SENTRY SOFTWARE

USER DOCUMENTATION

STORAGE MONITORING

TrueSight Operations Management - NetApp Storage

Version 3.2.02

November 2015

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Release Notes for v3.2.02

What's New

- The debug file now stores additional critical information, warning and error messages when the debug mode is activated.
- In order to optimize the monitoring on large environment, users can now customize the discovery and the collect processes timeouts directly from the user interface. See the Configuring Monitor Settings section for detailed information.

Fixed Issues

- An exception could occur when:
  - discovering quota in 7-mode.
  - some privileges were missing.
- The solution failed to discover volumes and their associated quotas in 7-mode if the multistore license was not active. If this situation occurs, the solution now forces the discovery of the vFiler0.
- Volumes were not properly associated to their aggregate.

Overview

The pages in this section provide a high-level overview of the product.

- User Goals and Features
- Product at a Glance
- Prerequisites
- Supported Platforms

Note that for convenience and brevity, reference to TrueSight Operations Management - NetApp Storage, may also be made as NetApp Storage Monitoring.

User Goals and Features

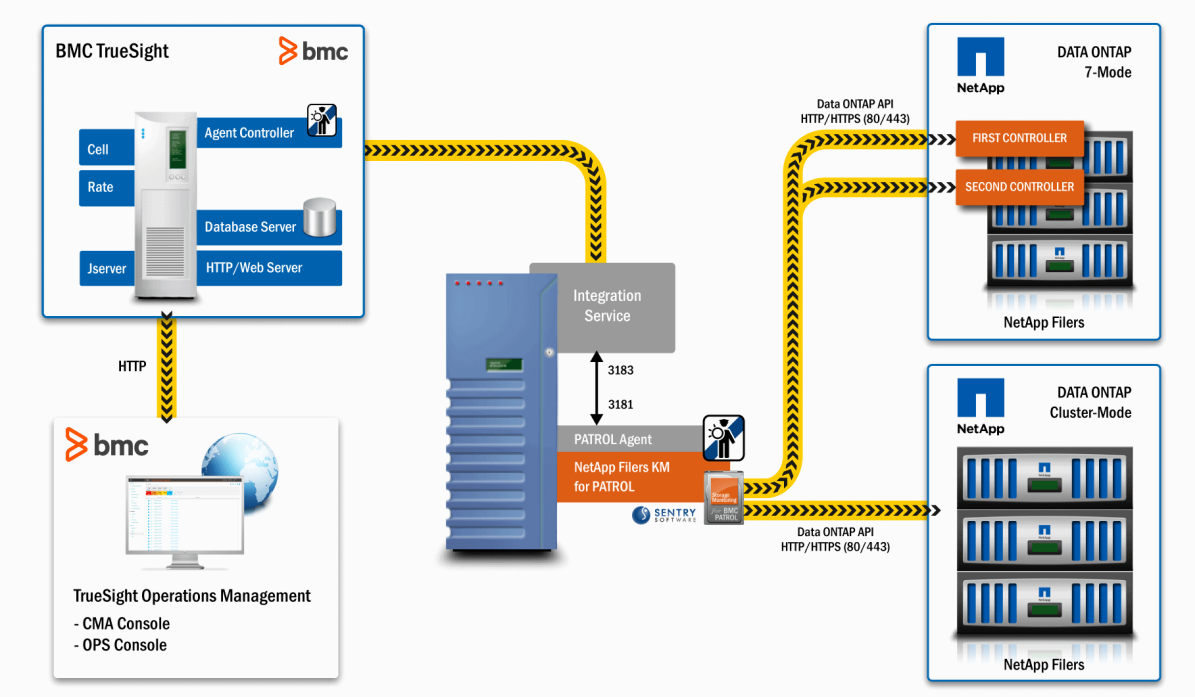
TrueSight Operations Management - NetApp Storage allows you to view, monitor, and manage your entire NetApp storage environment by making available current and historical information through a centralized console.

TrueSight Operations Management - NetApp Storage enables you to manage the following aspects of your environment:

- **Array activity statistics** (network, disk activity, backups, processor utilization, etc.)
- **Files System monitoring** (space consumption, available snapshots, quotas, etc.)
- **Per-protocol statistics** (CIFS, NFS, fiber, etc.)
- **Mirroring reports** (Snapmirror and Snapvault activity and traffic, etc.)
- **LUN Statistics** (statistics report on read/write usage over the past days/hours, mapping)…
- **Cluster monitoring** (interconnection status, partner status)…

Product at a Glance

TrueSight Operations Management - NetApp Storage provides current and historical information through a centralized console so you can easily view and manage your entire NetApp environment. The product collects and brings critical performance data and useful metrics into the BMC TrueSight Operations Management environment and enables you to be warned whenever a problem occurs in your NetApp environment.



TrueSight Operations Management - NetApp Storage Architecture Diagram

TrueSight Operations Management - NetApp Storage:

- Collects NetApp Filers hardware and performance metrics and bring them into your BMC environment
- Identifies performance bottlenecks (physical disks, controllers, fiber links, etc.)
- Manages and helps rationalize disk space consumption
- Reports on activity generated by each protocol
- Analyzes overall traffic and in-depth I/Os, etc.

Supported Platforms

BMC Framework

- BMC ProactiveNet 9.0 and higher
- BMC ProactiveNet Central Monitoring Administration 9.0 and higher
- BMC TrueSight Operations Management 10

PATROL Agent

TrueSight Operations Management - NetApp Storage supports PATROL Agent v3.9 and higher.

JAVA

TrueSight Operations Management - NetApp Storage requires at least Java 1.6 and a Java Run Environment (JRE) to be installed on the same system that the PATROL Agent.

You can download the Java Runtime Environment along with the monitoring solution from the Sentry Software Website.

NetApp Storage Devices

TrueSight Operations Management - NetApp Storage supports:

- **In 7-mode (traditional mode)**: All NetApp storage filers with Data ONTAP 7.3.1 or higher.
- **In C-mode (cluster mode)**: All NetApp storage filers with Data ONTAP 8.1 or higher.

Filers from other vendors that have an OEM agreement with NetApp are also supported.

Prerequisites

Data ONTAP

We recommend using Data ONTAP version 8.2. The following versions of Data ONTAP are however supported:

- In 7-Mode (traditional mode): Data ONTAP 7.3.1
- In Cluster-Mode: Data ONTAP 8.1 and higher

User Privileges

7-Mode:

To monitor a NetApp storage system in 7-mode, you need to create a user with read-only access to the Data ONTAP API. Please copy-paste the following command lines into the NetApp CLI:

1. Create a new role to access the Data ONTAP API used by TrueSight Operations Management - NetApp Storage:

```
> useradmin role add newrole -a login-http-admin,api-license-list-info,api-system-
get-version,api-perf-object-get-instances,api-aggr-list-info,api-volume-list-
info,api-lun-list-info,api-lun-map-list-info,api-qtree-list,api-system-get-info,api-
storage-adapter-get-adapter-list,api-storage-adapter-get-adapter-info,api-net-config-
get-active,api-fcp-adapter-list-info,api-fcp-adapter-stats-list-info,api-cifs-list-
config,api-iscsi-service-status,api-iscsi-adapter-list-info,api-nfs-status,api-sis-
status,api-snapmirror-get-status,api-snapvault-primary-destinations-list-info,api-
storage-shelf-list-info,api-disk-list-info,api-storage-shelf-environment-list-
info,api-vfiler-list-info,api-
cifs-status,api-vfiler-get-status,api-snapvault-primary-get-relationship-status,api-
quota-report
```

2. Create a new group using the previously created role:

```
> useradmin group add newgroup -c "adding group for newuser" -r newrole
```

3. Create a new user in the previously created group:

```
> useradmin user add newuser -g newgroup
```

Cluster-Mode:

To monitor a NetApp storage system in Cluster mode, you need to create a user with read-only access to the Data ONTAP API. Please copy-paste the following command lines into the NetApp CLI:

```
>::security >login create -username newuser -application http -authmethod password -role readonly
>::security >login create -username newuser -application ontapi -authmethod password -role readonly
```

Enabling TLS on NetApp (7-mode only)

Data ONTAP supports SSLv3 and TLS (disabled by default) to secure its connection with **TrueSight Operations Management - NetApp Storage**. When using Java 1.8, which no longer uses SSLv3 but TLS, **TrueSight Operations Management - NetApp Storage** cannot connect to Data ONTAP. To guarantee the correct operation of **TrueSight Operations Management - NetApp Storage**, you will have to first enable TLS. For more information, please refer to the NetApp documentation.

Other Components

- Java 1.6 or higher

Installing the Monitoring Solution

Once the latest version of the solution has been loaded into Central Monitoring Administration, administrators can create all the installation packages required for their different operating systems and platforms and save them for later use in the Monitoring Installation Packages list. These packages can then be deployed to multiple computers. Administrators just have to connect to TrueSight Operations Management from the server where they want to install the package, download it and launch the installation.

This section describes the different steps to follow to install **NetApp Storage Monitoring**:

- Importing NetApp Storage Monitoring into Central Monitoring Administration
- Creating the Installation Package
- Downloading the Installation Package
- Installing the Package

Importing the Monitoring Solution into Central Administration

The TrueSight Central Monitoring Repository includes the current versions of TrueSight Operations Management - NetApp Storage that you can use with BMC TrueSight. If the version available in the Repository does not correspond to the latest one, you will have to manually import it:

1. Log on to **TrueSight Operations Management**.
2. Click the **Repository** drawer and select **Manage Repository**.
3. Check that the version of the BMC component available is actually the latest one. If not, download the latest version corresponding to your operating system (Windows or UNIX/ Linux) available on the Sentry Software Website.
4. From **TrueSight Operations Management**, click **Import**  .
5. Select **Single solution**.
6. Browse to the .zip source file.
7. Click **Import**.

The selected archive file is imported to the repository.

Creating the Installation Package

The installation package to deploy to managed systems can be created directly from TrueSight Operations Management:

1. Log on to **TrueSight Operations Management**
2. Click the **Repository** drawer and select **Deployable Package Repository**.
3. Click **Add** .
4. Select the operating system and platform for which you want to create a package. The components available in the repository for the selected operating system and platform are displayed.
5. Select the Installation Package Component:
   - From the **Available** components list, select the relevant component.
   - From the **Version** list, select the latest version.
   - Click the right arrow button to move the component into the **Selected Components** list. By default, the appropriate BMC PATROL Agent for the operating system and platform that you chose is included in the **Selected components** list.
   - Click **Next**. The **Add Component Installation Package** wizard are displayed.
6. Go through the wizard and specify the required PATROL information. The **Installation Package Details** is displayed.
7. Verify that:
   - the operating system and platform are correct
   - the components that you want to include are listed in the **Included Components** list.
8. Provide the following information:
   - **Name**: Enter a unique name for the package.
   - (Optional) **Description**: Enter a description of the package. The description is displayed in the **Monitoring Installation Packages** list on the **Monitoring Repository** window.
   - **Format**: Select a file compression format for the package.
9. Click **Save Installation Package**.
10. Click **Close**. The package is now available in the **Monitoring Installation Packages** list.

Downloading the Installation Package

You can download an installation package and install the components on one or more hosts. The installation runs silently with the information entered during package creation.

> **Recommendation**
> If you defined the BMC TrueSight Integration Service variable for PATROL Agents in the installation package, ensure the agents are started in phases. Do not start newly deployed agents all at once. Start and configure monitoring for the agents in planned phases to reduce the performance impact on the Integration Service nodes and on the BMC TrueSight Server associated with the automatic workflow process.

1. Log on to **TrueSight Operations Management** from the computer on which the PATROL Agent is installed or to be installed.
2. Click the **Repository** drawer and select **Deployable Package Repository**.
3. (Optional) To filter the list of installation packages, select an operating system from the **Filter by Operating System** list.
4. Click the link for the installation package that you want to download.
5. Through the browser's download dialog box, save the installation package.

Installing the Package

This chapter provides a step by step procedure to install a monitoring solution package:

1. From the computer on which you want to install the package, log on to TrueSight Operations Management.
2. (Optional) To filter the list of installation packages, select an operating system from the **Filter by Operating System** list.
3. Click the link for the installation package that you want to download.
4. Through the browser's download dialog box, save the installation package in a temporary file.
5. Extract the installation package that is appropriate for your operating system. The package is extracted to the bmc_products directory on the current host.
6. From the bmc_products directory, run the installation utility for your operating system:
   - (UNIX or Linux) RunSilentInstall.sh
   - (Microsoft Windows) RunSilentInstall.exe

The package is installed on the current host. If the package includes a BMC PATROL Agent, the agent sends a configuration request by passing its tags to Central Monitoring Administration, via the Integration Service. Central Monitoring Administration evaluates policies that match the tags, determines the final configuration to be applied, and sends the configuration information back to the agent. Monitoring is based on the configuration information received by the agent.

Configuring After Installation

Monitoring your Storage Environment

Monitoring NetApp storage systems with **TrueSight Operations Management - NetApp Storage** is very simple. Once the monitoring solution is properly installed and configured, **NetApp Storage Monitoring** automatically detects the various NetApp storage features and components and displays them in the Operations Console.

NetApp Storage Monitoring can for example help you:

- Check available spare disks
- Check disks health
- Detect high processor utilization
- Detect a controller overload
- Identify aggregates with space reservation enabled
- Identify busiest volumes
- Reclaim space of unused LUNs
- Report disk space consumption
- View the overall activity of a NetApp Filer.

The procedures were performed with BMC ProactiveNet Performance Management v.9.5. They may therefore be slightly different for BMC TrueSight Operations Management v10.

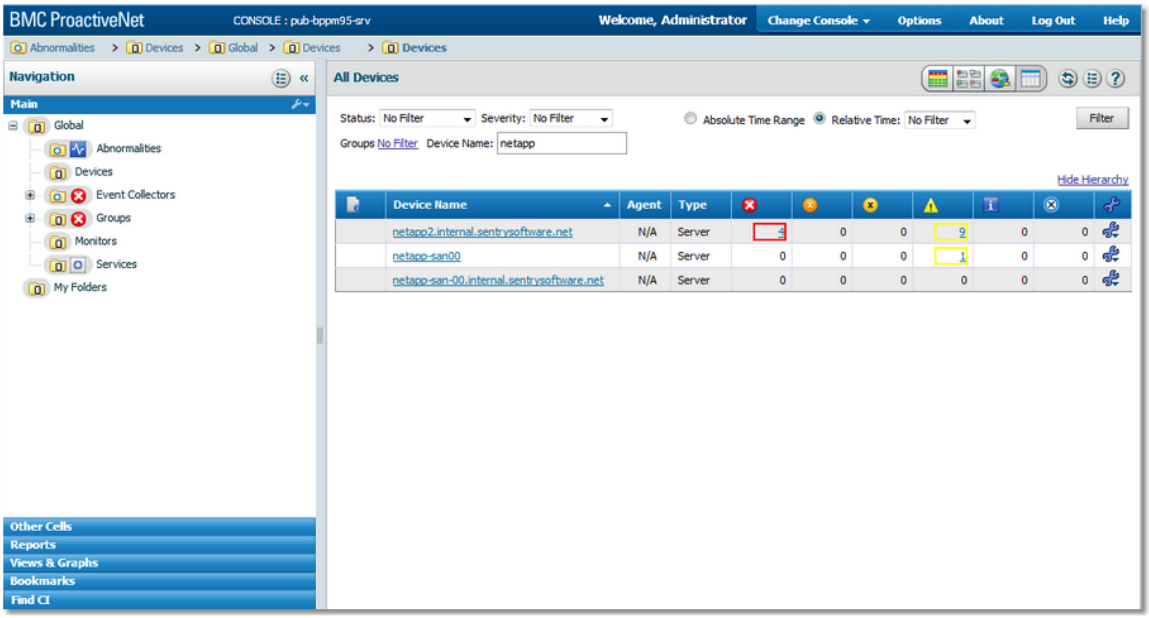
Checking Available Spare Disks

To avoid any loss of critical data, it is essential for a filer to always maintain a pool of spare disks that can replace the faulty disk when a disk failure occurs. A filer without any left spare disk will not be able to keep the level of data safety and performance in case of a disk failure.

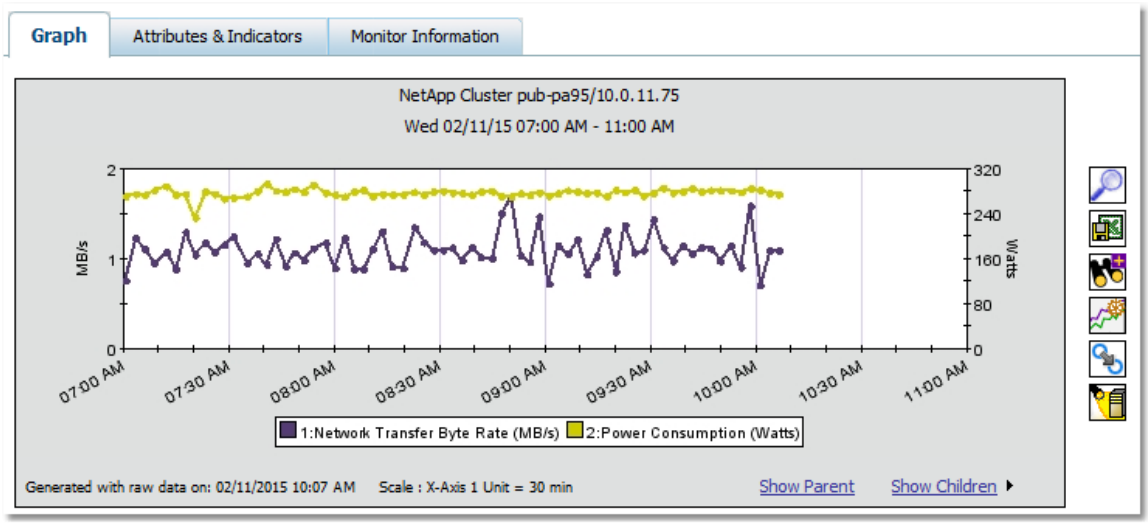
The **Spare Disk Count** attribute reports the number of spare disks available for each filer monitored with the solution. By default, a warning is triggered when no spare disk is available (**Spare Disk Count** is set to zero).

To verify the number of available spare disks

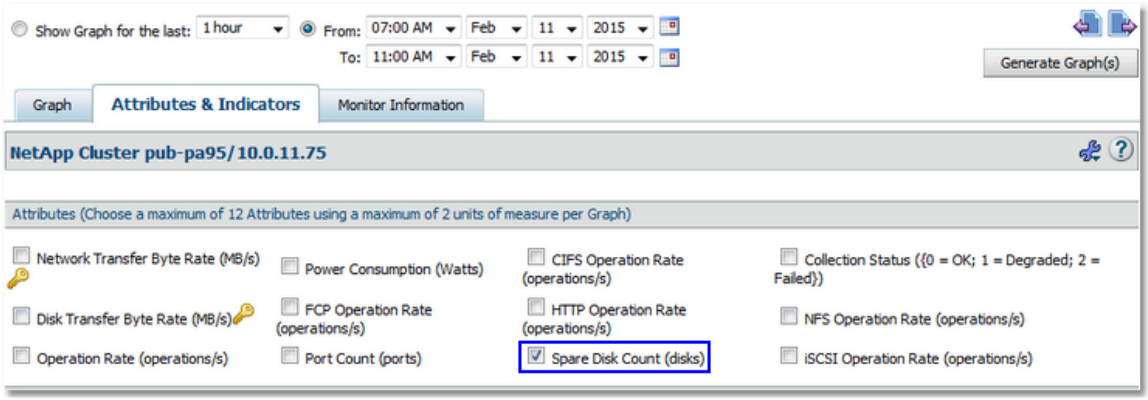
1. Log on to the BMC ProactiveNet Operations Console.
2. Display the list of devices monitored by BPPM:
   - In the **Navigation** frame, select the **Main** drawer.
   - Click **Devices**.
   - Click  to display the list of devices in a grid.



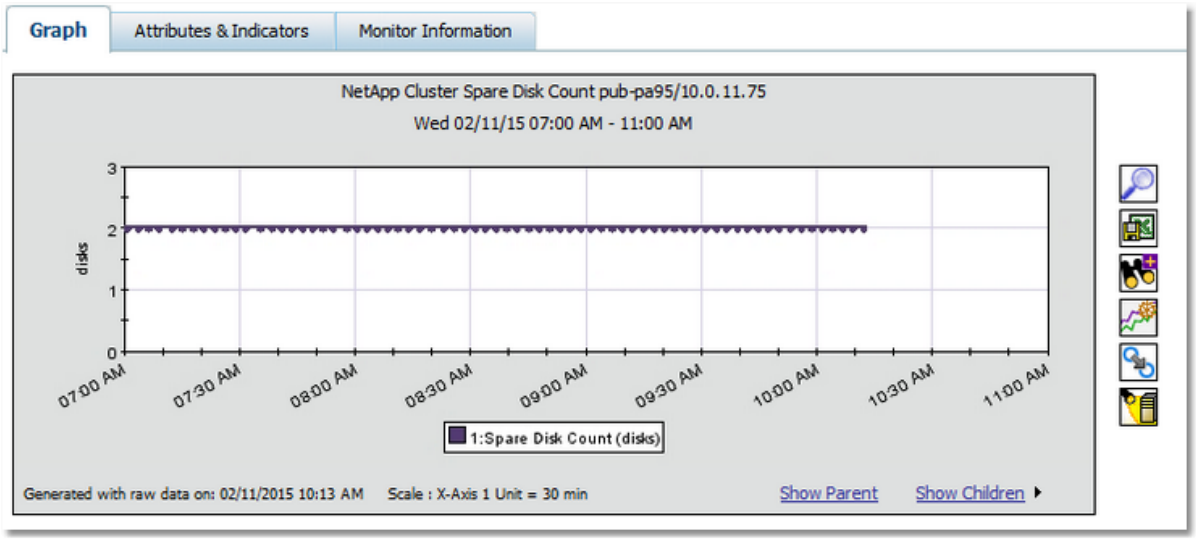
3. Click the device for which you need to check the available spare disks.
4. The list of monitors is displayed. Click for the NetApp Cluster.



5. The **Network Transfer Byte Rate** and **Power Consumption** attributes are displayed by default. To display the **Spare Disk Count** attribute:
   - Click the **Attributes & Indicators** tab.
   - Uncheck **Network Transfer Byte Rate** and **Power Consumption**.
   - Check **Spare Disk Count (disks)**.



6. Click **Generate Graph(s)**.



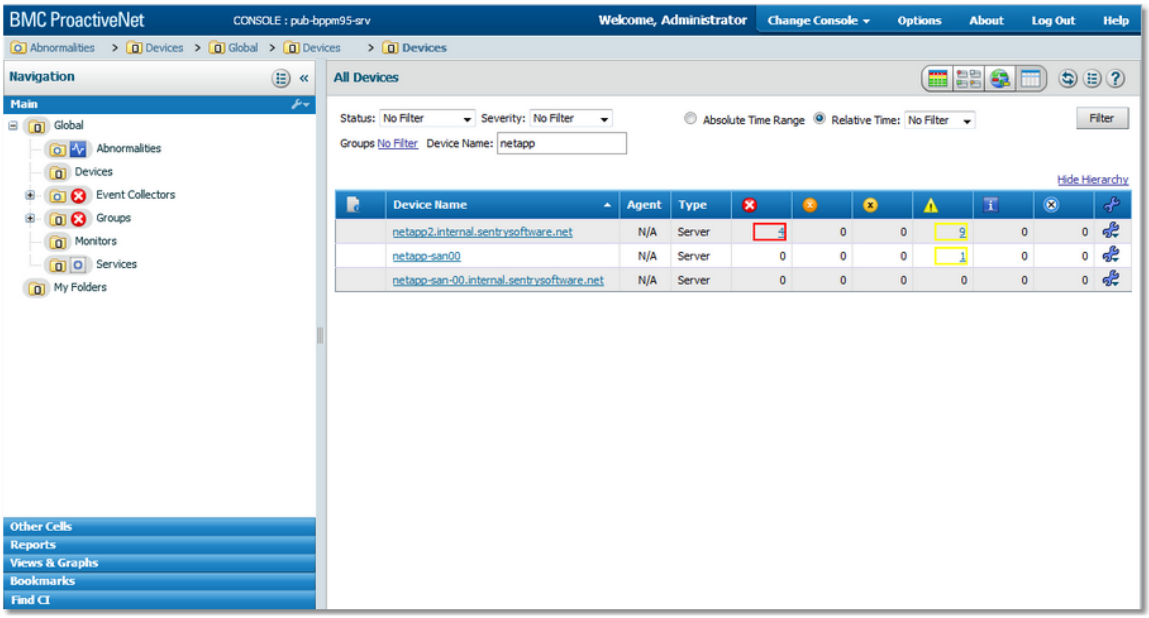
7. Add the graph to the view. Click  . A pop-up is displayed.
8. Click **Add to View**.
9. In the **View Title** field, type the name of the view (**NetApp Cluster - Available Spare Disks**) and click **Add View**. The **View created successfully** message appears. Click **Close**.
10. The view is now created and available under the **Views & Graphs** drawer in the **Navigation** pane.

