IBM System Storage N series

IBM

OnCommand Unified Manager Performance Advisor Administration Guide For Use with Core Package 5.1

Contents

Preface

Supported features

IBM System Storage N series storage systems are driven by NetApp Data ONTAP software. Some features described in the product software documentation are neither offered nor supported by IBM. Please contact your local IBM representative or reseller for further details.

Information about supported features can also be found on the N series support website (accessed and navigated as described in *Websites* on page 8).

Websites

IBM maintains pages on the World Wide Web where you can get the latest technical information and download device drivers and updates. The following web pages provide N series information:

- A listing of currently available N series products and features can be found at the following web page:
  www.ibm.com/storage/nas/
- The IBM System Storage N series support website requires users to register in order to obtain access to N series support content on the web. To understand how the N series support web content is organized and navigated, and to access the N series support website, refer to the following publicly accessible web page:
  www.ibm.com/storage/support/nseries/
  This web page also provides links to AutoSupport information as well as other important N series product resources.
- IBM System Storage N series products attach to a variety of servers and operating systems. To determine the latest supported attachments, go to the IBM N series interoperability matrix at the following web page:
  www.ibm.com/systems/storage/network/interophome.html
- For the latest N series hardware product documentation, including planning, installation and setup, and hardware monitoring, service and diagnostics, see the IBM N series Information Center at the following web page:
  publib.boulder.ibm.com/infocenter/nasinfo/nseries/index.jsp

Getting information, help, and service

If you need help, service, or technical assistance or just want more information about IBM products, you will find a wide variety of sources available from IBM to assist you. This section contains

information about where to go for additional information about IBM and IBM products, what to do if you experience a problem with your IBM N series product, and whom to call for service, if it is necessary.

Before you call

Before you call, make sure you have taken these steps to try to solve the problem yourself:

• Check all cables to make sure they are connected.
• Check the power switches to make sure the system is turned on.
• Use the troubleshooting information in your system documentation and use the diagnostic tools that come with your system.
• Refer to the N series support website (accessed and navigated as described in *Websites* on page 8) for information on known problems and limitations.

Using the documentation

The latest versions of N series software documentation, including Data ONTAP and other software products, are available on the N series support website (accessed and navigated as described in *Websites* on page 8).

Current N series hardware product documentation is shipped with your hardware product in printed documents or as PDF files on a documentation CD. For the latest N series hardware product documentation PDFs, go to the N series support website.

Hardware documentation, including planning, installation and setup, and hardware monitoring, service, and diagnostics, is also provided in an IBM N series Information Center at the following web page:

publib.boulder.ibm.com/infocenter/nasinfo/nseries/index.jsp

Hardware service and support

You can receive hardware service through IBM Integrated Technology Services. Visit the following web page for support telephone numbers:

www.ibm.com/planetwide/

Firmware updates

IBM N series product firmware is embedded in Data ONTAP. As with all devices, ensure that you run the latest level of firmware. Any firmware updates are posted to the N series support website (accessed and navigated as described in *Websites* on page 8).

Note: If you do not see new firmware updates on the N series support website, you are running the latest level of firmware.

Verify that the latest level of firmware is installed on your machine before contacting IBM for technical support.

How to send your comments

Your feedback helps us to provide the most accurate and high-quality information. If you have comments or suggestions for improving this document, please send them by email to *starpubs@us.ibm.com*.

Be sure to include the following:

- Exact publication title
- Publication form number (for example, GC26-1234-02)
- Page, table, or illustration numbers
- A detailed description of any information that should be changed

What Performance Advisor is

Performance Advisor is a Java-based client application that runs in the Management Console and allows you to view comprehensive performance information about storage objects in your environment.

You can use the performance data to perform the following:

- Monitor storage objects for usage levels and optimal functioning, by viewing the data for all the monitored devices discovered by the DataFabric Manager server.
- Identify potential issues in the data infrastructure.
- Perform short-term trend analysis for the data infrastructure.

Topology of Performance Advisor

The topology of Performance Advisor is designed specifically to help you gather performance data.

Performance Advisor topology

The Performance Advisor topology includes the Management Console (which provides the interface to Performance Advisor), the DataFabric Manager server (which includes a *performance-monitoring server*), and one or more storage systems, vFiler units, clusters or Vservers.

Elements in the Performance Advisor interact in the following ways:

- The performance-monitoring server collects and stores performance data from one or more storage systems or vFiler units on the network. The monitoring server is installed and enabled by default as part of the DataFabric Manager server installation.
- Performance Advisor reads the performance data stored on the monitoring server and generates performance-related views and charts. You must install the Management Console on a separate host (Windows or Linux system) to manage the performance-monitoring server and view performance data.

  Note: Performance Advisor is available only on the host on which the Management Console is installed. You cannot view Performance Advisor remotely through a browser.

- The DataFabric Manager server monitors one or more storage nodes, Vservers, storage systems or vFiler units.

Limitations of Performance Advisor (7-Mode only)

Performance Advisor does not collect real-time data for any view that includes a bar graph to minimize CPU utilization.

Although the performance-monitoring server supports simultaneous connections from multiple Performance Advisor instances, connection from many instances of Performance Advisor simultaneously can result in slower collection of data.

Authentication of a Performance Advisor instance

The Management Console platform in which Performance Advisor runs must supply valid user name and password credentials to connect with the performance-monitoring server. The server obtains the user name and the password from the database on the workstation, and validates the credentials with the HTTP or HTTPS authentication mechanisms.

HTTP is the default protocol in 7-Mode systems and HTTPS is the default protocol in Cluster-Mode systems.

Performance Advisor support for hierarchical groups

Performance Advisor supports hierarchical groups created on the DataFabric Manager server 3.3.1 or later, including groups with or without storage objects, groups containing direct storage groups, groups containing subgroups, and the global group.

A group can be one of the following:

- An empty group with no storage objects or subgroups
- A group containing storage objects only, with no subgroups
- A group containing subgroups only, without direct storage objects
- A group containing one or more direct storage objects and one or more subgroups
- The global group
  The properties and configurations of this group are applied by default to all of its subgroups.

All the operations that you can perform on the global group are valid for the subgroups too. For example, you can click a subgroup folder to display the Summary View window.

Performance Advisor support for secure connections

Performance Advisor supports HTTP, SSL, and HTTPS connections for the performance-monitoring server, Performance Advisor, and the monitored storage systems, clusters, Vservers, and vFiler hosts.

The DataFabric Manager server generates an SSL certificate for the performance-monitoring server automatically at startup. You do not have to take any action to generate the certificate.

Note: If you use HTTPS transport for the connection between the performance-monitoring server and the storage system or vFiler host, it might adversely affect the performance of the storage system. In such cases, you should use HTTP transport only.

Administrator roles in Performance Advisor

You can use administrator roles such as the GlobalRead, GlobalWrite, GlobalDelete, and GlobalPerfManagement roles to control access to performance data in the DataFabric Manager server.

The administrator roles determine the availability of menu options in Performance Advisor. If the options appear dimmed in the application interface, it indicates that the options are unavailable to you for the selected storage system or vFiler unit.

The following roles help you to work with performance views in the interface:

- The GlobalRead role allows you to view all the performance views.
- The GlobalWrite and GlobalDelete roles allow you to create, edit, and delete custom views within any group.
- The GlobalPerfManagement role allows you to manage views, event thresholds, and alarms, apart from viewing performance information in the application.
  You can use this role to work with custom views.

Performance Advisor support for vFiler units (7-Mode only)

Performance Advisor supports the MultiStore feature in DataFabric Manager server 3.3.1 or later. You can view performance data for the objects in a vFiler unit, such as LUNs, volumes, and qtrees. You can also view physical performance data about the hosting storage system, such as CPU usage.

The vFiler unit counters are displayed for the hosting storage systems running Data ONTAP 7.1 or later.

Note: The vFiler unit, All report in Operations Manager console lists your network's vFiler units and their hosting storage systems.

See the *OnCommand Unified Manager Operations Manager Administration Guide* for information about the DataFabric Manager server support for vFiler units.

Related information

The IBM N series support website: www.ibm.com/storage/support/nseries/

Understanding information relevant to 7-Mode and Cluster-Mode environments

Because OnCommand Unified Manager supports both Cluster-Mode and 7-Mode environments, it is important to identify the information that is relevant to you.

The following labeling guidelines can help you to better understand the content that is provided in the OnCommand Unified Manager documentation:

- (7-Mode only)

  Topic titles or information within a topic include this label when the topic or information is applicable to the 7-Mode environment only. For example, the title *Adding storage systems (7-Mode only)* indicates that this task is relevant for the 7-Mode environment only.
- (Cluster-Mode only)

  Topic titles or information within a topic include this label when the topic or information is applicable to the Cluster-Mode environment only. For example, the title *Adding clusters (Cluster-Mode only)* indicates that this task is relevant for the Cluster-Mode environment only.
- No mode labels in titles

  Topics that apply to both 7-Mode and Cluster-Mode environments do not include any labels in the title. For example, the topic *Creating alarms for events* provides information that is relevant to both 7-Mode and Cluster-Mode environments.
- No mode labels in topic information

  Information within a topic that applies to both 7-Mode and Cluster-Mode environments does not include any labels.

The documentation includes the following topics to help you navigate to the specific information that you want:

- Each section in the Help includes two topics that provide links to information in that section of the Help, which is relevant to each mode.
- Each product manual includes two topics that provide links to information throughout the manual, which is relevant to each mode.

7-Mode: List of Performance Advisor tasks and information

Because Unified Manager supports both Cluster-Mode and 7-Mode environments, it is important to identify the information that relates to your 7-Mode environment.

The following list provides links to all the administration tasks and information related to storage in a 7-Mode environment:

Performance Advisor

About Management Console

Performance objects and counters

Access permissions for Role Based Access Control

Performance Advisor setup

Performance Advisor user interface

Dashboard and events

Views

Alarms, Storage systems, and Thresholds

Cluster-Mode: List of Performance Advisor tasks and information

Because Unified Manager supports both Cluster-Mode and 7-Mode environments, it is important to identify the information that relates to your 7-Mode environment.

The following list provides links to all the administration tasks and information related to storage in a Cluster-Mode environment:

Performance Advisor

About Management Console

Performance objects and counters

Access permissions for Role Based Access Control

Performance Advisor setup

Performance Advisor user interface

Dashboard and events

Views

Alarms, Storage systems, and Thresholds

About Management Console

Management Console is used by administrators to complete management tasks aided by the DataFabric Manager server, but it runs on a Windows or Linux system separate from the server on which the DataFabric Manager server is installed.

Management Console enables storage, application, and server administrators to perform management tasks such as data backup protection, space management, resource provisioning, data migration, and performance tuning, without having to switch between separate user interfaces.

The DataFabric Manager server provides infrastructure services (such as discovery, monitoring, role-based access control (RBAC), auditing, and logging for products in the storage and data suites) for IBM N series Manageability Software client consoles. The DataFabric Manager server software runs on a separate server and is managed through the Operations Manager console, the Web-based user interface of the DataFabric Manager server. For more information about the DataFabric Manager server and Operations Manager console, see the *Operations Manager Administration Guide*.

Related information

OnCommand Unified Manager Operations Manager Administration Guide - www.ibm.com/ storage/support/nseries/

What Management Console is

Management Console is a client platform that supports IBM N series Manageability Software capabilities. Together, Management Console and the associated OnCommand Unified Manager console, enable you to implement both policy-based and on-demand protection, provisioning, migration, and restoration of data contained in your physical and virtual storage systems.

Applications and capabilities supported by the N series Management Console

The Management Console supports Performance Advisor, data protection capability, and provisioning capability.

Performance Advisor	This application provides a single location from which you can view comprehensive information about the performance of storage systems, vFiler units, storage nodes and Vservers, and perform short-trend analysis. The application also helps you identify the data infrastructure causes and potential causes of reduced performance.

The N series Management Console data protection capability	The N series Management Console data protection capability provides a policy-based management tool to help you unify and automate backup and mirroring operations. This capability uses a holistic approach to data protection. It provides end-to-end, workflow-based design and seamless integration of SnapVault, SnapMirror, and Open Systems SnapVault to enable you to manage large-scale deployments easily.
	The disaster recovery feature of the N series Management Console data protection capability enhances your data protection services by enabling you to continue to provide data access to your users, even in the event of mishap or disaster that disables or destroys the storage systems and gateways in your primary data node. You can quickly enable your secondary storage systems to provide primary data storage access to your users with little or no interruption, until your primary storage systems are reenabled or replaced.
The N series Management Console provisioning capability	The N series Management Console provisioning capability helps you simplify and automate the tasks of provisioning and managing storage. It provides policy-based provisioning and conformance of storage in datasets. This capability also enables you to manually add volumes or qtrees to a dataset at any time, provides manual controls for space and capacity management of existing storage and newly provisioned storage, and enables you to migrate datasets and vFiler units to a new storage destination.
	The deduplication feature of the N series Management Console provisioning capability enhances your data provisioning services by enabling you to eliminate duplicate data blocks to reduce the amount of storage space used to store active data.

Management Console window layout and navigation

You can use Management Console to navigate between capabilities, to display Help, and to log out of the console.

Learning about the N series Management Console data protection capability	The Get Started section of the user interface provides an overview of the N series Management Console data protection capability, a short tutorial that demonstrates how to set up protection, and a list of frequently asked questions (FAQs).
Learning about disaster recovery	The Get Started section of the user interface provides an overview of disaster recovery, a short tutorial that demonstrates how to set up disaster recovery, and a list of frequently asked questions (FAQs).
Learning about the N series Management Console provisioning capability	The Get Started section of the user interface provides an overview of the N series Management Console provisioning capability, a short tutorial that demonstrates how to set up provisioning, and a list of frequently asked questions (FAQs).

Moving back and forth between panes	The Back and Forward arrow buttons helps you toggle between your last and previous panes.
Toggling between capabilities	• To use the N series Management Console data protection capability or the N series Management Console provisioning capability, select **Tasks > Manage Data** or go to the Tasks Bar and click 🔲. • To use Performance Advisor, select **Tasks > Manage Performance** or go to the Tasks Bar and click 🕙.
Displaying help	• To display the Help for all applications and capabilities on Management Console, click **Help > Help Contents**. • To display Help for the specific window that is currently displayed, click **Help > Help For This View** or click ❓.
Logging out	• To log out, select **File > Log Out** or click the **logout** button. • To log out and close Management Console, select **File > Exit**.
Viewing product license information	To view information about the product licenses you have installed, click **Help > About > Licenses**. Removed or added licenses are reflected in the license list after you restart Management Console.

Capabilities that run in Management Console vary in their window layout. However, the windows are generally divided into two panes:

• Use the menu bar on the left to move within N series Management Console.
• Use the content pane on the right to view and manage data.
  The content pane is generally divided into two areas: lists of selectable data and details of the selected data. Click 🔲, when it is displayed, for additional details.

Note: Some applications or capabilities might have additional navigation features not described in this section. In addition, software version incompatibility might result in some reduced functionality, which might cause some menu options or buttons to be disabled.

Management Console window customization

Management Console includes features that you can use to customize the console window layout. By customizing the console windows, you can control which data is viewable or how it is displayed.

Note: You cannot perform all the following customizing tasks for every window.

Hiding or redisplaying the Tasks Bar	You can hide the Tasks Bar to increase the space available for the content pane. (The overall width of the window remains the same when the bar is hidden.) You use the **View** menu to hide or display the bar.

Selecting columns to display	In content panes that include a list divided into columns, you can choose which columns you want to display. To display or hide a column, you can click the column-selection icon in the upper-right corner above the scroll bar ( ), and then click the name of a column heading from the selection list. Columns that are already displayed are identified with a check mark.
	Note: The default version of a list does not necessarily include all the available columns. You might find additional columns available in the column selection list.
Readjusting column widths	In content panes that include a list divided into columns, you can adjust the width of individual columns by horizontally dragging the vertical line between the column headings. If accommodating all the columns you want to include results in column widths that obscure data, you can still see the entire value of a column field by placing your cursor over the field. A tool tip opens, displaying the entire value of the field. You can maximize data visibility across all the columns by clicking the column selection icon ( ) and selecting Pack All Columns.
Rearranging the column order	In content panes that include a list divided into columns, you can rearrange the column order for a session by dragging and dropping column headings horizontally within the table. The arrangement persists until you exit the console.
Reapportioning a content pane	A splitter bar divides a content pane list area from the details area. You can move the splitter bar to increase or decrease the proportion of the content pane that displays the list of selectable data.

Management Console data filtering

You can use the data filtering features to display only data meeting the criteria you specify.

In large-scale environments, the content pane might list so much data that it becomes difficult to locate the information you want. Filtering the data by specified criteria helps you focus on the issues most important to you.

> **Note:** Not all filtering features are available for every window.

