per cluster is reaching upper limit.	RecoverPoint cluster number of protected VMDKs > 1946			The maximum number of protected volumes per vRPA cluster is 2K.
Splitter	Number of attached volumes per splitter is reaching upper limit.	Splitter number of volumes attached > 3890	The maximum number of attached volumes per splitter is 4K.		

Launching Unisphere

EMC Storage Analytics provides metrics that enable you to assess the health of monitored resources. If the resource metrics indicate that you need to troubleshoot those resources, EMC Storage Analytics provides a way to launch Unisphere on the array.

The capability to launch Unisphere on the array is available for:

- VNX Block
- VNX File
- Unity

To launch Unisphere on the array, select the resource and click the **Link and Launch** icon. The **Link and Launch** icon is available on most widgets (hovering over an icon displays a tooltip that describes its function).

Note

This feature requires a fresh installation of the EMC Adapter (not an upgrade). You must select the object to launch Unisphere. Unisphere launch capability does not exist for VMAX or VPLEX objects.

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 in vRealize 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.

Log Insight overview

This topic provides an overview of Log Insight and its use with EMC Storage Analytics.

VMware vRealize Log Insight provides log management for VMware environments. Log Insight includes dashboards for visual display of log information. Content packs extend this capability by providing dashboard views, alerts, and saved queries.

For information on working with Log Insight, refer to the Log Insight documentation: <https://www.vmware.com/support/pubs/log-insight-pubs.html>.

Log Insight configuration

This topic describes important background information about the integration of Log Insight with EMC Storage Analytics.

You can send the EMC Storage Analytics logs stored on the vRealize Operations Manager virtual machine to the Log Insight instance to facilitate performance analysis and perform root cause analysis of problems.

The adapter logs in vRealize Operations Manager are stored in a subdirectory of the `/storage/vcops/log/adapters/EmcAdapter` directory. The directory name and

the log file are created by concatenating the adapter instance name with the adapter instance ID.

An example of the contents of `EmcAdapter` follows. Notice that the adapter name parsing changes dots and spaces into underscores. For example, the adapter instance named `ESA3.0 Adapter VNX File` is converted to `ESA3_0_Adapter_VNX_File`. The adapter instance ID of `455633441` is concatenated to create the subdirectory name as well as the log file name.

```
-rw-r--r-- 1 admin admin 27812 Sep 26 10:37 ./
ESA3_0_Adapter_VNX_File-455633441/
ESA3_0_Adapter_VNX_File-455633441.log
-rw-r--r-- 1 admin admin 1057782 Sep 26 15:51 ./
ESA3_0_VNX_Adapter-1624/ESA3_0_VNX_Adapter-1624.log
-rw-r--r-- 1 admin admin 40712 Sep 23 11:58 ./
ESA3_0_VNX_Adapter-616398625/ESA3_0_VNX_Adapter-616398625.log
-rw-r--r-- 1 admin admin 40712 Sep 23 11:58 ./
ESA3_0_VNX_Adapter-725881978/ESA3_0_VNX_Adapter-725881978.log
-rw-r--r-- 1 admin admin 31268 Sep 10 11:33 ./
ESA_3_0_Adapter-1324885475/ESA_3_0_Adapter-1324885475.log
-rw-r--r-- 1 admin admin 193195 Sep 26 10:48 ./EmcAdapter.log
-rw-r--r-- 1 admin admin 25251 Sep 26 10:48 ./My_VNXe-1024590653/
My_VNXe-1024590653.log
-rw-r--r-- 1 admin admin 25251 Sep 26 10:48 ./My_VNXe-1557931636/
My_VNXe-1557931636.log
-rw-r--r-- 1 admin admin 4853 Sep 26 10:48 ./My_VNXe-1679/
My_VNXe-1679.log
```

In the vRealize Operations Manager **Solution Details** view, the corresponding adapter instance names appear as follows:

- ESA 3.0 Adapter VMAX
- My VNXe
- ESA 3.0 VNX Adapter
- ESA 3.0 Adapter VNX File

As seen in the example, multiple instances of each of the adapter types appear because EMC Storage Analytics creates a new directory and log file for the Test Connection part of discovery as well as for the analytics log file.

`My_VNXe-1557931636` and `My_VNXe-1024590653` are the Test Connection log locations, and `My_VNXe-1679` is the analytics log file.