Checking Disks Health

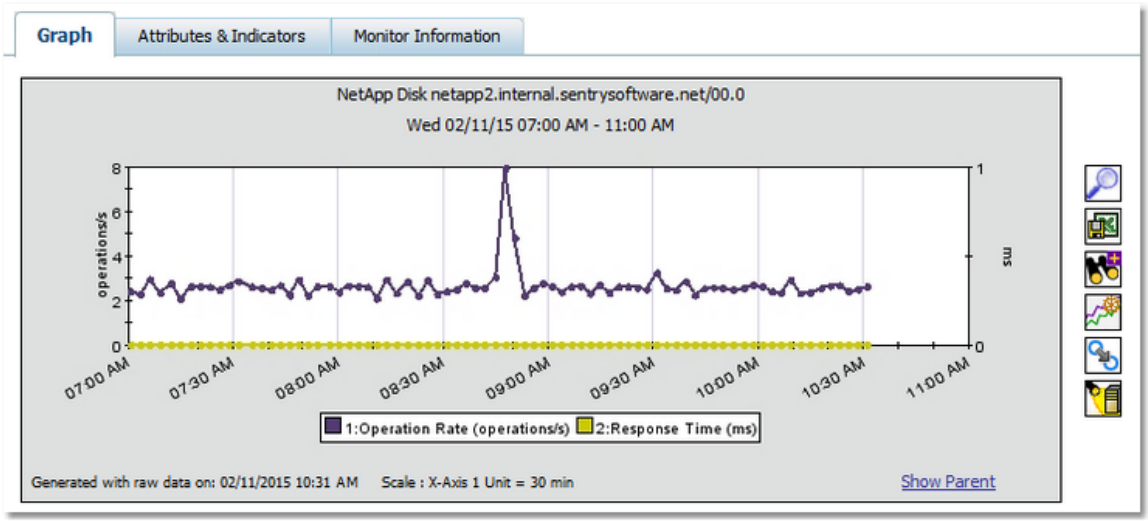
Manufacturers use the “mean time to failure” or MTTF to indicate the operational reliability of their products. But the advertised MTTF of 1,000,000 hours is misleading. Recent studies show that the average annual replacement rate for hard disks is typically between 3% and 15%. Because a disk failure can result in loss of data, unavailability and performance degradation, it is highly recommended to monitor disks health.

To monitor disks

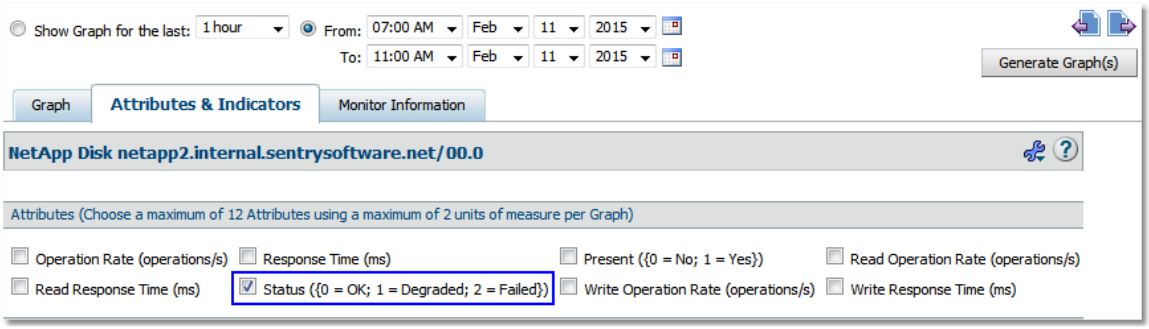
1. Log on to the BMC ProactiveNet Operations Console.
2. Display the list of devices monitored by BPPM:
   - In the **Navigation** frame, select the **Main** drawer.
   - Click **Devices**.
   - Click  to display the list of devices in a grid.



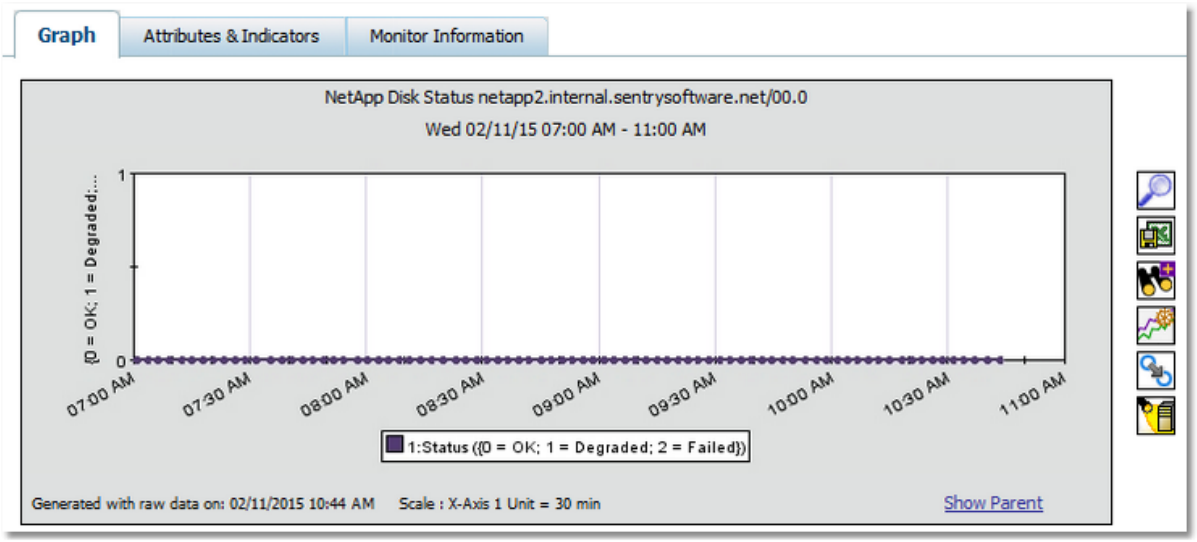
3. Click a device.
4. The list of monitors is displayed. Click  for the **NetApp Disk** for which you need to check the health.



5. The **Operation Rate** and **Response Time** attributes are displayed by default. To display the **Status** attribute:
   - Click the **Attributes & Indicators** tab.
   - Uncheck **Operation Rate** and **Response Time**.
   - Check **Status**.



6. Click **Generate Graph(s)**.



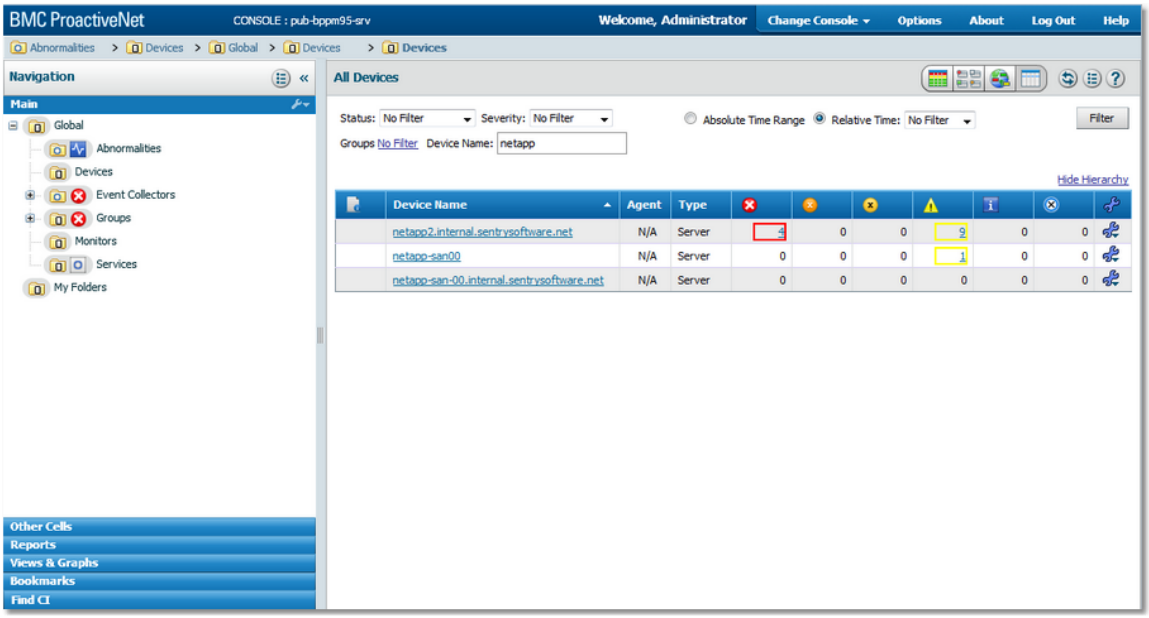
7. Add the graph to the view. Click  . A pop-up is displayed.
8. Click **Add to View**.
9. In the **View Title** field, type the name of the view (**NetApp Disk Health**) and click **Add View**. The **View created successfully** message appears. Click **Close**.
10. The view is now created and available under the **Views & Graphs** drawer in the **Navigation** pane.
11. Resume the procedure to add to the **NetApp Disk Health** view as many NetApp Disks as required.

Detecting High Processor Utilization

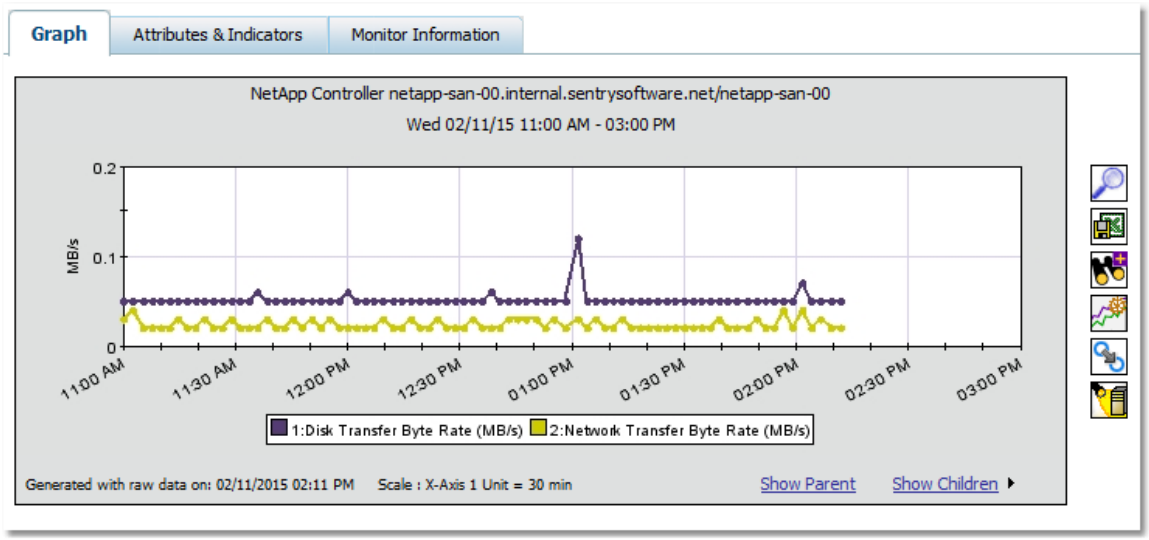
A processor overload can lead to unpredictable performance degradations in a filer. To prevent such problems, administrators need to monitor the **Processor Utilization** attribute on each filer to diagnose whether the filer processor constitutes the performance bottleneck.

To detect high processor utilization:

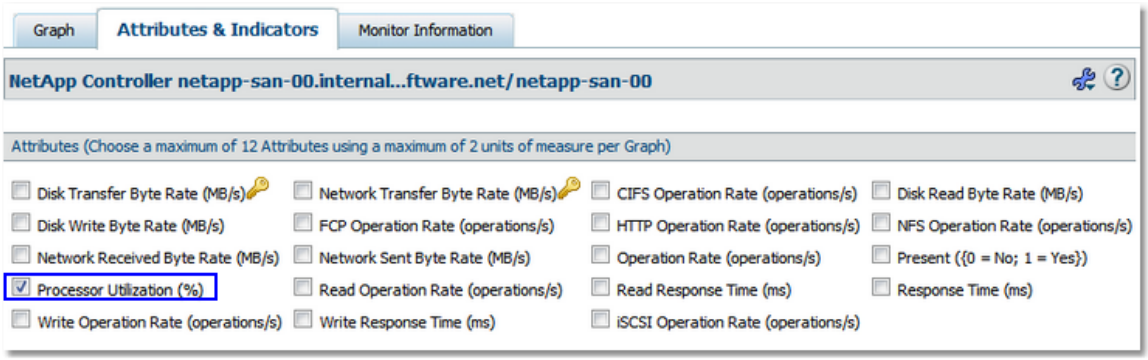
1. Log on to the BMC ProactiveNet Operations Console.
2. Display the list of devices monitored by BPPM:
   - In the **Navigation** frame, select the **Main** drawer.
   - Click **Devices**.
   - Click  to display the list of devices in a grid.



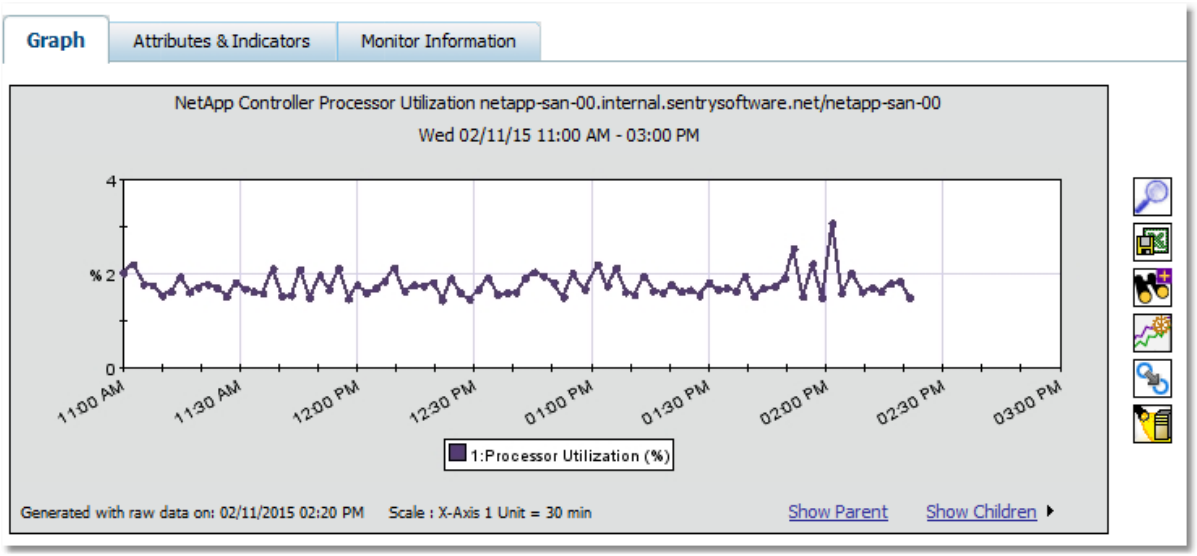
3. Click the device for which you need to compare the controllers' processor utilization.
4. Click for the **NetApp Controller**.



5. The **Disk Transfer Byte Rate** and **Network Transfer Byte Rate** attributes are displayed by default. To display the **Processor Utilization** attribute:
   - Click the **Attributes & Indicators** tab.
   - Uncheck **Disk Transfer Byte Rate** and **Network Transfer Byte Rate**.
   - Check **Processor Utilization**.



6. Click **Generate Graph(s)**.



7. Add the graph to the view. Click  . A pop-up is displayed.
8. Click **Add to View**.
9. In the **View Title** field, type the name of the view (**NetApp - High Processor Utilization**) and click **Add View**. The **View created successfully** message appears. Click **Close**.
10. The view is now created and available under the **Views & Graphs** drawer in the **Navigation** pane.

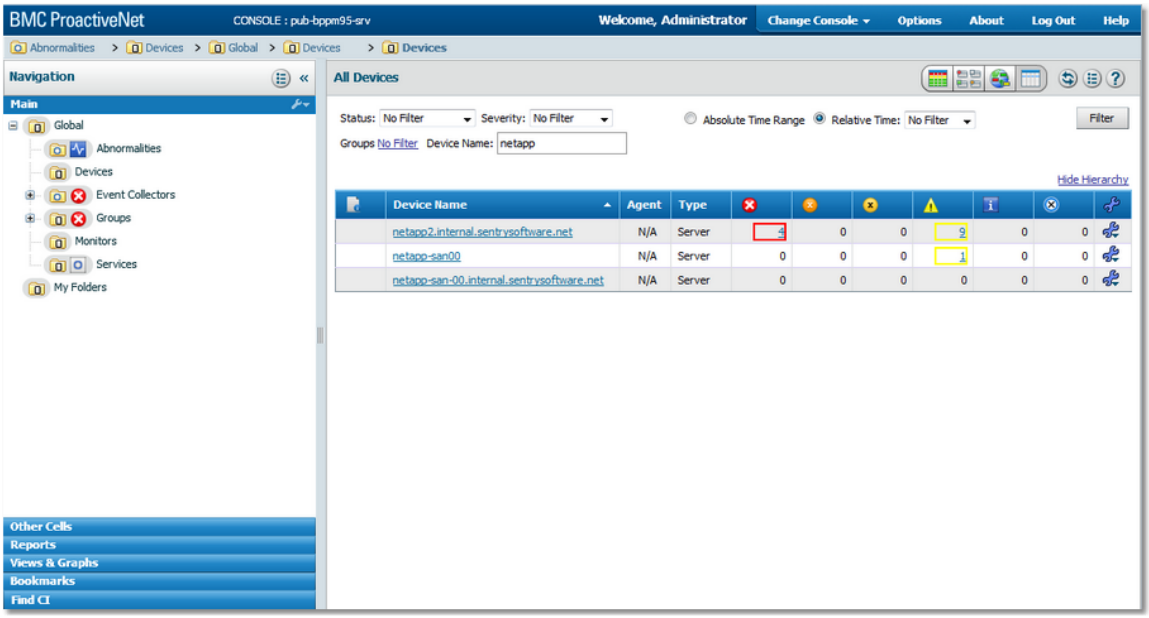
A processor utilization over 80% means that this controller is overloaded and that the filer constitutes a bottleneck.

Detecting a Controller Overload

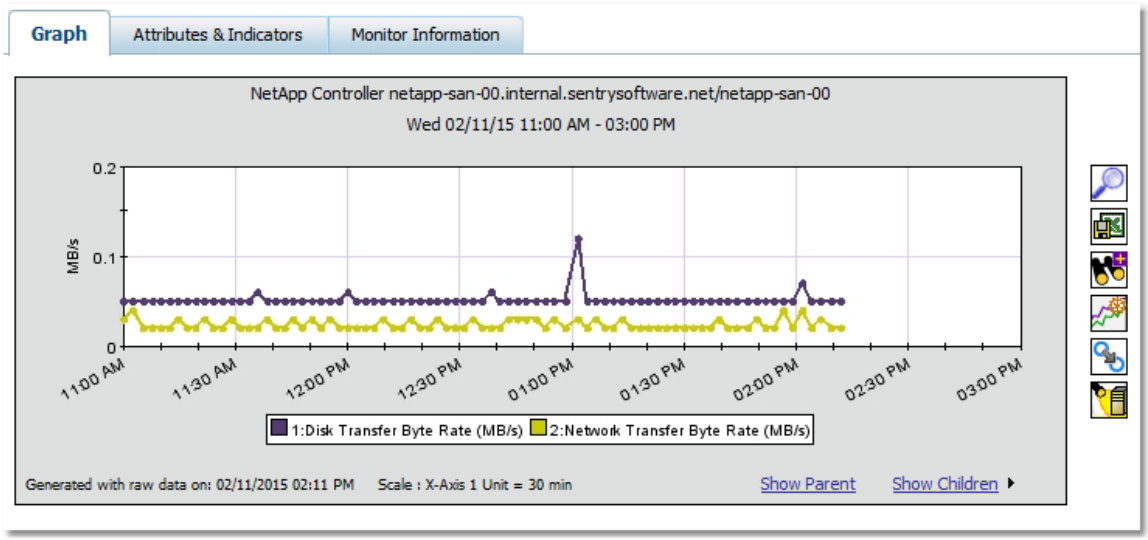
A controller (which is referred to as a node in Cluster-Mode) manages the flow of information between the server and the data, assigning two paths, in case one of the paths fails or is overloaded. For the best levels of performance and availability, every layer of technology must be balanced.

Comparing the Processor Utilization of your Controllers

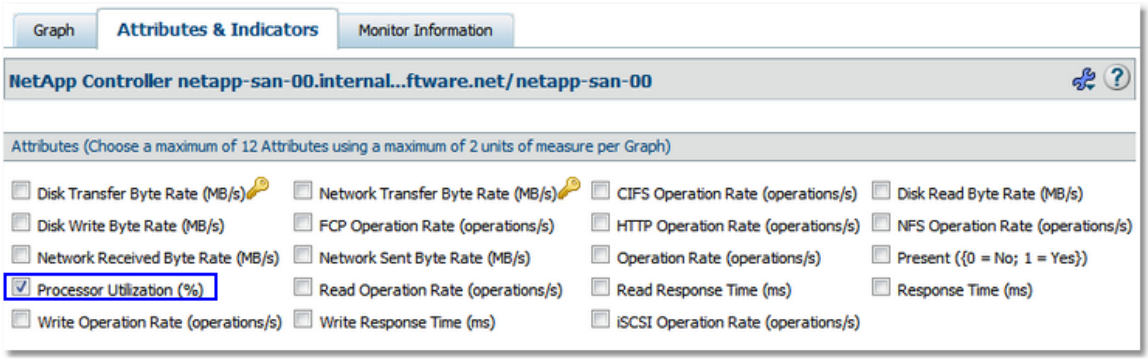
1. Log on to the BMC ProactiveNet Operations Console.
2. Display the list of devices monitored by BPPM:
   - In the **Navigation** frame, select the **Main** drawer.
   - Click **Devices**.
   - Click  to display the list of devices in a grid.



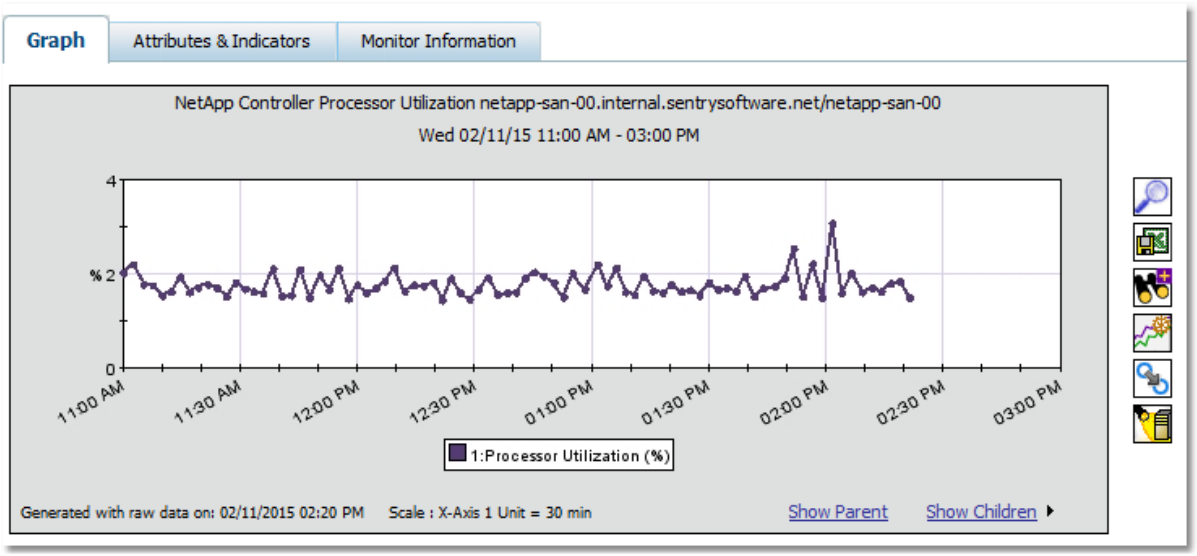
3. Click the device for which you need to compare the controllers' processor utilization.
4. Click for the **NetApp Controller**.



