

Dell EMC ViPR Controller Analytics Pack for VMware vRealize Operations Management Suite

Version 3.6.2

Installation and Configuration Guide

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CHAPTER 1

Overview

This chapter contains the following topics.

- [Product overview](#)6
- [Dashboard overview](#)6
- [Deploying the ViPR Controller analytics pack](#).....6

Product overview

EMC ViPR Controller Analytics Pack provides enhanced capabilities for VMware vRealize Operations Management Suite (vROps).

Note

Throughout this document, virtual storage pools are also referred to as virtual pools and virtual storage arrays are also referred to as virtual arrays.

- Import ViPR Controller inventory, metering, and event data to VMware vRealize Operations Management Suite
- Provide preconfigured dashboards for troubleshooting issues in ViPR Controller
- Provide a collection of volume, storage port, storage system, and virtual pool data for computing key resource status scores used in ViPR Controller
- Present dashboard views that summarize resource details, the behavior of individual metrics, and ViPR Controller event alerts
- Improve the health scores of ViPR Controller resources by utilizing performance data from VNX/VMAX adapters

Dashboard overview

EMC ViPR Controller Analytics Pack for VMware vRealize Operations Management Suite provides a set of preconfigured dashboards.

- The EMC ViPR Capacity dashboard allows users to monitor virtual storage pool capacity and datastore disk usage.
- The EMC ViPR Performance dashboard allows users to monitor storage network and datastore latency performance data.
- The EMC ViPR At-A-Glance dashboard allows users to monitor performance and capacity data from a single dashboard.

Refer to [Dashboards](#) on page 21 for dashboard details and examples.

Deploying the ViPR Controller analytics pack

Use this procedure to install the EMC ViPR Controller Analytics Pack for VMware vRealize Operations Management Suite.

Procedure

1. Review the minimum system requirements in the *EMC ViPR Controller Support Matrix* document.
2. Review the minimum VMware vRealize Operations Management Suite configuration requirements in [VMware vRealize Operations Management Suite configuration requirements](#).
3. Install VMware vRealize Operations Management Suite using the recommended settings in your VMware documentation, before starting the steps in this guide.
4. Review [Gathering information needed during installation](#) on page 10 to ensure that you have all of the information needed to complete the installation.

5. Install the ViPR Controller Analytics Pack using the steps in [Installation](#) on page 11.
6. Configure the ViPR Controller Analytics Pack using the steps in [Configuration](#) on page 15.
7. Configure the ViPR Controller Analytics Pack dashboards using the steps in [Dashboards](#) on page 21.

CHAPTER 2

Configuration Requirements

This chapter contains the following topics.

- [VMware vRealize Operations Management Suite configuration requirements....](#) 10
- [Gathering information needed during installation.....](#) 10

VMware vRealize Operations Management Suite configuration requirements

VMware vRealize Operations Management Suite must meet specific configuration requirements to support the EMC ViPR Controller Analytics Pack for VMware vRealize Operations Management Suite.

For the most recent version support refer to the [ViPR Controller Support Matrix](#).

Note

Users must be part of the VMware vRealize Operations Management Suite administrator privilege group to install the ViPR Controller Analytics Pack, change log files, or change settings. To monitor ViPR Controller using the Analytics Pack, users must have at least read-only privileges in VMware vRealize Operations Management Suite.

Refer to the *VMware vRealize Operations Management Suite* documentation for specific configuration steps or to assign user permissions.

Gathering information needed during installation

Gather configuration information before installing the EMC ViPR Controller Analytics Pack for VMware vRealize Operations Management Suite.

CHAPTER 3

Installation

This chapter contains the following topics.

- [Installing the ViPR Controller Analytics Pack for vOps.....](#) 12

Installing the ViPR Controller Analytics Pack for vROps

Use this procedure to install the EMC ViPR Controller Analytics Pack for VMware vRealize Operations Management Suite.

