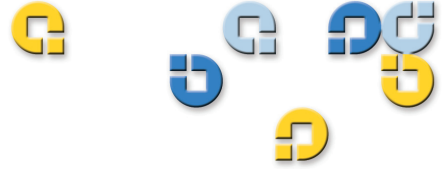


Quantum.



User's Guide User's Guide User's Guide User's Guide

DXi Advanced Reporting

DXi-Series

Quantum DXi Advanced Reporting User's Guide, 6-67004-01 Rev A, June 2010, Product of USA.

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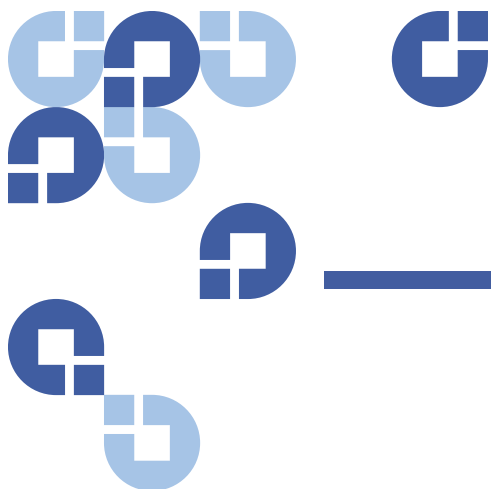
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Contents

Preface

xiii

Chapter 1

DXi Advanced Reporting Introduction

1

About DXi Advanced Reporting	1
Extension to DXi Remote Management	2
On Demand Reports	2
Historical Data	4
Logging Database	4
Round Robin Database	4
Database Resolution	4
Performance Impact	5

Chapter 2

DXi Advanced Reporting Installation

7

Verifying Version Compatibility	7
Setting the Date and Time	8
Obtaining DXi Advanced Reporting	9
Checking if DXi Advanced Reporting is Pre-Installed	9
Downloading DXi Advanced Reporting	9
Installing DXi Advanced Reporting	10

Adding the DXi Advanced Reporting License	11
Uploading the DXi Advanced Reporting Software	13
Activating the DXi Advanced Reporting Software (DXi3500 and DXi5500).	17

Chapter 3 DXi Advanced Reporting Navigation 19

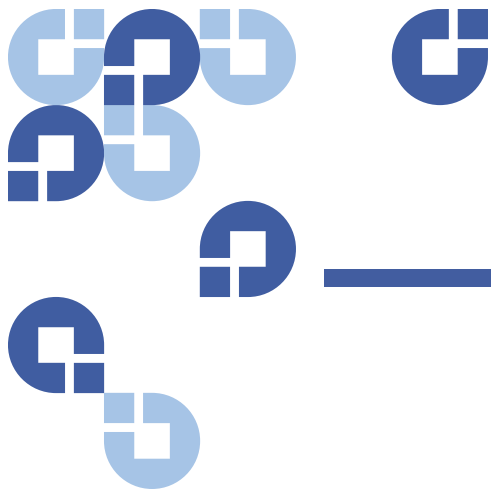
Accessing DXi Advanced Reporting	19
Supported Browsers	20
Logging On to DXi Advanced Reporting	21
Logging Off of DXi Advanced Reporting.	22
Using the Report Window	23
Menu	24
Toolbar	25
View Controls	26
Graphs	26
Working With Time Ranges	27
Changing the Time Range.	28
Working With Graphs	32
Selecting the Base.	33
First, Last, and Delta	34
Gaps in Graphs	34
Stacked and Layered Graphs.	34
The Zero Line	36
Interpreting Performance Data	37

Chapter 4 Advanced Reports 41

Reports and Graphs.	41
Report Descriptions	43
Overview.	44
Capacity	48
Capacity detail	51
Capacity delta - bytes/h.	53
Capacity delta - bytes/s	56
Data Reduction	56
CPU load.	58
Ethernet I/O	60
Fibre Channel I/O	61