Filtering by group	The Group selection list in the toolbar enables you to display only the data that pertains to objects in a selected group. This setting persists until you log out or choose a different group.
Filtering by regular expression	You can filter columns displaying site-specific values, such as storage system names or dataset names, by regular expression. To filter a column by regular expression, click the filter icon in the column heading (￦) and specify the regular expression to match against values in the column field. Headings of

filtered columns are highlighted to remind you that some data is not currently displayed.

Management Console uses Java regular expression syntax for filtering data, for example:

- To view only items beginning with the letters "sch," type **sch** in the filter field, which matches Schedule but not SnapMirror.
- To view only items containing "space" somewhere in their string, type **.*space** in the filter field, which matches strings such as Volume Space Normal.
- To view only items ending with the string "ok," type ***ok** in the filter field, which matches strings such as SnapMirror: Date Ok.

Filtering by column values When a column displays a set of predefined possible values, you can choose to display only the rows of data that include a selected value. To filter a column by a specific, predefined value, click the filter icon in the column heading (⩌) and select one or more of the predefined values from the drop-down list. Headings of filtered columns are highlighted to remind you that some data is not currently displayed. Click "All" to select or clear all the values.

Filtering by column view You can click in the upper-right corner of the list to select the columns you want displayed.

Sorting by column values You can click the column header to change the sort order of the column entries. When you click the column header, the sort arrow appears for that column.

Performance objects and counters

You can monitor the performance of storage systems by understanding performance objects and counters in Performance Advisor.

What performance objects are

Performance objects are collections of counters for specific subsystem types.

The names of the objects correspond to the subsystem names that are displayed in the navigation pane of Performance Advisor.

List of performance objects (7-Mode only)

You should be aware of the performance objects that you monitor as part of storage administration in 7-Mode systems.

Performance Advisor displays a default performance view for every performance object listed in the following tables, except for qtrees.

Note: In the following table, performance objects that apply to both storage system and vFiler units are noted in parentheses. All other listed performance objects apply to storage system only.

The following performance objects are available for monitoring storage objects running Data ONTAP 8.0 (or later):

Object name	Type of data contained
aggregate	Aggregate statistics (includes aggregates containing traditional volumes)
cifs	CIFS statistics for systems with a CIFS license
disk	Disk statistics (per disk)
fcp	FCP statistics for systems with an FCP license
ifnet	Statistics on various network interface cards in the system **Note:** It is possible that a system can have all target cards and no interface cards.
iscsi	iSCSI statistics for systems with an iSCSI license
LUN (applies to vFiler units also)	LUN statistics (per LUN)

Object name	Type of data contained
nfsv3	NFS statistics for systems with an NFS license
nfsv4	NFS statistics for systems with an NFS license
processor	Processor statistics (per processor)
qtree (applies to vFiler units also)	Qtree statistics (per qtree) **Note:** To minimize negative performance impact on storage systems that it monitors, Performance Advisor does not automatically generate default performance views for its qtree performance objects; however, you can use the application to define performance views for individual qtrees.
system	Summary of the general performance health status of the system
target	Statistics on the target cards in the system
vFiler units (applies to vFiler units and their hosting storage systems)	Statistics that apply to vFiler units and their hosting storage systems
volume (applies to vFiler units also)	Volume statistics (per volume)

List of performance objects (Cluster-Mode only)

You should be aware of the performance objects that you monitor when administering Cluster-Mode systems.

Performance Advisor displays a default performance view for every performance object that is listed in the following tables, except for qtrees.

The following performance objects are available for monitoring storage objects running Data ONTAP 8.0 or later:

Object name	Type of data contained
system	Summary of the general performance health status of the system
nfsv3	NFS statistics for systems with an NFS license
cifs:node	CIFS statistics for systems with a CIFS license, at the node level
cifs:vserver	CIFS statistics for systems with a CIFS license, at the Vserver level

Object name	Type of data contained
fcp_lif:node	FCP statistics for systems with an FCP license, at the node level
fcp_lif:vserver	FCP statistics for systems with an FCP license, at the Vserver level
iscsi_lif:vserver	iSCSI statistics for systems with an iSCSI license, at the Vserver level
LUN	LUN statistics (per LUN)
processor	Processor statistics (per processor)
ifnet	Statistics on the network interface cards in the system
aggregate	Aggregate statistics
volume	Volume statistics (per volume)
volume:vserver	Volume statistics, at the Vserver level
volume:node	Volume statistics, at the node level
disk	Disk statistics (per disk)

What a performance counter is

A performance counter is the statistical measurement of activity on a storage object or a storage subsystem. The DataFabric Manager server collects data from the monitored storage object, and Performance Advisor uses this data to generate a performance chart or part of a performance chart.

For example, Performance Advisor might use the volume's total_ops counter of a storage system to generate a chart that displays total operations-per-second on that volume on a minute-to-minute basis.

The server collects data for a counter from the time the counter is added to a view. When the view is deleted, data collection for the counter stops. When you add a counter to a view, data collection begins with the counter in that view.

Note: Each type of storage object or subsystem has a set of counters. However, a particular storage object might not have non-zero data for all the counters available to it.

For example, every storage system has an http_ops counter. However, if HTTP is not enabled on the storage system, the counter contains only zero-value data. If SnapMirror is not licensed on the storage system, the counters for the SnapMirror statistics do not contain any data.

Definitions of performance counters

You must be aware of the performance counters in Performance Advisor that enable you to collect data for each performance object.

The availability of the counters and their descriptions might vary depending on the version of Data ONTAP running on the storage system.

Aggregate object

Counter name	Description	Unit
total_transfers	Total number of disk operations serviced by the aggregate	per sec
user_reads	Number of user read operations performed by the aggregate	per sec
user_writes	Number of user write operations performed by the aggregate	per sec
cp_reads	Number of read operations to the aggregate during consistency-point processing	per sec
user_read_blocks	Number of blocks transferred for user read operations	per sec
user_write_blocks	Number of blocks transferred for user write operations	per sec
cp_read_blocks	Number of blocks transferred for consistency-point read operations	per sec

cifs object (7-Mode only)

Counter name	Description	Unit
cifs_latency	Average latency for CIFS operations	millisec
cifs_ops	Total number of CIFS operations	per sec

cifs:node object (Cluster-Mode only)

Counter name	Description	Unit
cifs_latency	Aggregated CIFS latency at the node level	microsec
cifs_ops	Aggregated CIFS operations at the node level	per sec

cifs:vserver object (Cluster-Mode only)

Counter name	Description	Unit
cifs_latency	Aggregated CIFS latency at the Vserver level	microsec
cifs_ops	Aggregated CIFS operations at the Vserver level	per sec

disk object

Counter name	Description	Unit
total_transfers	Total number of disk operations performed by the aggregate	per sec
user_reads	Number of user read operations performed by the aggregate	per sec
user_writes	Number of user write operations performed by the aggregate	per sec
cp_reads	Number of read operations to the aggregate during consistency point processing	per sec
guaranteed_reads	Number of disk read operations initiated each second for RAID reconstruction or scrubbing activities	per sec
guaranteed_writes	Number of write operations initiated each second for RAID reconstruction or scrubbing activities	per sec

Counter name	Description	Unit
user_read_chain	Average number of blocks transferred in each user read operation	NA
user_write_chain	Average number of blocks transferred in each user write operation	NA
cp_read_chain	Average number of blocks transferred in each consistency-point read operation during a consistency point	NA
disk_busy	Time since the last outstanding request to the disk	percent
user_read_blocks	Number of blocks transferred for user read operations	per sec
user_write_blocks	Number of blocks transferred for user write operations	per sec
cp_read_blocks	Number of blocks transferred for consistency-point read operations	per sec
user_read_latency	Average latency per block, in microseconds, for user read operations	microsec
user_write_latency	Average latency per block, in microseconds, for user write operations	microsec
cp_read_latency	Average latency per block, in microseconds, for consistency-point read operations	microsec

disk object (7-Mode only)

Counter name	Description	Unit
throughput	Disk KB read and written	per sec

fcp object (7-Mode only)

Counter name	Description	Unit
fcp_ops	FCP operations per second	per sec
fcp_write_data	FCP bytes written per second	b per sec
fcp_read_data	FCP bytes read per second	b per sec
fcp_read_latency	Average latency of read operations for all the LUNs in the system accessed over FCP	millisec
fcp_read_ops	Total number of read operations for all the LUNs in the system accessed over FCP	per sec
fcp_write_latency	Average latency of write operations for all the LUNs in the system accessed over FCP	millisec
fcp_write_ops	Total number of write operations for all the LUNs in the system accessed over FCP	per sec
fcp_throughput	Total FCP data sent and received by the system	b per sec

fcp_lif:node object (Cluster-Mode only)

Counter name	Description	Unit
read_ops	Aggregated FCP read operations at the node level	per sec
write_ops	Aggregated FCP write operations at the node level	per sec
other_ops	Other FCP operations at the node level	per sec
read_data	Aggregated read data at the node level	b per sec
write_data	Aggregated write data at the node level	b per sec

fcp_lif:vserver object (Cluster-Mode only)

Counter name	Description	Unit
read_ops	Aggregated FCP read operations at the Vserver level	per sec
write_ops	Aggregated FCP write operations at the Vserver level	per sec
other_ops	Other FCP operations at the Vserver level	per sec
read_data	Aggregated read data at the Vserver level	b per sec
write_data	Aggregated write data at the Vserver level	b per sec

ifnet object

Counter name	Description	Unit
recv_packets	Packets received per second	per sec
recv_errors	Errors per second while receiving packets	per sec
send_packets	Packets sent per second	per sec
send_errors	Errors per second while sending packets	per sec
collisions	Collisions per second on CSMA interfaces	per sec
recv_data	Total bytes received per second	b per sec
send_data	Total bytes sent per second	b per sec
recv_mcasts	Packets received per second through multicast	per sec
send_mcasts	Packets sent per second through multicast	per sec
total_data	Total data sent and received over the interface	b per sec
total_errors	Total data sent and received over the interface	per sec

Counter name	Description	Unit
total_mcasts	Total number of errors while receiving and sending over the interface	per sec
total_packets	Total packets sent and received through multicast	per sec

iSCSI object (7-Mode only)

Counter name	Description	Unit
iscsi_ops	iSCSI operations per second	per sec
iscsi_write_data	iSCSI bytes written per second	b per sec
iscsi_read_data	iSCSI bytes read per second	b per sec
iscsi_read_latency	Average latency of read operations for all the LUNs in the system accessed over iSCSI	millisec
iscsi_read_ops	Total number of read operations for all the LUNs in the system accessed over iSCSI	per sec
iscsi_write_latency	Average latency of write operations for all the LUNs in the system accessed over iSCSI	millisec
iscsi_write_ops	Total number of write operations for all the LUNs in the system accessed over iSCSI	per sec
iscsi_throughput	Total FCP data sent and received by the system	b per sec

iscsi_lif:vserver object (Cluster-Mode only)

Counter name	Description	Unit
iscsi_read_ops	Aggregated total number of read operations for all the LUNs in the system accessed over iSCSI, at the Vserver level	per sec

Counter name	Description	Unit
iscsi_write_ops	Aggregated total number of write operations for all the LUNs in the system accessed over iSCSI, at the Vserver level	per sec

LUN object

Counter name	Description	Unit
read_ops	Read operations per second	per sec
write_ops	Write operations per second	per sec
other_ops	Other operations per second	per sec
read_data	Read bytes per second	b per sec
write_data	Write bytes per second	b per sec
total_ops	Total number of operations on the LUN	per sec
avg_latency	Average latency for all operations on the LUN	millisec
read_align_histo	Histogram of WAFL read alignment	percent
read_partial_blocks	Percentage of reads whose size is not a multiple of the WAFL block size	percent
throughput	Total data sent and received by the LUN	b per sec
unaligned_reads	Percentage of WAFL unaligned read operations	percent
unaligned_writes	Percentage of WAFL unaligned write operations	percent
write_align_histo	Histogram of WAFL write alignment	percent
write_partial_blocks	Percentage of write whose size is not a multiple of the WAFL block size	percent

nfsv3 object

Counter name	Description	Unit
nfsv3_ops	Total number of NFSv3 operations	per sec
nfsv3_read_ops	Total NFSv3 read operations	per sec
nfsv3_write_ops	Total NFSv3 write operations	per sec

nfsv3 object (7-Mode only)

Counter name	Description	Unit
nfsv3_avg_op_latency	Average latency of the NFSv3 operations	millisec
nfsv3_read_latency	Average latency for NFSv3 read operations	millisec
nfsv3_read_size_histo	Histogram of NFSv3 read sizes	NA
nfsv3_write_latency	Average latency for NFSv3 write operations	millisec
nfsv3_write_size_histo	Histogram of NFSv3 write sizes	NA

nfsv4 object (7-Mode only)

Counter name	Description	Unit
nfsv4_ops	Number of total NFSv4 operations	per sec
nfsv4_read_ops	Number of NFSv4 read operations	per sec
nfsv4_avg_latency	Average latency of an NFSv4 request	millisec
nfsv4_write_ops	Number of NFSv4 write operations	per sec
nfsv4_read_size_histo	Histogram of NFS v4 read sizes	NA
nfsv4_write_size_histo	Histogram of NFS v4 write sizes	NA

Perf object

Counter name	Description	Unit
data_disk_util_percnt_histo	Histogram of data disk utilization	percent
ops_per_sec_histo	Histogram of operations handled by the appliance	percent
parity_disk_util_percnt_histo	Histogram of parity disk utilization	percent

Priority queue (7-Mode only)

Counter name	Description	Unit
max_user_reads	Maximum number of user reads ever outstanding at one time for this queue	NA
nvlog_limit	Amount of nvlog this queue might use during CP	NA
nvlog_limit_full	Number of times the nvlog queue limit was hit during CP	NA
nvlog_used_max	Maximum amount of nvlog this queue used during a CP	NA
sys_read_limit	Limit on system reads outstanding on this queue	NA
sys_sched_total	Number of scheduled system requests	per sec
sys_weight	System request scheduling weight within the priority queue	NA
usr_read_limit	Limit on user reads outstanding on this queue	NA
usr_sched_total	Number of scheduling user requests	per sec
usr_weight	User request scheduling weight within a queue	NA

Prescheduled (7-Mode only)

Counter name	Description	Unit
bypass_rate	Rate at which guardrail scheduler is bypassed	per sec
delayed_io_blocked	Number of times delayed messages were found and all queues were I/O blocked	NA
delayed_messages	Number of times a delayed message was found and pushed	NA
preempt_rate	Scheduler preemption rate	per sec
queued	Current messages queued	NA
queued_max	Maximum scheduling queue depth	NA
schedslow	Number of times scheduler was found to be slow	NA
wake_on_mesg_rate	Scheduler wake on message received rate	per sec
wake_on_sig_rate	Scheduler wake on signal received rate	per sec

Processor object

Counter name	Description	Unit
domain_busy	Array of processor time spent in various domains	percent
processor_busy	Percentage of elapsed time that the processor is executing non-idle processes	percent

qtree object (7-Mode only)

> **Note:** To minimize negative performance impact on storage systems that Performance Advisor monitors, the default performance views are not automatically generated for its qtree performance objects. However, you can use the following counters to define performance views for individual qtrees.