5. The **Disk Transfer Byte Rate** and **Network Transfer Byte Rate** attributes are displayed by default. To display the **Processor Utilization** metric:
   - Click the **Attributes & Indicators** tab.
   - Uncheck **Disk Transfer Byte Rate** and **Network Transfer Byte Rate**.
   - Check **Processor Utilization**.



6. Click **Generate Graph(s)**.



7. Add the graph to the view. Click  . A pop-up is displayed.
8. Click **Add to View**.
9. In the **View Title** field, type the name of the view (**NetApp - High Processor Utilization**) and click **Add View**. The **View created successfully** message appears. Click **Close**.
10. The view is now created and available under the **Views & Graphs** drawer in the **Navigation** pane.
11. Resume the procedure to add the other controller in the **NetApp - High Processor Utilization**.

If the Processor Utilization on one controller goes above 80% while the other controller stays almost idle, it indicates that one of the controllers constitutes a bottleneck for the storage system that could be alleviated by better sharing the load between the controllers.

Verifying the Controllers Response Time

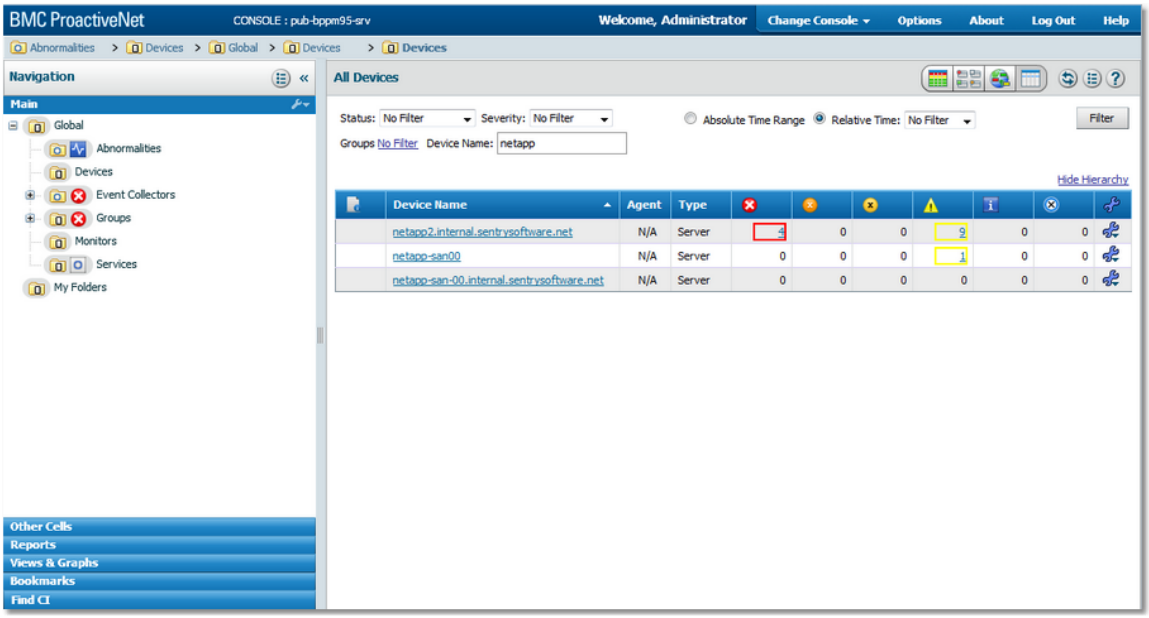
The **Response Time** attribute of the **NetApp Controller** monitor type, represents the average time it took the controllers to process the read and write requests of the hosts. The higher the **Response Time** goes, the slower I/Os the servers will get. By default, the solution triggers a warning when the controller takes more than 30 milliseconds on average to complete the I/O requests and an alarm when the response time reaches 100 milliseconds.

Identifying Aggregates with Space Reservation Enabled

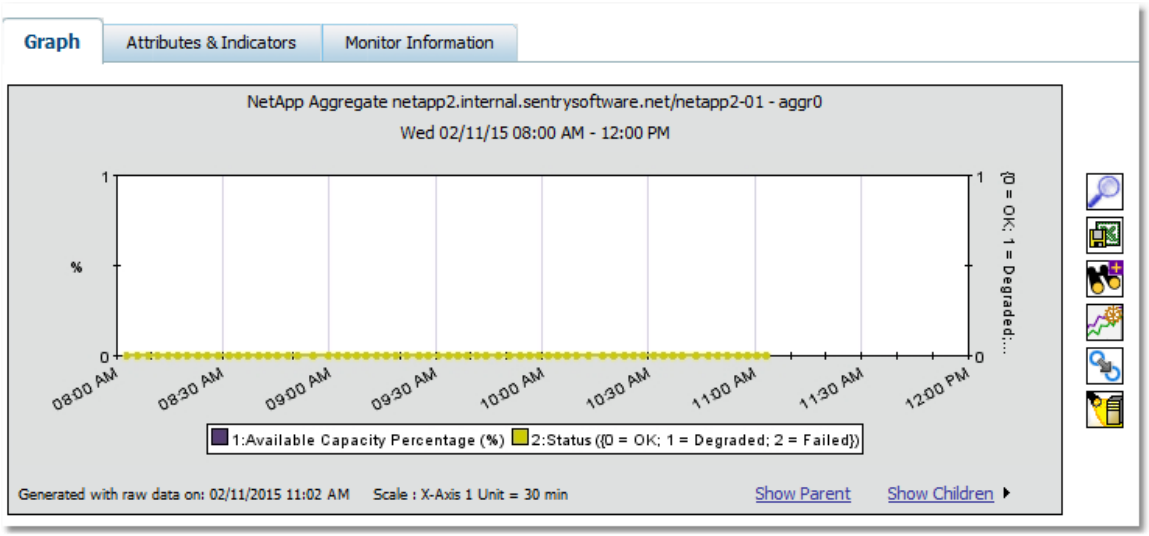
Enabling snapshots for a volume can sometimes lead to data loss or corruption if the additional space required to store the previous version(s) of the modified or deleted blocks is running out. To avoid this problem, NetApp allows administrators to reserve space in advance in the volume. As an administrator, you may need to know whether your aggregates or LUNs have this option enabled. This information is provided by the **Space Reservation Status** attribute of the NetApp Aggregate or NetApp LUN monitor types.

Identifying Aggregates with Space Reservation Enabled

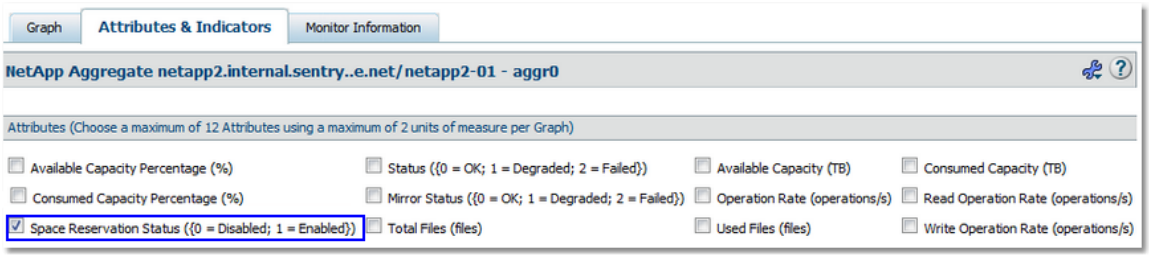
1. Log on to the BMC ProactiveNet Operations Console.
2. Display the list of devices monitored by BPPM:
   - In the **Navigation** frame, select the **Main** drawer.
   - Click **Devices**.
   - Click  to display the list of devices in a grid.



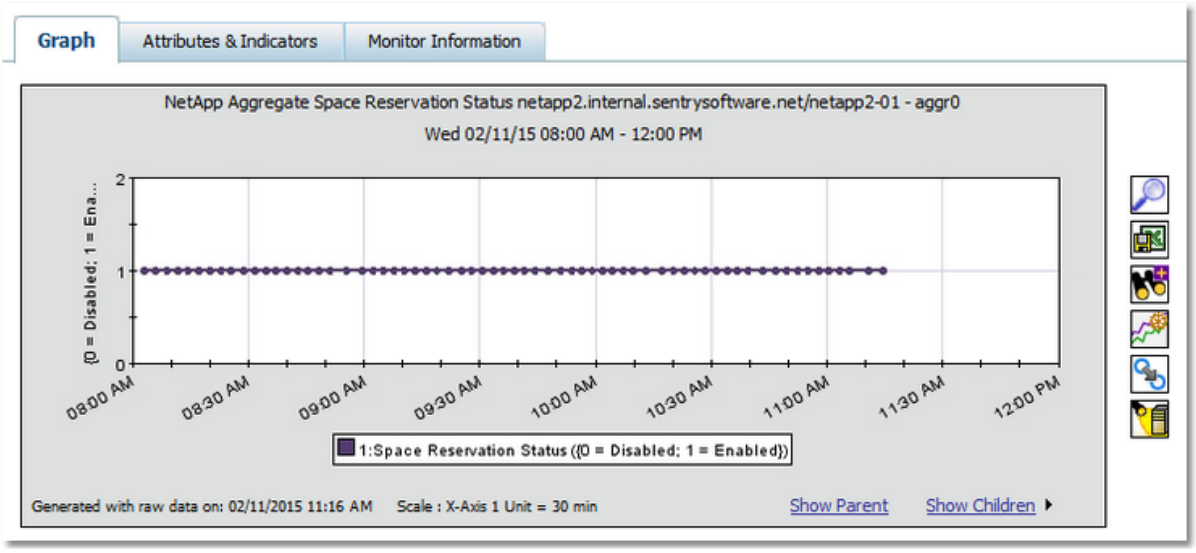
3. Click a device.
4. The list of monitors is displayed. Click  for the **NetApp Aggregate** or **NetApp LUN** for which you need to verify whether space has been reserved in advance.



5. The **Available Capacity Percentage** and **Status** attributes are displayed by default. To display the **Space Reservation Status** attribute:
   - Click the **Attributes & Indicators** tab
   - Uncheck **Available Capacity Percentage** and **Status**
   - Check **Space Reservation Status**.



6. Click **Generate Graph(s)**.



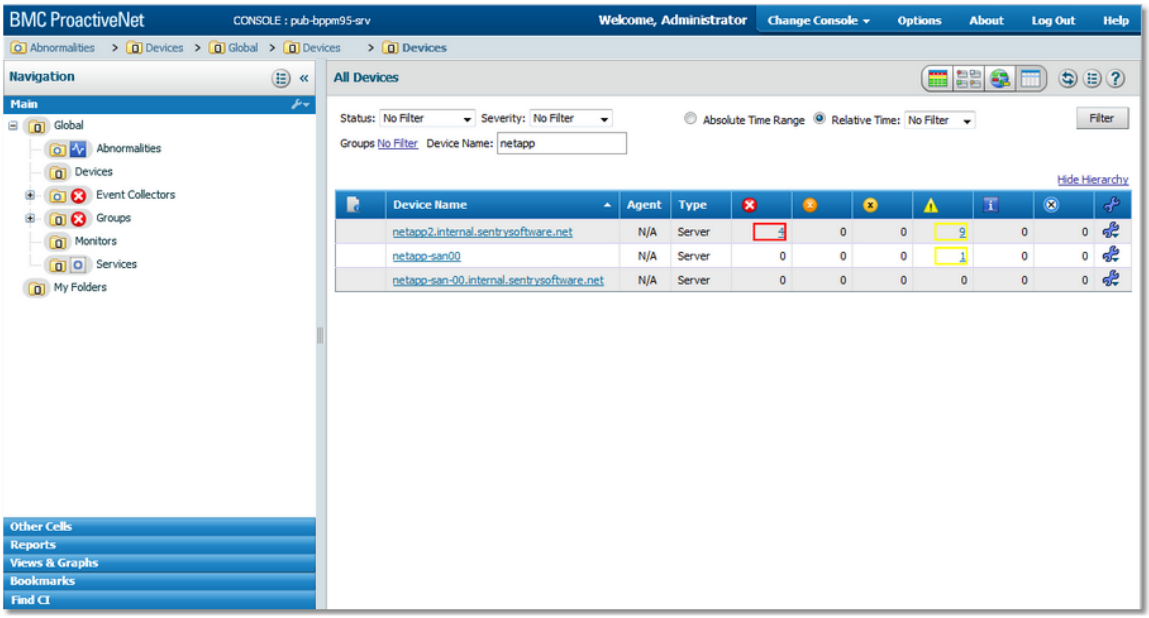
7. Add the graph to the view. Click  . A pop-up is displayed.
8. Click **Add to View**.
9. In the **View Title** field, type the name of the view (**NetApp - Space Reservation Status**) and click **Add View**. The **View created successfully** message appears. Click **Close**.
10. The view is now created and available under the **Views & Graphs** drawer in the **Navigation** pane.

Identifying Busiest Volumes

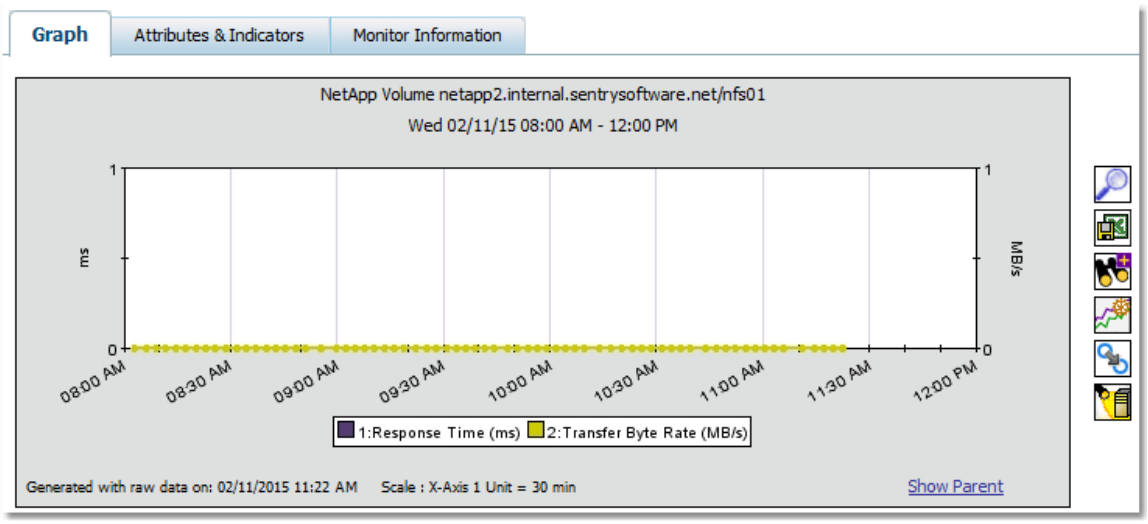
To identify the volumes that generate the most traffic, you can create a specific view that will display the **Read Byte Rate** and **Write Byte Rate** attributes of the **NetApp Volume** Monitor Type.

Creating the Busiest Volumes View

1. Log on to the BMC ProactiveNet Operations Console.
2. Display the list of devices monitored by BPPM:
   - In the **Navigation** frame, select the **Main** drawer.
   - Click **Devices**.
   - Click  to display the list of devices in a grid.



3. Click a device.
4. The list of monitors is displayed. Click  for the **NetApp Volume** for which you need to verify the traffic.



5. The **Response Time** and **Transfer Byte Rate** attributes are displayed by default. To display the **Read Byte Rate** and **Write Byte Rate** attributes:
   - Click the **Attributes & Indicators** tab.
   - Uncheck **Response Time** and **Transfer Byte Rate**.
   - Check **Read Byte Rate** and **Write Byte Rate**.

6. Click **Generate Graph(s)**.
7. Add the graph to the view. Click  . A pop-up is displayed.
8. Click **Add to View**.
9. In the **View Title** field, type the name of the view (**NetApp - Busiest Volumes**) and click **Add View**. The **View created successfully** message appears. Click **Close**.
10. The view is now created and available under the **Views & Graphs** drawer in the **Navigation** pane.

Reclaiming Space of Unused LUNs

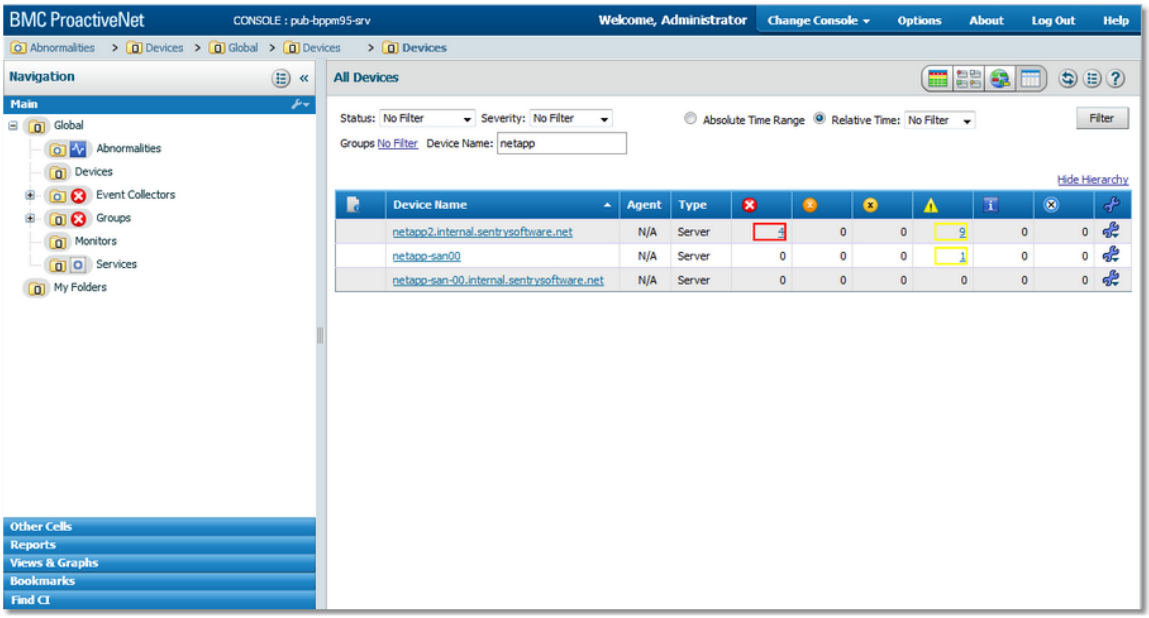
Identifying Unmapped (Orphans) LUNs

Over time, as servers connected to a SAN get decommissioned, administrators find an increasing number of unmapped LUNs, or volumes that are no longer used by any server. These LUNs, while unused, still occupy disk space in the filer. Being able to identify such unmapped LUNs and reclaim the disk space uselessly consumed by these LUNs will help administrators avoid unnecessary upgrades and extensions of their filers. To know the LUNs in a filer that are not mapped to any server and therefore safe to remove, you can generate an automatic LUNs Mapping Table report

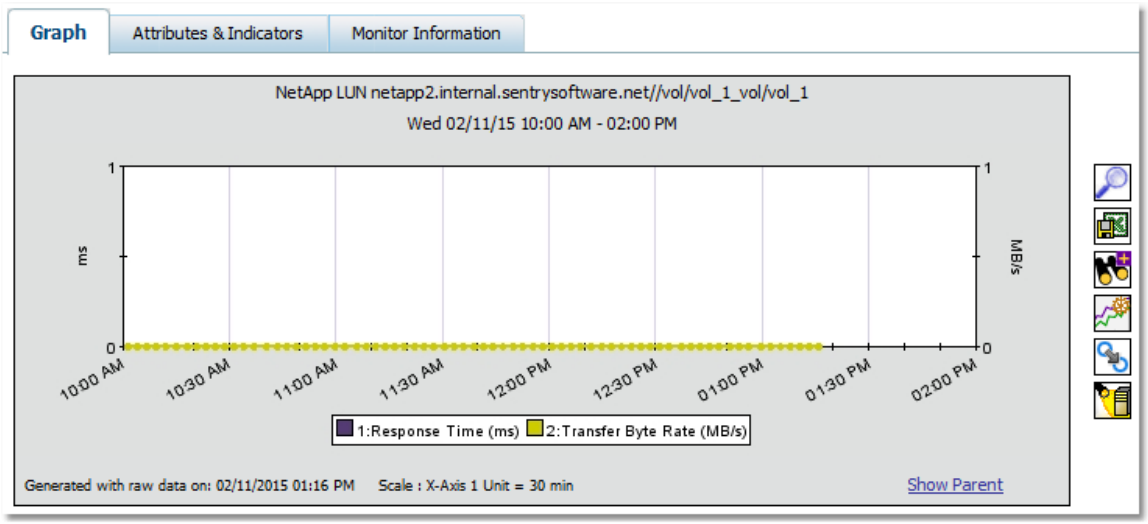
Identifying Unused LUNs

When a server is decommissioned or reconfigured, its associated LUNs can stay mapped preventing storage administrator from accurately identifying unused LUNs. Since the solution monitors permanently the traffic on each LUN, it becomes easy to detect LUNs for which the activity is null.

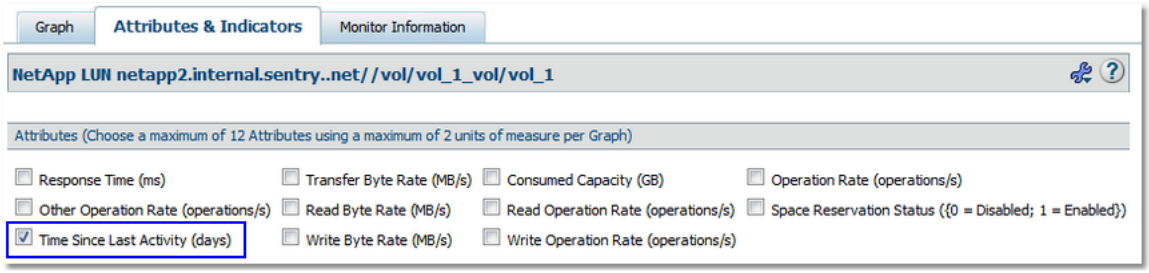
1. Log on to the BMC ProactiveNet Operations Console.
2. Display the list of devices monitored by BPPM:
   - In the **Navigation** frame, select the **Main** drawer.
   - Click **Devices**.
   - Click  to display the list of devices in a grid.



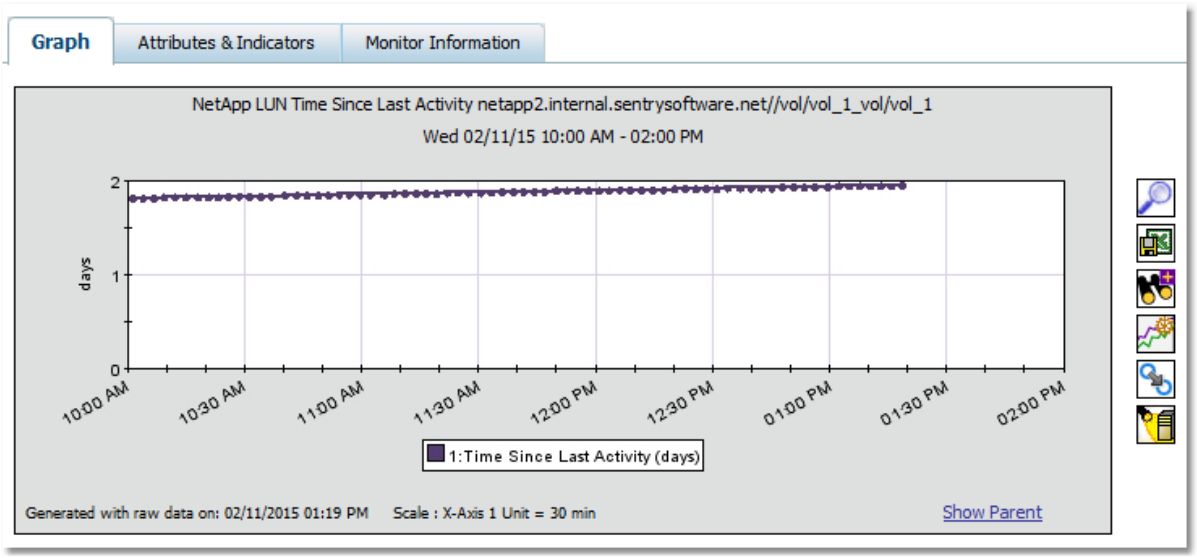
3. Click a device.
4. The list of monitors is displayed. Click  for the **NetApp LUN** for which you need to verify whether its activity is null.