Before you begin

You must download the ViPR Controller Analytics Pack package (.pak) file and have administrator access to the vRealize Operations Manager administration console.

Note

If you are installing versions of the EMC ViPR Controller Analytics Pack for VMware vRealize Operations Management Suite earlier than 6.0.1 (formerly named EMC ViPR Controller Analytics Pack for VMware vCenter Operations Management Suite (vCOPS)), refer to the steps described in [Installing the ViPR Controller Analytics Pack for vCOPS](#).

Procedure

1. Log into the vRealize Operations Manager administration console, as an administrator.

For example, `https://<Hostname>` where `<Hostname>` is the IP address or hostname of the user interface virtual machine for the vRealize Operations Manager virtual appliance.
2. Go to **Home > Administration > Solutions**, and click the **Add Solutions (+)** button.
3. In the **Add Solutions** window, browse to the location of the package (.pak) file, and click **Upload**.
4. Once the installation package is uploaded, click on **Next**, and accept the **EULA**.
5. Follow the on-screen instructions to complete the installation.

Once Installation is successful, the EMC-ViPR vROPs plugin is displayed in the list of solutions.

After you finish

Installation logs reside in the `/var/log/emc/install-.log` file on the user interface virtual machine for the vRealize Operations Manager virtual appliance. Once the analytics pack is created, it can take several minutes for the initial data collection to complete. If there is data collected from ViPR Controller, navigate to **Environment > All Objects > EMC ViPR** to find new resources.

Installing the ViPR Controller Analytics Pack for vCOPS

Use this procedure to install the EMC ViPR Controller Analytics Pack for VMware vCenter Operations Management Suite (vCOPS).

Before you begin

You must download the ViPR Controller Analytics Pack package (.pak) file and have administrator access to the vCenter Operations Manager administration console.

Note

If you are installing the EMC ViPR Controller Analytics Pack for VMware vRealize Operations Management Suite (vROps)), refer to the steps described in [Installing the ViPR Controller Analytics Pack for vROps](#).

Procedure

1. Log into the vCenter Operations Manager administration console, as an administrator.

For example, `https://admin` where `<Hostname>` is the IP address or hostname of the user interface virtual machine for the vCenter Operations Manager virtual appliance.
2. Select **Update**.
3. Browse to the location of the package (.pak) file and click **Update**.
4. Follow the on-screen instructions to complete the installation.

After you finish

Once the analytics pack is created, it can take several minutes for the initial data collection to complete. If there is data collected from ViPR, navigate to **Environment > Environment Overview** to find new resources.

CHAPTER 4

Configuration

This chapter contains the following topics.

- [Configuring the ViPR Controller Analytics Pack for vROps.....](#)16
- [Configuring the ViPR Controller Analytics Pack for vCOps.....](#)17
- [Reconfiguring the ViPR Controller Analytics Pack Properties for vROps.....](#)18
- [Reconfiguring the ViPR Controller Analytics Pack Properties for vCOps.....](#)19

Configuring the ViPR Controller Analytics Pack for vROps

Use this procedure to configure the EMC ViPR Controller Analytics Pack for VMware vRealize Operations Management Suite.

Before you begin

You must have administrator access to the vRealize Operations Manager administration console.

Note

If you are configuring versions of the EMC ViPR Controller Analytics Pack for VMware vRealize Operations Management Suite earlier than 6.0.1 (formerly named EMC ViPR Controller Analytics Pack for VMware vCenter Operations Management Suite (vCOPS)), refer to the steps described in [Configuring the ViPR Controller Analytics Pack for vCOPS](#).