Counter name	Description	Unit
nfs_ops	NFS operations per second	per sec
cifs_ops	CIFS operations per second	per sec
internal_ops	Number of internal operations generated by activities such as SnapMirror and backup to the qtree	per sec
total_ops	Total operations on the qtree	per sec

System object

Counter name	Description	Unit
net_data_recv	Network KB received per second	per sec
net_data_sent	Network KB sent per second	per sec
disk_data_read	Disk KB read per second	per sec
disk_data_written	Disk KB written per second	per sec
cpu_busy	Percentage of time one or more processors is busy in the system **Note:** For storage systems running Data ONTAP 7.2 or earlier, the cpu_busy counter is the amount of time that any one CPU is busy. This results in a value for cpu_busy that is inflated. For storage systems running Data ONTAP 7.2.1 or later, the cpu_busy counter is the greater of either the average CPU utilization or the busiest domain.	percent
avg_processor_busy	Average processor utilization across all processors in the system	percent
total_processor_busy	Total processor utilization of all processors in the system	percent
disk_data_read_ mbps	MB read per second	mb per sec

Counter name	Description	Unit
disk_data_written_mbps	MB written per second	mb per sec
nas_throughput	Network throughput in a NAS network	kb per sec
disk_throughput	Disk throughput in the storage system or cluster	kb per sec

System object (7-Mode only)

Counter name	Description	Unit
cifs_ops	CIFS operations per second	per sec
dafs_ops	DAFS operations per second	NA
fcp_ops	FCP object operations per second	per sec
http_ops	HTTP operations per second	per sec
iscsi_ops	iSCSI operations per second	per sec
nfs_ops	NFS operations per second	per sec
load_inbound_mbps	Total data received by the system	mb per sec
load_outbound_mbps	Total data sent by the system	mb per sec
load_read_bytes_ratio	Ratio of the disk data read and load outbound mbps	NA
load_total_mbps	Total data sent and received by the system	mb per sec
load_write_bytes_ratio	Ratio of the disk data write and load inbound mbps	NA
nc_urls	NetCache URLs served per second	NA
pa_total_ops	Total operations on the system	per sec
pq_max_sys_reads	Maximum number of system read requests ever outstanding at one time for the default queue	NA

Counter name	Description	Unit
pq_max_user_reads	Maximum number of user reads ever outstanding at one time for the default queue	NA
pq_nvlog_limit	Amount of nvlog default queue might use during CP	NA
pq_nvlog_limit_full	Number of times the nvlog queue limit was hit during CP for the default queue	NA
pq_nvlog_used_max	Maximum amount of nvlog queue used during a CP	NA
pq_sys_read_limit	Limit on system reads outstanding on the default queue	NA
pq_sys_sched_total	Number of scheduled system requests for the default queue	per sec
pq_sys_weight	System request scheduling weight within the default queue	NA
pq_usr_read_limit	Limit on user reads outstanding on the default queue	NA
pq_usr_sched_total	Number of scheduling user requests for the default queue	per sec
pq_usr_weight	User request scheduling weight within the default queue	NA
san_throughput	Total SAN data sent and received by the system	kb per sec

Target object (7-Mode only)

Counter name	Description	Unit
queue_full	iSCSI queue full responses per second	per sec
read_ops	Read operations per second	per sec
write_ops	Write operations per second	per sec
other_ops	Other operations per second	per sec

vFiler object (7-Mode only)

Counter name	Description	Unit
vfiler_cpu_busy	Percentage of CPU capacity used per second by hosting storage system that contains the vFiler unit	percentage
vfiler_net_data_recv	Network data received in kilobytes per second	kb per sec
vfiler_net_data_sent	Network data sent in kilobytes per second	kb per sec
vfiler_read_ops	Read operations on the vFiler unit	per sec
vfiler_write_ops	Write operations on the vFiler unit	per sec
vfiler_misc_ops	Miscellaneous operations on the vFiler unit	per sec
vfiler_read_bytes	Data read in kilobytes per second on the vFiler unit	kb per sec
vfiler_write_bytes	Data written in kilobytes per second on the vFiler unit	kb per sec
vfiler_data_transferred	Total data transferred by the vFiler unit	kb per sec
vfiler_nw_throughput	Total network data received and transmitted by the vFiler unit	kb per sec
vfiler_total_ops	Total operations on the vFiler unit	per sec

Volume object

Counter name	Description	Unit
total_ops	Number of operations performed by the volume	per sec
avg_latency	Average latency for all the operations on the volume	millisec
read_ops	Number of reads to the volume	per sec

Counter name	Description	Unit
read_data	Bytes read from the volume	b per sec
read_latency	Average time for reads from the volume	microsec
write_data	Bytes written to the volume	b per sec
write_latency	Average time for writes to the volume	microsec
other_ops	Number of other operations to the volume	per sec
other_latency	Average time for other operations to the volume	microsec
write_ops	Number of writes to the volume	per sec
nfs_read_ops	Number of NFS reads to the volume	per sec
nfs_read_latency	Average time for NFS reads from the volume	microsec
nfs_write_ops	Number of NFS writes to the volume	per sec
nfs_write_latency	Average time for NFS writes to the volume	microsec
nfs_other_ops	Number of other NFS operations to the volume	per sec
nfs_other_latency	Average time for other NFS operations to the volume	microsec
cifs_latency	Average time for CIFS operations to the volume	millisec
cifs_ops	CIFS operations on the volume	per sec
cifs_read_ops	Number of CIFS reads to the volume	per sec
cifs_read_latency	Average time for CIFS reads to the volume	microsec
cifs_write_ops	Number of CIFS writes to the volume	per sec
cifs_write_latency	Average time for CIFS writes to the volume	microsec
cifs_other_ops	Number of other CIFS operations to the volume	per sec

Counter name	Description	Unit
cifs_other_latency	Average time for other CIFS operations to the volume	microsec
san_read_ops	Number of block protocol reads to the volume	per sec
san_read_latency	Average time for block protocol reads to the volume	microsec
san_write_ops	Number of block protocol writes to the volume	per sec
san_write_latency	Average time for block protocol writes to the volume	microsec
san_other_ops	Number of other block protocol operations to the volume	per sec
san_other_latency	Average time for other block protocol operations to the volume	microsec
flexcache_other_ops	Number of other FlexCache operations to the volume	per sec
flexcache_read_ops	Number of FlexCache read operations from the volume	per sec
flexcache_write_ops	Number of FlexCache write operations to the volume	per sec
nfs_latency	Average time for NFS operations to the volume	millisec
nfs_ops	user operations on the volume	per sec
sys_ops	sys operations on the volume	per sec
throughput	Total data sent and received by the volume	b per sec
user_ops	user operations on the volume	per sec

Volume object (7-Mode only)

Counter name	Description	Unit
pq_max_sys_reads	Maximum number of system read requests ever outstanding at one time for the default queue for the volume	NA
pq_max_user_reads	Maximum number of user reads ever outstanding at one time for this queue in the volume	NA
pq_nvlog_limit	Amount of nvlog this queue might use during CP for the volume	NA
pq_nvlog_limit_full	Number of times the nvlog queue limit was hit during CP for the volume	NA
pq_nvlog_used_max	Maximum amount of nvlog this queue might use during CP for the volume	NA
pq_sys_read_limit	Limit on System reads outstanding on this queue in the volume	NA
pq_sys_sched_total	Number of scheduling system requests with in the volume	per_sec
pq_sys_weight	System request scheduling weight within the volume	NA
pq_usr_read_limit	Limit on user reads outstanding on this queue in the volume	NA
pq_usr_sched_total	Number of scheduling user requests with in the volume	per sec
pq_usr_weight	User request scheduling weight within the volume	NA

Volume object (Cluster-Mode only)

Counter name	Description	Unit
flexcache_other_ops	Number of other FlexCache operations to the volume	per sec

Counter name	Description	Unit
flexcache_read_ops	Number of read FlexCache operations to the volume	per sec
flexcache_write_ops	Number of write FlexCache operations to the volume	per sec
san_latency	Aggregated SAN latency at the volume level	millisec
san_ops	SAN operations per second	per sec

volume:vserver object (Cluster-Mode only)

Counter name	Description	Unit
other_ops	Aggregated number of other operations to the volume at the Vserver level	per sec
read_data	Aggregated bytes read from the volume, at the Vserver level	b per sec
read_ops	Aggregated number of reads to the volume, at the Vserver level	per sec
total_ops	Aggregated number of operations performed by the volume, at the Vserver level	per sec
write_data	Aggregated bytes written to the volume, at the Vserver level	b per sec
write_ops	Aggregated number of writes to the volume, at the Vserver level	per sec

volume:node object (Cluster-Mode only)

Counter name	Description	Unit
other_ops	Aggregated number of other operations to the volume at the Vserver level	per sec
read_data	Aggregated bytes read from the volume, at the Vserver level	b per sec
read_ops	Aggregated number of reads to the volume, at the Vserver level	per sec

Counter name	Description	Unit
total_ops	Aggregated number of operations performed by the volume, at the Vserver level	per sec
write_data	Aggregated bytes written to the volume, at the Vserver level	b per sec
write_ops	Aggregated number of writes to the volume, at the Vserver level	per sec
avg_latency	Average latency in microseconds for the WAFL file system to process all the operations on the volume; not including request processing or network communication time	microsec
cifs_other_latency	Average time for the WAFL file system to process other CIFS operations to the volume; not including CIFS protocol request processing or network communication time which will also be included in client observed CIFS request latency	microsec
cifs_other_ops	Number of other CIFS operations to the volume	per sec
cifs_read_latency	Average time for the WAFL file system to process CIFS read requests to the volume; not including CIFS protocol request processing or network communication time which will also be included in client observed CIFS request latency	microsec
cifs_read_ops	Number of CIFS reads to the volume	per sec

Counter name	Description	Unit
cifs_write_latency	Average time for the WAFL file system to process CIFS write requests to the volume; not including CIFS protocol request processing or network communication time which will also be included in client observed CIFS request latency	microsec
cifs_write_ops	Number of CIFS writes to the volume	per sec
flexcache_other_ops	Number of other FlexCache operations to the volume	per sec
flexcache_read_ops	Number of FlexCache read operations from the volume	per sec
flexcache_write_ops	Number of FlexCache write operations to the volume	per sec
nfs_other_latency	Average time for the WAFL file system to process other NFS operations to the volume; not including NFS protocol request processing or network communication time which will also be included in client observed NFS request latency	microsec
nfs_other_ops	Number of other NFS operations to the volume	per sec
nfs_read_latency	Average time for the WAFL file system to process NFS protocol read requests to the volume; not including NFS protocol request processing or network communication time which will also be included in client observed NFS request latency	microsec
nfs_read_ops	Number of NFS reads to the volume	per sec

Counter name	Description	Unit
nfs_write_latency	Average time for the WAFL file system to process NFS protocol write requests to the volume; not including NFS protocol request processing or network communication time which will also be included in client observed NFS request latency	microsec
nfs_write_ops	Number of NFS writes to the volume	per sec
other_latency	Average latency in microseconds for the WAFL file system to process other operations to the volume; not including request processing or network communication time	microsec
read_latency	Average latency in microseconds for the WAFL file system to process read request to the volume; not including request processing or network communication time	microsec
san_other_latency	Average time for the WAFL file system to process other block protocol requests to the volume; not including block protocol request processing or network communication time which will also be included in client observed block protocol request latency	microsec
san_other_ops	Number of other block protocol operations to the volume	per sec

Counter name	Description	Unit
san_read_latency	Average time for the WAFL file system to process block protocol read requests to the volume; not including block protocol request processing or network communication time which will also be included in client observed block protocol request latency	microsec
san_read_ops	Number of block protocol reads to the volume	per sec
san_write_latency	Average time for the WAFL file system to process block protocol write requests to the volume; including block protocol request processing or network communication time which will also be included in client observed block protocol request latency	microsec
san_write_ops	Number of block protocol writes to the volume	per sec
write_latency	Average latency in microseconds for the WAFL file system to process write request to the volume; not including request processing or network communication time	microsec

List of CLI commands

You must be aware of some CLI commands in order to perform certain operations such as creating a view, modifying thresholds, listing counters, and managing performance diagnostics, in Performance Advisor.

The CLI commands in the following table are applicable to both 7-Mode systems and Cluster-Mode systems:

CLI command	Description
`dfm perf counter list`	Lists the performance counters for the storage object
`dfm perf threshold list`	Lists the performance thresholds
`dfm perf threshold create`	Creates the performance thresholds
`dfm perf threshold delete`	Deletes the performance thresholds
`dfm perf threshold refresh`	Refreshes the performance thresholds
`dfm perf threshold modify`	Modifies the performance thresholds
`dfm perf threshold filter list`	Lists the performance thresholds based on filter
`dfm perf data list`	Lists information about all the counter groups
`dfm perf data describe`	Describes the counter group
`dfm perf data retrieve`	Retrieves the performance data of the storage object
`dfm perf view describe`	Describes the performance views
`dfm perf view list`	Lists the performance views

CLI command (7-Mode only)	Description
`dfm perf view create`	Creates a view
`dfm perf view counter add`	Adds a performance counter
`dfm perf view counter delete`	Deletes a performance counter
`dfm perf view chart add`	Adds a performance chart
`dfm perf view chart delete`	Deletes a performance chart
`dfm perf view destroy`	Destroys the performance view
`dfm perf template create`	Creates the threshold templates
`dfm perf template detach`	Removes the threshold templates
`dfm perf template attach`	Attaches the threshold templates
`dfm perf template list`	Lists the threshold templates
`dfm perf template delete`	Deletes the threshold templates
`dfm perf template modify`	Modifies the threshold templates

CLI command (7-Mode only)	Description
`dfm perf template threshold add| modify`	Modifies the threshold template
`dfm perf export counter list|add| delete`	Manages data export for counter groups
`dfm perf data modify`	Modifies the data collection configuration
`dfm perf data export`	Manages data export
`dfm perf data enable|disable`	Enables or disables the counter group
`dfm perf diag`	Manages performance diagnostics
`dfm perf clientstats`	Manages client statistics
`dfm perf clientstat collect`	Collects the client statistics
`dfm perf clientstat list`	Lists the client statistics
`dfm perf clientstat purge`	Removed the client statistics that was collected
`dfm perf data copy`	Copies the data collection configuration

What access permission is

Access permissions allow you to customize views, change storage system settings, set event thresholds, and configure events and alarms.

You can use role-based access control (RBAC) to grant access to the user. The access to resources is defined and controlled based on the role or job function of a user.

RBAC for configuring views (7-Mode only)

You must be aware of the capabilities you require to configure custom views for the objects you are monitoring.

The following table lists the tasks you can perform to configure views and the required capabilities:

Task	Capability	Object
View the performance data of a counter in a view	Database Read	Managed object associated with the counter instance in the view
Create a custom view	PerfView Write	Global
Modify a custom view: Add a counter	PerfView Write	Global
Modify a custom view: Remove a counter	Database Read	Managed object associated with the counter instance in the view
Modify a custom view: Rename a view	PerfView Write	Global
Delete a custom view	PerfView Delete	Global
View real-time performance data	PerfView RealTimeRead **Note:** Requires the Database Read Capability	Global

RBAC for modifying storage system settings (7-Mode only)

You must be aware of the capabilities you require to configure the storage system settings.

The following table lists the tasks and the required capabilities for modifying the storage system settings:

Task	Capability	Object
Modify a custom view: • Change credentials • Change the transport protocol	Database Write	Storage system

RBAC for setting thresholds

The tasks and capabilities available for storage objects are based on the RBAC settings. You can create, view, or edit thresholds based on the RBAC.

The following table lists the tasks and the capabilities related to the threshold operations, and the objects for which you can perform these operations:

Task	Capability	Object
You can create or edit thresholds on the counters of the following objects: • (Cluster-Mode only) Vservers • (Cluster-Mode only) Nodes • (7-Mode only) vFiler units • (7-Mode only) Qtrees • (7-Mode only) Targets • Aggregates • Volumes • LUNs • Disks • Network interfaces	Database Write	On each instance of the object

Task	Capability	Object
You can view thresholds on the counters of the following objects: • (Cluster-Mode only) Vservers • (Cluster-Mode only) Nodes • (7-Mode only) vFiler units • (7-Mode only) Qtrees • (7-Mode only) Targets • Aggregates • Volumes • LUNs • Disks • Network interfaces	Database Read	On each instance of the object
You can create or edit thresholds on the counters of all the storage objects, such as the following: • (Cluster-Mode only) Vservers • (Cluster-Mode only) Nodes • (7-Mode only) vFiler units • (7-Mode only) Qtrees • (7-Mode only) Targets • Systems • NFSv3 • CIFS • FCP • iSCSI	Database Write	Storage systems

Task	Capability	Object
You can view thresholds on the counters of all the storage objects, such as the following: • (Cluster-Mode only) Vservers • (Cluster-Mode only) Nodes • (7-Mode only) vFiler units • (7-Mode only) Qtrees • (7-Mode only) Targets • Systems • NFSv3 • CIFS • FCP • iSCSI	Database Read	Storage systems

RBAC for threshold templates (7-Mode only)

You must be aware of the capabilities required to configure threshold templates by using role-based access control (RBAC).

The following table lists the threshold template operations that you can perform on objects, the capabilities you require, and the objects on which you can perform the operation:

Task	Capability	Object
Create or edit threshold templates	PerfThreshTemplate Write	
View threshold templates	PerfThreshTemplate Read	

Task	Capability	Object
Apply or remove a threshold template on the following objects: • Storage system or a group of storage systems • Aggregate • Volume • Qtree • LUN • Disk • Network interface • vFiler units • Targets	Database Write	On each instance of the object

RBAC for configuring events (7-Mode only)

You must be aware of the capabilities you require to configure events for the objects you are monitoring. You can configure events by using role-based access control (RBAC).

The following table lists the capabilities required to configure threshold templates:

Task	Capability	Object
View an event	Event Read	Source of the event
Delete an event	Database Write	Source of the event
Acknowledge an event	Event Write	Source of the event

RBAC for configuring alarms (7-Mode only)

You must be aware of the capabilities you require to configure alarms for the objects you are monitoring.

The following table lists the tasks you can perform to configure alarms and the required capabilities:

Task	Capability	Object
Creating an alarm	Alarm Write	Group associated with the alarm

Task	Capability	Object
Modifying an alarm	Alarm Write	Group associated with the alarm
Deleting an alarm	Alarm Delete	Group associated with the alarm
Listing all alarms	Alarm Read	Group associated with the alarm

Requirements to install Performance Advisor

Before you use Performance Advisor, you must install Management Console and ensure that the prerequisites are met.