5. The **Response Time** and **Transfer Byte Rate** attributes are displayed by default. To display the **Time Since Last Activity** attribute:
   - Click the **Attributes & Indicators** tab.
   - Uncheck **Response Time** and **Transfer Byte Rate**.
   - Check **Time Since Last Activity**.



6. Click **Generate Graph(s)**.



7. Add the graph to the view. Click  . A pop-up is displayed.
8. Click **Add to View**.
9. In the **View Title** field, type the name of the view (**NetApp LUN - Time Since Last Activity**) and click **Add View**. The **View created successfully** message appears. Click **Close**.
10. The view is now created and available under the **Views & Graphs** drawer in the **Navigation** pane.

The value collected for this attribute upon the first collect reflects the number of days since any activity occurred on the volume for the time observed by the monitoring solution, i.e. this first collected metric might not reflect the actual absence of activity on the volume.

Reporting Disk Space Consumption

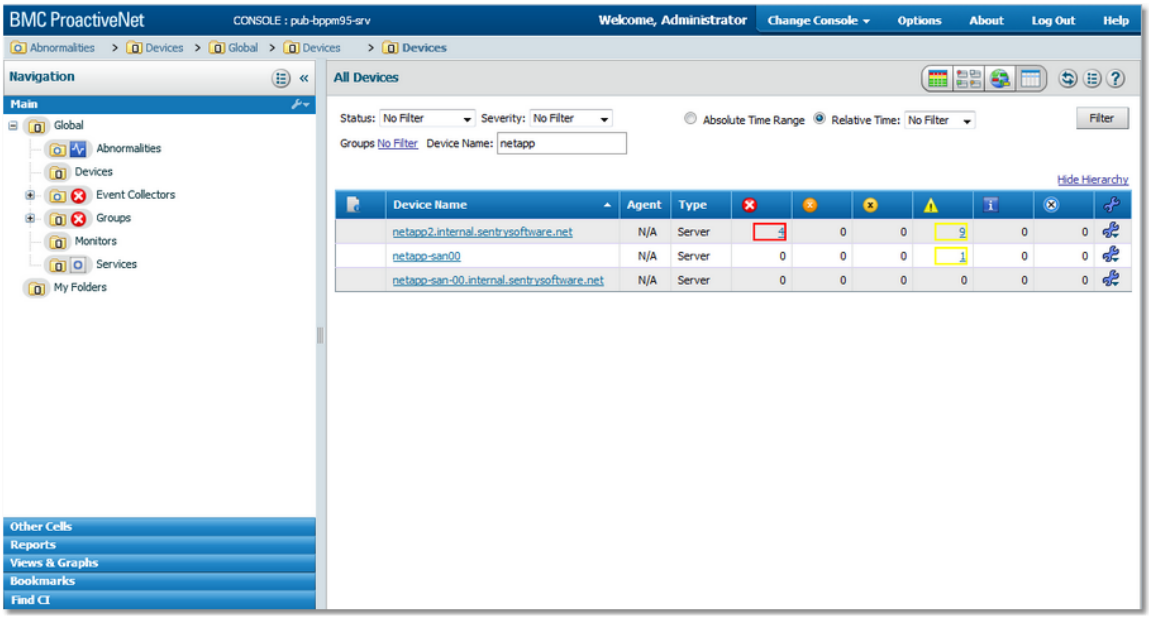
Making sure that a filer has enough remaining disk space available is critical for several reasons:

- SAN administrators want to make sure to be able to provision disk space for new servers and users when requested, as quickly as possible.
- The filer itself may need additional disk space for specific features to work properly, like automatic snapshots, mirroring, etc.
- Users and applications actively using a share on the filer will surely be severely impacted by the fatal "File system is full" error message

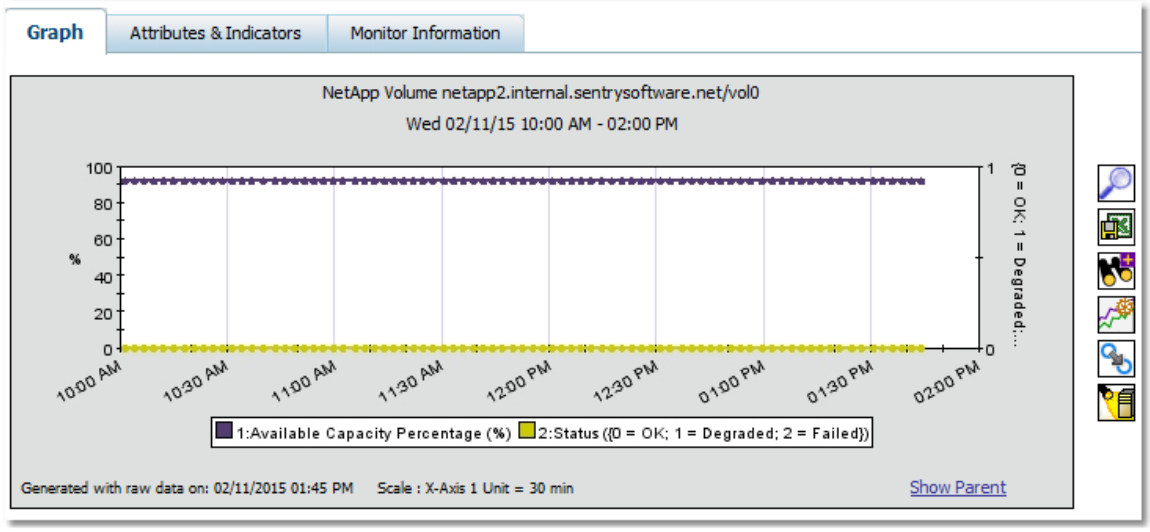
The disk space used is permanently monitored for each aggregate and each volume with the **NetApp Aggregate** and **NetApp Volume** monitor types.

Reporting Disk Space Consumption on a Volume and an Aggregate

1. Log on to the BMC ProactiveNet Operations Console.
2. Display the list of devices monitored by BPPM:
   - In the **Navigation** frame, select the **Main** drawer.
   - Click **Devices**.
   - Click  to display the list of devices in a grid.



3. Click a device.
4. The list of monitors is displayed. Click  for the **NetApp Aggregate** or **NetApp Volume** for which you need to know the disk space consumption.
5. Check the value of the **Available Capacity Percentage** attribute.



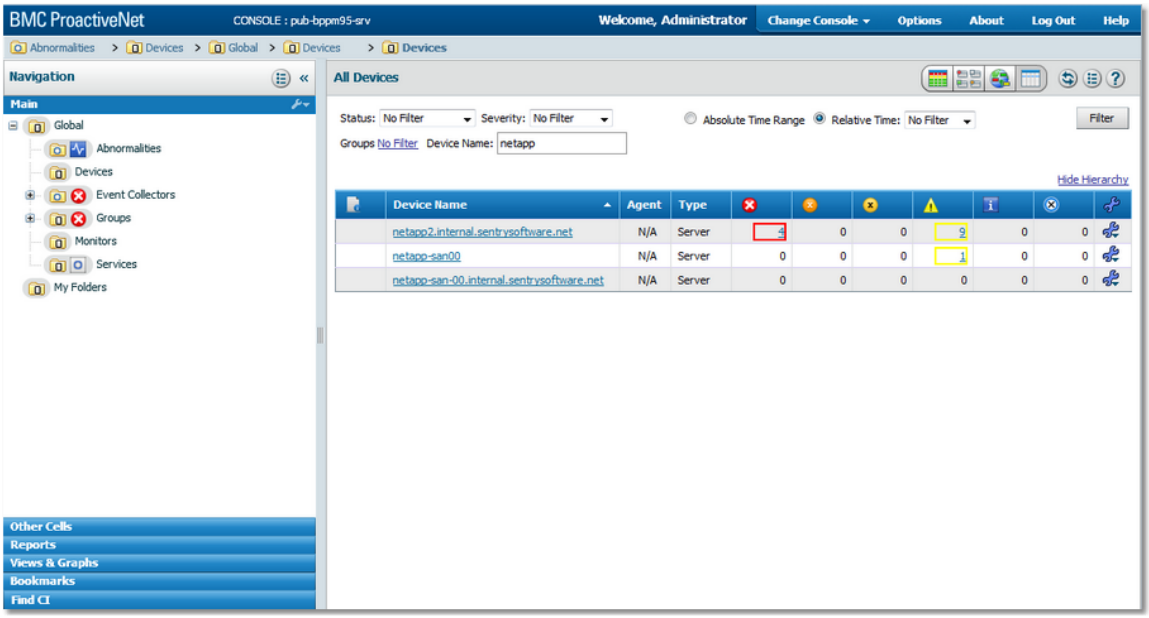
6. Add the graph to the view. Click  . A pop-up is displayed.
7. Click **Add to View**.
8. In the **View Title** field, type the name of the view (**NetApp Volume - Disk Space Consumption**) and click **Add View**. The **View created successfully** message appears. Click **Close**.
9. The view is now created and available under the **Views & Graphs** drawer in the **Navigation** pane.

Viewing the Overall Activity of a NetApp Filer

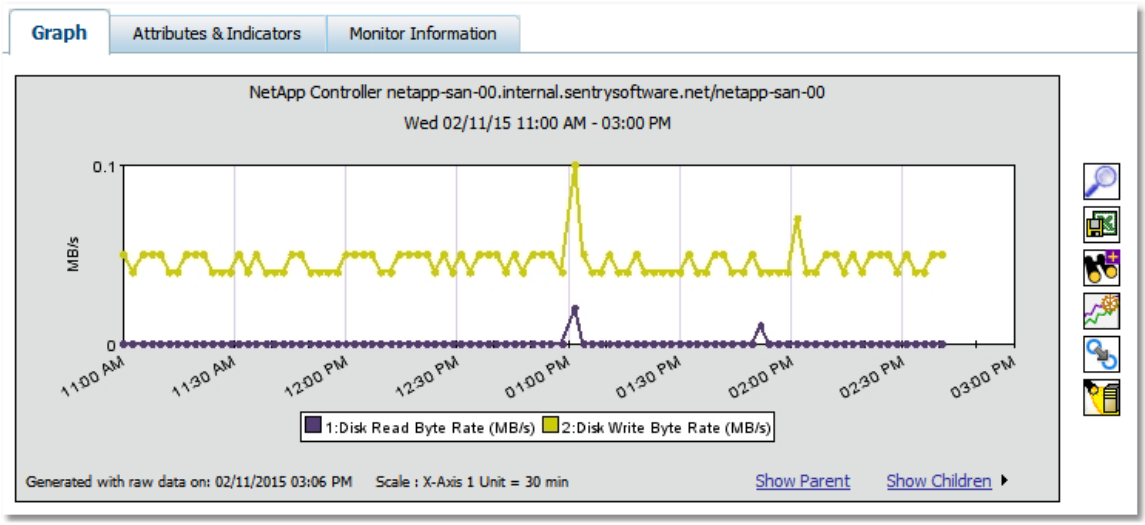
In order to visualize the activity of a NetApp Filer, use the **Disk Read Byte Rate** and **Disk Write Byte Rate** as well as the **Network Received Byte Rate** and the **Sent Byte Rate** attributes of the **NetApp Controller** or **NetApp Node** monitor type. These attributes represent the overall traffic in megabytes per second for each monitored file.

To view the overall activity

1. Log on to the BMC ProactiveNet Operations Console.
2. Display the list of devices monitored by BPPM:
   - In the **Navigation** frame, select the **Main** drawer.
   - Click **Devices**.
   - Click  to display the list of devices in a grid.

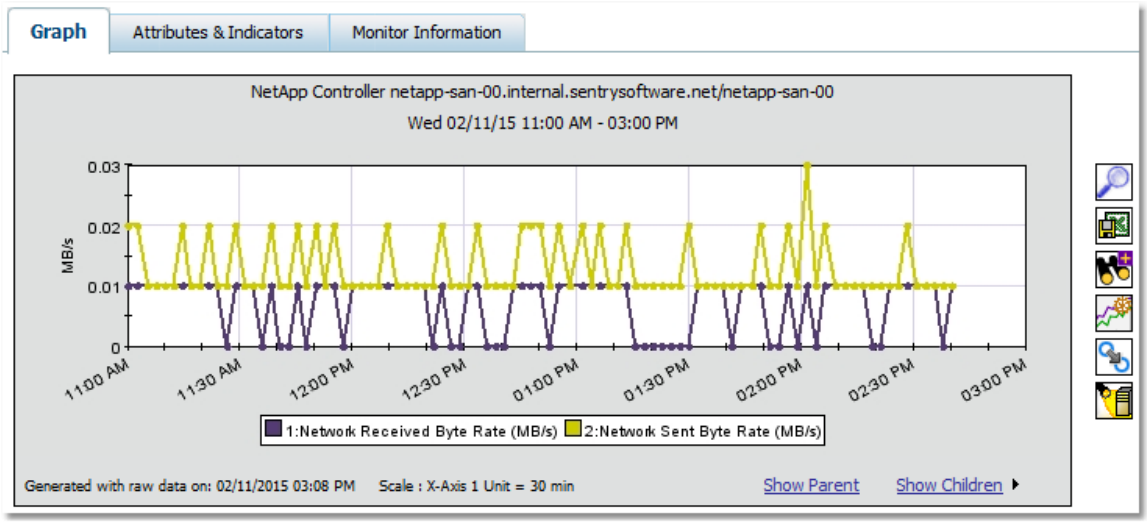


3. Click a device.
4. The list of monitors is displayed. Click  for the **NetApp Controller** for which you need to view the activity.
5. Generate a graph with the **Disk Read Byte Rate** and **Disk Write Byte Rate** attributes:
   - Click the **Attributes & Indicators** tab.
   - Only check the **Disk Read Byte Rate** and **Disk Write Byte Rate** boxes and click **Generate Graph(s)**.



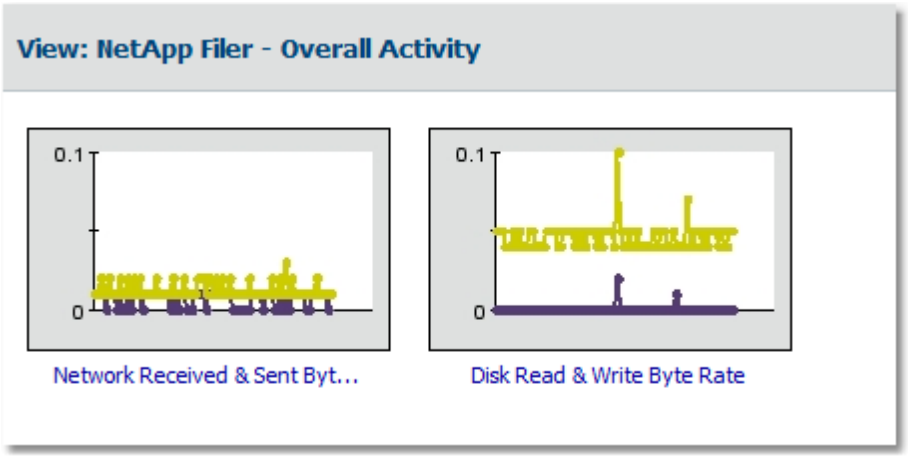
- Add the graph to the view. Click  . A pop-up is displayed.
- Click **Add to View**.
- Name your graph.
- In the **View Title** field, type the name of the view (**NetApp Filer - Overall Activity**) and click **Add View**. The **View created successfully** message appears. Click **Close**.

6. Generate a graph with the **Network Received Byte Rate** and **Sent Byte Rate** attributes:
   - Click the **Attributes & Indicators** tab.
   - Only check the **Network Received Byte Rate** and **Sent Byte Rate** boxes and click **Generate Graph(s)**.



- Add the graph to the view. Click  . A pop-up is displayed.
- Name your graph.
- From the **Add to View** pull-down list, select the **NetApp Filer - Overall Activity** view that you previously created.

The view is now created and available under the **Views & Graphs** drawer in the **Navigation** pane.

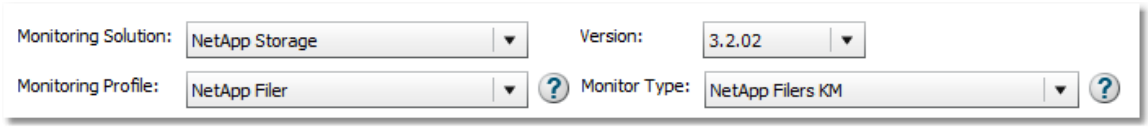


Configuring Monitor Settings

When you create or edit a policy, you can add and configure monitor types. The **Add Monitor Types** dialog box presents configuration fields for compatible BMC PATROL monitoring solutions that are located in the Central Monitoring Repository.

To configure the Monitor Type settings

1. Log on to **Central Monitoring Administration**.
2. Create a **Monitoring Policy**:
   - In the **Navigation** pane, click the **Policies** drawer
   - Expand the **Monitoring** folder and select a policy view (e.g. **All**).
   - Click . The **Monitoring Policy Configuration** wizard is displayed.
   - Click **Next**.
   - Define the general policy details and select the agent. For more information, refer to the BMC TrueSight Operations Management Documentation.
   - Click **Next** to configure the monitor type.
3. Add a **Monitor Type**:
   - Click **Add**
   - From the **Monitoring Solution** menu, select **NetApp Storage**.
   - From the **Version** menu, select the required version.

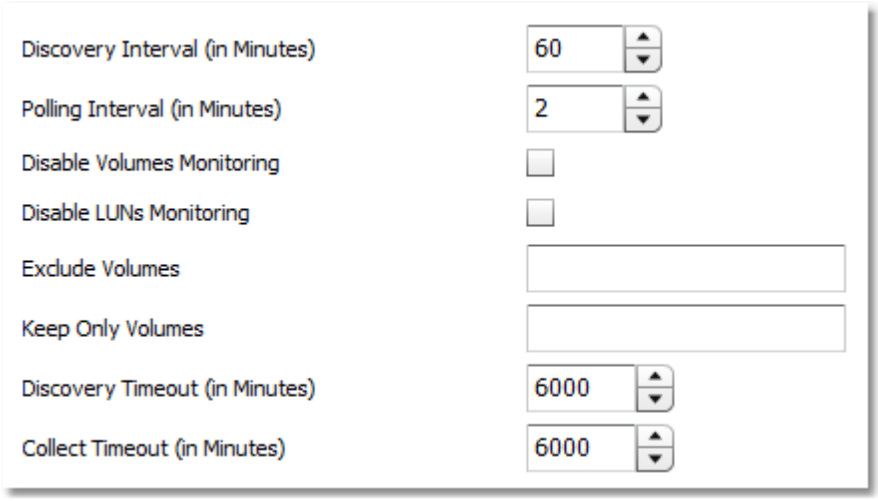


Specifying the Monitoring Solution and Monitor Type

4. Configure the connection settings to the NetApp Filer you wish to monitor:
   - **Mode**: Select the connection mode of the version of the Data ONTAP operating System installed on your NetApp Filer.

- **Hostname**: If your NetApp Filer runs a Data ONTAP 7-Mode, enter the name (or the IP address) of the main controller of the NetApp Filer you wish to monitor; if your NetApp Filer runs a Data ONTAP Cluster-mode, enter the name (or the IP address) of the clustered NetApp Filer you wish to monitor
- **Partner Hostname**: If your NetApp Filer runs a Data ONTAP 7-Mode, you can enter the Partner Hostname, i.e the name (or IP address) of the second controller of the NetApp Filer you wish to monitor (optional)
- **Port Number**: Use the spin button to set the port number used by the Data ONTAP Service. By default, the Data ONTAP Service uses port 443 with encryption or port 80 without encryption.
- **Encryption**: Check this option to encrypt the connection.
- **NetApp Filer Credentials**: Enter the username and password that will be used to connect to the NetApp Filer.

5. Click **Add to List** to create the new connection and click **Update**.
6. (Optional) If needed:
   - Configure the discovery interval
   - Configure the polling interval
   - Filter LUNs and Volumes to monitor
   - Configure the discovery timeout
   - Configure the collect timeout



7. (Optional) Click the **Advanced Settings** button if you *need* to:
   - enable the debug mode
   - set advanced configuration variables

8. (Optional) Click the **Schedule** button if you *need* to schedule automatic reports.

9. (Optional) Click the **Alert Actions** button if you *need* to indicate the specific actions to be executed when a storage problem is detected.

10. Click **Add**. If the monitor configuration has been successfully added, click **Close**.
11. Click **Finish** to save your monitoring policy.

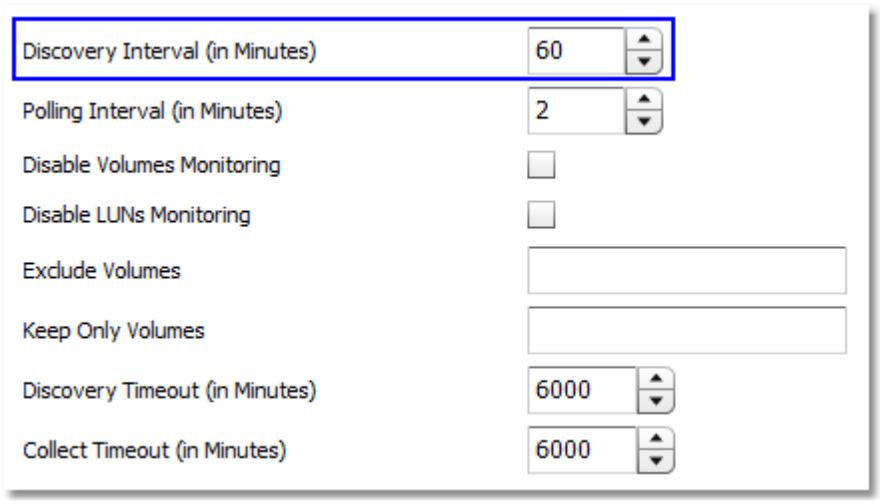
Configuring the Discovery Interval

TrueSight Operations Management - NetApp Storage periodically performs discoveries to detect new components in your monitored environment. By default, the solution runs a discovery every hour, but you can customize this interval to match your specific needs.

According to the Data ONTAP mode, 7-Mode or Cluster-Mode, the discovery interval will apply to either the NetApp Filer or the entire cluster.

To configure the discovery interval

1. Edit the policy that applies to the PATROL Agent for which you need to configure the discovery interval.
2. Click the **Monitor Configuration** link.
3. Select the **Monitor Type** to edit and click .
4. In the **List - NetApp Filers** section, select the NetApp filer for which you need to configure the discovery interval.



Configuring the Discovery Interval

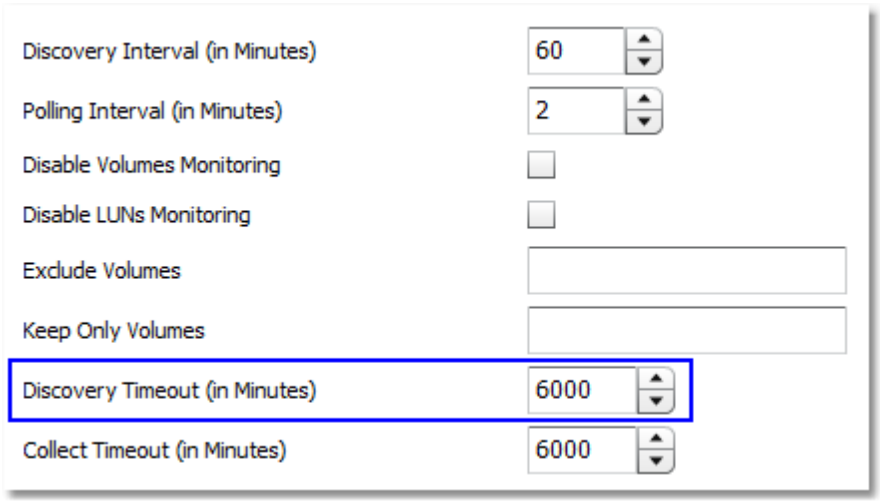
5. Enter the frequency of the discovery process in the **Discovery Interval (in Minutes)** field. Use the spin button to enter the appropriate number of minutes. By default, the discovery interval is set to 60 minutes.
6. Click **Modify Selection**.
7. Click **Update** to save your settings.

Configuring the Discovery Timeout

To optimize the monitoring on large environments, you can customize the discovery timeout. By default the discovery timeout is set to 6000 minutes.