Procedure

1. Open the vRealize Operations Manager console as an administrator.
2. Click **Home** > **Administration** > **Solution**.
3. Click the name of the solution, and the adapter type by click on it in solution details tab.
4. From the **Solutions Details** tab, click the adapter type.
5. At the top of the Solutions tab, click **Configure**.
6. A popup appears, where a new adapter instance should be added by providing the following properties:

Table 1 Reconfigurable analytic pack properties

Property name	Description
Adapter Instance Name	Analytic pack instance name
Host Name	ViPR Controller hostname
Enable Filtering	<p>Turn filtering on or off. Filtering is used to limit the import of resources from ViPR Controller to the vRealize being monitored by vRealize Operations Manager.</p> <hr/> <p>Note</p> <p>Setting the value to false disables filtering. Any resources that are created due to the lack of filtering must be removed from vRealize Operations Manager manually. Disabling filtering can result in vRealize Operations Manager exceeding the maximum number of objects it can support.</p> <hr/>
Credential	ViPR Controller credentials assigned to the analytic pack instance. Changing this property will assign a different set of credentials to the analytic pack instance.

7. (Optional) Click **Test** to check the connection between the analytic pack instance and ViPR Controller.

8. Click **OK**.

After you finish

Once the analytics pack is created, it can take several minutes for the initial data collection to complete. If there is data collected from ViPR Controller, navigate to **Environment > Environment Overview** to find new resources.

Configuring the ViPR Controller Analytics Pack for vCOPs

Use this procedure to configure the EMC ViPR Analytics Pack for VMware vCenter Operations Management Suite (vCOPs).

Before you begin

You must have administrator access to the vCenter Operations Manager administration console.

Note

If you are running the EMC ViPR Controller Analytics Pack for VMware vRealize Operations Management Suite (vROps)) version 6.0.1 or higher, you do not have to perform these steps.

Procedure

1. Log into the vCenter Operations Manager custom console, as an administrator.
For example, `https://vcops-custom` where `<Hostname>` is the IP address or hostname of the user interface virtual machine for the vCenter Operations Manager virtual application.
2. Click **Environment > Configuration > Adapter Instances**.
3. Click the following icon to add a new adapter instance.



4. Choose **VCenter Standard Operations Server** from the Collector list.
5. Choose **EMC ViPR Adapter** from the Adapter Kind list.
6. Enter an adapter instance name.
For example, ViPR135.
7. Type a hostname, fully qualified domain name (FQDN), or IP address of the ViPR instance.
For example, 192.168.1.135.
8. For **Enable Filtering of Non-vCenter Related Objects**, click **True** or **False**.

Note

Setting the value to false disables filtering. You must manually remove any resources that are created due to the lack of filtering from vCenter Operations Manager. Disabling filtering can result in vCenter Operations Manager exceeding the maximum number of objects it can support.

9. Create a new credential, or select an existing credential. If you are creating a new credential, follow these steps.

- a. Click **Add**.
- b. For **Credential Kind**, select **EMC ViPR Credential**.
- c. Type the instance name.
For example, ViPRCre.
- d. Type the EMC ViPR user name.
For example, myadmin@corpname.com.
- e. Type the EMC ViPR password.
For example, sysadminpassword.
- f. Click **OK**.

10. Click **OK**.

After you finish

Once the analytics pack is created, it can take several minutes for the initial data collection to complete. If there is data collected from ViPR, navigate to **Environment > Environment Overview** to find new resources.

Reconfiguring the ViPR Controller Analytics Pack Properties for vROps

Use this procedure to configure the ViPR Controller Analytics Pack for VMware vRealize Operations Management Suite properties.

Before you begin

You must have administrator access to the vRealize Operations Manager administration console.

Note

If you reconfiguring the properties for versions earlier than 6.0.1 (formerly named EMC ViPR Controller Analytics Pack for VMware vCenter Operations Management Suite (vCOPS)) refer to the steps described in [Reconfiguring the ViPR Controller Analytics Pack for vCOPS properties](#).