The prerequisites to access Performance Advisor are as follows:

- The Management Console must be installed.
- The performance-monitoring server must be enabled.
- The DataFabric Manager server must be installed.
- You must display the storage objects and vFiler units for which you want to monitor performance data to the DataFabric Manager server.

Note: For details about downloading and installing the Management Console, see the *OnCommand Unified Manager Installation and Setup Guide*. When upgrading to DataFabric Manager server 3.6 or later, the application graphs that show the calculated statistics display data for the period after the upgrade.

Enabling the performance-monitoring server

Before you start Management Console and log in to Performance Advisor, you must enable the performance-monitoring server.

Steps

1. In the Operations Manager console, select **Control Center > Setup > Options > Performance Advisor**.

   The Performance Advisor options are displayed.

2. If Management Console is disabled, from Performance Advisor **Options**, select **Performance Advisor Enabled > Enabled**.

   You can perform this task if the performance-monitoring server is disabled.

3. Click **Update**.

Setting up transport protocols between the performance-monitoring server and Performance Advisor

By default, both HTTP and HTTPS are enabled as transport protocols between the performance-monitoring server and Performance Advisor. You can change the transport protocol and

performance-monitoring server ports by using the Performance Advisor options in the Operations Manager console.

Steps

1. In the Operations Manager console, select **Control Center > Setup > Options > Performance Advisor** to display the Performance Advisor options.

2. Select one or more of the following options to accept or modify the settings as appropriate to your environment:

   • Server HTTP Port

     This option sets the port used by the performance-monitoring server to receive HTTP connections from the application. The default value is 8088.

   • Server HTTP Enabled

     This option enables or disables HTTP as a transport protocol used by the application. The default value is Yes.

   • Server HTTPS Port

     This option sets the port used by the performance-monitoring server to receive HTTPS connections from the application. The default value is 8488.

   • Server HTTPS Enabled

     This option enables or disables HTTP as a transport protocol used by the application. The default value is Yes.

3. Click **Update**.

Setting up appliance-level transport between Performance Advisor and monitored devices

You can edit the **Performance Advisor Transport** setting for an individual storage system or a vFiler host by using the Operations Manager console. You can specify whether the individual device can use HTTP only or use both HTTP and HTTPS as the transport protocols between Performance Advisor and the performance-monitoring server.

Steps

1. Click the name of the device in the Operations Manager console.

2. Click **Edit Settings**.

3. Select the options you want from the **Performance Advisor Transport** list.

4. Click **Update**.

Setting up transport protocols between Performance Advisor and monitored devices

You can set up transport protocols between Performance Advisor and monitored devices by enabling both HTTP and HTTPS or enabling HTTPS only as transport protocols in Operations Manager console.

Before you begin

There must be no conflicting transport setting between Performance Advisor and the individual storage systems.

Steps

1. In the Operations Manager console, select **Control Center > Setup > Options > Performance Advisor** to display the Performance Advisor options.

2. Select one of the following **Performance Advisor Transport** options to accept or modify the settings as appropriate to your environment:

   • httpOnly

   Specifies HTTP only as the global transport protocol between the performance-monitoring server and all the monitored devices. This is the default setting.

   • httpsOk

   Enables both HTTP and HTTPS as global transport protocols between the performance-monitoring server and all the monitored devices.

   Note: When the transport protocol for the host is HTTPS, you must not set the **Performance Advisor Transport** option to HTTP.

3. Click **Update**.

Getting started with the Performance Advisor user interface

By using the Management Console, you can login to the DataFabric Manager server to access and start or stop the Performance Advisor application.

Starting Performance Advisor

You can start monitoring the performance of storage objects and systems by starting Performance Advisor from the Management Console.

Steps

1. Click **Start > All Programs > IBM > N series Management Console**.
2. Enter the fully qualified domain name, user name, and the password for the DataFabric Manager server you want to log in to.

   The user name, domain name, transport, and port number from your previous login session are saved. Therefore, if you are logging in as the same user as before, you have to enter only your password.
3. Select **HTTP** or **HTTPS** transport.

   The default port is selected automatically. If you log in using any other port, you must set the serverHTTPSPort option to the matching port.
4. Click **Connect**.
5. Click **Manage Performance** to display the top-level groups configured for the DataFabric Manager server that you have logged in to.

Disconnecting from Performance Advisor

You can stop Performance Advisor when you have completed the performance analysis of the storage objects in your environment by closing Management Console.

Step

1. From the menu, Select **File > Exit**.

Storage objects unavailable in Performance Advisor

Some storage objects might be unavailable in Performance Advisor under certain circumstances. Storage objects that are not available are displayed in the Set Up Storage Systems window in 7-Mode

systems, and the Set Up Cluster window in Cluster-Mode systems, and not in the View navigation pane.

Storage objects might be unavailable under the following conditions:

* The DataFabric Manager server is not managing storage objects.
* Data collection from the DataFabric Manager server by the application is not enabled.
* You do not have sufficient access privileges to these storage objects.
* If the login credentials used to access the storage system are incorrect, Performance Advisor will not continue data collection.
* If there is a mismatch in the protocols (perfadvisortransport) used by the performance monitoring server and the storage system.

Unavailable menu options in the Performance Advisor interface

The availability of menu options in the Performance Advisor interface is determined by your DataFabric Manager server administrator roles. Options that are dimmed are not available to you for the storage system or vFiler unit you have currently selected.

Zero-value data in a Performance Advisor chart

When the performance-monitoring server sends nothing but zeros to Performance Advisor for the counter or counters in a chart, this is called *zero-value data*.

Zero-value data is displayed for any counters monitoring protocols that are not enabled on the storage system or vFiler unit. A chart displaying only zero-value data shows a vertical axis numbered from 0 to 1, and vertical lines, but no graph.

Lack of data in a Performance Advisor chart

If a chart does not contain any data, it indicates that the performance-monitoring server has not sent any data to Performance Advisor for the counters in the chart for the period displayed.

An empty chart indicates that you cannot access the data. This situation is unlikely, unless one of the following conditions is true:

* You are viewing SnapMirror counters for a storage system that does not have a SnapMirror license.
* If LUNs are not available, then the "Top N luns" chart does not display any data.
* If qtrees are not available, then the "Top qtrees in a dataset" chart does not display any data.
* If the FlexShare option is turned off, then the "Priority queue" chart does not display any data.

- Performance Advisor has not collected any performance data.
  You can verify this by using the `dfm perf data retrieve` command.

Display of new storage objects in Performance Advisor

When the DataFabric Manager server discovers new storage systems or clusters, or when you manually add storage systems or clusters, you must refresh the display for the application to list the new devices.

You must press F5 to refresh the display.

Overview of the Management Console dashboard

The Management Console provides an overview of various aspects of your data management environment, including monitoring information.

Monitor dashboard   The Monitor dashboard in Performance Advisor displays information about the current overall performance status of your systems, such as performance events, top storage systems by the total number of operations, top storage systems by network throughput, top storage systems by CPU utilization, Top Nodes by CPU Utilization and Top Vservers by Total Ops. You can modify the default settings to configure any view on the global group as a dashboard.

Dashboard panel descriptions

The dashboard panels provide a cumulative at-a-glance status information about your system.

Performance Advisor dashboard

You can view more details about the Performance Advisor dashboard by clicking 🔵 in the dashboard panel title bar.

Dashboard panels (Cluster-Mode only)

Top Performance Events   Displays the five events with the highest severity levels. Items are ordered first by severity, then by time that they occurred. More detail about each event is provided in **Monitor > Events**.

Top Nodes by CPU Utilization   Displays a bar chart of the top five nodes that are discovered and monitored by the DataFabric Manager server and sorted by the highest CPU utilization. The vertical axis displays the percentage of CPU utilization for that node. The horizontal axis displays the node name.

Top Vservers by Total Ops   Displays a bar chart of the top five Vservers that are discovered and monitored by the DataFabric Manager server, and sorted by the highest total operations. The vertical axis displays the total operations per second for that Vserver. The horizontal axis displays the Vserver name.

Dashboard panels (7-Mode only)

Top Performance Events   Displays the five events with the highest severity levels. Items are ordered first by severity, then by time that they occurred. More detail about each event is provided in **Monitor > Events**.

Top Storage Systems by Network Throughput	Displays a bar chart of the top five storage systems, sorted by the highest network throughput. The number above each bar chart displays the exact value of the throughput per second from that system. The vertical axis displays the megabytes of throughput per second. The horizontal axis displays the name of the storage system.
Top Storage Systems by Total Ops	Displays a bar chart of the top five storage systems, sorted by the highest total operations. The vertical axis displays the total operations per second for that storage system. The horizontal axis displays the storage system name.
Top Storage Systems by CPU Utilization	Displays a bar chart of the top five storage systems, sorted by the highest average CPU utilization. The number above each bar chart displays the exact value of the throughput per second from that system. The vertical axis displays the percentage CPU usage of the storage system. The horizontal axis displays the name of the storage system.

What events are

Events are generated automatically when a predefined condition occurs or when an object crosses a threshold. Event messages inform you when specific events occur and ignoring such events can lead to poor performance and system unavailability. All events are assigned a severity type and are automatically logged and retained for a default of 180 days.

You can configure alarms to send notification automatically when specific events or events of a specific severity occur. If an application is not configured to trigger an alarm when an event is generated, then you can discover events by checking the Events window.

It is important that you take immediate corrective action for events with severity level Error, Critical, or Emergency.

Event types are predetermined. You can manage event notification, but you cannot add or delete event types. However, you can modify event severity using the command-line interface.

Configuring events

You can learn about event occurrences by viewing the event log or by configuring alarms to automatically notify you when events occur.

- Viewing the event log
  You can use the Events window to view a list of all the events that occurred and to view detailed information about any selected event.
- Configuring alarms
  You can use the Alarms window to add an alarm that sends notifications automatically when an event occurs.

Monitoring events

You can view a list of all the events that occurred and view detailed information about any event. You can also view events that are marked for deletion.

Before you begin

You must be authorized to perform all the steps of this task; your RBAC administrator can confirm your authorization in advance.

Steps

1. You can monitor events from the Management Console or Performance Advisor.

To monitor events from...	Do this...
The Management Console	From the menu bar, click **Notifications > Events**.
Performance Advisor	From the menu bar, click **Monitor > Events**.

2. Optional: Customize the **Events** window in one of the following ways:

   - Select an event to view details about that event.
   - Click � in the column header to control the event entries that you want displayed.
   - Click the sort arrows in the column header to change the sort order of the entries in that column.
   - Click 🔲 in the upper-right corner of the list to select which columns are displayed.
   - Drag the bottom of the events list area up or down to resize that area.

3. Optional: View the events that are marked for deletion by displaying hidden columns and removing a text filter, as follows:

   a) Click 🔲 in the upper-right corner of the list and select the **Deleted By** and **Deleted Time** columns.

   b) Click ⇥ in the **Deleted By** column header and delete the default search string.

   The default filtering of deleted events is stopped and the deleted event entries are displayed in the list.

Responding to and acknowledging events

When an event occurs, you must take appropriate action to acknowledge and manage it and correct the problem. Responding to an event includes viewing it, acknowledging it, and correcting the problem.

Before you begin

You must be authorized to perform all the steps of this task; your RBAC administrator can confirm your authorization in advance.

Steps

1. From the menu bar, click **Notifications > Events**. For Performance Advisor, from the menu bar, click **Monitor > Events**.

2. In the **Events** window, select an event to view the details about it.

3. Select an event and click **Acknowledge** to indicate that you are taking responsibility for managing that event.

4. In the Acknowledge Events dialog box, click **Yes** to acknowledge the selected event.

   Your user name and the time are entered in the Events list for the selected event.

5. Find the cause of the event and take corrective action.

Deleting events

You can delete an event from the event list. Typically, you delete an event only after you acknowledge it and resolve the problem. However, you can also delete unacknowledged events if they are not important.

Before you begin

You must be authorized to perform all the steps of this task; your RBAC administrator can confirm your authorization in advance.

Steps

1. For protection, provisioning, or disaster recovery events, from the menu bar, click **Notifications > Events**. For Performance Advisor events, from the menu bar, click **Monitor > Events**.

2. In the **Events** window, select an event and click **Delete**.

3. In the Delete Events dialog box, click **Yes** to delete the selected event.

4. Verify that the event is deleted by viewing the **Events** window.

After you finish

You can view events that are marked for deletion by clicking in the corner of the list.

Views in Performance Advisor

You can use views in Performance Advisor to analyze and interpret performance data.

What the performance view window is

The performance view window enables you to view the performance data of the selected group or the object in the hierarchy.

What predefined views are

Predefined views are default and system-generated views that are available in Performance Advisor. You can use predefined views to view performance data, which is collected by the performance-monitoring server and displayed in Performance Advisor.

You cannot edit or delete predefined views. However, in 7-Mode systems, you can save a copy of the predefined view and create a custom view.

For example, you might want to monitor the physical objects with the most performance. The default view is Storage System Summary View. Using the Views list, you can set the Storage System - Top Physical Objects view for the storage systems to be displayed as the default view. The Storage System Summary View is no longer the default view that appears when you click the storage systems.

Note: If you change the default view of the global group, then the Dashboards window uses the new view to display the panels.

What custom views are (7-Mode only)

You can create custom views through the Performance Advisor interface so that you can monitor one or more specific storage objects. In a single custom view, you can add multiple counters from a single chart or multiple charts. By default, custom views are associated with the Global group.

You can combine any counters you want for display in a single view. Additionally, you can include multiple counters in a single chart, and multiple charts in a single view. By default, custom views are associated with the Global group.

Note: Although you can combine any counters in a single chart, if you combine counters with different units, the chart displays multiple vertical ("y") axes with the respective unit labels of the counters. For example, combining the disk_data_read counter (KB per second) with the processor_busy counter (percentage) results in a chart with multiple vertical ("y") axes, where each axis displays the respective unit label of the counter.

Note: On upgrading to the DataFabric Manager server 3.6.1 or later, multiple custom views with the same name in the earlier versions of Performance Advisor are displayed in the *view name>_ view Id* format. For example, if there are multiple custom views with the same name *cv1*,

then after the upgrade, these custom views are shown in the *cv1_view Id* format. Because the **view Id** is unique, the custom view name is unique after the upgrade.

You can create custom views to perform the following actions:

• Access real-time data, other than what appears in the default view
• Group counters into combinations that are not offered by default views
• Use a chart type different from the charts in the default view
  You can temporarily select a different chart type in a default view through the right-click menu. However, the view returns to the default chart type each time you invoke it from the navigation pane.

What advanced views are

Advanced views enable you to view the performance data based on statistical parameters for a period of time. You can set parameters such as minimum, maximum, mean, and percentile on the collected data for further consolidation.

These views enable you to set the baseline for data collection and thus help you to set appropriate thresholds. The following are the three types of computations that are applicable to the statistical parameters:

• Simple
  This is a single value of the statistical parameter for the whole period of time. A horizontal line is displayed in the view.
• Step
  The values are accumulated for a specified period. This calculation yields multiple values and displays a series of horizontal lines in steps.
• Rolling
  The values are accumulated for a specified period in regular intervals. This calculation yields multiple values and displays smoothened lines.

The statistical computations are based on the Boost.Accumulators library.

Note: Computation types in advanced views are calculated based on the unconsolidated performance data. In the other views, data is graphically represented based on the consolidated performance data (using the performance settings.) Therefore, the baseline might not meet the graph in the advanced views. This might result in inconsistencies in the advanced views.

Related information

Accumulators: www.boost.org/doc/libs/1_38_0/doc/html/accumulators.html

Types of data in Performance Advisor

You can use *historical data* for diagnosing past performance problems or for short-term trend analysis, and you can use *real-time data* (7-Mode only) for diagnosing immediate performance issues by either saving or exporting the data for analysis.

The following types of data are available in Performance Advisor:

*   Historical data
    Historical data is data that is archived on the DataFabric Manager server. The data is collected on an ongoing basis, irrespective of whether the performance view is open.
*   Real-time data (7-Mode only)
    Real-time data is data that is sent through the performance-monitoring server and displayed in Performance Advisor. The data is collected only as long as a performance view displaying it is open in the Performance Advisor interface. Unlike historical data, real-time data is not stored.

    Note: In Cluster-Mode systems, when you move a volume from one aggregate to another aggregate within the same node, or between aggregates of different nodes, Performance Advisor will not retain the historical data.

Logical and physical objects hierarchy

You can view the hierarchy of logical and physical objects in the navigation tree from the navigation pane. By default, the hierarchy of logical objects hierarchy is displayed in the navigation pane.

For Cluster-Mode systems, the logical hierarchy displays clusters at the top level, which in turn displays Vservers, LUNs, and volumes.

The physical hierarchy includes the cluster, nodes, disks, LUNs, processors, and aggregates.

Viewing historical data

You can view and analyze the historical data by selecting the time range on a chart. You can update the time range on all charts by synchronizing the time axes.