To configure the discovery timeout

1. Edit the policy that applies to the PATROL Agent for which you need to configure the discovery timeout.
2. Click the **Monitor Configuration** link.
3. Select the **Monitor Type** to edit and click .
4. In the **List - NetApp Filers** section, select the NetApp filer for which you need to configure the discovery timeout.



Configuring the Discovery Interval

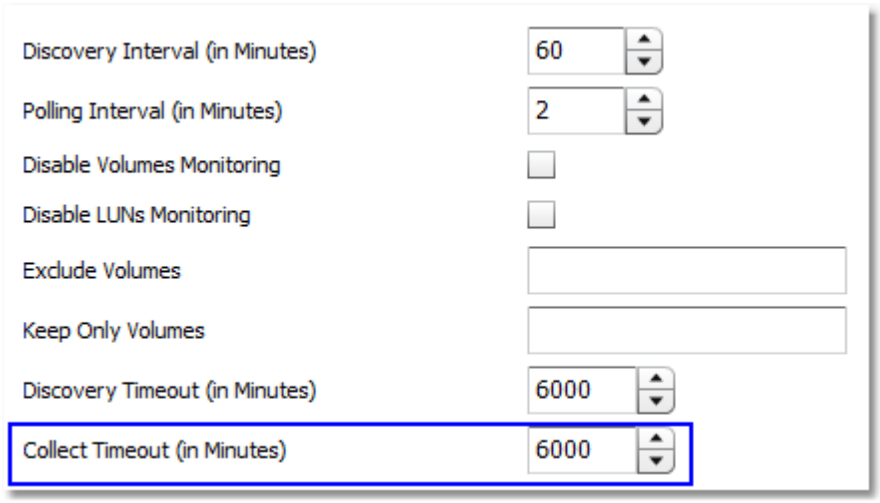
5. In the **Discovery Timeout** field, specify the number of minutes after which the discovery should be stopped. By default the discovery timeout is set to 6000 minutes. When the timeout is reached, the Collection Status attribute of the NetApp Filers KM monitor type is set to 2 (Failure) and triggers an alert.
6. Click **Modify Selection**.
7. Click **Update** to save your settings.

Configuring the Collect Timeout

To optimize the monitoring on large environments, you can customize the collect timeout. By default the collect timeout is set to 6000 minutes.

To configure the collect timeout

1. Edit the policy that applies to the PATROL Agent for which you need to configure the collect timeout.
2. Click the **Monitor Configuration** link.
3. Select the **Monitor Type** to edit and click .
4. In the **List - NetApp Filers** section, select the NetApp filer for which you need to configure the collect timeout.



Configuring the Discovery Interval

5. In the **Collect Timeout** field, specify the number of minutes after which the collect should be stopped. By default the collect timeout is set to 6000 minutes. When the timeout is reached, the **Collection Status** attribute of the NetApp Filer or NetApp Cluster monitor type is set to 2 (Failure) and triggers an alert.
6. Click **Modify Selection**.
7. Click **Update** to save your settings.

Configuring the Polling Interval

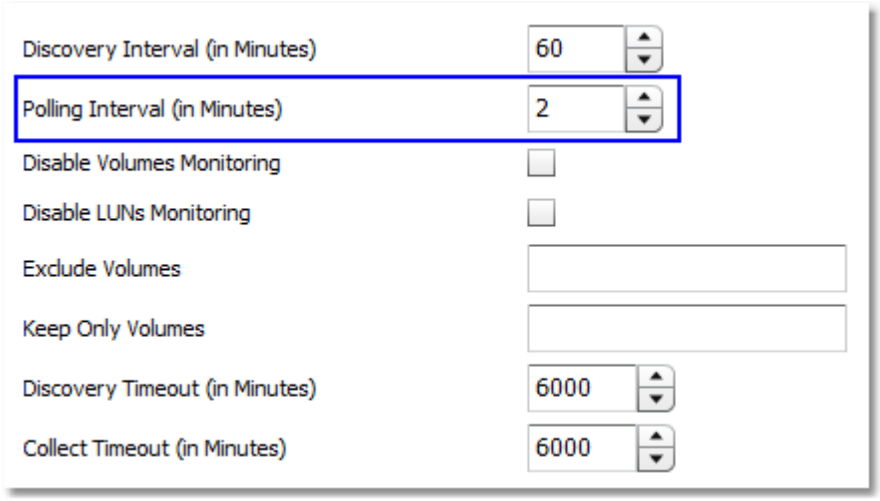
A polling interval defines how often new data is collected. A new collect can be performed from once every second, to once in a day. **TrueSight Operations Management - NetApp Storage** polls the managed systems to collect performance and statistics data. By default, the polling interval for this "data-collect" is set to every 2 minutes.

According to the Data ONTAP mode, 7-Mode or Cluster-Mode, the polling interval will apply to either the NetApp Filer or the entire cluster.

The more the polling interval is low, the more the collection process is time consuming.

To configure the polling interval

1. Edit the policy that applies to the PATROL Agent for which you need to configure the polling interval.
2. Click the **Monitor Configuration** link.
3. Select the **Monitor Type** to edit and click .
4. In the **List - NetApp Filers** section, select the NetApp filer for which you need to configure the polling interval.



Configuring the Polling Interval

5. Enter the frequency of the polling process in the **Polling Interval (in Minutes)** field. Use the spin button to enter the appropriate number of minutes. By default, the polling interval is set to 2 minutes.
6. Click **Modify Selection**.
7. Click **Update** to save your settings.

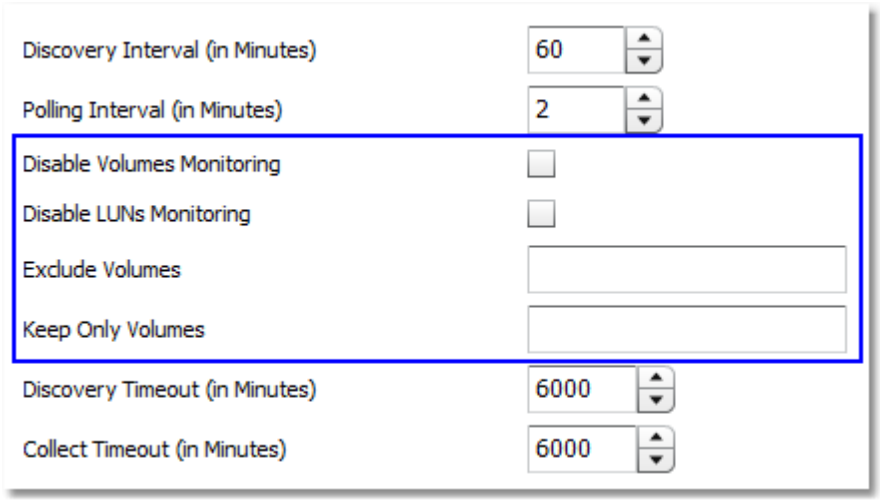
Filtering LUNs and Volumes to Monitor

By default, the solution discovers and monitors all LUNs and volumes in the NetApp Filers. There may be a very large number of LUNs and volumes to monitor and this may represent an important workload to the agents and the TrueSight OM servers. Also, the monitoring of some of these LUNs or volumes may be irrelevant for various reasons.

You can filter the LUNs and volumes that will be monitored by the solution. You can either exclude LUNs or volumes from the monitoring or keep only certain LUNs or volumes.

To filter LUNs and volumes to monitor

1. Edit the policy that applies to the PATROL Agent monitoring the LUNs or volumes you need to exclude or keep in the monitoring process.
2. Click the **Monitor Configuration** link.
3. Select the **Monitor Type** to edit and click .
4. In the **List - NetApp Filers** section, select the NetApp filer for which you need to disable Volumes or LUNs monitoring.



Selecting LUNs and Volumes to monitor

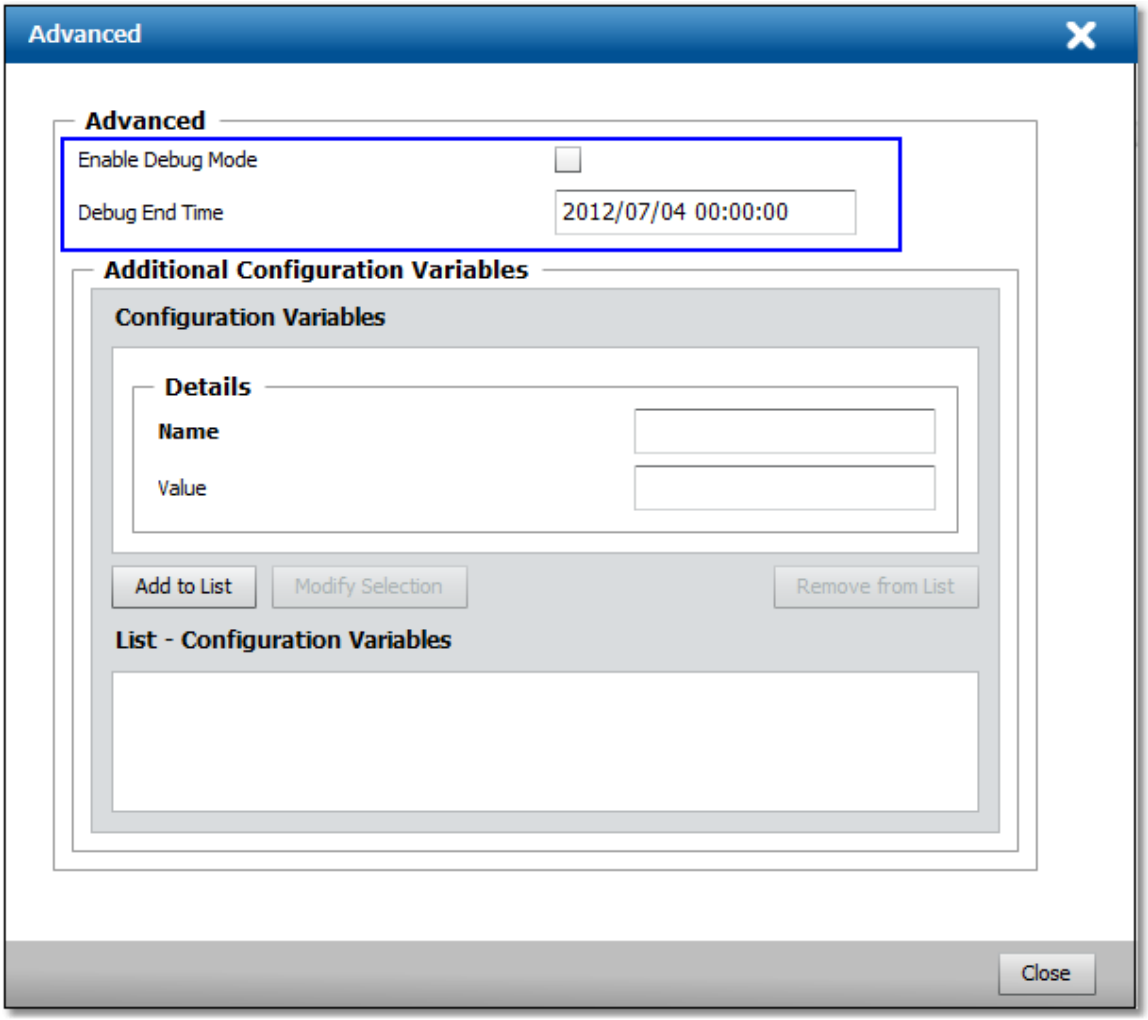
5. Check the **Disable Volumes Monitoring** box if you want to limit the number of Volume instances created and therefore reduce the system resource consumption. Discovery and collect requests and operations will no longer be performed.
6. Check the **Disable LUNs Monitoring** box if you want to limit the number of LUN instances created and therefore reduce the system resource consumption. Discovery and collect requests and operations will no longer be performed.
7. Specify the volumes to be excluded (**Exclude Volumes** field) or included (**Keep Only Volumes** field). You can either enter the volumes names or a regular expression.
8. Click **Modify Selection**.
9. Click **Update** to save your settings.

Enabling the Debug Mode

When you encounter an issue and wish to report it to Sentry Software, you will be asked to enable the Debug Mode and provide the debug output to the Sentry Software support team.

To enable the debug mode

1. Edit the policy that applies to the PATROL Agent for which you need to enable the debug mode.
2. Click the **Monitor Configuration** link.
3. Select the **Monitor Type** to edit and click .
4. Click the **Advanced** button.



Enabling the Debug Mode

5. Check the **Enable Debug Mode** option. The solution will store debug information in a log file. By default debug files are stored in the %PATROL_HOME%\log folder
6. In the **Debug End Time** field, enter the date and time at which the system must stop logging debug information. Required format: yyyy/mm/dd hh:mm:ss.
7. Click **Close** to save your settings.

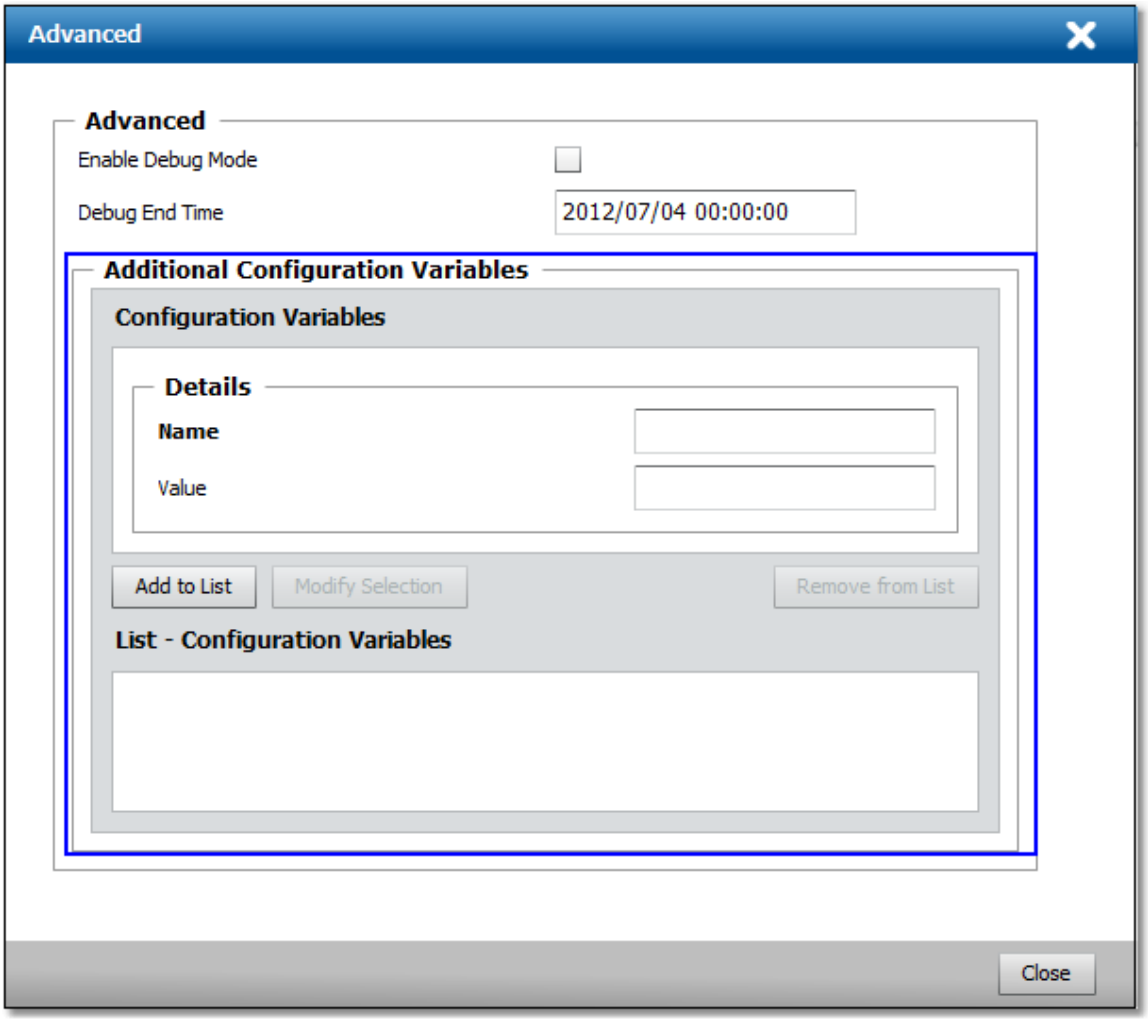
For the debug mode to be enabled, the Enable Debug Mode must be checked and the Debug End Time must be properly set to a date and time in the future.

Setting Advanced Configuration Variables

Advanced configuration variables are used to manually set variables that are normally not available through the standard interface.

These variables should only be set when instructed so by Sentry Software Support.

1. Edit the policy that applies to the PATROL Agent for which you need to configure variables.
2. Click the **Monitor Configuration** tab.
3. Click the **Advanced** button.



Configuring variables

4. In the **Configuration Variables** section, enter the configuration variables you need to configure and enter the value to be set:

Variables	Default Value	Description
collectionHubHeapSizeMax	1024	Maximum heap size in megabytes allocated to the Java Collection Hub.
collectionHubHeapSizeMin	None	Minimum heap size in megabytes allocated to Java Collection Hub. Default: Not set
collectionHubOverrideJavaCommandLine	None	Command line used by the monitoring solution to launch the Java Collection Hub. Default: Not set This variable should only be set if instructed by Sentry Support.
defaultReinitializationOptions	None	List of default options to be executed by TrueSight Operations Management - NetApp Storage on reinitialization. • resetThresholds • resetThresholdManagementMode • resetAlertActions • resetOtherAlertSettings • resetDebugMode • resetRemovedPausedObjectList • resetReport • resetSecuritySettings • resetJavaSettings Insert a colon ";" between the variable and its value: "resetThresholds;1"; and if you enter multiple variables, they need to be separated by a carriage return.
disableJRECheck	0 = JRE validation tests enabled	When set to 1, disable the validation tests of the JRE used by the monitoring solution to run Java code. This can be used to force the monitoring solution to use a non-Sun or non-Oracle JRE.
disablePslExecuteBugWorkaround	0 = activated	When set to '1', deactivates the workaround in the monitoring solution for a bug in the PslExecute() PSL function. If the monitoring solution detects that the version of the PATROL Agent is affected by the PslExecute() bug, it uses an alternate technique to create asynchronous threads with the event_trigger() function and the RemPsl standard event. The disablePslExecuteBugWorkaround variable disables this workaround.
forceClassicConfigMode	0 = disabled	When the monitoring solution is used with TrueSight OM, all the KM configuration menus are disabled in the PATROL Consoles. To enable them, set the forceClassicConfigMode variable to 1.
javaPath	None	Path to the folder containing the Java executable used by the Collection Hub. Default: Not set (The monitoring solution will search for a suitable JRE automatically).
javaPassword	None	Password associated to the javaUsername variable.

Variables	Default Value	Description
javaUsername	None	Username used to launch the Java Collection Hub. Default: Not set.
pausedObjectList	n/a	List of the PATROL object path of the paused objects. (i.e. for which no collection will be performed).
productVersion	n/a	Indicates the version level of the configuration. This should always match with the monitoring solution version. The monitoring solution uses this variable to perform migration operations on the configuration variables. The variable is automatically set by the monitoring solution during its initialization.
pscommand	n/a	Command used on UNIX/Linux systems to retrieve the list of the currently running processes. Note: This command is used for debug purpose.
removedObjectList	None	List of instances that have been removed from the monitoring environment through the 'Remove' KM Command through a standard PATROL console. Default: Not set.
retryDiscoveryAfterNTimes	5	Specifies the maximum number of retries when the discovery fails.
startupDelay	0 second	To specify the number of seconds that TrueSight Operations Management - NetApp Storage will wait before starting its discovery. This variable may be useful on fast booting computers where the NetApp Filer starts after the KM and triggers an alert.

5. Click **Add to List**.
6. Click **Close** to save your settings.

You can easily modify or remove a variable by selecting it in the list and clicking either the **Modify Selection** or the **Remove from List** buttons.

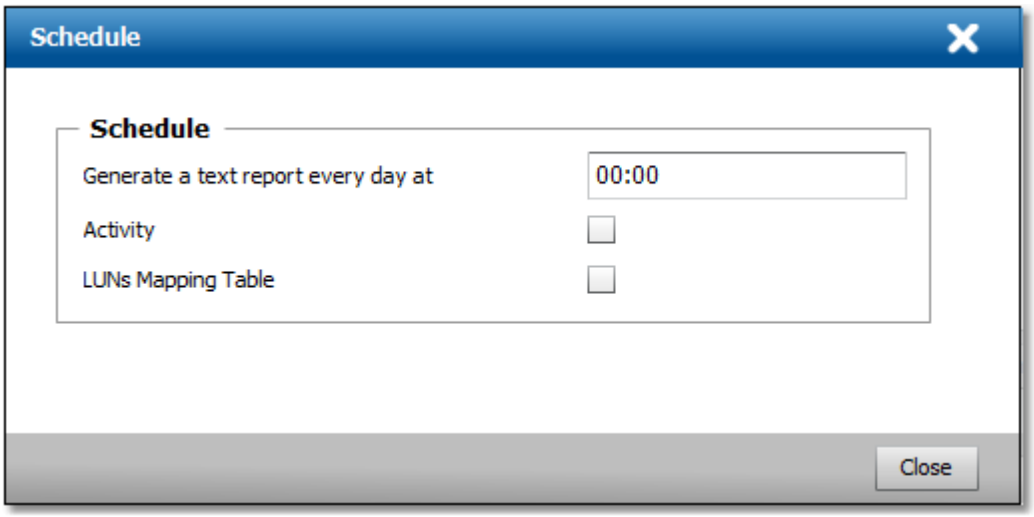
Scheduling Automatic Reports

TrueSight Operations Management - NetApp Storage can automatically produce text reports about the monitored storage systems.

To schedule automatic reports

1. Log on to **Central Monitoring Administration**.
2. Edit the policy that applies to the PATROL Agent for which you need to configure the scheduling of automatic reports:
   - In the **Navigation** pane, click the **Policies** drawer.
   - Expand the **Monitoring** folder and select a policy view (e.g. **All**).
   - Select your policy and click .
   - Click the **Monitor Configuration** link.
   - Select the **NetApp Storage** Monitor Type and click .

3. Click the **Schedule** button.



Scheduling automatic reports

4. In the **Schedule** section, indicate the time at which the report(s) must be generated.
5. Check the report(s) you wish to generate:
   - **Activity** — to automatically generate an activity report for all the monitored NetApp Filers. By default, activity reports are saved as SEN_NAP_activity*.csv in the %PATROL_HOME% \Log folder.
   - **LUNs Mapping Table** — to automatically generate a report on mapped and unmapped LUNs. By default, LUNs Mapping Table reports are saved as SEN_NAP_LUNS_mapping_table*.csv in the %PATROL_HOME%\Log folder.
6. Click **Close** to save your settings.

The history retention period can be set from the PATROL Console or from the PATROL Agent using a configuration variable. The default collection (retention) period is one day. Whenever a stored attribute value exceeds its retention period, it is automatically deleted from the attribute history file. Refer to BMC documentation for details.

Configuring Alert Actions

NetApp Storage Monitoring allows you to configure specific alert actions to be executed when a problem occurs:

1. Log on to **Central Monitoring Administration**.
2. Edit the Monitoring Policy that applies to the PATROL Agent for which to need to configure variables.
3. In the **Global Alert Settings** section, click **Alert Actions**.

Configuring Alert Actions

4. Select the type of event you want the solution to perform **Upon a Storage Problem**:
   - A STD 41 PATROL Event
   - A Specific PATROL Event
   - No Event

These events are generated every time a threshold is exceeded. They contain a full Storage Health Report detailing the fault that has occurred.

5. (BPPM 9.5 and higher) Check the **Enable Annotations** option to make the solution annotate the parameter's graph with a comprehensive report of the problem.
6. Click **Close** to save your settings.
7. Click **Update**.
8. Click **Finish** to save your monitoring policy.

Monitor Types And Attributes

This chapter provides statistical information about resources, operating status, and performances managed by the TrueSight Operations Management - NetApp Storage. It contains tables describing the attributes used in the monitoring solution, grouped by Monitor Types, and provides a brief description of each attribute and its default settings.

Baselines and Key Performance Indicators

Some attributes are identified by default as Key Performance Indicators (KPIs) and therefore automatically included in the base lining calculation. To learn more about auto baselining and KPIs, please refer to the "Managing Baselines and Key Performance Indicators" chapter.