Procedure

1. Open the vRealize Operations Manager console as an administrator.
2. Click **Home > Administration > Solution**.
3. Click the name of the solution. and the adapter type by click on it in solution details tab.
4. From the **Solutions Details** tab, click the adapter type.
5. At the top of the Solutions tab, click **Configure**.
6. A popup appears with the following properties which can be edited:

Table 2 Reconfigurable analytic pack properties

Property name	Description
Adapter Instance Name	Analytic pack instance name

Table 2 Reconfigurable analytic pack properties (continued)

Property name	Description
Host Name	ViPR Controller hostname
Enable Filtering	<p>Turn filtering on or off. Filtering is used to limit the import of resources from ViPR Controller to the vRealize being monitored by vRealize Operations Manager.</p> <hr/> <p>Note</p> <p>Setting the value to false disables filtering. Any resources that are created due to the lack of filtering must be removed from vRealize Operations Manager manually. Disabling filtering can result in vRealize Operations Manager exceeding the maximum number of objects it can support.</p> <hr/>
Credential	ViPR Controller credentials assigned to the analytic pack instance. Changing this property will assign a different set of credentials to the analytic pack instance.

7. (Optional) Click **Test** to check the connection between the analytic pack instance and ViPR Controller.
8. Click **OK**.

Reconfiguring the ViPR Controller Analytics Pack Properties for vCOPs

Use this procedure to reconfigure the ViPR Controller analytic pack for vCOPs properties.

Before you begin

You must have administrator access to the vCenter Operations Manager administration console.

Note

If you are reconfiguring the EMC ViPR Controller Analytics Pack for VMware vRealize Operations Management Suite, properties refer to the steps described in [Reconfiguring the ViPR Controller Analytics Pack for vROps properties](#).

Procedure

1. Open the vCenter Operations Manager custom console as an administrator.
2. Click **Environment > Configuration > Adapter Instances**.
3. Choose an adapter from the Adapter Instances list.
4. Click the following icon to edit an adapter instance.



5. Edit the analytic pack instance properties.

Table 3 Reconfigurable analytic pack properties

Property name	Description
Adapter Instance Name	Analytic pack instance name
Host Name	ViPR hostname
Enable Filtering	<p>Turn filtering on or off. Filtering is used to limit the import of resources from ViPR to the vCenter being monitored by vCenter Operations Manager.</p> <hr/> <p>Note</p> <p>Setting the value to false disables filtering. Any resources that are created due to the lack of filtering must be removed from vCenter Operations Manager manually. Disabling filtering can result in vCenter Operations Manager exceeding the maximum number of objects it can support.</p> <hr/>
Credential	ViPR credentials assigned to the analytic pack instance. Changing this property will assign a different set of credentials to the analytic pack instance.

6. (Optional) Click **Test** to check the connection between the analytic pack instance and ViPR Controller.
7. Click **OK**.

CHAPTER 5

Dashboards

This chapter contains the following topics.

- [ViPR Controller Capacity dashboard](#)..... 22
- [ViPR Controller Performance dashboard](#).....22
- [ViPR Controller At-A-Glance dashboard](#)..... 23
- [Dashboard view status indicators and thresholds](#).....23
- [Collected metrics per device type](#).....24

ViPR Controller Capacity dashboard

Use the ViPR Controller Capacity dashboard to monitor virtual storage pool capacity and datastore disk usage.

The ViPR Controller Capacity dashboard has the following components:

- **Virtual Storage Pool Workload** — displays the provisioned capacity used by the datastores
- **Virtual Storage Pool Capacity Remaining** — displays the free capacity for storage pools
- **Resource selector** — used to search for a specific resource
- **Status boards** — displays various status and relationship information for ViPR Controller resources
- **Clusters in Workload** — displays the top clusters in disk capacity workload
- **Datastores in Workload** — displays the top datastores in disk capacity workload

Using the ViPR Controller Capacity dashboard

Use the ViPR Controller Capacity dashboard to monitor capacity-related data.

Below are some common examples for using the ViPR Controller Capacity dashboard.

ViPR Controller Performance dashboard

Use the ViPR Controller Performance dashboard to monitor storage network and datastore latency performance data.