Steps

1. From the **View** tab, select a view from the **Available Views** list.
2. Select the chart in a view.
3. Click **Range > Custom**.
4. Edit **Start Date** and **End Date**.
5. Click **Ok**.

Result

The chart is refreshed to display the historical data for the time range specified.

What synchronizing time axes is

You can synchronize the axes when you want the time axes of all line charts in a view to be in sync. It helps in detecting performance blockage by interpreting data through views.

For example, if you observe a spike in one of the charts in the Summary View window, you can probe further by interpreting data in the related charts of the window. You must synchronize the time axes on all charts to investigate the data for a particular time period.

Viewing historical data

You can view the historical data of an object by selecting the object in the navigation tree.

About this task

You can also view the performance data of an object by using the Open View wizard.

Steps

1. From the menu bar, click **View**.

2. Expand the storage objects in the navigation tree to view the storage objects (child objects) within them.

   The parent object displays a tree of objects.

3. Click the object for which you want to view the data.

   The default view of the selected object is displayed.

   > **Note:** You can change the default view by using the **Set Default** button.

Displaying tabbed views

You can view the performance data of multiple groups or objects at the same time using tabbed views.

Steps

1. From the menu bar, click **View**.

2. Right-click an object in the navigation pane.

3. Click **Open in New Tab**.

Selecting a performance view

You can select a performance view from a list to view the performance view of your choice. The **Available views** list in performance view window displays a list of various types of performance views.

Step

1. In the **Summary View** window, select the view from the **Available Views** list.

Closing a performance view

You can close any current view by using the **x** icon.

Step

1. Click the **x** icon.

Actions you can perform in the performance views

You can view and analyze data in performance views by using charts. You can perform many actions in performance views such as list storage objects, manage the performance charts, add a counter and threshold.

You can view and analyze either 7-Mode or Cluster-Mode data by performing the following actions on performance charts:

- List all related objects using the arrow icon in the upper-right corner of the title bar in the chart. Clicking the arrow displays a tree view of objects related to the content of the chart.

  Note: In Cluster-Mode systems, LUNs are not displayed as related objects for nodes.

- Select the range of data to be displayed, such as performance details collected for the past one hour.
- Zoom in to the chart by 10%.
- Zoom out of the chart by 10%.
- Reset the axes.
- Add one or more thresholds.
- Save as an image file.
- Print the chart.

In addition, you can perform the following actions in 7-Mode environments only:

- Plot the Performance Advisor events on the chart and identify the cause of the increased rates or decreased throughput.
  You can identify the nature of the event by moving the pointer over the plotted event.
- Add one or more counters.
  In a custom view, when you stop the data collection, the historical view chart displays a blank space from the point of time the data collection was stopped. When the data collection is

restarted, the polyline graph connects the point at which the data collection was stopped to the point where the data collection is restarted. To identify the break in the data collection, you should go to the respective scatter graph to know whether there is any disconnection.

If a chart contains managed objects and unmanaged objects, the tree view of the object that is displayed in that particular chart displays only the managed objects. The tree view is blank if any chart contains unmanaged objects.

You can maximize or minimize the chart by double-clicking its title. Any view that contains only one chart is always maximized.

Viewing the time period in a chart

You can view the performance details for the selected portion of time by moving the time period axis.

About this task

The screen resolution determines the amount of data that is displayed (as opposed to the entire range of data you can scroll to). Therefore, resizing a chart does not increase or decrease the amount of data you can view; it only increases or decreases the number of pixels per data point. The zoom buttons help you compress or lengthen the time scale and modify the time period that is displayed in the chart.

Step

1. View the performance data by clicking the appropriate button near the Show Threshold check box.

Resetting both axes

You can reset the axes in any chart of a view. The "x" or horizontal axis represents time in line charts and objects in bar charts. The units on the "y" or vertical axis vary, depending on the counters included in the chart.

Step

1. Click **Action > Reset Both Axes**.

   Alternatively, right-click anywhere in the chart and click **Reset Both Axes**.

Synchronizing time axes

You can synchronize the time axis in charts by using **Performance Settings** and activating **Synchronize** in a view.

Steps

1. Click the **Performance Settings** icon in the menu bar.

2. Select one of the following options to accept or modify the settings:

   - Synchronize all charts in a view
   - Synchronize all charts across all views

3. Click **View** and select a view from **Available views**.

4. Click **View Actions > Synchronize**.

Undoing synchronization of time axes

You can undo the synchronization of the time axis in charts by using **Undo synchronize** in a view.

Steps

1. Click **View** and select a view from **Available views**.

2. Click **View Actions > Undo synchronize**.

How to use the legend for predefined views and custom views

You can use the legend in predefined views to interpret the performance data that is displayed. Each performance view includes a legend.

The legend for a predefined view contains the following information:

- A sample of the graph color
- The name of the counter
- Unit of x-axis
- Unit of y-axis

In addition to the above, the legend for a custom view includes the name of the storage object, subsystem, or group of storage object units from which the data is collected.

Using the legend, you can select the counters that you want to view in the performance chart.

How to view thresholds

You can view thresholds along with the performance data for a counter using views.

You can select the **Show thresholds** check box located next to the **Show legends** check box to view thresholds. The dotted lines that appear in the chart indicate the threshold values.

Creating advanced views

You can create advanced views for any storage system by using the View window, to gather additional information about the storage system performance.

Steps

1. From the Management Console navigation pane, click **View**.

2. Select the storage system for which you want to create the advanced view.

3. Click **View Actions > Metrics**.

4. Click **Metric Settings**.

5. Select metric and computation types with period settings.

6. Click **Add metric** and then click **Ok**.

7. Click **Filter Settings**.

8. Specify the time and day of the week and click **Ok**.

Adding thresholds using a view

You can use a view to add thresholds for the counters displayed on the chart.

Steps

1. Click **View** and select a view from **Available views**.

2. Right-click the chart.

3. Move the pointer over **Add Threshold** and click a counter.

Changing the chart type

You can identify the breaks in data collection by changing the type of chart.

Steps

1. Display the performance view.

2. Right-click the chart.

3. Move the pointer over **Chart Type** and click **Scatter Chart**.

Pausing data collection

You can play or pause the data collection if you want to examine a graph in detail. This is useful if the graph is updated frequently.

Steps

1. Select a view from **View > Available views**.

2. Click **View Actions**.

3. Click **Pause** once to pause data collection.

   However, the DataFabric Manager server does not stop collecting data.

4. Click **Play** to restart the data collection.

Printing a chart from a view

You can print a chart by clicking in the view.

Steps

1. Identify the performance view that you want to print and right-click in the chart.

2. Click **Print**.

3. Specify the name of the printer and click **Ok**.

Enabling charts to scale the y axis

You can enable charts to scale the vertical axis automatically for best view during various periods of data collection.

Steps

1. Display the performance view.

2. Right-click in the chart.

3. Click **Auto Scale Y-Axis**.

Diagnosing a performance issue (7-Mode only)

If the storage system is facing a performance bottleneck, you can diagnose the performance issue by checking the health of Data ONTAP, network, NAS, and SAN.

About this task

During the diagnosis of a storage system, Performance Advisor investigates the following: Data ONTAP, Network, NAS, and SAN.

Steps

1. From the menu bar, click **View**.

2. Open a performance view of a storage system.

3. Click **View Actions**.

4. Click **Diagnose**.

5. Select the time for which you want to collect data.

6. Click **Diagnose**.

After you finish

After Performance Advisor diagnosis the performance issue, it provides observations and recommendations for each category. You must check the details of each category and act on the recommendations, if necessary.

Performance monitoring with custom views (7-Mode only)

Custom views enable you to display data in combinations or styles, depending on your requirements. For example, you might want to monitor a single counter across several storage systems or vFiler units. You might want to use predefined views to view counter combinations, but in a different type of chart.

When must you create a custom view (7-Mode only)

You must create a custom view if you want to access real-time data, display counters in combinations that are not offered by predefined views, use chart types different from that of predefined views, and use different views to compare the performance of the same counter on different objects.

You can temporarily select a different chart type in a predefined view through the right-click menu. However, the view returns to the default chart type each time you open it from the Performance Views panel.

How data from counters is displayed (7-Mode only)

Counter data is shared across different views. Any data collected for a counter in other performance views is displayed in a new view. When you add a counter to a performance view, if data collection is enabled for this counter in another view, then the new view displays the data collected in the other view.

Viewing real time data (7-Mode only)

You can access and view real-time data from Performance Advisor. By default, all the performance views display historical data in Performance Advisor.

About this task

Note: Real-time data collection can increase storage system CPU utilization, which might negatively impact the performance of the storage system.

Steps

1. From the **View** tab, select a view from the **Available Views** list.

2. Click **View Actions > Real Time**.

3. Select **Real Time**.

4. Select **Sample Rate** and **Retention Period**.

5. Click **Ok**.

6. Click **Yes** to the Performance Warning message.

Creating a custom view (7-Mode only)

You can create a custom view with selected counters in bar and line charts, to analyze specific parameters in Performance Advisor.

Before you begin

You must be assigned the DataFabric Manager GlobalWrite and GlobalDelete roles.

About this task

Although you can combine any counters in a single chart, combining counters with different units results in a chart with multiple vertical ("y") axes. For example, combining the disk_data_read counter (KB per second) with the processor_busy counter (percentage) results in a chart with multiple vertical ("y") axes, where each y axis represents the respective unit labels of the counters.

Steps

1. Click **Set Up > Custom Views**.

2. Click **Add**.

3. In the **View name** field, type the name of the custom view that you want to create.

   The custom view names should be unique.

4. Select the storage object for which you want the view to be created.

5. Click **Add Chart** so that you can display the data in graphs.

   You can add more than one chart to the view.

6. Select **Show events** to display the top five events for each object that is associated with the view.

7. Click **Add**.

Opening a custom view (7-Mode only)

You can open a custom view in the performance view window to see information about the selected storage object counters. You can open a custom view only for the associated storage object.

Steps

1. Click **Set Up > Custom Views**.

2. Select or right-click the custom view and click **Open**.

   If you create a custom view for a particular storage object, then **Open** is enabled.

Editing custom views (7-Mode only)

You can edit the view name, the chart name, and the counter details in a custom view.

Before you begin

You must be assigned the GlobalWrite and GlobalDelete roles.

About this task

You cannot edit predefined views.

Steps

1. Click **Set Up > Custom Views**.

2. Edit the custom view in one of the following ways:

   • Select the custom view and click **Edit**.
   • Right-click the selected custom view and click **Edit**.

3. In the properties sheet for the selected custom view, click the fields you want to modify, and enter the new values.

4. Click **Apply**.

Deleting a custom view (7-Mode only)

You can delete a custom view from the Custom Views window if it is no longer required.

Before you begin

You must be assigned the GlobalWrite and GlobalDelete roles.

About this task

You can delete only custom views, not predefined views.

Steps

1. Click **Set Up > Custom Views**.

2. Select one or more custom views in the **Custom Views** window and click **Delete**.

3. Click **Ok**.

CPU utilization limitations on storage systems or vFiler hosts

The performance-monitoring settings might increase the storage system CPU utilization beyond expected levels.

You must check the current CPU utilization level on the storage system or vFiler host before you perform the following operations:

- Enable SecureAdmin on a storage system, which requires the DataFabric Manager server to use HTTPS to monitor performance data
- Switch the data source in views to real time (7-Mode only)

Analysis of real-time data (7-Mode only)

You must either save or export the real-time data to analyze it. The real-time data is not archived and exists only when the performance view is displayed.

Methods for saving performance data

You can save the performance data of a storage object for analysis in Performance Advisor by using the **Save as** option or the **Export** option.

Saving a chart

You can save the chart of the performance view with details in your directory.

About this task

> **Note:** To get a good result for a .png file with proper details, you should maximize the chart view by double-clicking the title bar of the chart and then save the chart.

Steps

1. Display the performance view.
2. Right-click the chart.
3. Click **Save as**.
4. Select the directory in which you want to save the chart.
5. Specify the name of the file.
6. Click **Save**.

Exporting a view to a .csv file

You can export the data from a view to a .csv (comma-separated value) file for analysis.

About this task

You can export performance data; however, you should be aware of the following limitations:

- Exporting data is disabled for top performance charts.
- If a view has top performance charts and detailed charts (non-top N charts), then the Export dialog box displays only the names of the detailed charts.

Steps

1. From the menu bar, click the group or the object that you want to view and for which you want to export data.

2. Click the name of the view you want to display.

3. From the **File** menu, select **Export**.

4. Select and specify the date range, the counters, and the date format.

   For advanced views, you can specify the metric data that you want to export.

5. Click **Browse**, and specify a file name and the location where you want to save the file.

6. Select **CSV** in the **Files of Type** field to export the data to CSV format.

7. Click **Save**.

8. Click **Ok**.

Result

The application saves the performance view file with a .csv extension to the location that you specified.

> **Note:** You can view the .csv output file format in Microsoft Excel or IBM Lotus Symphony. You can also view this file using common text editors, because the data is in plain-text format.

Predefined views of logical and physical objects

You can use predefined views to display performance data of physical and logical storage objects, such as storage systems, network interfaces, aggregates, volumes, clusters, and Vservers.

Predefined views are available for the following logical and physical objects:

- Global groups
- Volumes

- Processors
- Network interfaces
- LUNs
- Aggregates
- Disks
- Vservers (Cluster-Mode only)
- Clusters (Cluster-Mode only)
- Nodes (Cluster-Mode only)
- Storage systems (7-Mode only)
- vFiler units (7-Mode only)
- Datasets (7-Mode only)
- Resource pools (7-Mode only)
- Qtrees (7-Mode only)
- Targets (7-Mode only)

Predefined views at the global or group level

You can display the views at the global or group level to analyze the performance data.

Group Summary View

This view provides a summary for the entire system or group. This view is displayed in either of the following cases:

- When a user first logs in
- When any group is selected

The following panels are available under this view:

- Top Performance Events
  Counters are not applicable for this panel.

- (7-Mode only) Top Storage Systems by Network Throughput
  Displays the load_total_mbps counter, which is calculated using the following formula:
  load_total_mbps = load_inbound_mbps + load_outbound_mbps
  load_inbound_mbps = system:system:net_data_recv + fcp:fcp:fcp_write_data + iscsi:iscsi:iscsi_write_data
  load_outbound_mbps = system:system:net_data_sent + fcp:fcp:fcp_read_data + iscsi:iscsi:iscsi_read_data

- (7-Mode only) Top Storage Systems by Total Ops
  Displays the pa_total_ops counter, which is calculated using the following formula:
  system:pa_total_ops = system:system:nfs_ops + system:system:cifs_ops + system:system:fcp_ops + system:system:iscsi_ops + system:system:http_ops

- (7-Mode only) Top Storage Systems by CPU Utilization
  This panel displays the cpu_busy counter.

- (Cluster-Mode only) Top Vservers by Total Ops
  This panel displays the top Vservers, based on certain performance counters.

- (Cluster-Mode only) Top Nodes by CPU Utilization
  This panel displays the top nodes based on the highest CPU utilization.

Group - Top Objects

This view displays the top five volumes and aggregates in a group. The following panels are available under this view:

- Top Volumes by Latency
  Displays the avg_latency counter.
- Top Volumes by Throughput
  Displays the throughput counter, which is calculated using the following formula:
  throughput = volume:<instance>:read_data + volume:<instance>:write_data
- Top Volumes by Total Ops
  Displays the total_ops counter.
- Top Aggregates by Total Ops
  Displays the total_transfers counter.

  Note: The Top N chart view does not display data for counter groups that have sampling intervals over 5 minutes. However, you can set the global option to a value >= 2 x counter group sampling interval, to populate the Top N chart.

(7-Mode only) Group -Top vFiler units

This view displays the top five vFiler units in a group. The following panels are available under this view:

- Top vFiler units by Disk Data Transferred
  Displays the vfiler_data_transferred counter, which is calculated using the following formula:
  vfiler_disk_transferred = vfiler:<instance>:vfiler_read_bytes +
  vfiler:<instance>:vfiler_write_bytes
- Top vFiler units by Network Throughput
  Displays the vfiler_nw_throughput counter, which is calculated using the following formula:
  vfiler_nw_throughput = vfiler:<instance>:vfiler_net_data_recv +
  vfiler:<instance>:vfiler_net_data_sent
- Top vFiler units by Total Ops
  Displays the vfiler_total_ops counter, which is calculated using the following formula:
  vfiler_total_ops = vfiler:<instance>:vfiler_read_ops + vfiler:<instance>:vfiler_write_ops +
  vfiler:<instance>:vfiler_misc_ops

Top CPUs

This view displays the top five CPUs in a group. The following panel is available under this view:

*   cpu_busy
    This panel displays the cpu_busy counter.