In this guide, attributes flagged as KPIs and included by default in the baseline calculation process are respectively identified by the following icons:

- 🔑 KPI

Managing Baselines and Key Performance Indicators

In order to facilitate the detection of abnormalities on your monitored environment, BMC TrueSight Operations Management baselines per attribute (metrics or attributes) based on values collected over a specified period of time to determine a normal operating range. When the collected values for these attributes are out of range, an alert is triggered.

Some attributes are identified by default as Key Performance Indicators (identified with the 🔑 icon) and therefore automatically included in the base lining calculation.

Managing baselines

The baseline is the expected normal operating range for a metric or attribute of a monitor.

The baseline is calculated by collecting the values for a monitor's attributes and metrics over a specified time period and establishing a low baseline value (consisting of the 10th percentile of all the values for a given time period) and a high baseline value (consisting of the 90th percentile of all the values for a given time period), taking a weighted average of these values over time. A higher weight is given to the latest data being factored into the baseline average. The accuracy of the baseline improves over time.

Requirements for baseline generation

For baselines to be generated for an attribute, that abnormality threshold means that the threshold exists and is not suppressed.
Additionally, if the Key Performance Indicator (KPI) mode is active, only those attributes that have an active abnormality threshold and are also KPI attributes will have baselines generated for them.

Absolute thresholds (with "outside baseline") or signature thresholds do not satisfy these requirements.

Managing Key Performance Indicators

The KPI attribute of a attribute can be activated or deactivated manually through the BMC ProactiveNet Administration Console. In this KM, some attributes or attributes have been designated as important indicators of performance (KPIs). We do not recommend that these default settings are modified.

However, advanced users may activate or deactivate KPIs from the BMC ProactiveNet Administration Console.

To add or remove Key Performance Indicator (KPI) attributes for a monitor type

1. In the **Administration Console**, from the menu bar, choose **Tools > KPI Administration**. The **KPI Administration** dialog box is displayed.
2. From the **Monitor Type** list, choose the monitor type for which you want to add or remove KPI attributes. A list of attributes for the selected monitor type is displayed.
3. In the KPI column for the attributes that you want to add or remove as Key Performance Indicators:
   - select the KPI check box to add the corresponding attribute as a KPI
   - deselect the KPI check box to remove the corresponding attribute from the KPIs for that monitor type

For complete and detailed information on this procedure, please refer to the BMC TrueSight Operations Management documentation available from BMC Web site.

Parameters for which the system by default calculates baselines as well as attributes considered as KPIs are respectively identified by the following icons:

- Baselining
- KPI

SEN_ NAP_MAIN

Attributes

Name	Description	Unit	Default Alert Conditions	Attribute Type
Collection Status	Status of the collection. Errors reported by this parameter are only related to NetApp Storage Monitoring itself.	{0 = OK; 1 = Degraded; 2 = Failed}	None	Collection Status

** Attributes marked with an asterisk are used by default when visualizing the corresponding monitor instance in TrueSight Operations Management.*

7-Mode

NetApp Aggregate

Attributes

Name	Description	Unit	Default Alert Conditions	Attribute Type
Available Capacity Percentage*	Percentage of capacity not consumed in the aggregate.	Percentage (%)	None	Statistics
Available Capacity	Total capacity not consumed in the aggregate.	Terabytes (TB)	None	Statistics
Consumed Capacity Percentage	Percentage of the capacity that is actually consumed in the aggregate.	Percentage (%)	Warning = 80 to 90 Alarm > 90	Statistics
Consumed Capacity	Number of terabytes actually consumed in the aggregate.	Terabytes (TB)	None	Statistics
Mirror Status	Overall mirror status of the aggregate.	{0 = OK; 1 = Degraded; 2 = Failed}	1 = Warning 2 = Alarm	Availability
Operation Rate	Total number of operations per second.	operations/s	None	Statistics
Read Operation Rate	Number of read operations per second.	operations/s	None	Statistics
Space Reservation Status	Indicates whether the space reservation is enabled or not.	{0 = disabled; 1 = enabled}	None	Availability
Status*	Status of the aggregate.	{0 = OK; 1 = Degraded; 2 = Failed}	1 = Warning 2 = Alarm	Availability
Total Files	Total count of user-visible files.	files	None	Statistics
Used Files	Number of user-visible files used.	files	None	Statistics
Write Operation Rate	Number of write operations per second.	operations/s	None	Statistics

** Attributes marked with an asterisk are used by default when visualizing the corresponding monitor instance in TrueSight Operations Management.*

NetApp CIFS

Attributes

Name	Description	Unit	Default Alert Conditions	Attribute Type
Operation Rate*	Total number of operations per second.	operations/s	None	Statistics
Read Operation Rate	Number of read operations per second.	operations/s	None	Statistics
Read Response Time	Average response time for read operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
Response Time*	Average response time for all operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
Status	Status of CIFS. *Note: This attribute is only available for NetApp Filers operated under 7-mode.*	{0 = OK; 1 = Degraded; 2 = Failed}	1 = Warning 2 = Alarm	Availability
Write Operation Rate	Number of write operations per second.	operations/s	None	Statistics
Write Response Time	Average response time for write operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time

** Attributes marked with an asterisk are used by default when visualizing the corresponding monitor instance in TrueSight Operations Management.*

NetApp Controller

Attributes

Name	Description	Unit	Default Alert Conditions	Attribute Type
CIFS Operation Rate	Total number of CIFS operations per second.	operations/s	None	Statistics
Disk Read Byte Rate	Bytes read per second from the disk since the last collect.	Megabytes per second (MB/s)	None	Statistics
Disk Transfer Byte Rate* 🔑	Total bytes read and written per second to the disk.	Megabytes per second (MB/s)	None	Statistics
Disk Write Byte Rate	Bytes written per second to the disk since the last collect	Megabytes per second (MB/s)	None	Statistics
FCP Operation Rate	Total number of FCP operations per second.	operations/s	None	Statistics
HTTP Operation Rate	Total number of HTTP operations per second.	operations/s	None	Statistics
iSCSI Operation Rate	Total number of iSCSI operations per second.	operations/s	None	Statistics
Network Received Byte Rate	Bytes received per second over the network.	Megabytes per second (MB/s)	None	Statistics
Network Sent Byte Rate	Bytes sent per second.	Megabytes per second (MB/s)	None	Statistics
Network Transfer Byte Rate* 🔑	Total bytes transferred per second (sent and received).	Megabytes per second (MB/s)	None	Statistics
NFS Operation Rate	Total number of NFS operations per second.	operations/s	None	Statistics
Operation Rate	Total number of operations per second.	operations/s	None	Statistics
Present	Indicates whether the device is still present or not since the last discovery. This attribute is updated at each discovery.	{0 = No; 1 = Yes}	0 = Alarm	Availability

Name	Description	Unit	Default Alert Conditions	Attribute Type
Processor Utilization	Percentage of utilization of the CPU resource.	Percentage (%)	Warning ≥ 80 Alarm ≥ 100	Statistics
Read Operation Rate	Number of read operations per second.	operations/s	None	Statistics
Read Response Time	Average response time for read operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
Response Time	Average response time for all operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
Write Operation Rate	Number of write operations per second.	operations/s	None	Statistics
Write Response Time	Average response time for write operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time

** Attributes marked with an asterisk are used by default when visualizing the corresponding monitor instance in TrueSight Operations Management.*

For detailed information about *KPI*, see Managing Baselines and Key Performance Indicators.

NetApp Disk

Attributes

Name	Description	Unit	Default Alert Conditions	Attribute Type
Operation Rate*	Total number of operations per second.	operations/s	None	Statistics
Present	Indicates whether the device is still present or not since the last discovery. This attribute is updated at each discovery.	{0 = No; 1 = Yes}	0 = Alarm	Availability
Read Operation Rate	Number of read operations per second.	operations/s	None	Statistics
Read Response Time	Average response time for read operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
Response Time*	Average response time for all operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 200	Response Time
Status	Status of the disk.	{0 = OK; 1 = Degraded; 2 = Failed}	1 = Warning 2 = Alarm	Availability
Write Operation Rate	Number of write operations per second.	operations/s	None	Statistics
Write Response Time	Average response time for write operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time

** Attributes marked with an asterisk are used by default when visualizing the corresponding monitor instance in TrueSight Operations Management.*

NetApp Ethernet Port

Attributes

Name	Description	Unit	Default Alert Conditions	Attribute Type
Bandwidth Utilization	Percentage used of the available bandwidth.	Percentage (%)	None	Statistics
Collisions Packet Rate	Number of collisions of packets per seconds.	packets/s	None	Statistics
Inbound Bandwidth Utilization	Percentage of inbound bandwidth used on the Ethernet port (received bytes).	Percentage (%)	None	Statistics
Link Speed	Actual speed of the Ethernet port.	Gigabits per second (Gb/s)	None	Statistics
Link Status	Indicates whether the link is up or down.	{0 = Plugged; 1 = Unplugged} }	1 = Warning	Availability
Multicast Received Packet Rate	Number of multicast packets received per second.	packets/s	None	Statistics
Multicast Sent Packet Rate	Number of multicast packets sent per second.	packets/s	None	Statistics
Multicast Transfer Packet Rate	Total number of multicast packets transferred per second (sent and received.)	packets/s	None	Statistics
Outbound Bandwidth Utilization	Percentage of outband bandwidth used on the Ethernet port (sent bytes).	Percentage (%)	None	Statistics
Present	Indicates whether the device is still present or not since the last discovery. This attribute is updated at each discovery.	{0 = No; 1 = Yes}	0 = Alarm	Availability
Received Byte Rate	Bytes received per second.	Megabytes per second (MB/s)	None	Statistics
Received Error Rate	Number of errors per second while receiving packets.	errors/s	None	Statistics
Received Packet Dropped Rate	Number of received packets dropped per second.	packets/s	None	Statistics
Received Packet Rate	Number of packets received per second.	packets/s	None	Statistics
Sent Byte Rate	Bytes sent per second.	Megabytes per second (MB/s)	None	Statistics

Name	Description	Unit	Default Alert Conditions	Attribute Type
Sent Error Rate	Number of errors per second while sending packets.	errors/s	None	Statistics
Sent Packet Rate	Number of packets sent per second.	packets/s	None	Statistics
Transfer Byte Rate*	Total bytes transferred per second (sent and received).	Megabytes per second (MB/s)	None	Statistics
Transfer Error Rate	Number of errors per second while transferring packets.	errors/s	None	Statistics
Transfer Packet Rate*	Number of packets transferred per second.	packets/s	None	Statistics

** Attributes marked with an asterisk are used by default when visualizing the corresponding monitor instance in TrueSight Operations Management.*

NetApp Fan

Attributes

Name	Description	Unit	Default Alert Conditions	Attribute Type
Present	Indicates whether the device is still present or not since the last discovery. This attribute is updated at each discovery.	{0 = No; 1 = Yes}	0 = Alarm	Availability
Speed*	Speed of the fan.	Revolutions per minute (RPM)	None	Statistics
Status*	Status of the fan.	{0 = OK; 1 = Degraded; 2 = Failed}	1 = Warning 2 = Alarm	Availability

** Attributes marked with an asterisk are used by default when visualizing the corresponding monitor instance in TrueSight Operations Management.*

NetApp FC Port

Attributes

Name	Description	Unit	Default Alert Conditions	Attribute Type
Bandwidth Utilization	Percentage used of the available bandwidth.	Percentage (%)	None	Statistics
Connected Initiators Count	Total number of initiators (hosts) connected to this port (target adapter).	initiators	None	Statistics
CRC Error Rate	CRC errors per second.	errors/s	None	Statistics
Discarded Frame Rate	Number of frames discarded per second.	frames/s	None	Statistics
FCP Protocol Error Rate	Number of FCP protocol errors per second.	errors/s	None	Statistics
Inbound Bandwidth Utilization	Percentage of inbound bandwidth used on the FC link (received bytes).	Percentage (%)	None	Statistics
Link Speed	Actual speed of the FC port.	Gigabyte per second (Gb/s)	None	Statistics
Link Status	Indicates whether the link is up or down.	{0 = Plugged; 1 = Unplugged}	1 = Warning	Availability
Operation Rate*	Total number of operations per second.	operations/s	None	Statistics
Other Operation Rate	Total number of other operations per second.	operations/s	None	Statistics
Outbound Bandwidth Utilization	Percentage of outband bandwidth used on the FC link (sent bytes).	Percentage (%)	None	Statistics
Present	Indicates whether the device is still present or not since the last discovery. This attribute is updated at each discovery.	{0 = No; 1 = Yes}	0 = Alarm	Availability
Read Operation Rate	Number of read operations per second.	operations/s	None	Statistics
Received Byte Rate	Bytes received per second.	Megabytes per second (MB/s)	None	Statistics
Sent Byte Rate	Bytes sent per second.	Megabytes per second (MB/s)	None	Statistics

Name	Description	Unit	Default Alert Conditions	Attribute Type
Status	Status of the FC port.	{0 = OK; 1 = Degraded; 2 = Failed}	1 = Warning 2 = Alarm	Availability
Transfer Byte Rate*	Total bytes transferred per second (sent and received).	Megabytes per second (MB/s)	None	Statistics
Write Operation Rate	Number of write operations per second.	operations/s	None	Statistics

** Attributes marked with an asterisk are used by default when visualizing the corresponding monitor instance in TrueSight Operations Management.*

NetApp Filer

Attributes

Name	Description	Unit	Default Alert Conditions	Attribute Type
CIFS Operation Rate	Total number of CIFS operations per second.	operations/s	None	Statistics
Collection Status	Status of the collection. Errors reported by this attribute are only related to NetApp Storage Monitoring itself.	{0 = OK; 1 = Degraded; 2 = Failed}	None	Collection Status
Disk Transfer Byte Rate 🔑	Total bytes read and written per second to the disk.	Megabytes per second (MB/s)	None	Statistics
FCP Operation Rate	Total number of FCP operations per second.	operations/s	None	Statistics
HTTP Operation Rate	Total number of HTTP operations per second.	operations/s	None	Statistics
iSCSI Operation Rate	Total number of iSCSI operations per second.	operations/s	None	Statistics
Network Transfer Byte Rate*🔑	Total bytes read and written per second through the network.	Megabytes per second (MB/s)	None	Statistics
NFS Operation Rate	Total number of NFS operations per second.	operations/s	None	Statistics
Operation Rate	Total number of operations per second.	operations/s	None	Statistics
Port Count	Number of physical ports in the filer. *Note: This value can be used to know the number of required licenses for the monitoring system*	ports	None	Statistics
Power Consumption*	Reports the electricity consumption of the filer.	Watts	None	Statistics
Spare Disk Count	Number of spare disks available in the filer.	disks	0= Warning	Statistics

** Attributes marked with an asterisk are used by default when visualizing the corresponding monitor instance in TrueSight Operations Management.*

For detailed information about 🔑 *KPI*, see Managing Baselines and Key Performance Indicators.

NetApp Host Adapter

Attributes

Name	Description	Unit	Default Alert Conditions	Attribute Type
in Use	Indicates whether the adapter is in use or not.	{0 = No; 1 = Yes}	None	Statistics
Operation Rate*	Total number of operations per second.	operations /s	None	Statistics
Present	Indicates whether the device is still present or not since the last discovery. This attribute is updated at each discovery.	{0 = No; 1 = Yes}	0 = Alarm	Availability
Read Byte Rate	Bytes read per second from the host adapter since the last collect.	Megabytes per second (MB/s)	None	Statistics
Read Operation Rate	Number of read operations per second.	operations /s	None	Statistics
Transfer Byte Rate*	Total bytes read and written per second to the host adapter.	Megabytes per second (MB/s)	None	Statistics
Write Byte Rate	Bytes written per second to the host adapter since the last collect	Megabytes per second (MB/s)	None	Statistics
Write Operation Rate	Number of write operations per second.	operations /s	None	Statistics

** Attributes marked with an asterisk are used by default when visualizing the corresponding monitor instance in TrueSight Operations Management.*

NetApp iSCSI

Attributes

Name	Description	Unit	Default Alert Conditions	Attribute Type
Operation Rate	Total number of operations per second.	operations/s	None	Statistics
Read Byte Rate	Bytes read per second from the iSCSI ports.	Megabytes per second (MB/s)	None	Statistics
Read Operation Rate	Number of read operations per second.	operations/s	None	Statistics
Read Response Time	Average response time for read operations	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
Response Time*	Average response time for all operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
Transfer Byte Rate*	Total bytes read and written per second to the iSCSI port.	Megabytes per second (MB/s)	None	Statistics
Write Byte Rate	Bytes written per second to the iSCSI port.	Megabytes per second (MB/s)	None	Statistics
Write Operation Rate	Number of write operations per second.	operations/s	None	Statistics
Write Response Time	Average response time for write operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time

**Attributes marked with an asterisk are used by default when visualizing the corresponding monitor instance in TrueSight Operations Management.*

NetApp iSCSI Port

Attributes

Name	Description	Unit	Default Alert Conditions	Attribute Type
Status*	Status of the iSCSI Port.	{0 = OK; 1 = Degraded; 2 = Failed}	1 = Warning 2 = Alarm	Availability

**Attributes marked with an asterisk are used by default when visualizing the corresponding monitor instance in TrueSight Operations Management.*

NetApp LUN

Attributes

Name	Description	Unit	Default Alert Conditions	Attribute Type
Consumed Capacity	Number of bytes actually consumed in the LUN.	Gigabytes (GB)	None	Statistics
Operation Rate	Total number of operations per second.	operations/s	None	Statistics
Other Operation Rate	Total number of other operations per second.	operations/s	None	Statistics
Read Byte Rate	Bytes read per second from the LUN since the last collect.	Megabytes per second (MB/s)	None	Statistics
Read Operation Rate	Number of read operations per second.	operations/s	None	Statistics
Response Time*	Average response time for all operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
Space Reservation Status	Space reservation status.	{0 = Disabled; 1 = Enabled}	None	Availability
Time Since Last Activity	Number of days since any activity occurred on the LUN.	Days	None	Statistics
Transfer Byte Rate*	Total bytes read and written per second to the LUN.	Megabytes per second (MB/s)	None	Statistics
Write Byte Rate	Bytes written per second to the LUN since the last collect.	Megabytes per second (MB/s)	None	Statistics
Write Operation Rate	Number of write operations per second.	operations/s	None	Statistics

** Attributes marked with an asterisk are used by default when visualizing the corresponding monitor instance in TrueSight Operations Management.*

NetApp NDMP

Attributes

Name	Description	Unit	Default Alert Conditions	Attribute Type
Opened Sessions*	Total number of NDMP sessions currently opened. Sessions may be running backups, restores or neither.	sessions	None	Statistics

** Attributes marked with an asterisk are used by default when visualizing the corresponding monitor instance in TrueSight Operations Management.*

NetApp NFS

Attributes

Name	Description	Unit	Default Alert Conditions	Attribute Type
Operation Rate*	Total number of operations per second.	operations/s	None	Statistics
Read Operation Rate	Number of read operations per second.	operations/s	None	Statistics
Read Response Time	Average response time for read operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
Response Time*	Average response time for all operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
Write Operation Rate	Number of write operations per second.	operations/s	None	Statistics
Write Response Time	Average response time for write operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time

** Attributes marked with an asterisk are used by default when visualizing the corresponding monitor instance in TrueSight Operations Management.*

NetApp NVRAM

Attributes

Name	Description	Unit	Default Alert Conditions	Attribute Type
Operation Rate*	Total number of operations per second.	operations/s	None	Statistics
Response Time*	Average response time for all operations. Note: This attribute is only available for NetApp Filers operated in cluster mode.	Milliseconds (ms)	Warning > 30 Alarm ≥ 100	Response Time
Transfer Byte Rate	Total bytes read and written per second to the NVRAM.	Megabytes per second (MB/s)	None	Statistics

** Attributes marked with an asterisk are used by default when visualizing the corresponding monitor instance in TrueSight Operations Management.*

NetApp Plex

Attributes

Name	Description	Unit	Default Alert Conditions	Attribute Type
Status*	Status of the plex.	{0 = OK ; 1 = Degraded 2 = Failed}	1 = Warning 2 = Alarm	Availability
Synchronized	Indicates whether the plex is currently synchronizing or not.	{0 = No ; 1 = Yes}	None	Statistics

** Attributes marked with an asterisk are used by default when visualizing the corresponding monitor instance in TrueSight Operations Management.*

NetApp Power Supply

Attributes

Name	Description	Unit	Default Alert Conditions	Attribute Type
Present	Indicates whether the device is still present or not since the last discovery. This attribute is updated at each discovery.	{0 = No; 1 = Yes}	0 = Alarm	Availability
Status*	Status of the power supply.	{0 = OK; 1 = Degraded; 2 = Failed}	1 = Warning 2 = Alarm	Availability

** Attributes marked with an asterisk are used by default when visualizing the corresponding monitor instance in TrueSight Operations Management.*

NetApp Processor

Attributes

Name	Description	Unit	Default Alert Conditions	Attribute Type
Present	Indicates whether the device is still present or not since the last discovery. This attribute is updated at each discovery.	{0 = No; 1 = Yes}	0 = Alarm	Availability
Processor Utilization *	Percentage of utilization of the CPU resource.	Percentage (%)	Warning > 80 Alarm > 90	Statistics

** Attributes marked with an asterisk are used by default when visualizing the corresponding monitor instance in TrueSight Operations Management.*

NetApp Qtree

Attributes

Name	Description	Unit	Default Alert Conditions	Attribute Type
CIFS Operation Rate*	Number of CIFS operations per second.	operations/s	None	Statistics
NFS Operation Rate*	Number of NFS operations per second.	operations/s	None	Statistics
Operation Rate	Total number of operations per second.	operations/s	None	Statistics
Other Operation Rate	Number of other operations per second.	operations/s	None	Statistics

** Attributes marked with an asterisk are used by default when visualizing the corresponding monitor instance in TrueSight Operations Management.*

NetApp Quota

Attributes

Name	Description	Unit	Default Alert Conditions	Attribute Type
Consumed Capacity	Number of gigabytes actually consumed.	Gigabytes (GB)	None	Statistics
Consumed Hard Capacity Percentage	Percentage of the hard capacity that is actually consumed.	Percentage (%)	None	Statistics
Consumed Soft Capacity Percentage	Percentage of the soft capacity that is actually consumed.	Percentage (%)	None	Statistics
File Count	Number of files counted towards the hard and soft limit set on the quota.	files	None	Statistics
Hard File Count Percentage	Number of files in percentage of the hard limit.	Percentage (%)	None	Statistics
Soft File Count Percentage	Number of files in percentage of the soft limit.	Percentage (%)	None	Statistics

NetApp Shelf

Attributes

Name	Description	Unit	Default Alert Conditions	Attribute Type
Present	Indicates whether the device is still present or not since the last discovery. This attribute is updated at each discovery.	{0 = No; 1 = Yes}	0 = Alarm	Availability
Status*	Status of the shelf.	{0 = OK; 1 = Degraded; 2 = Failed}	1 = Warning 2 = Alarm	Availability

** Attributes marked with an asterisk are used by default when visualizing the corresponding monitor instance in TrueSight Operations Management.*

NetApp SIS Volume

Attributes

Name	Description	Unit	Default Alert Conditions	Attribute Type
Dense Files	Number of dense files in the SIS volume.	files	None	Statistics
Last Operation Size	Data size processed in the last SIS operation.	Megabytes (MB)	None	Statistics
Number Of Files Too Small	Number of files found that are too small to be deduplicated (compressed).	files	None	Statistics
Saved Space Percentage*	Percent saving because of deduplication (compression).	Percentage (%)	None	Statistics
Shared Saved Blocks	Number of blocks saved by sharing in the SIS volume.	blocks	None	Statistics
SIS Duration	Time since the last SIS operation has begun.	seconds	None	Statistics
Space Condition Limitation Count	Number of times deduplication could not happen because of out of space condition.	times	None	Statistics
Status*	Status of the SIS volume.	{0 = OK; 1 = Degraded; 2 = Failed}	1 = Warning 2 = Alarm	Availability

** Attributes marked with an asterisk are used by default when visualizing the corresponding monitor instance in TrueSight Operations Management.*

NetApp Snapmirror

Attributes

Name	Description	Unit	Default Alert Conditions	Attribute Type
Lag	Amount of time since the last Snapmirror transfer in seconds.	seconds	None	Statistics
Last Transfer Duration	Duration of the last Snapmirror transfer in seconds.	seconds	None	Statistics
Last Transfer Size	Size of the last Snapmirror transfer.	Gigabytes (GB)	None	Statistics
Status*	Status of the Snapmirror.	{0 = OK; 1 = Degraded; 2 = Failed}	1 = Warning 2 = Alarm	Availability
Transfer Byte Rate*	Total bytes read and written per second to the Snapmirror.	Megabytes per second (MB/s)	None	Statistics