The ViPR ViPR Controller Performance dashboard has the following components:

- **Storage Network Workload** — displays the collected IO utilization for all storage ports in a network
- **Storage Port Workload** - displays the IO workload for storage ports
- **Resource selector** — used to search for a specific resource
- **Status boards** — displays various status and relationship information for ViPR Controller resources
- **Datastores with highest IO workload** — displays the top datastores with the highest IO workload
- **Datastores with highest read latency** — displays the top datastores with the highest read latency
- **Datastores with highest write latency** — displays the top datastores with the highest write latency

Using the ViPR Performance dashboard

Use the ViPR Performance dashboard to monitor performance-related data.

Below is a common example for using the ViPR Performance dashboard.

ViPR Controller At-A-Glance dashboard

Use the ViPR Controller At-A-Glance dashboard to monitor performance and capacity data from a single dashboard.

The ViPR Controller At-A-Glance dashboard has the following components:

- **Capacity Status Monitoring** — combines the **Virtual Storage Pool Workload**, **Virtual Storage Pool Capacity Remaining**, and **Clusters in Workload** components to create a single dashboard for monitoring capacity status.
- **Performance Status Monitoring** — combines the **Storage Network Workload**, **Storage Port Workload**, and **Datastores with highest latency** components to create a single dashboard for monitoring performance status.

Dashboard view status indicators and thresholds

A status board appears on the EMC ViPR Controller Capacity and EMC ViPR Controller Performance dashboards.

Note

The thresholds for each status board are configurable.

Table 4 Dashboard view status board values and thresholds

Status Board Value	Value description	Default thresholds
EMC ViPR Controller Capacity View		
Workload values	The color indicates the level of used capacity compared to the provisioned capacity. For example, a red capacity workload status indicates the used capacity level is high.	Green — under 75% Yellow — 75% to 90% Orange — 90% to 95% Red — above 95%
Reclaimable waste values	The color indicates the level of reclaimable waste. For example, a red reclaimable waste status indicates there is a high number of reclaimable resources for the datastore.	Green — under 75% Yellow — 75% to 90% Orange — 90% to 95% Red — above 95%
Capacity remaining values	The color indicates the level of capacity remaining. For example, a green capacity remaining status indicates the associated virtual storage pool and the related storage pools have capacity remaining and the datastore could possibly be expanded.	Green — above 25% Yellow — 10% to 25% Orange — 5% to 10% Red — under 5%
EMC ViPR Controller Performance View		

Table 4 Dashboard view status board values and thresholds (continued)

Status Board Value	Value description	Default thresholds
Workload values	The color indicates the level of IO utilization. For example, a red performance workload status indicates the IO utilization level is high.	Green — under 75% Yellow — 75% to 90% Orange — 90% to 95% Red — above 95%

Collected metrics per device type

Different metric data is collected for each device type.

Table 5 Metrics collected for each device type

Resource kind	Category	Raw metric/Calculated metric	Available device type
Volume	Capacity	AllocatedCapacity	VMAX Block, VNX Block
		ProvisionedCapacity	VMAX Block, VNX Block
		SnapshotCapacity	VMAX Block, VNX Block
	Performance	Reads IO(KB/s) = BandwidthOut delta	VMAX Block, VNX Block
		Writes IO(KB/s) = BandwidthIn delta	VMAX Block, VNX Block
		Busy = (IOTime delta) / (IOTime delta + IdleTime delta)	VNX Block
		KbytesTransferred	VMAX Block, VNX Block
		QueueLength	VNX Block
		ReadIOs	VMAX Block, VNX Block
		TotalIOs	VMAX Block, VNX Block
		WriteIOs	VMAX Block, VNX Block
	Datastore	Provisioned Capacity	VMAX Block, VNX Block
		Used Capacity	VMAX Block, VNX Block
		Waste Disk Space	VMAX Block, VNX Block
	Badge	Reclaimable Waste	VMAX Block, VNX Block
		Workload	VMAX Block, VNX Block
FileSystem	Capacity	AllocatedCapacity	VNX File, Isilon
		ProvisionedCapacity	VNX File, Isilon
		SnapshotCapacity	VNX File, Isilon
	Performance	Reads IO(KB/s) = BandwidthOut delta	VNX File
		Writes IO(KB/s) = BandwidthIn delta	VNX File