Top Network Interfaces

This view displays the top five network interfaces in a group. The following panels are available under this view:

*   recv_data
    Displays the recv_data counter.
*   recv_errors
    Displays the recv_errors counter.
*   recv_packets
    Displays the recv_packets counter.
*   send_data
    Displays the send_data counter.
*   send_errors
    Displays the send_errors counter.
*   send_packets
    Displays the send_packets counter.

Predefined views at the storage system level (7-Mode only)

You can display predefined views at the storage system level to analyze the performance data.

Storage system Summary View

This view provides a performance summary for a specific storage system. This is the default view that is displayed when you select or navigate to a storage system.

The following panels are available under this view:

*   Top Performance Events
    Counters are not applicable for this panel.

*   Network Throughput
    Displays the load_total_mbps, load_inbound_mbps, and load_outbound_mbps counters, which are calculated using the following formulae:
    load_total_mbps = load_inbound_mbps + load_outbound_mbps
    load_inbound_mbps = system:system:net_data_recv + fcp:fcp:fcp_write_data + iscsi:iscsi:iscsi_write_data
    load_outbound_mbps = system:system:net_data_sent + fcp:fcp:fcp_read_data + iscsi:iscsi:iscsi_read_data

- Average Latency per Protocol
  Displays the nfsv3_avg_op_latency, nfsv4_op_latency, and cifs_latency counters.

- All Protocol Ops
  Displays the following counters:

  - system:system:nfs_ops
  - system:system:cifs_ops
  - system:system:http_ops
  - system:system:fcp_ops
  - system:system:iscsi_ops

- CPU Utilization
  Displays the cpu_busy counter.

Storage system - Top Logical Objects

This view displays the top five logical objects, such as volumes, qtrees, and LUNs, based on different counters.

The following panels are available under this view:

- Top Volumes by Ops
  Displays the volume:<instance>:total_ops counter.
- Top Volumes by Latency
  Displays the volume:<instance>:avg_latency counter.
- Top LUNs by Ops
  Displays the lun:<instance>:total_ops counter.
- Top LUNs by Latency
  Displays the lun:<instance>:avg_latency counter.
- Top Qtrees by Total Ops
  Displays the total_ops counter, which is the sum of qtree:<instance>:nfs_ops and qtree:<instance>:cifs_ops counters.

Storage system - Top Physical Objects

This view displays the top five aggregates and disks in a storage system.

The following panels are available under this view:

- Top Aggregates by Total Ops
  Displays the aggregate:<instance>:total_transfers counter.
- Top Disks by Disk Busy Percentage
  Displays the disk_busy counter.

Storage system - Per Protocol Latencies

This view displays the details of the latencies for different protocols at the storage system level.

The following panels are available under this view:

- Average Latency per Protocol
  Displays the nfsv3_avg_op_latency, nfsv4_op_latency, and cifs_latency counters.
- NFSv3 Latency by Optype
  Displays the nfsv3_avg_op_latency, nfsv3_read_latency, and nfsv3_write_latency counters.
- NFSv4 Latency by Optype
  Displays the nfsv4_avg_latency counter.
- CIFS Latency by Optype
  Displays the cifs_latency counter.
- FCP Latency by Optype
  Displays the fcp_read_latency and fcp_write_latency counters.
- iSCSI Latency by Optype
  Displays the iscsi_read_latency and iscsi_write_latency counters.

Storage system - Per Protocol Sizes

This view displays the details of the read and write sizes for different protocols at the storage system level.

The following panels are available under this view:

- NFSv3 Read Sizes
  Displays the nfsv3_read_size_histo counter.
- NFSv4 Read Sizes
  Displays the nfsv4_read_size_histo counter.
- NFSv3 Write Sizes
  Displays the nfsv3_write_size_histo counter.
- NFSv4 Write Sizes
  Displays the nfsv4_write_size_histo counter.

Storage system - Per Protocol Ops

This view displays the details of the total operations for different protocols at the storage system level.

The following panels are available under this view:

- NFSv3 Ops by Optype
  Displays the nfsv3_read_ops, nfsv3_write_ops, and nfsv3_ops counters.
- NFSv4 Ops by Optype
  Displays the nfsv4_read_ops, nfsv4_write_ops, and nfsv4_ops counters.

- CIFS Ops by Optype

  Displays the system:cifs_ops counter.
- FCP Ops by Optype

  Displays the fcp_read_ops, fcp_write_ops, and fcp_ops counters.
- iSCSI Ops by Optype

  Displays the iscsi_read_ops, iscsi_write_ops, and iscsi_ops counters.
- All Protocol Ops

  Displays the nfs_ops, cifs_ops, http_ops, fcp_ops, and iscsi_ops counters.

Storage system - Network Throughput

This view displays the details of the network throughput at the storage system level.

The following panels are available under this view:

- Total Throughput

  Displays the san_throughput and nas_throughput counters.

  This panel also displays the load_total_mbps, load_inbound_mbps, and load_outbound_mbps counters, which are calculated using the following formulae:

  load_total_mbps = load_inbound_mbps + load_outbound_mbps

  load_inbound_mbps = system:system:net_data_recv + fcp:fcp:fcp_write_data + iscsi:iscsi:iscsi_write_data

  load_outbound_mbps = system:system:net_data_sent + fcp:fcp:fcp_read_data + iscsi:iscsi:iscsi_read_data
- NAS Throughput

  Displays the net_data_recv, net_data_sent, and nas_throughput counters.

  The nas_throughput counter is calculated using the following formula:

  nas_throughput = net_data_recv + net_data_sent
- FCP Throughput

  Displays the fcp_write_data, fcp_read_data, and fcp_throughput counters.

  The fcp_throughput counter is calculated using the following formula:

  fcp_throughput = fcp_write_data + fcp_read_data
- iSCSI Throughput

  Displays the iscsi_write_data, iscsi_read_data, and iscsi_throughput counters.

  The iscsi_throughput counter is calculated using the following formula:

  iscsi_throughput = iscsi_write_data + iscsi_read_data
- Disk Traffic to User Traffic ratio

  Displays the load_write_bytes_ratio and load_read_bytes_ratio counters, which are calculated using the following formulae:

  load_write_bytes_ratio = disk_data_written/load_ inbound_mbps

  load_read_bytes_ratio = disk_data_read/load_out bound_mbps

Storage system - Disk Throughput

This view displays the details of the disk throughput. The data is averaged over all the disks in the storage system.

The following panel is available under this view:

- Total disk Throughput in Kb/Sec
  Displays the disk_data_read, disk_data_written, and disk_throughput counters. The disk_throughput counter is calculated using the following formula:
  disk_throughput = disk_data_read + disk_data_written

Storage system - Top vFiler units

This view displays the details of the top five vFiler units in the storage system.

The following panels are available under this view:

- Top vFiler units by CPU Utilization
  Displays the vfiler_cpu_busy counter.
- Top vFiler units by Network Throughput
  Displays the vfiler_nw_throughput counter.
- Top vFiler units by Disk Data Transferred
  Displays the vfiler_data_transferred counter.
- Top vFiler units by Total Ops
  Displays the vfiler_total_ops counter.

Top Aggregates

This view displays the details of the top five aggregates in the storage system.

The following panels are available under this view:

- total_transfers
  Displays the aggregate:total_transfers counter.
- user_reads
  Displays the aggregate:user_reads counter.
- cp_reads
  Displays the aggregate:cp_reads counter.
- user_writes
  Displays the aggregate:user_writes counter.

Top LUNs

This view displays the details of the top five LUNs in the storage system.

The following panels are available under this view:

- read_ops

  Displays the lun:read_ops counter.
- other_ops

  Displays the lun:other_ops counter.
- write_ops

  Displays the lun:write_ops counter.

Top Volumes

This view displays the details of the top five volumes in the storage system.

The following panels are available under this view:

- read_ops

  Displays the volume:read_ops counter.
- other_ops

  Displays the volume:total_ops counter.
- write_ops

  Displays the volume:write_ops counter.

Predefined views at the vFiler unit level (7-Mode only)

You can displays predefined views at the vFiler unit level to analyze the performance data from these objects.

vFiler unit Summary View

This view provides a summary of the vFiler unit details. The following panels are available under this view:

- Recent events

  Counters are not applicable for recent events.
- Top Volumes by Latency

  Displays the volume:<instance>:avg_latency counter.
- Top Volumes by Ops

  Displays the volume:<instance>:total_ops counter.
- Top Qtrees by Ops

  Displays the total_ops counter, which is calculated using the following formula:

  total_ops = qtree: <instance>:nfs_ops + qtree: <instance>:cifs_ops
- Top LUNs by Ops

  Displays the lun:<instance>:total_ops counters.
- Top LUNs by Latency

  Displays the lun:<instance>:avg_latency counters.

vFiler unit Basic View

This view displays the details of various metrics for the vFiler unit. The following panels are available under this view:

* vfiler_read_ops
  Displays the vfiler_read_ops counter.
* vfiler_write_ops
  Displays the vfiler_write_ops counter.
* vfiler_misc_ops
  Displays the vfiler_misc_ops counter.
* vfiler_cpu_busy
  Displays the vfiler_cpu_busy counter.
* vfiler_read_bytes
  Displays the vfiler_read_bytes counter.
* vfiler_write_bytes
  Displays the vfiler_write_bytes counter.
* vfiler_net_data_recv
  Displays the vfiler_net_data_recv counter.
* vfiler_net_data_sent
  Displays the vfiler_net_data_sent counter.

Predefined views at the processor level

You can use the view at the processor level to display the performance data.

Processor Summary View

This view provides the summary of the processor details.

The following panels are available under this view:

* CPU Utilization
  This panel displays the processor_busy counter.
* Average CPU Busy per Domain
  This panel displays the following counters:

  * processor:domain_busy:idle
  * processor:domain_busy:kahuna
  * processor:domain_busy:storage
  * processor:domain_busy:exempt
  * processor:domain_busy:raid
  * processor:domain_busy:target
  * processor:domain_busy:netcache
  * processor:domain_busy:netcache2

- processor:domain_busy:cifs
- processor:domain_busy:wafl_exempt
- processor:domain_busy:network

Predefined views at the network interface level

You can use the views at the network interface level to display the performance data.

Network Interface Summary View

This view provides the summary of details about a network interface card.

The following panels are available under this view:

- Top Performance Events
  Counters are not applicable for this panel.
- Collisions
  This panel displays the collisions counter.
- Throughput in Pkts/Sec
  This panel displays the ifnet:recv_packets, ifnet:send_packets, and ifnet:total_packets counters.
  The ifnet:total_packets counter is calculated using the following formula:
  ifnet:total_packets = ifnet:recv_packets + ifnet:send_packets
- Throughput in Bytes/Sec
  This panel displays the ifnet:recv_data, ifnet:send_data, and ifnet:total_data counters.
  The ifnet:total_data counter is calculated using the following formula:
  ifnet:total_data = ifnet:recv_data + ifnet:send_data
- Packet Errors
  This panel displays the ifnet:recv_errors, ifnet:send_errors, and ifnet:total_errors counters.
  The ifnet:recv_errors counter is calculated using the following formula:
  ifnet:total_errors = ifnet:recv_errors + ifnet:send_errors
- Multicast Packets
  This panel displays the ifnet:send_mcasts, ifnet:recv_mcasts, and ifnet:total_mcasts counters.
  The ifnet:total_mcasts counter is calculated using the following formula:
  ifnet:total_mcasts = ifnet:send_mcasts + ifnet:recv_mcasts

Predefined views at the dataset level (7-Mode only)

You can display views at the dataset level to analyze their performance data.

Dataset Summary View

This view displays the top five components in a dataset.

The following panels are available under this view:

- Top Volumes by Latency

This panel displays the volume:<instance>:avg_latency counter.

- Top Volumes by ops
  This panel displays the volume:<instance>:total_ops counter.
- Top Qtrees by Ops
  This panel displays a counter, which is a sum of the qtree:<instance>:nfs_ops and qtree:<instance>:cifs_ops counters.

Predefined views at the resource pool level (7-Mode only)

You can display predefined views at the resource pool level to analyze the performance data.

Resource Pool Summary View

This view displays the top five objects in a resource pool.

The following panels are available under this view:

- Top Aggregates by Total Transfers
  This panel displays the aggregate:<instance>:total_transfers counter.
- Top Disks by Disk Busy
  This panel displays the disk:<instance>:disk_busy counter.
- Top Storage Systems by Ops
  This panel displays the pa_total_ops counters.

Predefined views at the volume level

You can use the views at the volume level to display the performance data.

Volume Summary View

This view provides the summary detail of the volume.

The following panels are available under this view:

- Top Performance Events
  Counters are not applicable for this panel.
- Top LUNs by Ops
  This panel displays the lun:<instance>:total_ops counter.
- Top LUNs by Avg Latency
  This panel displays the lun:<instance>:avg_latency counter.
- Top Qtrees by Ops (7-Mode only)
  This panel displays the total_ops counter, which is the sum of qtree:<instance>:nfs_ops and qtree:<instance>:cifs_ops.
- Overall Latency by Optype
  This panel displays the following counters:

  - volume:<instance>:avg_latency

- volume:<instance>:read_latency
- volume:<instance>:write_latency
- volume:<instance>:other_latency
- Overall Iops by Optype
  This panel displays the following counters:

  - volume:<volume_name>:read_ops
  - volume:<volume_name>:write_ops
  - volume:<volume_name>:other_ops
  - volume:<volume_name>:total_ops

Volume Latency View

This view displays details of the latencies for different protocols for the volume.

The following panels are available under this view:

- Overall Latency by Optype
  This panel displays the following counters:

  - volume:<instance>:avg_latency
  - volume:<instance>:read_latency
  - volume:<instance>:write_latency
  - volume:<instance>:other_latency
- NFS Latency by Optype
  This panel displays the following counters:

  - volume:<instance>:nfs_read_latency
  - volume:<instance>:nfs_write_latency
  - volume:<instance>:nfs_other_latency
  - volume:<instance>:nfs_latency
- CIFS Latency by Optype
  This panel displays the following counters:

  - volume:<instance>:cifs_read_latency
  - volume:<instance>:cifs_write_latency
  - volume:<instance>:cifs_other_latency
  - volume:<instance>:cifs_latency
- SAN Latency by Optype
  This panel displays the following counters:

  - volume:<instance>:san_read_latency
  - volume:<instance>:san_write_latency
  - volume:<instance>:san_other_latency
  - volume:<instance>:san_latency

Volume IOPs View

This view displays the details of the IOPS for different protocols at the storage system level.

The following panels are available under this view:

- Overall Iops by Optype
  This panel displays the following counters:

  - volume:<volume_name>:read_ops
  - volume:<volume_name>:write_ops
  - volume:<volume_name>:other_ops
  - volume:<volume_name>:total_ops
- NFS Iops by Optype
  This panel displays the following counters:

  - volume:<volume_name>:nfs_read_ops
  - volume:<volume_name>:nfs_write_ops
  - volume:<volume_name>:nfs_other_ops
  - volume:<volume_name>:nfs_ops
- CIFS Iops by Optype
  This panel displays the following counters:

  - volume:<volume_name>:cifs_read_ops
  - volume:<volume_name>:cifs_write_ops
  - volume:<volume_name>:cifs_other_ops
  - volume:<volume_name>:cifs_ops
- SAN Iops by Optype
  This panel displays the following counters:

  - volume:<volume_name>:san_read_ops
  - volume:<volume_name>:san_write_ops
  - volume:<volume_name>:san_other_ops
  - volume:<volume_name>:san_ops
- User Ops v/s Sys Ops
  This panel displays the following counters:

  - volume_user_ops
  - volume_sys_ops

  The above counters are calculated using the following formula:

  - volume_user_ops = sum(volume:<instance>:nfs_read_ops + nfs_write_ops + nfs_other_ops + cifs_read_ops + cifs_write_ops + cifs_other_ops + san_read_ops + san_write_ops + san_other_ops)
  - volume_sys_ops = volume:<instance>:total_ops - volume_user_ops
- FlexCache Iops by Optype

The above counters are calculated using the following formula:

- volume:<volume_name>:flexcache_read_ops
- volume:<volume_name>:flexcache_write_ops
- volume:<volume_name>:flexcache_other_ops

Predefined views at the qtree level (7-Mode only)

You can display predefined views at the qtree level to analyze their performance data.

Qtree Summary View

This view provides the summary details of the qtree.

The following panels are available under this view:

- Top Performance Events
  Counters are not applicable for this panel.
- Throughput in Ops
  This panel displays the following counters:

  - qtree:<instance>:nfs_ops
  - qtree:<instance>:cifs_ops
  - qtree:<instance>:internal_ops

Predefined views at the LUN level

You can use the views at the LUN level to display the performance data.

LUN Summary View

This view provides the summary of LUN details.