** Attributes marked with an asterisk are used by default when visualizing the corresponding monitor instance in TrueSight Operations Management.*

NetApp Snapvault

Attributes

Name	Description	Unit	Default Alert Conditions	Attribute Type
Lag	Amount of time since the last Snapvault transfer in seconds.	seconds	None	Statistics
Last Transfer Duration	Duration of the last vault synchronization.	seconds	None	Statistics
Last Transfer Size	Size of the transfer for the last vault synchronization.	Gigabytes (GB)	None	Statistics
Status*	Status of the Snapvault.	{0 = OK; 1 = Degraded; 2 = Failed}	1 = Warning 2 = Alarm	Availability
Transfer Byte Rate*	Total bytes read and written per second to the Snapvault.	Megabytes per second (MB/s)	None	Statistics

** Attributes marked with an asterisk are used by default when visualizing the corresponding monitor instance in TrueSight Operations Management.*

NetApp Temperature

Attributes

Name	Description	Unit	Default Alert Conditions	Attribute Type
Status	Status of the temperature sensor.	{0 = OK; 1 = Degraded; 2 = Failed}	1 = Warning 2 = Alarm	Availability
Temperature Status*	Status of the temperature sensor according to the temperature thresholds settings.	{0 = OK; 1 = Degraded; 2 = Failed}	1 = Warning 2 = Alarm	Availability
Temperature*	Current temperature reading in degrees Celsius.	degrees Celsius (°C)	None	Statistics

** Attributes marked with an asterisk are used by default when visualizing the corresponding monitor instance in TrueSight Operations Management.*

NetApp vFiler

Attributes

Name	Description	Unit	Default Alert Conditions	Attribute Type
CPU Utilization	Percentage CPU time used by the vFiler.	Percentage (%)	None	Statistics
Network Received Byte Rate	Bytes received per second over the network.	Megabytes per second (MB/s)	None	Statistics
Network Sent Byte Rate	Bytes sent per second over the network.	Megabytes per second (MB/s)	None	Statistics
Network Transfer Byte Rate	Total bytes transferred per second (sent and received) over the network.	Megabytes per second (MB/s)	None	Statistics
Operation Rate*	Total number of operations per second.	operations /s	None	Statistics
Other Operation Rate	Total number of other operations per second.	operations /s	None	Statistics
Read Byte Rate	Bytes read per second by the vFiler.	Megabytes per second (MB/s)	None	Statistics
Read Operation Rate	Number of read operations per second.	operations /s	None	Statistics
Status	Status of the vFiler.	{0 = OK; 1 = Degraded; 2 = Failed}	1 = Warning 2 = Alarm	Availability
Transfer Byte Rate*	Total bytes read and written per second by the vFiler.	Megabytes per second (MB/s)	None	Statistics
Write Byte Rate	Bytes written per second by the vFiler.	Megabytes per second (MB/s)	None	Statistics
Write Operation Rate	Number of write operations per second.	operations /s	None	Statistics

** Attributes marked with an asterisk are used by default when visualizing the corresponding monitor instance in TrueSight Operations Management.*

NetApp Voltage

Attributes

Name	Description	Unit	Default Alert Conditions	Attribute Type
Status*	Status of the voltage sensor.	{0 = OK; 1 = Degraded; 2 = Failed}	1 = Warning 2 = Alarm	Availability

** Attributes marked with an asterisk are used by default when visualizing the corresponding monitor instance in TrueSight Operations Management.*

NetApp Volume

Attributes

Name	Description	Unit	Default Alert Conditions	Attribute Type
Available Capacity Percentage	Percentage of capacity not consumed in the volume.	Percentage (%)	None	Statistics
Available Capacity	Total capacity not consumed in the volume.	Gigabytes (GB)	None	Statistics
Capacity	Total usable capacity (in bytes) of the volume, excluding WAFL reserve and volume snapshot reserve.	Gigabytes (GB)	None	Statistics
CIFS Operation Rate	Total number of CIFS operations per second.	operations /s	None	Statistics
CIFS Read Byte Rate	Bytes read per second via CIFS from the volume.	Megabytes per second (MB/s)	None	Statistics
CIFS Read Operation Rate	Number of read operations per second.	operations /s	None	Statistics
CIFS Read Response Time	Average response time for read operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
CIFS Response Time	Average response time for all CIFS operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
CIFS Transfer Byte Rate	Total bytes read and written per second via CIFS to the volume.	Megabytes per second (MB/s)	None	Statistics
CIFS Write Byte Rate	Bytes written per second via CIFS to the volume since the last collect.	Megabytes per second (MB/s)	None	Statistics

Name	Description	Unit	Default Alert Conditions	Attribute Type
CIFS Write Operation Rate	Number of write CIFS operations per second.	operations /s	None	Statistics
CIFS Write Response Time	Average response time for CIFS write operations	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
Consumed Capacity Percentage	Percentage of the capacity that is actually consumed in the volume.	Percentage (%)	None	Statistics
Consumed Capacity	Number of bytes actually consumed in the volume.	Gigabytes (GB)	None	Statistics
FCP Operation Rate	Total number of FCP operations per second.	operations /s	None	Statistics
FCP Read Byte Rate	Bytes read per second via FCP from the volume since the last collect.	Megabytes per second (MB/s)	None	Statistics
FCP Read Operation Rate	Number of FCP read operations per second.	operations /s	None	Statistics
FCP Read Response Time	Average response time for FCP read operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
FCP Response Time	Average response time for all FCP operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
FCP Transfer Byte Rate	Total bytes read and written per second via FCP to the volume.	Megabytes per second (MB/s)	None	Statistics
FCP Write Byte Rate	Bytes written per second via FCP to the volume since the last collect.	Megabytes per second (MB/s)	None	Statistics
FCP Write Operation Rate	Number of write FCP operations per second.	operations /s	None	Statistics
FCP Write Response Time	Average response time for FCP write operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
FlexCache Read Byte Rate	Bytes read per second from the FlexCache since the last collect.	Megabytes per second (MB/s)	None	Statistics
FlexCache Write Byte Rate	Bytes written per second to the FlexCache since the last collect.	Megabytes per second (MB/s)	None	Statistics
iSCSI Operation Rate	Total number of block protocol operations per second.	operations /s	None	Statistics
iSCSI Read Byte Rate	Bytes read per second via block protocol from the volume since the last collect.	Megabytes per second (MB/s)	None	Statistics

Name	Description	Unit	Default Alert Conditions	Attribute Type
iSCSI Read Operation Rate	Number of block protocol read operations per second.	operations /s	None	Statistics
iSCSI Read Response Time	Average response time for block protocol read operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
iSCSI Response Time	Average response time for all block protocol operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
iSCSI Transfer Byte Rate	Total bytes read and written per second via iSCSI to the volume.	Megabytes per second (MB/s)	None	Statistics
iSCSI Write Byte Rate	Bytes written per second via iSCSI to the volume since the last collect.	Megabytes per second (MB/s)	None	Statistics
iSCSI Write Operation Rate	Number of iSCSI write operations per second.	operations /s	None	Statistics
iSCSI Write Response Time	Average response time for iSCSI write operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
Mirror Status	Volume's mirror status.	{0 = OK; 1 = Degraded; 2 = Failed}	1 = Warning 2 = Alarm	Availability
NFS Operation Rate	Total number of NFS operations per second.	operations /s	None	Statistics
NFS Read Byte Rate	Bytes read per second via NFS from the volume since the last collect.	Megabytes per second (MB/s)	None	Statistics
NFS Read Operation Rate	Number of NFS read operations per second.	operations /s	None	Statistics
NFS Read Response Time	Average response time for NFS read operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
NFS Response Time	Average response time for all NFS operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
NFS Transfer Byte Rate	Total bytes read and written per second via NFS to the volume.	Megabytes per second (MB/s)	None	Statistics
NFS Write Byte Rate	Bytes written per second via NFS to the volume since the last collect.	Megabytes per second (MB/s)	None	Statistics
NFS Write Operation Rate	Number of write NFS operations per second.	operations /s	None	Statistics
NFS Write Response Time	Average response time for NFS write operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time

Name	Description	Unit	Default Alert Conditions	Attribute Type
Operation Rate	Total number of operations per second.	operations /s	None	Statistics
Read Byte Rate	Bytes read per second from the volume since the last collect.	Megabytes per second (MB/s)	None	Statistics
Read Operation Rate	Number of read operations per second.	operations /s	None	Statistics
Read Response Time	Average response time for read operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
Response Time*	Average response time for all operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
SAN Operation Rate	Total number of SAN operations per second	operations /s	None	Statistics
SAN Read Byte Rate	Bytes read per second from the SAN since the last collect.	Megabytes per second (MB/s)	None	Statistics
SAN Read Operation Rate	Number of SAN read operations per second.	operations /s	None	Statistics
SAN Read Response Time	Average response time for SAN read operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
SAN Response Time	Average response time for all SAN operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
SAN Transfer Byte Rate	Total bytes read and written per second via SAN to the volume.	Megabytes per second (MB/s)	None	Statistics
SAN Write Byte Rate	Bytes written per second via SAN to the volume since the last collect.	Megabytes per second (MB/s)	None	Statistics
SAN Write Operation Rate	Number of SAN write operations per second.	operations /s	None	Statistics
SAN Write Response Time	Average response time for SAN write operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
Snapshot Reserved Capacity Percentage	Percentage of disk space that has been set aside as reserved for snapshot usage.	Percentage (%)	Warning ≥ 80 Alarm ≥ 90	Statistics
Status	Status of the volume.	{0 = OK; 1 = Degraded; 2 = Failed}	1 = Warning 2 = Alarm	Availability
Transfer Byte Rate*	Total bytes read and written per second to the volume.	Megabytes per second (MB/s)	None	Statistics

Name	Description	Unit	Default Alert Conditions	Attribute Type
Inodes Used	Number of user-visible files (inodes) used. If the volume is restricted or offline, a value 0 returned.	inodes	None	Statistics
Used Inodes Percentage	Percentage of user-visible files (inodes) used.	Percentage (%)	None	Statistics
Write Byte Rate	Bytes written per second to the volume since the last collect.	Megabytes per second (MB/s)	None	Statistics
Write Operation Rate	Number of write operations per second.	operations /s	None	Statistics
Write Response Time	Average response time for write operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time

** Attributes marked with an asterisk are used by default when visualizing the corresponding monitor instance in TrueSight Operations Management.*

Cluster Mode

NetApp Cluster Aggregate

Attributes

Name	Description	Unit	Default	Attribute Type
Available Capacity	Total capacity not consumed in the aggregate.	Terabytes (TB)	None	Statistics
Available Capacity Percentage*	Percentage of capacity not consumed in the aggregate.	Percentage (%)	None	Statistics
Consumed Capacity	Number of bytes actually consumed in the aggregate.	Terabytes (TB)	None	Statistics
Consumed Capacity Percentage	Percentage of the capacity that is actually consumed in the aggregate.	Percentage (%)	Warning > 80 Alarm > 90	Statistics
Mirror Status	Overall mirror status of the aggregate.	{0 = OK; 1 = Degraded; 2 = Failed}	1 = Warning 2 = Alarm	Availability
Operation Rate	Total number of operations per second.	operations/s	None	Statistics
Read Operation Rate	Number of operation read per second.	operations/s	None	Statistics
Space Reservation Status	Indicates whether the space reservation is enabled or not.	{0 = Disabled; 1 = Enabled}	None	Availability
Status*	Status of the aggregate.	{0 = OK; 1 = Degraded; 2 = Failed}	1 = Warning 2 = Alarm	Availability
Total Files	Total count of user-visible files.	files	None	Statistics
Used Files	Number of user-visible files used.	files	None	Statistics
Write Operation Rate	Number of write operations per second.	operations/s	None	Statistics

** Attributes marked with an asterisk are used by default when visualizing the corresponding monitor instance in TrueSight Operations Management.*

NetApp Cluster CIFS

Attributes

Display Name	Description	Unit	Default Alert Conditions	Attribute Type
Administrative Status	The current status of the CIFS service.	{0 = Up; 1 = Down}	1 = Alarm	Availability
Operation Rate*	Total number of operations per second.	operations/s	None	Statistics
Read Operation Rate	Number of read operations per second.	operations/s	None	Statistics
Read Response Time	Average response time for read operations	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
Response Time*	Average response time for all operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
Write Operation Rate	Number of write operations per second.	operations/s	None	Statistics
Write Response Time	Average response time for write operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time

** Attributes marked with an asterisk are used by default when visualizing the corresponding monitor instance in TrueSight Operations Management.*

NetApp Cluster

Attributes

Name	Decription	Unit	Default Alert Conditions	Attribute Type
CIFS Operation Rate	Number of CIFS operations per second.	operations/s	None	Statistics
Collection Status	Status of the collection. Errors reported by this parameter are only related to NetApp Storage Monitoring itself.	{0 = OK; 1 = Degraded; 2 = Failed}	None	Collection Status
Disk Transfer Byte Rate 🔑	Total bytes read and written per second to the disk.	Megabytes per second (MB/s)	None	Statistics
FCP Operation Rate	Number of FCP operations per second.	operations/s	None	Statistics
HTTP Operation Rate	Number of HTTP operations per second.	operations/s	None	Statistics
iSCSI Operation Rate	Number of iSCSI operations per second.	operations/s	None	Statistics
Network Transfer Byte Rate* 🔑	Total bytes read and written per second through the network.	Megabytes per second (MB/s)	None	Statistics
NFS Operation Rate	Number of NFS operations per second.	operations/s	None	Statistics
Operation Rate	Total number of operations per second.	operations/s	None	Statistics
Port Count	Number of physical ports in the cluster. *Note: This value can be used to know the number of required licenses for the monitoring system*	ports	None	Statistics
Power Consumption*	Reports the electricity consumption of the storage system.	Watts	None	Statistics
Spare Disk Count	Number of spare disks in the storage system.	disks	0 = Warning	Statistics

For detailed information about 🔑 *KPI*, see Managing Baselines and Key Performance Indicators.

** Attributes marked with an asterisk are used by default when visualizing the corresponding monitor instance in TrueSight Operations Management.*

NetApp Cluster Disk

Attributes

Name	Description	Unit	Default Alert Conditions	Attribute Type
Operation Rate*	Total number of operations per second.	operations/s	None	Statistics
Present	Indicates whether the device is still present or not since the last discovery. This parameter is updated at each discovery.	{0 = No; 1 = Yes}	0 = Alarm	Availability
Read Operation Rate	Number of read operations per second.	operations/s	None	Statistics
Read Response Time	Average response time for read operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
Response Time*	Average response time for all operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
Status	Status of the disk.	{0 = OK; 1 = Degraded; 2 = Failed}	1 = Warning 2 = Alarm	Availability
Write Operation Rate	Number of write operations per second.	operations/s	None	Statistics
Write Response Time	Average response time for write operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time

** Attributes marked with an asterisk are used by default when visualizing the corresponding monitor instance in TrueSight Operations Management.*

NetApp Cluster Ethernet Port

Attributes

Name	Description	Unit	Default Alert Conditions	Attribute Type
Bandwidth Utilization	Percentage used of the available bandwidth.	Percentage (%)	None	Statistics
Collisions Packet Rate	Number of collision of packets per seconds.	packets/s	None	Statistics
Inbound Bandwidth Utilization	Percentage of inbound bandwidth used on the Ethernet port (received bytes).	Percentage (%)	None	Statistics
Link Speed	Actual speed of the Ethernet port.	Gigabits per second (Gb/s)	None	Statistics
Link Status	Current status of the Ethernet port.	{0 = Plugged; 1 = Unplugged}	1 = Warning	Statistics
Multicast Received Packet Rate	Number of multicast packets received per second.	packets/s	None	Statistics
Multicast Sent Packet Rate	Number of multicast packets sent per second.	packets/s	None	Statistics
Multicast Transfer Packet Rate	Total number of multicast packets transferred per second (sent and received.)	packets/s	None	Statistics
Outbound Bandwidth Utilization	Percentage of outband bandwidth used on the Ethernet port (sent bytes).	Percentage (%)	None	Statistics
Present	Indicates whether the device is still present or not since the last discovery. This parameter is updated at each discovery.	{0 = No; 1 = Yes}	0 = Alarm	Availability

Name	Description	Unit	Default Alert Conditions	Attribute Type
Received Byte Rate	Bytes received per second.	Megabytes per second (MB/s)	None	Statistics
Received Error Rate	Number of errors per second while receiving packets.	errors/s	None	Statistics
Received Packet Dropped Rate	Number of received packets dropped per second.	packets/s	None	Statistics
Received Packet Rate	Number of packets received per second.	packets/s	None	Statistics
Sent Byte Rate	Bytes sent per second.	Mebagytes per second (MB/s)	None	Statistics
Sent Error Rate	Number of errors per second while sending packets.	errors/s	None	Statistics
Sent Packet Rate	Number of packets sent per second.	packets/s	None	Statistics
Transfer Byte Rate*	Total bytes transferred per second (sent and received).	Megabytes per second (MB/s)	None	Statistics
Transfer Error Rate	Number of errors per second while transferring packets.	errors/s	None	Statistics
Transfer Packet Rate*	Number of packets transferred per second.	packets/s	None	Statistics

** Attributes marked with an asterisk are used by default when visualizing the corresponding monitor instance in TrueSight Operations Management.*

NetApp Cluster Fan

Attributes

Name	Description	Unit	Default Alert Conditions	Attribute Type
Present	Indicates whether the device is still present or not since the last discovery. This parameter is updated at each discovery.	{0 = No; 1 = Yes}	0 = Alarm	Availability
Speed*	Speed of the fan.	Revolutions per minute (RPM)	None	Statistics
Status*	Status of the fan.	{0 = OK; 1 = Degraded; 2 = Failed}	1 = Warning 2 = Alarm	Availability

** Attributes marked with an asterisk are used by default when visualizing the corresponding monitor instance in TrueSight Operations Management.*

NetApp Cluster FC Port

Attributes

Name	Description	Unit	Default Alert Conditions	Attribute Type
Bandwidth Utilization	Percentage used of the available bandwidth.	Percentage (%)	None	Statistics
Inbound Bandwidth Utilization	Percentage of inbound bandwidth used on the FC link (received bytes).	Percentage (%)	None	Statistics
Link Speed	Actual speed of the FC port.	Gigabit per second (Gb/s)	None	Statistics
Link Status	Indicates whether the link is up or down.	{0 = Plugged; 1 = Unplugged}	1 = Warning	Availability
Operation Rate*	Total number of operations per second.	operations/s	None	Statistics
Other Operation Rate	Total number of other operations per second.	operations/s	None	Statistics
Outbound Bandwidth Utilization	Percentage of outband bandwidth used on the FC link (sent bytes).	Percentage (%)	None	Statistics

Name	Description	Unit	Default Alert Conditions	Attribute Type
Present	Indicates whether the device is still present or not since the last discovery. This attribute is updated at each discovery.	{0 = No; 1 = Yes}	0 = Alarm	Availability
Read Operation Rate	Number of read operations per second.	operations/s	None	Statistics
Received Byte Rate	Bytes received per second.	Megabytes per second (MB/s)	None	Statistics
Sent Byte Rate	Bytes sent per second.	Megabytes per second (MB/s)	None	Statistics
Status	Status of the FC port.	{0 = OK; 1 = Degraded; 2 = Failed}	1 = Warning 2 = Alarm	Availability
Transfer Byte Rate*	Total bytes transferred per second (sent and received).	Megabytes per second (MB/s)	None	Statistics
Write Operation Rate	Number of write operations per second.	operations/s	None	Statistics

** Attributes marked with an asterisk are used by default when visualizing the corresponding monitor instance in TrueSight Operations Management.*

NetApp Cluster Host Adapter

Attributes

Name	Description	Unit	Default Alert Conditions	Attribute Type
inUse	Indicates whether the adapter is in use or not.	{0 = No; 1 = Yes}	None	Statistics
Operation Rate*	Total number of operations per second.	operations/s	None	Statistics
Present	Indicates whether the device is still present or not since the last discovery. This parameter is updated at each discovery.	{0 = No; 1 = Yes}	0 = Alarm	Availability
Read Byte Rate	Bytes read per second from the host adapter since the last collect.	Megabytes per second (MB/s)	None	Statistics
Read Operation Rate	Number of read operations per second.	operations/s	None	Statistics

Name	Description	Unit	Default Alert Conditions	Attribute Type
Transfer Byte Rate*	Total bytes read and written per second to the host adapter.	Megabytes per second (MB/s)	None	Statistics
Write Byte Rate	Bytes written per second to the host adapter since the last collect.	Megabytes per second (MB/s)	None	Statistics
Write Operation Rate	Number of write operations per second.	operations/s	None	Statistics

** Attributes marked with an asterisk are used by default when visualizing the corresponding monitor instance in TrueSight Operations Management.*

NetApp Cluster iSCSI

Attributes

Name	Description	Unit	Default Alert Conditions	Attribute Type
Error Percentage*	iSCSI Protocol error percentage.	Percentage (%)	None	Statistics

** *Attributes marked with an asterisk are used by default when visualizing the corresponding monitor instance in TrueSight Operations Management.*

NetApp Cluster iSCSI Port

Attributes

Name	Description	Unit	Default Alert Conditions	Attribute Type
Operation Rate*	Total number of operations per second.	operations/s	None	Statistics
Read Operation Rate	Number of read operations per second.	operations/s	None	Statistics
Read Response Time	Average response time for read operations.	Milliseconds (ms)	None	Response Time
Response Time*	Average response time for all operations.	Milliseconds (ms)	None	Response Time
Write Operation Rate	Number of write operations per second.	operations/s	None	Statistics
Write Response Time*	Average response time for write operations.	Milliseconds (ms)	None	Response Time

**Attributes marked with an asterisk are used by default when visualizing the corresponding monitor instance in TrueSight Operations Management.*

NetApp Cluster LUN

Attributes

Name	Description	Unit	Default Alert Conditions	Attribute Type
Consumed Capacity	Number of bytes actually consumed in the LUN.	Gigabytes (GB)	None	Statistics
Operation Rate	Total number of operations per second.	operations/s	None	Statistics
Other Operation Rate	Total number of other operations per second.	operations/s	None	Statistics
Read Byte Rate	Bytes read per second from the LUN.	Megabytes per second (MB/s)	None	Statistics
Read Operation Rate	Number of read operations per second.	operations/s	None	Statistics
Response Time*	Average response time for all operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
Space Reservation Status	Space reservation status.	{0 = Disabled; 1 = Enabled}	None	Availability
Time Since Last Activity	Number of days since any activity occurred on the LUN.	Days	None	Statistics
Transfer Byte Rate*	Total bytes read and written per second to the LUN.	Megabytes per second (MB/s)	None	Statistics
Write Byte Rate	Bytes written per second to the LUN.	Megabytes per second (MB/s)	None	Statistics
Write Operation Rate	Number of write operations per second.	operations/s	None	Statistics

**Attributes marked with an asterisk are used by default when visualizing the corresponding monitor instance in TrueSight Operations Management.*

NetApp Cluster NFS

Attributes

Name	Description	Unit	Default Alert Conditions	Attribute Type
Operation Rate*	Total number of operations per second.	operations/s	None	Statistics
Read Operation Rate	Number of read operations per second.	operations/s	None	Statistics
Read Response Time	Average response time for read operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
Response Time*	Average response time for all operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
Write Operation Rate	Number of write operations per second.	operations/s	None	Statistics
Write Response Time	Average response time for write operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time

**Attributes marked with an asterisk are used by default when visualizing the corresponding monitor instance in TrueSight Operations Management.*

NetApp Node

Attributes

Name	Description	Unit	Default Alert Conditions	Attribute Type
CIFS Operation Rate	Total number of CIFS operations per second.	operations/s	None	Statistics
Disk Read Byte Rate	Bytes read per second from the disk since the last collect.	Megabytes per second (MB/s)	None	Statistics
Disk Transfer Byte Rate* 🔑	Total bytes read and written per second to the disk.	Megabytes per second (MB/s)	None	Statistics
Disk Write Byte Rate	Bytes written per second to the disk since the last collect.	Megabytes per second (MB/s)	None	Statistics
FCP Operation Rate	Total number of FCP operations per second.	operations/s	None	Statistics
HTTP Operation Rate	Total number of HTTP operations per second.	operations/s	None	Statistics
iSCSI Operation Rate	Total number of iSCSI operations per second.	operations/s	None	Statistics
Network Received Byte Rate	Bytes received per second.	Megabytes per second (MB/s)	None	Statistics
Network Sent Byte Rate	Bytes sent per second.	Megabytes per second (MB/s)	None	Statistics
Network Transfer Byte Rate* 🔑	Total bytes transferred per second (sent and received).	Megabytes per second (MB/s)	None	Statistics
NFS Operation Rate	Total number of NFS operations per second.	operations/s	None	Statistics
Operation Rate	Total number of operations per second.	operations/s	None	Statistics
Present	Indicates whether the device is still present or not since the last discovery. This attribute is updated at each discovery.	{0 = No; 1 = Yes}	0 = Alarm	Availability

Name	Description	Unit	Default Alert Conditions	Attribute Type
Processor Utilization	Percentage of utilization of the CPU resource.	Percentage (%)	Warning ≥ 30 Alarm ≥ 100	Statistics
Read Operation Rate	Number of read operations per second.	operations/s	None	Statistics
Read Response Time	Average response time for read operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
Response Time	Average response time for all operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
Uptime	Amount of time the system has been up and running.	days	None	Statistics
Write Operation Rate	Number of write operations per second.	operations/s	None	Statistics
Write Response Time	Average response time for write operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time

** Attributes marked with an asterisk are used by default when visualizing the corresponding monitor instance in TrueSight Operations Management.*

For detailed information about *KPI*, see Managing Baselines and Key Performance Indicators.