The Test Connection logs have a null name associated with the adapter ID, for example:

```
id=adapterId[id='1557931636',name='null']'
```

The same entry type from the analytics log shows:

```
id=adapterId[id='1679',name='My_VNXe']'
```

You can forward any logs of interest to Log Insight, remembering that forwarding logs consumes bandwidth.

Sending logs to Log Insight

This topic lists the steps to set up `syslog-ng` to send EMC Storage Analytics logs to Log Insight.

Before you begin

Import the vRealize Operations Manager content pack into Log Insight. This context-aware content pack includes content for supported EMC Adapter instances.

Results

Login to Log Insight to ensure the logs are being sent.

Error handling and event logging

Errors in the EMC Storage Analytics operation are written to log files available through vRealize Operations Manager.

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

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

View logs relating to EMC Storage Analytics operation in the vRealize 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 vRealize Operations Manager custom user interface and log in as administrator.

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

2. Select **Admin > Support**. Select the **Logs** tab.
3. Expand the `vCenter Operations Collector` folder, then the `adapter` folder, then the `EmcAdapter` folder. Log files appear under the `EmcAdapter` folder. Double-click a log entry in the log tree.

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

Creating and downloading a support bundle

Procedure

1. On the **Logs** tab, click the **Create Support Bundle** icon.
The bundle encapsulates all necessary logs.
2. Select the bundle name and click the **Download Bundle** icon.

Log file sizes and rollover counts

This topic describes the default log file size and rollover count for EMC Adapter instances.

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

Log files in this directory follow this naming convention:

```
<EMC_adapter_name>-<adapter_instance_ID>.log.<rollover_count>
```

For example: `VNX_File-131.log.9`

The log filename begins with the name of the EMC Adapter instance. 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 rollover increment. When the default log file size is reached, the system starts a new log file with a new increment. The lowest-numbered increment represents the most recent log. Each rollover is 10 MB (default value, recommended). Ten rollovers (default value) are allowed; the system deletes the oldest log files.

Finding adapter instance IDs

This describes how to find the ID for an EMC Adapter instance.

Procedure

1. In vRealize Operations Manager, select **Administration** > **Environment** > **Adapter Types** > **EMC Adapter**.
2. In the **Internal ID** column, you can view the IDs for adapter instances.

Configuring log file sizes and rollover counts

This topic describes how to change the default values for all adapter instances or for a specific adapter instance.

Before you begin



EMC recommends that you not increase the 10 MB default value for the log file size. Increasing this value makes the log file more difficult to load and process as it grows in size. If more retention is necessary, increase the rollover count instead.

Procedure

1. On the vRealize Operations Manager virtual machine, find and edit the `adaptor.properties` file:


```
/usr/lib/vmware-vcops/user/plugins/inbound/emc-vcops-adapter/conf/adaptor.properties
```
2. Locate these EMC Adapter instance properties:


```
com.emc.vcops.adapter.log.size=10MB
com.emc.vcops.adapter.log.count=10
```

3. To change the properties for all EMC Adapter instances, edit only the log size or log count values. For example:

```
com.emc.vcops.adapter.log.size=12MB
```

```
com.emc.vcops.adapter.log.count=15
```

4. To change the properties for a specific EMC Adapter instance, insert the EMC Adapter instance ID as shown in this example:

```
com.emc.vcops.adapter.356.log.size=8MB
```

```
com.emc.vcops.adapter.356.log.count=15
```

Activating configuration changes

This topic describes how to activate changes you made to the log file size or rollover count for an EMC Adapter instance.

Procedure

1. In vRealize Operations Manager, select **Environment** > **Environment Overview**.
2. In the navigation pane, expand **Adapter Kinds**, then select **EMC Adapter**.
3. In the **List** tab, select a resource from the list and click the **Edit Resource** icon.

The **Resource Management** window for the EMC Adapter opens.

4. Click the **OK** button. No other changes are required.

This step activates the changes you made to the log file size or rollover count for the EMC Adapter instance.

Verifying configuration changes

This topic describes how to verify the changes you made to the log file size or rollover counts of an EMC Adapter instance.

Procedure

1. Log into vRealize Operations Manager.
2. Change directories to `/data/vcops/log/adapters/EmcAdapter`.
3. Verify the changes you made to the size of the log files or the number of saved rollover backups.