The following panels are available under this view:

- Top Performance Events
  Counters are not applicable for this panel.
- Throughput in Ops
  This panel displays the following counters:

  - lun:<instance>:read_ops
  - lun:<instance>:write_ops
  - lun:<instance>:other_ops
  - lun:<instance>:total_ops
- Throughput in Bps
  This panel displays the following counters:

  - lun:<instance>:read_data
  - lun:<instance>:write_data

- throughput
- Average Latency
  This panel displays the lun:<instance>:avg_latency counter.

LUN Alignment View

This view provides the alignment details of the LUN.

The following panels are available under this view:

- Aligned WAFL Ops
  This panel displays the following counters:

  - read_align_histo
  - write_align_histo
- Unaligned WAFL Ops
  This panel displays the following counters:

  - unaligned_reads
  - unaligned_writes
- Partial blocks
  This panel displays the following counters:

  - read_partial_blocks
  - write_partial_blocks

Predefined views at the aggregate level

You can view the details of the aggregate to understand the performance data.

Aggregate Summary View

This view provides the summary of aggregate details.

The following panels are available under this view:

- Top Performance Events
  Counters are not applicable for this panel.
- Top Disks by disk_busy
  This panel displays the disk:<instance>:disk_busy counter.
- Throughput in Blocks/Sec
  This panel displays the following counters:

  - aggregate:<instance>:user_read_blocks
  - aggregate:<instance>:user_write_blocks
  - aggregate:<instance>:cp_read_blocks
  - total_transfers

Predefined views at the disk level

You can use the views at the disk level to display the performance data.

Disk Summary view

This view provides the summary of the disk details.

The following panels are available under this view:

- Top Performance Events
  Counters are not applicable for this panel.
- Throughput in Ops
  This panel displays the following counters:

  - disk:<instance>:total_transfers
  - disk:<instance>:user_reads
  - disk:<instance>:user_writes
  - disk:<instance>:cp_reads
- Throughput in Blocks
  This panel displays the following counters:

  - disk:<instance>:user_read_blocks
  - disk:<instance>:user_write_blocks
  - disk:<instance>:cp_read_blocks
  - throughput
- Disk Latency
  This panel displays the following counters:

  - disk:<instance>:user_read_latency
  - disk:<instance>:user_write_latency
  - disk:<instance>:cp_read_latency
- Disk Chain Info
  This panel displays the following counters:

  - disk:<instance>:user_read_chain
  - disk:<instance>:user_write_chain
  - disk:<instance>:cp_read_chain
- Disk Util
  This panel displays the disk:<instance>:disk_busy counter.
- Guaranteed Ops
  This panel displays the guaranteed_reads and guaranteed_writes counters.

Predefined view at the target level (7-Mode only)

You can display a view at the target level to interpret the performance data.

Target Basic

This view provides the basic details at the target level.

The following panels are available under this view:

- read_ops
  Displays the read_ops counter.
- write_ops
  Displays the write_ops counter.
- other_ops
  Displays the other_ops counter.
- queue_full
  Displays the queue_full counter.

Predefined views at the cluster level (Cluster-Mode only)

You can display the views at the cluster level to analyze the performance data.

Cluster Summary View

This view provides a summary for a specific cluster. This is the default view that is displayed when you select or navigate to a cluster.

The following panels are available under this view:

- Top Performance Events
  Counters are not applicable for this panel.

- Top Vservers by Total Ops
  Displays the total_ops counter.

- Top Nodes by CPU Busy
  Displays the cpu_busy counter.

- Top Aggregates by total_transfers
  Displays the total_transfers counter.

- Top Volumes by Latency
  Displays the avg_latency counter.

Predefined views at the Vserver level (Cluster-Mode only)

You can display views at the Vserver level to analyze the performance data.

Vserver Summary View

This view provides a summary of a specific Vserver. This is the default view that is displayed when you select or navigate to a Vserver. The following panels are available under this view:

- Top Performance Events
  Counters are not applicable for this panel.

- Vservers by Total Ops
  Displays the total_ops counter.

- Vserver - All Protocol Ops
  Displays the cifs_ops, iscsi_pa_total_ops and fcp_pa_total_ops counters.

Vservers - Top Volumes

This view displays the top five volumes in the Vserver. The following panels are available under this view:

- Top Volumes by Total Ops
  Displays the total_ops counter.

- Top Volumes by Aggregate Latency
  Displays the avg_latency counter.

- Top Volumes by Read Ops
  Displays the read_ops counter.

- Top Volumes by Write Ops
  Displays the write_ops counter.

Vservers - Top LUNs

This view displays the top five LUNs in the Vserver. The following panels are available under this view:

- Top LUNs by Total Ops
  Displays the total_ops counter.

- Top LUNs by Aggregate Latency
  Displays the avg_latency counter.

- Top LUNs by Read Ops
  Displays the read_ops counter.

- Top LUNs by Write Ops
  Displays the write_ops counter.

Vserver CIFS View

This view provides a summary of the CIFS performance of the Vserver. The following panels are available under this view:

- Vserver CIFS Ops
  Displays the cifs_ops, cifs_read_ops, cifs_write_ops, cifs_read_latency and the cifs_write_latency counters.

- Vserver CIFS Latencies
  Displays the cifs_latency counter.

Vserver FCP View

This view provides a summary of the FCP performance of the Vserver. The following panel is available under this view:

- Vserver FCP Ops
  Displays the fcp_read_ops and fcp_write_ops counters.

Vserver iSCSI View

This view provides a summary of the iSCSI performance of the Vserver. The following panel is available under this view:

- Vserver iSCSI Ops
  Displays the iscsi_read_ops and iscsi_write_ops counters.

Predefined views at the node level (Cluster-Mode only)

You can display the views at the node level to analyze the performance data of nodes.

Node Summary View

This view gives a summary for a specific node. This is the default view that is displayed when a user selects or navigates to a node.

The following panels are available under this view:

- Top Performance Events
  Counters are not applicable for this panel.

- Throughput
  Displays the net_data_sent, net_data_recv, disk_data_read, and the disk_data_written counters.

- Volume Throughput

Displays the read_data and write_data counters.

- Volume Latencies
  Displays the avg_latency counter.

- CPU Utilization
  Displays the cpu_busy counter.

Node Per Protocol Ops

This view displays charts related to the network throughput of the specified node.

The following panels are available under this view:

- NFSv3 ops
  Displays the nfsv3_read_ops and nfsv3_write_ops counters.

- CIFS ops
  Displays the cifs_read_ops and cifs_write_ops counters.

- FCP ops
  Displays the read_ops and write_ops counters.

Node - Top Volumes

This view displays the top five volumes in the node. This panel displays the following counters:

- read_ops
  Displays the read_ops counter.
- write_ops
  Displays the write_ops counter.
- total_ops
  Displays the total_ops counter.

Node - Top Physical Objects

This view displays the top five physical objects in the node. The following panels are available under this view:

- Top Aggregates by Total Ops
  Displays the total_transfers counter.

- Top Disks by Disk Busy Percentage
  Displays the disk_busy counter.

Node - Top Logical Objects

This view shows the top five logical objects in the node. The following panels are available under this view:

- Top LUNs by Latency
  Displays the avg_latency counter.

- Top LUNs by Ops
  Displays the total_ops counter.

- Top Volumes by Latency
  Displays the avg_latency counter.

- Top Volumes by Ops
  Displays the total_ops counter.

Node - Top Aggregates

This view displays the top five aggregates in the node. This panel displays the following counters:

- total_transfers
  Displays the total_transfers counter.
- cp_reads
  Displays the cp_reads counter.
- user_reads
  Displays the user_reads counter.
- user_writes
  Displays the user_writes counter.

Node - Top LUNs

This view displays the top five LUNs in the node. This panel displays the following counters:

- read_ops
  Displays the read_ops counter.
- write_ops
  Displays the write_ops counter.
- other_ops
  Displays the other_ops counter.

Alarms, hosts, and thresholds

You can use alarms, list of hosts, and thresholds in Performance Advisor to monitor datasets and resources, edit login credentials on hosts, and identify potential performance issues of storage systems.

What alarms are

Alarms are configured notifications that are sent whenever a specific event or an event of a specific severity type occurs, not necessarily related to a specific user. Alarms are used to monitor and manage datasets and resources, as a whole.

Alarms are not the events themselves, only the notification of events. Alarms are not the same as user alerts. For a complete description of user alerts, see the *Operations Manager Administration Guide*.

You can create alarms for any storage system for which you want automatic notification of events. You can use the Set Up Alarms window to add, monitor, and edit alarms.

List of alarm management tasks

You can respond to, view, edit, test, disable, enable, add, or delete data performance alarms.

Alarm management tasks	This list describes the alarm management tasks that you perform most often.
Responding to alarms	When you receive an alarm, you should acknowledge the event and resolve the condition that triggered the alarm. If the repeat notification feature is enabled and the alarm condition persists, you continue to receive notifications until you acknowledge the event.
Viewing the list of alarms	View the list of all currently configured data protection alarms when you want an overview of what is configured for any selected group. You can control the sort order of any column in the list. You can also control which alarms are displayed by filtering the information in any column in the list.
Viewing the configuration values for any selected alarm	View the configuration details of any selected alarm when you want to know specific information or you are considering modifying the configuration.
Editing the alarm	Modify the configuration of an alarm when you need to accommodate changes in the environment. For example, you might need to update a recipient e-mail address, add another recipient pager address, add a recipient script name, or change the hours during which the alarm is active.

Testing an alarm	Test a new or modified alarm by having Protection Manager send a test message to all the recipients configured for the selected alarm.
Disabling or enabling an alarm	Disable an alarm when you need to stop its functioning for a while but want to retain the alarm configuration. For example, if you have an alarm configured for the SnapVault Backup Failed event and you scheduled downtime for maintenance on that host, you might disable the alarm during the planned downtime. When the host is up again, you can enable the alarm.
Adding an alarm	Configure a new alarm when you want notification of a specific event or any event of a specific severity type for a group.
Deleting an alarm	Delete an alarm only when you are sure that you no longer need notification of the event or severity type occurring for the group.

Managing and monitoring alarms

You can use the Alarms window to perform all the alarm monitoring and managing tasks. When responding to an alarm, you can use the Events window to view details about the event.

Monitoring alarms

You can view a list of all the alarms configured for your application and capabilities.

Before you begin

You must be authorized to perform all the steps of this task; your RBAC administrator can confirm your authorization in advance.

Steps

1. Depending on the alarms you want to view, perform one of the following actions:

   - For protection, provisioning, or disaster recovery alarms, from the menu bar, click **Notifications > Alarms**.
   - For Performance Advisor alarms, from the menu bar, click **Set Up > Alarms**.

2. Optional: You can customize the **Alarms** window in one of the following ways:

   - Select an alarm to see the configured property values for that alarm.
   - Click ⇳ in a column header to control which alarm entries you want displayed.
     The color of the column header changes to indicate that you are filtering the entries in that column.
     Some column filters display a drop-down list to select from and other column filters display a search field in which you can enter text to select.
   - Click the sort arrows in a column header to change the sort order of the entries in that column.

- Click 🔲 in the upper-right corner of the list to select which columns are displayed.
- Drag the bottom of the alarms list area up or down to resize that area.

Creating alarms

You can create alarms by using the Add Alarm wizard.

Steps

1. Click **Set Up > Thresholds**.

2. Click the **Summary** tab.

3. Select the threshold.

4. Click **Add Alarm**.

5. Complete the **Add Alarm** wizard.

Editing alarms

You can change the configuration of an existing alarm.

Before you begin

You must be authorized to perform all the steps of this task; your RBAC administrator can confirm your authorization in advance.

Steps

1. For protection, provisioning, or disaster recovery alarms, from the menu bar, click **Notifications > Alarms**. For Performance Advisor alarms, from the menu bar, click **Set Up > Alarms**.

2. Select an alarm in the **Alarms** window and click **Edit**.

3. Use the tabs in the **Properties** sheet (Group, Event Type, Recipient, and Details) to change the configured property values.

4. Click **Apply** to commit your changes.

5. Click **OK** to close the **Properties** sheet.

   The new configuration is immediately activated and displayed in the Alarms list.

6. Verify your changes by viewing the results that are displayed in the **Alarms** window.

   You can select an alarm to view the current property values for that alarm.

Testing alarms

You can test an alarm to check its configuration, after creating or editing the alarm.

Before you begin

You must be authorized to perform all the steps of this task; your RBAC administrator can confirm your authorization in advance.

Steps

1. For protection, provisioning, or disaster recovery alarms, from the menu bar, click **Notifications > Alarms**. For Performance Advisor alarms, from the menu bar, click **Set Up > Alarms**.

2. Select an alarm and click **Test**.

   You can select any alarm regardless of whether it is enabled or disabled.

3. Click **OK** in the Confirm Alarm(s) Test window to begin the test.

   A test event notification is sent to each configured recipient. If a script is configured, the test notification runs the script.

4. Verify the alarm recipient configuration by checking that each recipient received a test message. If a script recipient is configured, check that the script was successfully started.

After you finish

You can modify any of the alarm properties from the Alarms window.

Enabling or disabling alarms

You can disable an alarm when you need to temporarily stop its functioning and enable it when you want it to start functioning again.

Before you begin

You must be authorized to perform all the steps of this task; your RBAC administrator can confirm your authorization in advance.

About this task

Disabling an alarm enables you to retain the alarm configuration while its functioning is temporarily stopped. For example, if you have an alarm that is configured for the SnapVault Backup Failed event and you scheduled down time for maintenance on a host that is in the resource pool for the group associated with that alarm, you might disable the alarm during the planned down time. When the host is up again, you can enable the alarm to resume its functioning.

Steps

1. For protection, provisioning, or disaster recovery alarms, from the menu bar, click **Notifications > Alarms**. For Performance Advisor alarms, from the menu bar, click **Set Up > Alarms**.

2. In the alarms list, locate the entry for the alarm you want to enable or disable.

3. Clear the **Enabled** check box to disable the associated alarm, or select the **Enabled** check box to enable it.

   The alarm is immediately disabled or enabled.

4. Verify your change by viewing the results that are displayed in the **Alarms** window.

Adding alarms

You can add an alarm when you want immediate notification that a specified event or event class or event of a specified severity level occurred.

Before you begin

You must be authorized to perform all the steps of this task; your RBAC administrator can confirm your authorization in advance.

Have the following information available to complete this task:

- The resource group with which you want the alarm associated.
- The event name, event class, or severity type that triggers the alarm.
- Who and what you want the event notification sent to.
- The time period during which the alarm is active.
- Whether you want the event notification repeated until the event is acknowledged and how often the notification should be repeated.

Steps

1. For protection, provisioning, or disaster recovery alarms, from the menu bar, click **Notifications > Alarms**. For Performance Advisor alarms, from the menu bar, click the **Set Up Alarms** window.

2. Click **Add** to start the **Add Alarm** wizard.

3. On each page of the wizard, enter the appropriate information.

4. Click **Finish** to commit your choices and close the **Add Alarm** wizard.

5. Verify the creation and configuration of the alarm by viewing the results that are displayed in the **Alarms** window.

After you finish

You can edit the alarm properties from the Alarms window.

Deleting alarms

You can delete an alarm when you no longer need immediate notification of an event or severity type.

Before you begin

You must be authorized to perform all the steps of this task; your RBAC administrator can confirm your authorization in advance.

Steps

1. For protection, provisioning, and disaster recovery alarms, from the menu bar, click **Notifications > Alarms**. For Performance Advisor alarms, from the menu bar, click **Set Up > Alarms**.

2. Select one or more alarms in the **Alarms** window and click **Delete**.

3. Click **OK** in the Confirm Alarm(s) Delete dialog box to delete the selected alarms.

   The alarm configurations are deleted and the alarms are removed from the Alarms list.

4. Verify your deletion by viewing the results that are displayed in the **Alarms** window.

Responding to alarms

When you receive an alarm, you can acknowledge the event and resolve the condition that triggered the alarm.

Before you begin

You must be authorized to perform all the steps of this task; your RBAC administrator can confirm your authorization in advance.

About this task

If the repeat notification feature is not enabled, you receive the event notification only once. If the repeat notification feature is enabled and the alarm condition persists, you continue to receive notifications until you acknowledge the event.

Steps

1. For protection, provisioning, and disaster recovery alarms, from the menu bar, click **Notifications > Events**. For Performance Advisor alarms, from the menu bar, click **Monitor > Events**.

2. Select an event whose details you want to view.

3. Click **Acknowledge** to indicate that you are taking responsibility for managing that event.

4. Click **Yes** in the Acknowledge Events dialog box to acknowledge the selected event.

   Your user name and the time are entered in the Events list for the selected event.

5. Find the cause of the event and take corrective action.

Display of storage systems by using Performance Advisor

You can use Performance Advisor to view a list of the hosts discovered by the DataFabric Manager server. You can set, modify, and check the login credentials on hosts by using the application.

The following conditions should be set for the DataFabric Manager server to start collecting data from the discovered storage systems:

- The login credentials for the storage system must be set.
- The transport protocol must be set for the storage system discovered by the DataFabric Manager server.
- The performance data collection option must be set.