Table 5 Metrics collected for each device type (continued)

Resource kind	Category	Raw metric/Calculated metric	Available device type
	Datastore	Provisioned Capacity	VNX File, Isilon
		Used Capacity	VNX File, Isilon
		Waste Disk Space	VNX File, Isilon
StoragePort	Performance	KbytesTransferred	VMAX Block, VNX Block
		TotalIOs	VMAX Block, VNX Block
	Badge	Workload = Performance KBytesTransferred / port_speed (from the topology feed)	VMAX Block, VNX Block
StorageSystem	Capacity	Total Allocated Capacity	VMAX Block, VNX Block, Isilon, VNX File
		Total Free Capacity	VMAX Block, VNX Block, Isilon, VNX File
		Total Provisioned Capacity	VMAX Block, VNX Block, Isilon, VNX File
		Total Snapshot Capacity	VMAX Block, VNX Block, Isilon, VNX File
		Total Subscribed Capacity	VMAX Block, VNX Block, Isilon, VNX File
		Total Usable Capacity	VMAX Block, VNX Block, Isilon, VNX File
	Performance	Reads IO(KB/s) = BandwidthOut delta	VMAX Block, VNX Block, VNX File
		Reads IO(KB/s) = BandwidthOut delta	VMAX Block, VNX Block, VNX File
		KbytesTransferred	VMAX Block, VNX Block, VNX File
		ReadIOs	VMAX Block, VNX Block, VNX File
		ReadHitIOs	VMAX Block, VNX Block, VNX File
		TotalIOs	VMAX Block, VNX Block, VNX File
		WriteHitIOs	VMAX Block, VNX Block, VNX File
		WriteIOs	VMAX Block, VNX Block, VNX File
	Datastore	Provisioned Capacity	VMAX Block, VNX Block, Isilon, VNX File
		Total Used Capacity	VMAX Block, VNX Block, Isilon, VNX File

Table 5 Metrics collected for each device type (continued)

Resource kind	Category	Raw metric/Calculated metric	Available device type
	Badge	Total Waste Disk Space	VMAX Block, VNX Block, Isilon, VNX File
		Capacity Remaining	VMAX Block, VNX Block, Isilon, VNX File
		Reclaimable Waste	VMAX Block, VNX Block, Isilon, VNX File
		Workload	VMAX Block, VNX Block, Isilon, VNX File
StoragePool	Capacity	Total Allocated Capacity	VMAX Block, VNX Block, Isilon, VNX File
		Total Free Capacity	VMAX Block, VNX Block, Isilon, VNX File
		Total Provisioned Capacity	VMAX Block, VNX Block, Isilon, VNX File
		Total Snapshot Capacity	VMAX Block, VNX Block, Isilon, VNX File
		Total Subscribed Capacity	VMAX Block, VNX Block, Isilon, VNX File
		Total Usable Capacity	VMAX Block, VNX Block, Isilon, VNX File
	Performance	Reads IO(KB/s) = BandwidthOut delta	VMAX Block, VNX Block, VNX File
		Writes IO(KB/s) = BandwidthIn delta	VMAX Block, VNX Block, VNX File
		Kbytes Transferred (KB/s)	VMAX Block, VNX Block, VNX File
		ReadIOs	VMAX Block, VNX Block, VNX File
		TotalIOs	VMAX Block, VNX Block, VNX File
		WriteIOs	VMAX Block, VNX Block, VNX File
	Datastore	Provisioned Capacity	VMAX Block, VNX Block, Isilon, VNX File
		Total Used Capacity	VMAX Block, VNX Block, Isilon, VNX File
		Total Waste Disk Space	VMAX Block, VNX Block, Isilon, VNX File
	Badge	Capacity Remaining	VMAX Block, VNX Block, Isilon, VNX File