If you changed:

- Only the default properties for log file size and rollover count, all adapter instance logs will reflect the changes
- Properties for a specific adapter instance, only the logs for that adapter instance will reflect the changes
- Log file size or rollover count to higher values, you will not notice the resulting changes until those thresholds are crossed

Editing the Collection Interval for a resource

From the vRealize Operations Manager user interface, you can edit the Collection Interval for a resource.

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

Note

For Unity, the maximum collection interval is 5 minutes.

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

Configuring the thread count for an adapter instance

This topic describes two ways to configure the thread count for an adapter instance.

Only administrative personnel should perform this procedure. Use this procedure to change the thread count for best performance. If the thread count is not specified in `adapter.properties`, `thread count = vCPU count + 2`. The maximum allowed thread count is 20.

Procedure

1. Access the `adapter.properties` file. You can find this file at:

```
/usr/vmware-vcops/user/plugins/inbound/emc-vcops-adapter/
conf/adapter.properties
```

2. Open and edit the thread count property for all adapter instances or for a specific adapter instance.
 - If you want to edit the thread count property for all adapter instances, change the `com.emc.vcops.adapter.threadcount` property.
 - If you want to edit the thread count property for a specific adapter instance, insert the adapter instance ID after `adapter`, for example:


```
com.emc.vcops.adapter.7472.threadcount
```

, and change the property value.

Note

To find an adapter instance ID, refer to [Finding adapter instance IDs on page 170](#).

3. To activate the property change, restart the adapter instance in the vRealize Operations Manager.

Connecting to vRealize Operations Manager by using SSH

This topic describes how to use SSH to login to vRealize Operations Manager as root.

Procedure

1. Open the VM console for the vRealize Operations Manager.
2. Press **Alt-F1** to open the command prompt.
3. Enter **root** for the login and leave the password field blank.

You are prompted for a password.

4. Set the root password.

You will be logged in.

5. Use this command to enable SSH:

```
service sshd start
```

You will be able to successfully login as root by using SSH.

Frequently asked questions

How many nodes are supported per vRealize Operations Manager cluster?

vRealize Operations Manager clusters consist of a master node and data nodes. A total of eight nodes are supported. The master node (required) and up to seven data nodes.

How many resources and metrics are supported per node in vRealize Operations Manager?

- Small Node - 4vCPU, 16GB Memory - Supports 2,000 objects and 1,000,000 metrics
- Medium Node - 8vCPU, 32GB Memory - Supports 6,000 objects and 3,000,000 metrics
- Large Node - 16vCPU, 64GB Memory - Supports 10,000 objects and 5,000,000 metrics

How does a product trial work?

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

How do health scores work?

Health scores measure how normal a resource is 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. vRealize 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.

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

vRealize Operations Manager will not delete any resources automatically because it retains historical statistics and topology information that may be important to the user. The resource enters an unknown state (blue). 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 vRealize 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 multiple EMC Adapter instances for my storage systems, and I have added license keys for each of them. Why are they 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. 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 `Resource down`. To verify that a valid license exists, select **Environment Overview**. The list that appears shows the license status.

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 `?`.

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.

How do I uninstall EMC Storage Analytics?

No uninstall utility exists. However, to remove EMC Storage Analytics objects, remove adapter instances for which the Adapter Kind is **EMC Adapter (Environment > Configuration > Adapter Instances)**. Then delete objects in the **Environment Overview** for which the Data Source is **EMC (Environment > Environment Overview)**.

If I test a 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 only message is that 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.

Can I modify or delete a 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.

Why do some of the boxes appear white in the 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 has been deleted, but the resources remain until they are removed from the **Environment Overview** page.

Which arrays does EMC Storage Analytics support?

A complete list of the supported models for EMC storage arrays is available in the [EMC Simple Support Matrix](#).

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 heat map work?

The FAST Cache heat maps are based on the FAST Cache read and write hit ratios. This heat map will turn red if these ratios are low because that indicates that FAST Cache is not being utilized efficiently. These heat maps 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 of 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 vRealize 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.

I received the following error when I attempted to modify the VNX Overview dashboard although I have only VMAX arrays. Is this a problem?

Error occurred

An error occurred on the page; please contact support.
Error Message: org.hibernate.exception.SQLGrammarException: could not execute query

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