If you are using a version of Management Console prior to version 2.1, then you must use the DataFabric Manager server to set the credentials. If you are using a version of Management Console later than version 2.1, then you must use the Management Console to set the credentials.

Host table field descriptions

You can select a host to display the host name, IP address, host status, user name, password, host transport, and other Performance Advisor details.

Field	Description
Name	The name of the host
Node Name	(Cluster-Mode only) The name of the host
IP address	The IP address of the host
Cluster Management IP address	(Cluster-Mode only) The IP address of the cluster
Node Management IP address	(Cluster-Mode only) The IP address of the node
Perf Status	The status of the performance
Status	The status of the host
Login Credentials	Information that the user is authenticated on the host
Perf Advisor Transport	The protocol used for communication
Data Collection Status	The status of data collection in the host
Max Projected Space	Maximum space that is available in the host

Field	Description
Used Space	Space that is used in the host
Percentage of Used Space	Space, in percentage, that is used in the host
Host Transport	The protocol used for communication

Editing host credentials

You can set, edit, or verify the host credentials in storage systems and clusters by using Performance Advisor.

Steps

1. From the menu, perform the appropriate action:

For...	Do this...
Storage systems (7-Mode only)	Click **Set Up > Storage Systems**.
Clusters (Cluster-Mode only)	Click **Set Up > Clusters**.

2. Select a host, and click **Edit**.

3. In the **Host Properties** window, enter the user name and password in the **Login Credentials** section.

4. Select the **Use hosts.equiv** check box to use the hosts.equiv option.

   For more information about the hosts.equiv option, see the *OnCommand Unified Manager Operations Manager Administration Guide*.

5. If you want to collect data from this specific host, select the **Enable Data Collection** check box.

6. Select the transport protocol for data collection from the **Perf Advisor Transport** list.

   You can select one of the following options for the transport protocol: HTTPS Ok, HTTP Only, or Global Default. The default protocol setting is HTTP.

7. Click **Apply**, and then click **Ok**.

Result

The credentials are updated in the DataFabric Manager server database.

Related information

IBM N series support website: www.ibm.com/storage/support/nseries

Configuration of data collection (7-Mode only)

You can configure data collection by enabling or disabling counters through the Data Collection Configuration Wizard. You can also change the sample rate and retention period for counter groups by using the wizard.

You can configure data collection only for 7-Mode systems. For Cluster-Mode systems, you can only view the default data collection configuration which is system generated.

Note: Performance Advisor does not support data collection for unmapped LUNs.

Copying the data collection configuration (7-Mode only)

You can copy the configuration related to the performance data collection of one storage system and apply it to one or more storage systems for easy management and administration.

Before you begin

The Data Collection Status icon in the hosts list must be green for the storage system.

Steps

1. Click **Set Up > Storage Systems**.

2. Click **Data Collection > Copy**, and then click **Next**.

3. Select one or more available storage systems.

   Note: If you select more than 10 storage systems, the Management Console might stop responding.

4. Click **Next**, and then click **Finish**.

Effect of increasing sample rates (7-Mode only)

You can lose the historical data if you increase the sample rates for data collection.

Some space is reclaimed on the DataFabric Manager server when data samples are collected in even numbers such as 2, 4, and 6.

For example, if you have 100 data samples collected for a week, when you double the sampling interval, the number of data samples collected are halved to 50. Every second sample from the collection is deleted.

Note: (Cluster-Mode only) The sampling interval for systems operating in Cluster-Mode is 5 minutes. You cannot modify the sampling interval.

Setting retention periods and sample rates (7-Mode only)

You can reset sample rates to set the frequency with which performance data should be collected, and retention periods to set how long the data should be retained in the system by using the Data Collection Configuration wizard. You can start the wizard from the Set Up Storage Systems window.

About this task

Attention: If you decrease the retention period immediately after increasing the sample rate, there might be a data loss.

Steps

1. Click **Set Up > Storage Systems**.

2. Select the storage system for which you want to set a retention period and sample rate.

3. Click **Data Collection > Edit**.

4. Set the retention period and sample rate in the **Data Collection Configuration** wizard.

How thresholds work

You can use thresholds to determine the point at which Performance Advisor should generate an event or alarm to identify potential issues that might impact the performance of storage objects.

This is dependent on the threshold interval and the counter value that you set. If you set a threshold on a counter such as the average latency counter on any volume, then an event is generated when the threshold breaches a particular counter value for an interval.

When you apply a threshold to a parent object, and if the threshold uses a counter associated with a child object, then the threshold is applied to all the child objects. If the parent-child object relationship is broken, the thresholds inherited from the parent no longer apply to the child.

You can apply thresholds for two or more counters on one or more objects. The threshold interval for all the thresholds in a combination remains the same. For example, you can set thresholds for the avg_latency and total_ops counters within a volume. Events are generated only when all the thresholds are breached.

If you apply thresholds to objects with a parent-child relationship, such as aggregate and disk objects, an event is generated at the child object level. For example, you can set threshold values for the cp_read_blocks counter on an aggregate and the disk_busy counter on a disk. The event is generated on the object that is lowest in the hierarchy.

In Cluster-Mode systems, every cluster node contains a volume called vol0 that stores the configuration information of the node. This volume does not belong to a Vserver and therefore, cannot be used to provide data. Performance Advisor does not manage these volumes.

You cannot apply thresholds to the following combination of Cluster-Mode objects:

- Disks and LUNs
- Disks and volumes
- Vservers and aggregates
- Vservers and disks
- Vservers and ifnet (interface)

You cannot apply thresholds to the following combination of 7-Mode objects:

- Disks and LUNs
- Disks and qtrees
- Disks and volumes
- Network interfaces and targets
- Aggregates and vFiler units
- vFiler units and disks

You can set thresholds on counters specific to objects such as targets, interfaces, and disks. However, you cannot set thresholds on processors, RAID groups, and plexes.

What resource properties are

Resource properties are conditions such as disk type, disk roles, system models, and system versions that should be met while applying thresholds on the objects. By applying resource properties, you can generate events only when a threshold breach occurs on a particular model and a version of the storage system.

Rule-based thresholds are applied to groups comprising storage systems. When a new storage system is added to the group, the threshold applied to the group must also be applied to the new member. The threshold settings are automatically refreshed after 15 min. However, you can refresh the settings immediately using the `dfm perf threshold refresh` command.

For example, you can set a threshold only on N6070 in a group by setting the filter details. However, the threshold must be rule-based.

You can use the Add Threshold Wizard to set the filter details for a threshold. You can display the filter property and the corresponding value by selecting a value in the list.

Viewing threshold values

You can view existing threshold values by using the Summary tab.

Steps

1. Click **Set Up > Thresholds**.
2. Click the **Summary** tab.

When to use thresholds in combination

You might not want to receive alerts for every small activity on an object. In such cases, you should consider applying thresholds in combination by creating a rule on more than one counter for objects in storage systems.

For example, if you set thresholds on the avg_latency counter for all LUNs in a storage system, you might receive alarms from LUNs which are hardly used. To stop generating such events, you must apply thresholds on more than one counter. In this case, you can create a rule to generate alerts only when the total_ops counter and the avg_latency counter breach the threshold values.

What the Details tab is

The Details tab displays a page with the object tree on the left pane and the list of counters with the threshold values on the right pane.

The objects in the object tree are of two types:

* Logical
* Physical

Adding thresholds

You can add thresholds for the performance counters on storage systems using the Set Up Thresholds window. Alternatively, you can right-click the object in the logical or physical hierarchy to add thresholds.

Steps

1. Click **Set Up > Thresholds**.

2. Click the **Summary** tab.

3. Click **Add**.

   You cannot add thresholds on the objects whose storage systems do not have valid credentials.

4. Complete the **Add Thresholds** wizard by entering the threshold values you want to set for your performance counters.

Editing thresholds by using the Summary tab

You can edit the type, value, and interval of thresholds and event names by using the Summary tab in the Set Up Thresholds window. However, you cannot edit thresholds that are based on threshold templates.

Steps

1. Click **Set Up > Thresholds**.

2. Click the **Summary** tab.

3. Modify the threshold by choosing one of the following actions:

   - Select the threshold, and click **Edit**.
   - Right-click the threshold, and click **Edit**.

4. Edit the threshold details.

5. Click **Apply**.

6. Click **OK**.

Editing thresholds using charts

You can modify the threshold value and the threshold interval on charts.

Steps

1. Select **Show Threshold** on the chart.

2. Drag the dotted line.

   However, you cannot edit thresholds if they are based on threshold templates or are set on parent objects. In such cases, you cannot drag the line.

3. Edit the threshold details.

4. Click **Apply**.

5. Click **OK**.

Editing thresholds using the Details tab

You can modify the threshold value and the threshold interval for the selected threshold using the **Details** tab in the Set Up Thresholds window.

About this task

   Note: You cannot edit thresholds based on threshold templates or thresholds set on parent objects.

Steps

1. Click **Set Up > Thresholds**.

2. Click the **Details** tab.

3. Select the object.

4. Click the threshold in the **Existing threshold** box.

5. Edit the threshold value.

6. Edit the threshold interval.

7. Click **Apply**.

    8. Click **OK**.

Deleting thresholds

You can delete thresholds by using the Summary tab in the Set Up Thresholds window.

Steps

1. Click **Set Up > Thresholds**.

2. Click the **Summary** tab.

3. Delete one or more thresholds by choosing one of the following actions:

   • Select the thresholds and click **Delete**.
   • Select the thresholds, and then right-click and click **Delete**.

4. Click **Ok**.

What a threshold template is (7-Mode only)

A threshold template is a set of thresholds that you can apply to one or more objects in a storage system. Using threshold templates, you can group multiple thresholds into a single unit and associate multiple objects to these thresholds.

You can assign an object to a template only if there is at least one applicable threshold in the template. For example, you can assign a volume to a template with two thresholds: one set on system:cpu_busy and the other set on volume:total_ops. You cannot assign a volume object if the volume threshold is not present in the template.

You might want to generate a set of events for an object when it exceeds its counter thresholds. In such cases, you should consider creating a threshold template, which defines a set of thresholds, and apply the template to the object. For example, you can create a threshold template that contains a threshold for the cp_writes counter greater than 10 per second for 5 minutes. You can apply these values in a template to objects to generate events.

You can create and view templates by using the Set Up Threshold Templates window, which has two sections. The section on the top displays the template table, and the section on the bottom lists the events, counters, and resource properties. The **object** tab in the bottom-half of the page displays the objects that are applied to the selected template.

When to use threshold templates (7-Mode only)

You might want to use threshold templates to modify a threshold that is applied on more than one object. You can also use the templates to add or remove thresholds on objects.

For example, if you want to change the threshold limit from 90% to 80% for a threshold that is applied on the system:cpu_busy counter for 10 storage systems, you can modify all the 10 thresholds by using threshold templates. Threshold templates enable you to modify the threshold on all the storage systems with just one change in the template.

If you want to create 10 identical thresholds for 10 storage systems, you can apply a template to all the storage systems to create as many thresholds. Similarly, you can remove the objects from an existing threshold by using the threshold templates.

Creating threshold templates (7-Mode only)

You can create threshold templates by using the Add Threshold Template wizard to apply threshold settings to a specific storage object.

About this task

> **Note:** You can add a threshold template by using the Set Up Thresholds window.

Steps

1. Click **Set Up > Threshold Templates**.

2. Click **Add**.

3. Follow the prompts in the wizard to create the threshold template.

Editing threshold templates (7-Mode only)

You can add, edit, or delete existing threshold templates by using the Set Up Threshold Templates window.

Steps

1. Click **Set Up > Threshold Templates**.

2. Click **Edit**.

3. Click **Threshold Details** to add, edit, or delete the thresholds in the template.

4. Click **Ok**.

Glossary

associated view   A performance view available for an object. An associated view can be a predefined view or a custom view. Predefined views are associated to an object based on the object type. Custom views can be associated to an object by the user.

counter   A statistical measurement of activity on a storage system or storage subsystem that is provided by Data ONTAP.

custom views   User-defined views that include metrics from multiple performance counters.

dataset   A collection of storage sets, along with configuration information, associated with data. The storage sets associated with a dataset include a primary storage set used to export data to clients, and the set of replicas and archives that exist on other storage sets. Datasets represent exportable user data.

hierarchical groups   The customizable grouping of storage systems, clusters, and nodes whose performance can be monitored and displayed through Performance Advisor. All systems that are monitored by the DataFabric Manager server and whose performance can be monitored by Performance Advisor are displayed in the Groups browser panel of Performance Advisor.

historical data   Data that is archived by the performance-monitoring server on the DataFabric Manager server. All the data that is included in the Performance Advisor default views is also archived as historical data.

   Historical data is accessible to any Performance Advisor that can connect to the workstation. Historical data is collected on an ongoing basis, independent of whether a client has the associated performance view open. Historical data can be used for diagnosing past performance problems or for short-term trend analysis.

hosting storage system   The physical storage system on which one or more vFiler units are configured. Some counters that Performance Advisor tracks apply to both storage systems and vFiler units. Other counters (for example, CPU usage) apply only to storage systems and the associated host of a vFiler unit. The hosting storage system is also referred to as the *vFiler host*.

logical objects   Object types that represent storage systems, such as volumes, qtrees, LUNs, vFiler units, Vservers, and datasets.

logical hierarchy   The hierarchy that displays the logical objects.

lower threshold   The type of threshold that is set for an event generation when the counter value falls and remains below the lower threshold value for longer than the Threshold Interval specified.

managed object	Any object that has an identity and a name in the DataFabric Manager server object table. A managed object is an object that is contained within a DataFabric Manager server group. Volumes, aggregates, qtrees, and LUNs are examples of managed objects.
Management Console	The client platform for the Java-based applications. Management Console runs on a Windows or Linux workstation, separate from the system on which the DataFabric Manager server is installed.
object	Typically there is an object associated with each hardware or software subsystem within Data ONTAP. Examples of hardware objects are the processor, disk, NVRAM, and networking card objects. FCP, iSCSI, CIFS, and NFS are examples of software protocol objects. WAFL, RAID, and target are examples of internal objects that are specific to Data ONTAP.
	Virtual objects, such as the system object, capture key statistics across all the other objects in one single place. Examples of system objects are avg_processor_busy, nfs_ops, cifs_ops, and net_data_recv.
Performance Advisor	The Performance Advisor component that is installed on the Management Console platform, which enables you to monitor the performance of storage systems and clusters.
	The user interface of Performance Advisor that contains only performance-monitoring information. This Performance Advisor interface is distinct from Operations Manager, which contains other DataFabric Manager server information.
performance-monitoring server	The Performance Advisor component that is enabled on the DataFabric Manager server to collect and archive performance data at regular intervals from the monitored storage systems and clusters. Performance Advisor gathers sets of data that the performance-monitoring server has collected to generate its graphical charts and views.
performance view	A collection of one or more counters accessible through Performance Advisor for a group of storage systems or subsystems through one or more charts. Performance Advisor displays predefined views that are built in to the system, and custom views.
physical objects	Object types that represent the physical resources in a storage system, such as disks, aggregates, memory, network interfaces, resource pools, and RAID groups.
physical hierarchy	The hierarchy that displays the physical objects and instances.
real-time data	Data that is collected by Performance Advisor for display but is not stored. Real-time data is collected only as long as the performance view window displaying it is open on Performance Advisor. Real-time data is accessible only to the client by which it is retrieved.

	Real-time data is suitable for diagnosing immediate performance issues.
resource pool	A managed object in the DataFabric Manager server, containing storage provisioning resources such as storage systems, aggregates, and spare disks.
retention period	The amount of previously collected data for a counter that is accessible to the user. You can set the retention period based on units of a minute, hour, day, week, month, or year.
sample rate	The rate at which data is collected for a counter. You can set the sample rate based on units of a minute.
storage set	Containers that are used for delegation, replication, and in some cases, substorage provisioning. A storage set contains a group of volumes, while a volume should be in at most one storage set.
storage system	An appliance that is attached to a computer network and is used for data storage. IBM N series storage systems and NearStore systems are examples of storage systems.
templates and predefined templates	A template is a view definition that applies to object instances known to Performance Advisor. A set of pre-configured templates in Performance Advisor is known as *Predefined Template*.
threshold interval	The amount of time, in seconds, for which an event generation is suppressed before Performance Advisor decides that a counter has crossed a specified threshold and an event has to be generated. The same interval is also used to generate a normal event.
unmanaged object	Objects apart from the managed objects belong to the class of unmanaged objects. An unmanaged object does not have a unique identity in the DataFabric Manager server table.
upper threshold	The type of threshold set for an event generation when the counter value exceeds and remains above the higher threshold value for longer than the specified Threshold Interval.
vFiler unit	One or more virtual storage systems that can be configured on a single physical storage system licensed for the MultiStore feature.
view	A collection of related panels represented together and displayed by the Performance Advisor client.

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