Table 5 Metrics collected for each device type (continued)

Resource kind	Category	Raw metric/Calculated metric	Available device type
		Reclaimable Waste	VMAX Block, VNX Block, Isilon, VNX File
		Workload	VMAX Block, VNX Block, Isilon, VNX File
Network	Performance	Kbytes Transferred (KB/s)	
		TotalIOs	
	Badge	Workload = Performance KBytesTransferred / port_speed (from the topology feed)	
VirtualPool	Capacity	Total Allocated Capacity	
		Total Free Capacity	
		Total Provisioned Capacity	
		Total Snapshot Capacity	
		Total Subscribed Capacity	
		Total Usable Capacity	
	Performance	Reads IO(KB/s) = BandwidthOut delta	
		Writes IO(KB/s) = BandwidthIn delta	
		Kbytes Transferred (KB/s)	
		ReadIOs	
		TotalIOs	
		WriteIOs	
	Datastore	Provisioned Capacity	
		Total Used Capacity	
		Total Waste Disk Space	
	Badge	Capacity Remaining	
		Reclaimable Waste	
		Workload	
VirtualArray	Capacity	Total Allocated Capacity	
		Total Free Capacity	
		Total Provisioned Capacity	
		Total Snapshot Capacity	
		Total Subscribed Capacity	
		Total Usable Capacity	
	Performance	Reads IO(KB/s) = BandwidthOut delta	
		Writes IO(KB/s) = BandwidthIn delta	

Table 5 Metrics collected for each device type (continued)

Resource kind	Category	Raw metric/Calculated metric	Available device type
		Kbytes Transferred (KB/s)	
		ReadIOs	
		TotalIOs	
		WriteIOs	
	Datastore	Provisioned Capacity	
		Total Used Capacity	
		Total Waste Disk Space	
	Badge	Capacity Remaining	
		Reclaimable Waste	
		Workload	
Project	Capacity	Total Allocated Capacity	
		Total Provisioned Capacity	
		Total Snapshot Capacity	
	Performance	Total Reads (KB/s) = BandwidthOut delta	
		Total Writes (KB/s) = BandwidthIn delta	
		Total Kbytes Transferred (KB/s)	
		Total ReadIOs	
		Total TotalIOs	
		Total WriteIOs	
	Datastore	Provisioned Capacity	
		Total Used Capacity	
		Total Waste Disk Space	
	Badge	Reclaimable Waste	
		Workload	
Tenant	Capacity	Total Allocated Capacity	
		Total Provisioned Capacity	
		Total Snapshot Capacity	
	Performance	Total Reads (KB/s) = BandwidthOut delta	
		Total Writes (KB/s) = BandwidthIn delta	
		Total Kbytes Transferred (KB/s)	
		Total ReadIOs	
		Total TotalIOs	
		Total WriteIOs	

Table 5 Metrics collected for each device type (continued)

Resource kind	Category	Raw metric/Calculated metric	Available device type
	Datastore	Provisioned Capacity	
		Total Used Capacity	
		Total Waste Disk Space	
	Badge	Reclamable Waste	
		Workload	
VirtualDataCenter	Capacity	Total Allocated Capacity	
		Total Free Capacity	
		Total Provisioned Capacity	
		Total Snapshot Capacity	
		Total Subscribed Capacity	
		Total Usable Capacity	
	Performance	Reads IO(KB/s) = BandwidthOut delta	
		Writes IO(KB/s) = BandwidthIn delta	
		Kbytes Transferred (KB/s)	
		ReadIOs	
		TotalIOs	
		WritelOs	
	Datastore	Provisioned Capacity	
		Total Used Capacity	
		Total Waste Disk Space	
	Badge	Capacity Remaining	
		Reclamable Waste	
		Workload	