NetApp Cluster Root Volume

Attributes

Name	Decription	Unit	Default Alert Conditions	Attribute Type
Available Capacity	Total capacity not consumed in the volume.	Gigabytes (GB)	None	Statistics
Available Capacity Percentage	Percentage of capacity not consumed in the volume.	Percentage (%)	None	Statistics
Capacity	Total usable capacity (in bytes) of the volume, excluding WAFL reserve and volume snapshot reserve.	Gigabytes (GB)	None	Statistics
CIFS Operation Rate	Total number of CIFS operations per second.	operations/s	None	Statistics
CIFS Read Byte Rate	Bytes read per second via CIFS from the volume since the last collect.	Megabytes per second (MB/s)	None	Statistics
CIFS Read Operation Rate	Number of read operations per second.	operations/s	None	Statistics
CIFS Read Response Time	Average response time for read operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
CIFS Response Time	Average response time for all CIFS operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
CIFS Transfer Byte Rate	Total bytes read and written per second via CIFS to the volume.	Megabytes per second (MB/s)	None	Statistics
CIFS Write Byte Rate	Bytes written per second via CIFS to the volume since the last collect.	Megabytes per second (MB/s)	None	Statistics
CIFS Write Operation Rate	Number of write CIFS operations per second.	operations/s	None	Statistics
CIFS Write Response Time	Average response time for CIFS write operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
Consumed Capacity	Number of bytes actually consumed in the volulme.	Gigabytes (GB)	None	Statistics
Consumed Capacity Percentage	Percentage of the capacity that is actually consumed in the volume.	Percentage (%)	None	Statistics
FCP Operation Rate	Total number of FCP operations per second.	operations/s	None	Statistics

Name	Decription	Unit	Default Alert Conditions	Attribute Type
FCP Read Byte Rate	Bytes read per second via FCP from the volume since the last collect	Megabytes per second (MB/s)	None	Statistics
FCP Read Operation Rate	Number of FCP read operations per second.	operations/s	None	Statistics
FCP Read Response Time	Average response time for FCP read operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
FCP Response Time	Average response time for all FCP operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
FCP Transfer Byte Rate	Total bytes read and written per second via FCP to the volume.	Megabytes per second (MB/s)	None	Statistics
FCP Write Byte Rate	Bytes written per second via FCP to the volume since the last collect.	Megabytes per second (MB/s)	None	Statistics
FCP Write Operation Rate	Number of write FCP operations per second.	operations/s	None	Statistics
FCP Write Response Time	Average response time for FCP write operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
FlexCache Read Byte Rate	Bytes read per second from the FlexCache since the last collect.	Megabytes per second (MB/s)	None	Statistics
FlexCache Write Byte Rate	Bytes written per second to FlexCache since the last collect.	Megabytes per second (MB/s)	None	Statistics
Inodes Used	Number of user-visible files (inodes) used. If the volume is restricted or offline, a value 0 returned.	inodes	None	Statistics
iSCSI Operation Rate	Total number of block protocol operations per second.	operations/s	None	Statistics
iSCSI Read Byte Rate	Bytes read per second via block protocol from the volume since the last collect.	Megabytes per second (MB/s)	None	Statistics
iSCSI Read Operation Rate	Number of block protocol read operations per second.	operations/s	None	Statistics
iSCSI Read Response Time	Average response time for block protocol read operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time

Name	Decription	Unit	Default Alert Conditions	Attribute Type
iSCSI Response Time	Average response time for all block protocol operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
iSCSI Transfer Byte Rate	Total bytes read and written per second via iSCSI to the volume.	Megabytes per second (MB/s)	None	Statistics
iSCSI Write Byte Rate	Bytes written per second via iSCSI to the volume since the last collect.	Megabytes per second (MB/s)	None	Statistics
iSCSI Write Operation Rate	Number of iSCSI write operations per second.	operations/s	None	Statistics
iSCSI Write Response Time	Average response time iSCSI write operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
Mirror Status	Volume's mirror status.	{0 = OK; 1 = Degraded; 2 = Failed}	1 = Warning 2 = Alarm	Availability
NFS Operation Rate	Total number of NFS operations per second.	operations/s	None	Statistics
NFS Read Byte Rate	Bytes read per second via NFS from the volume since the last collect.	Megabytes per second (MB/s)	None	Statistics
NFS Read Operation Rate	Number of NFS read operations per second.	operations/s	None	Statistics
NFS Read Response Time	Average response time for NFS read operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
NFS Response Time	Average response time for all NFS operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
NFS Transfer Byte Rate	Total bytes read and written per second via NFS to the volume.	Megabytes per second (MB/s)	None	Statistics
NFS Write Byte Rate	Bytes written per second via NFS to the volume since the last collect.	Megabytes per second (MB/s)	None	Statistics
NFS Write Operation Rate	Number of write NFS operations per second.	operations/s	None	Statistics
NFS Write Response Time	Average response time for NFS write operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
Operation Rate	Total number of operations per second.	operations/s	None	Statistics

Name	Decription	Unit	Default Alert Conditions	Attribute Type
Read Byte Rate	Bytes read per second from the volume since the last collect.	Megabytes per second (MB/s)	None	Statistics
Read Operation Rate	Number of read operations per second.	operations/s	None	Statistics
Read Response Time	Average response time for read operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
Response Time*	Average response time for all operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
SAN Operation Rate	Total number of SAN operations per second.	operations/s	None	Statistics
SAN Read Byte Rate	Bytes read per second from the SAN since the last collect.	Megabytes per second (MB/s)	None	Statistics
SAN Read Operation Rate	Number of SAN read operations per second.	operations/s	None	Statistics
SAN Read Response Time	Average response time for SAN read operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
SAN Response Time	Average response time for all SAN operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
SAN Transfer Byte Rate	Total bytes read and written per second via SAN to the volume.	Megabytes per second (MB/s)	None	Statistics
SAN Write Byte Rate	Bytes written per second via SAN to the volume since the last collect.	Megabytes per second (MB/s)	None	Statistics
SAN Write Operation Rate	Number of SAN write operations per second.	operations/s	None	Statistics
SAN Write Response Time	Average response time for SAN write operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
Snapshot Reserved Capacity Percentage	Percentage of disk space that has been set aside as reserved for snapshot usage.	Percentage (%)	Warning ≥ 80 Alarm ≥ 90	Statistics
Status	Status of the volume.	{0 = OK; 1 = Degraded; 2 = Failed}	1 = Warning 2 = Alarm	Availability

Name	Decription	Unit	Default Alert Conditions	Attribute Type
Transfer Byte Rate*	Total bytes read and written per second to the volume.	Megabytes per second (MB/s)	None	Statistics
Used Inodes Percentage	Percentage of user-visible files (inodes) used.	Percentage (%)	None	Statistics
Write Byte Rate	Bytes written per second to the volume since the last collect.	Megabytes per second (MB/s)	None	Statistics
Write Operation Rate	Number of write operations per second.	operations/s	None	Statistics
Write Response Time	Average response time for write operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time

** Attributes marked with an asterisk are used by default when visualizing the corresponding monitor instance in TrueSight Operations Management.*

NetApp Cluster NVRAM

Attributes

Name	Description	Unit	Default Alert Conditions	Attribute Type
Operation Rate*	Total number of operations per second.	operations/s	None	Statistics
Response Time*	Average response time for all operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
Transfer Byte Rate	Total bytes read and written per second to the NVRAM.	Megabytes per second (MB/s)	None	Statistics

** Attributes marked with an asterisk are used by default when visualizing the corresponding monitor instance in TrueSight Operations Management.*

NetApp Cluster Plex

Attributes

Name	Decription	Unit	Default Alert Conditions	Attribute Type
Status*	Status of the plex.	{0 = OK ; 1 = Degraded 2 = Failed}	1 = Warning 2 = Alarm	Availability
Synchronized	Indicates whether the plex is currently synchronizing or not.	{0 = No ; 1 = Yes}	None	Statistics

** Attributes marked with an asterisk are used by default when visualizing the corresponding monitor instance in TrueSight Operations Management.*

NetApp Cluster Power Supply

Attributes

Display Name	Description	Unit	Default Alert Conditions	Attribute Type
Present	Indicates whether the device is still present or not since the last discovery. This parameter is updated at each discovery.	{0 = No; 1 = Yes}	0 = Alarm	Availability
Status*	Status of the power supply.	{0 = OK; 1 = Degraded; 2 = Failed}	1 = Warning 2 = Alarm	Availability

** Attributes marked with an asterisk are used by default when visualizing the corresponding monitor instance in TrueSight Operations Management.*

NetApp Cluster Processor

Attributes

Name	Description	Unit	Default Alert Conditions	Attribute Type
Present	Indicates whether the device is still present or not since the last discovery. This parameter is updated at each discovery.	{0 = No; 1 = Yes}	0 = Alarm	Availability
Processor Utilization*	Percentage of utilization of the CPU.	Percentage (%)	Warning ≥ 80 Alarm ≥ 90	Statistics

** Attributes marked with an asterisk are used by default when visualizing the corresponding monitor instance in TrueSight Operations Management.*

NetApp Cluster Qtree

Attributes

Name	Description	Unit	Default Alert Conditions	Attribute Type
CIFS Operation Rate*	Number of CIFS operations per second.	operations/s	None	Statistics
NFS Operation Rate*	Number of NFS operations per second to the qtree.	operations/s	None	Statistics
Operation Rate	Total number of operations per second.	operations/s	None	Statistics
Other Operation Rate	Number of other operations per second.	operations/s	None	Statistics

** Attributes marked with an asterisk are used by default when visualizing the corresponding monitor instance in TrueSight Operations Management.*

NetApp Cluster Quota

Attributes

Name	Description	Unit	Default Alert Conditions	Attribute Type
Consumed Capacity	Number of gigabytes actually consumed.	Gigabytes (GB)	None	Statistics
Consumed Hard Capacity Percentage	Percentage of the hard capacity that is actually consumed.	Percentage (%)	None	Statistics
Consumed Soft Capacity Percentage	Percentage of the soft capacity that is actually consumed.	Percentage (%)	None	Statistics
File Count	Number of files counted towards the hard and soft limit set on the quota.	files	None	Statistics
Hard File Count Percentage	Number of files in percentage of the hard limit.	Percentage (%)	None	Statistics
Soft File Count Percentage	Number of files in percentage of the soft limit.	Percentage (%)	None	Statistics

NetApp Cluster Shelf

Attributes

Name	Description	Unit	Default Alert Conditions	Attribute Type
Present	Indicates whether the device is still present or not since the last discovery. This parameter is updated at each discovery.	{0 = No; 1 = Yes}	0 = Alarm	Availability
Status*	Status of the shelf.	{0 = OK; 1 = Degraded; 2 = Failed}	1 = Warning 2 = Alarm	Availability

** Attributes marked with an asterisk are used by default when visualizing the corresponding monitor instance in TrueSight Operations Management.*

NetApp Cluster SIS Volume

Attributes

Name	Description	Unit	Default Alert Conditions	Attribute Type
Dense Files	Number of dense files in the SIS volume.	files	None	Statistics
Last Operation Size	Data size processed in last SIS operation.	Megabytes (MB)	None	Statistics
Number Of Files Too Small	Number of files found that are too small to be deduplicated (compressed).	files	None	Statistics
Saved Space Percentage*	Percent saving because of deduplication.	Percentage (%)	None	Statistics
Shared Saved Blocks	Number of blocks saved by sharing in the SIS volume.	blocks	None	Statistics
SIS Duration	Time since the last SIS operation has begun.	seconds	None	Statistics
Space Condition Limitation Count	Number of times deduplication could not happen because of out of space condition.	times	None	Statistics
Status*	Status of the SIS volume.	{0 = OK; 1 = Degraded; 2 = Failed}	1= Warning 2 = Alarm	Availability

** Attributes marked with an asterisk are used by default when visualizing the corresponding monitor instance in TrueSight Operations Management.*

NetApp Cluster Snapmirror

Attributes

Name	Description	Unit	Default Alert Conditions	Attribute Type
Lag	Amount of time since the last Snapmirror transfer in seconds.	seconds	None	Statistics
Last Transfer Duration	Duration of the last SnapMirror transfer in seconds.	seconds	None	Statistics
Last Transfer Size	Size of the last SnapMirror transfer.	Gigabytes (GB)	None	Statistics
Status*	Status of the Snapmirror.	{0 = OK; 1 = Degraded; 2 = Failed}	1 = Warning 2 = Alarm	Availability
Transfer Byte Rate*	Total bytes read and written per second to the Snapmirror.	Megabytes per second (MB/s)	None	Statistics

** Attributes marked with an asterisk are used by default when visualizing the corresponding monitor instance in TrueSight Operations Management.*

NetApp Cluster Temperature

Attributes

Name	Decription	Unit	Default Alert Conditions	Attribute Type
Status*	Status of the temperature sensor.	{0 = OK; 1 = Degraded; 2 = Failed}	1 = Warning 2 = Alarm	Availability
Temperature*	Current temperature reading in degrees Celsius.	degrees Celsius (°C)	None	Statistics
Temperature Status*	Status of the temperature sensor according to the temperature thresholds settings.	{0 = OK; 1 = Degraded; 2 = Failed}	1 = Warning 2 = Alarm	Availability

** Attributes marked with an asterisk are used by default when visualizing the corresponding monitor instance in TrueSight Operations Management.*

NetApp Cluster Voltage

Attributes

Name	Decription	Unit	Default Alert Conditions	Attribute Type
Status*	Status of the voltage sensor.	{0 = OK; 1 = Degraded; 2 = Failed}	1 = Warning 2 = Alarm	Availability

** Attributes marked with an asterisk are used by default when visualizing the corresponding monitor instance in TrueSight Operations Management.*

NetApp Cluster Volume

Attributes

Name	Decription	Unit	Default Alert Conditions	Attribute Type
Available Capacity	Total capacity not consumed in the volume.	Gigabytes (GB)	None	Statistics
Available Capacity Percentage	Percentage of capacity not consumed in the volume.	Percentage (%)	None	Statistics
Capacity	Total usable capacity (in bytes) of the volume, excluding WAFL reserve and volume snapshot reserve.	Gigabytes (GB)	None	Statistics
CIFS Operation Rate	Total number of CIFS operations per second.	operations/s	None	Statistics
CIFS Read Byte Rate	Bytes read per second via CIFS from the volume.	Megabytes per second (MB/s)	None	Statistics
CIFS Read Operation Rate	Number of read operations per second.	operations/s	None	Statistics
CIFS Read Response Time	Average response time for read operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
CIFS Response Time	Average response time for all CIFS operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
CIFS Transfer Byte Rate	Total bytes read and written per second via CIFS to the volume.	Megabytes per second (MB/s)	None	Statistics

Name	Decription	Unit	Default Alert Conditions	Attribute Type
CIFS Write Byte Rate	Bytes written per second via CIFS to the volume since the last collect.	Megabytes per second (MB/s)	None	Statistics
CIFS Write Operation Rate	Number of write CIFS operations per second.	operations/s	None	Statistics
CIFS Write Response Time	Average response time for CIFS write operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
Consumed Capacity	Number of bytes actually consumed in the volume.	Gigabytes (GB)	None	Statistics
Consumed Capacity Percentage	Percentage of the capacity that is actually consumed in the volume.	Percentage (%)	None	Statistics
FCP Operation Rate	Total number of FCP operations per second.	operations/s	None	Statistics
FCP Read Byte Rate	Bytes read per second via FCP from the volume since the last collect	Megabytes per second (MB/s)	None	Statistics
FCP Read Operation Rate	Number of FCP read operations per second.	operations/s	None	Statistics
FCP Read Response Time	Average response time for FCP read operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
FCP Response Time	Average response time for all FCP operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
FCP Transfer Byte Rate	Total bytes read and written per second via FCP to the volume.	Megabytes per second (MB/s)	None	Statistics
FCP Write Byte Rate	Bytes written per second via FCP to the volume since the last collect.	Megabytes per second (MB/s)	None	Statistics
FCP Write Operation Rate	Number of write FCP operations per second.	operations/s	None	Statistics
FCP Write Response Time	Average response time for FCP write operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
FlexCache ReadByte Rate	Bytes read per second from the FlexCache since the last collect.	Megabytes per second (MB/s)	None	Statistics
FlexCache Write Byte Rate	Bytes written per second to FlexCache since the last collect.	Megabytes per second (MB/s)	None	Statistics

Name	Decription	Unit	Default Alert Conditions	Attribute Type
Inodes Used	Number of user-visible files (inodes) used. If the volume is restricted or offline, a value 0 returned.	inodes	None	Statistics
iSCSI Operation Rate	Total number of block protocol operations per second.	operations/s	None	Statistics
iSCSI Read Byte Rate	Bytes read per second via block protocol from the volume since the last collect.	Megabytes per second (MB/s)	None	Statistics
iSCSI Read Operation Rate	Number of block protocol read operations per second.	operations/s	None	Statistics
iSCSI Read Response Time	Average response time for block protocol read operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
iSCSI Response Time	Average response time for all block protocol operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
iSCSI Transfer Byte Rate	Total bytes read and written per second via iSCSI to the volume.	Megabytes per second (MB/s)	None	Statistics
iSCSI Write Byte Rate	Bytes written per second via iSCSI to the volume since the last collect.	Megabytes per second (MB/s)	None	Statistics
iSCSI Write Operation Rate	Number of iSCSI write operations per second.	operations/s	None	Statistics
iSCSI Write Response Time	Average response time iSCSI write operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
Mirror Status	Volume's mirror status.	{0 = OK; 1 = Degraded; 2 = Failed}	1 = Warning 2 = Alarm	Availability
NFS Operation Rate	Total number of NFS operations per second.	operations/s	None	Statistics
NFS Read Byte Rate	Bytes read per second via NFS from the volume since the last collect.	Megabytes per second (MB/s)	None	Statistics
NFS Read Operation Rate	Number of NFS read operations per second.	operations/s	None	Statistics
NFS Read Response Time	Average response time for NFS read operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time

Name	Decription	Unit	Default Alert Conditions	Attribute Type
NFS Response Time	Average response time for all NFS operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
NFS Transfer Byte Rate	Total bytes read and written per second via NFS to the volume.	Megabytes per second (MB/s)	None	Statistics
NFS Write Byte Rate	Bytes written per second via NFS to the volume since the last collect.	Megabytes per second (MB/s)	None	Statistics
NFS Write Operation Rate	Number of write NFS operations per second.	operations/s	None	Statistics
NFS Write Response Time	Average response time for NFS write operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
Operation Rate	Total number of operations per second.	operations/s	None	Statistics
Read Byte Rate	Bytes read per second from the volume since the last collect.	Megabytes per second (MB/s)	None	Statistics
Read Operation Rate	Number of read operations per second.	operations/s	None	Statistics
Read Response Time	Average response time for read operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
Response Time*	Average response time for all operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
SAN Operation Rate	Total number of SAN operations per second.	operations/s	None	Statistics
SAN Read Byte Rate	Bytes read per second from the SAN since the last collect.	Megabytes per second (MB/s)	None	Statistics
SAN Read Operation Rate	Number of SAN read operations per second.	operations/s	None	Statistics
SAN Read Response Time	Average response time for SAN read operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
SAN Response Time	Average response time for all SAN operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
SAN Transfer Byte Rate	Total bytes read and written per second via SAN to the volume.	Megabytes per second (MB/s)	None	Statistics

Name	Decription	Unit	Default Alert Conditions	Attribute Type
SAN Write Byte Rate	Bytes written per second via SAN to the volume since the last collect.	Megabytes per second (MB/s)	None	Statistics
SAN Write Operation Rate	Number of SAN write operations per second.	operations/s	None	Statistics
SAN Write Response Time	Average response time for SAN write operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time
Snapshot Reserved Capacity Percentage	Percentage of disk space that has been set aside as reserved for snapshot usage.	Percentage (%)	Warning ≥ 80 Alarm ≥ 90	Statistics
Status	Status of the volume.	{0 = OK; 1 = Degraded; 2 = Failed}	1 = Warning 2 = Alarm	Availability
Transfer Byte Rate*	Total bytes read and written per second to the volume.	Megabytes per second (MB/s)	None	Statistics
Used Inodes Percentage	Percentage of user-visible files (inodes) used.	Percentage (%)	None	Statistics
Write Byte Rate	Bytes written per second to the volume since the last collect.	Megabytes per second (MB/s)	None	Statistics
Write Operation Rate	Number of write operations per second.	operations/s	None	Statistics
Write Response Time	Average response time for write operations.	Milliseconds (ms)	Warning ≥ 30 Alarm ≥ 100	Response Time

** Attributes marked with an asterisk are used by default when visualizing the corresponding monitor instance in TrueSight Operations Management.*

NetApp Vserver

Attributes

Name	Description	Unit	Default Alert Conditions	Attribute Type
Operation Rate	Total number of operations per second.	operations/s	None	Statistics
Read Byte Rate	Bytes read per second by the vServer.	Megabytes per second (MB/s)	None	Statistics
Read Operation Rate	Number of read operations per second.	operations/s	None	Statistics
Status*	Status of the vServer.	{0 = OK; 1 = Degraded; 2 = Failed}	1 = Warning 2 = Alarm	Availability
Transfer Byte Rate*	Total bytes transferred per second (sent and received) over the network.	Megabytes per second (MB/s)	None	Statistics
Write Byte Rate	Bytes written per second by the vServer.	Megabytes per second (MB/s)	None	Statistics
Write Operation Rate	Number of write operations per second.	operations/s	None	Statistics

** Attributes marked with an asterisk are used by default when visualizing the corresponding monitor instance in TrueSight Operations Management.*

Troubleshooting Connectivity Issues

TrueSight Operations Management - NetApp Storage leverages the Data ONTAP API to collect hardware and performance information. Because some connectivity issues may exist and cause TrueSight Operations Management - NetApp Storage to fail, it is highly recommended to test the connection to the Data ONTAP API before contacting the Sentry Support Team.

To troubleshoot connectivity issues:

1. Download the connection tool required from the Sentry Software Website (**Downloads** section of your product). Please note that the connection tool requires Java v1.6 or higher.
2. Run the command **java -jar NetApp-Connection-Tool_<version>.jar** to launch the connection tool.
3. Enter the information required to connect to the system and click **Test Connection**.
4. Wait for the test to complete. If a connectivity issue is detected, an error message will appear. In this case, the issue encountered has nothing to do with **NetApp Storage Monitoring**. Check your configuration to diagnose the source of the issue.
5. Click **Save As** to export the connection test results into a txt file. You can then send this information to the Sentry Support Team.

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BMC Software helps leading companies around the world put technology at the forefront of business transformation, improving the delivery and consumption of digital services. From mainframe to cloud to mobile, BMC delivers innovative IT management solutions that have enabled more than 20,000 customers to leverage complex technology into extraordinary business performance—increasing their agility and exceeding anything they previously thought possible. For more information about BMC Software, visit www.bmc.com.

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