Replication 62
Space Reclamation 64
System Load 65
Data Ingest Per Week 68

Glossary **71**

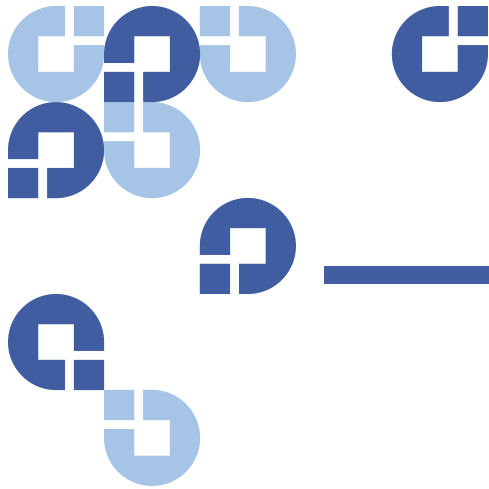


Figures

Figure 1	DXi Advanced Reporting Overview Report	3
Figure 2	License Key Management Page	12
Figure 3	License Keys Page	13
Figure 4	Software Page	14
Figure 5	Login Window	21
Figure 6	The Report Window	23
Figure 7	Selecting a Report	25
Figure 8	Arranging Graphs	27
Figure 9	Using the Timeline	29
Figure 10	Selecting a Preset Time Range	29
Figure 11	Using the Navigation Buttons	30
Figure 12	Click and Drag to Zoom	31
Figure 13	Using the Preset Zoom Buttons	31
Figure 14	The Graph Legend	33
Figure 15	Selecting a Base	34
Figure 16	Layered Graph	35
Figure 17	Stacked Graph	36
Figure 18	Graph With a Zero Line	36

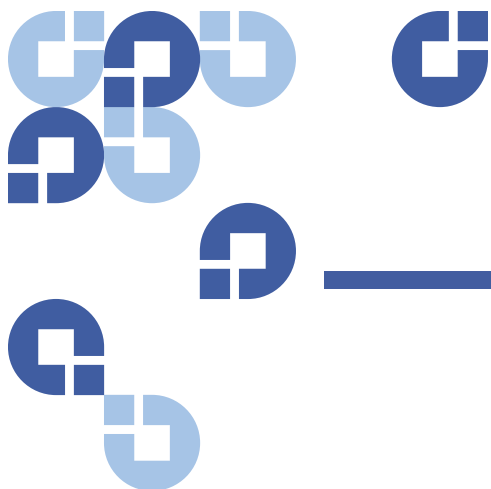
Figure 19	Amplitude Changes With Resolution	39
Figure 20	Data Volume Overview Graph	45
Figure 21	Reduction Ratio Graph	46
Figure 22	Fibre Channel Activity Graph	47
Figure 23	Ethernet Activity Graph	48
Figure 24	After Reduction vs. Used Disk Space Graph	49
Figure 25	Before Reduction vs. After Reduction Graph.	50
Figure 26	After Reduction vs. Unique Data found Graph	50
Figure 27	Before Reduction Graph	51
Figure 28	After Reduction Graph	52
Figure 29	Unique Data found Graph	52
Figure 30	Used Disk Space Graph.	53
Figure 31	Combined - delta in Bytes/h Graph.	54
Figure 32	Before Reduction - delta in Bytes/h Graph	54
Figure 33	After Reduction - delta in Bytes/h Graph	55
Figure 34	Unique Data found - delta in Bytes/h Graph.	55
Figure 35	Used Disk Space - delta in Bytes/h Graph	56
Figure 36	Deduplication Ratio Graph	57
Figure 37	Compression Ratio Graph.	58
Figure 38	CPU Load Average Graph	58
Figure 39	CPU stats in % Graph	59
Figure 40	ethn Activity Graph.	61
Figure 41	Fibre Channel Port n Activity Graph	62
Figure 42	Namespace Replication % Complete Graph	63
Figure 43	Continuous Replication % Complete Graph	64
Figure 44	Space Reclamation Graph.	65
Figure 45	CPU Load Average Graph	66
Figure 46	Disk I/O usage in % Graph	67
Figure 47	Data Ingest Volume per week Graph	69

Figure 48 Data Ingest Volume per day Graph. 69



Tables

Table 1	Logging Database Resolution	5
Table 2	Navigation Button Functions	30
Table 3	DXi Advanced Reporting Reports and Graphs.	42
Table 4	Categories of Processes in the CPU stats in % Graph	59



Preface

Quantum[®] DXi[™] Advanced Reporting provides performance data logging and visual reporting and graphing features for Quantum DXi[™]-Series systems.

This guide introduces DXi Advanced Reporting and discusses the following topics:

- Installation
- Navigation
- Reports

Audience

This guide is written for DXi operators and system administrators.

Document Organization

This guide contains the following chapters:

- [Chapter 1, DXi Advanced Reporting Introduction](#) provides an overview of the features of DXi Advanced Reporting.
- [Chapter 2, DXi Advanced Reporting Installation](#) provides step-by-step instructions for installing and running DXi Advanced Reporting on a DXi system.

- [Chapter 3, DXi Advanced Reporting Navigation](#) describes how to access and work with the Web-based user interface of DXi Advanced Reporting.
- [Chapter 4, Advanced Reports](#) describes how to view and interpret the available performance reports.
- [Glossary](#) provides definitions of technical terms used in this document.

Notational Conventions

This manual uses the following conventions:

Convention	Example
User input is shown in bold font.	./DARTinstall
Computer output and command line examples are shown in monospace font.	<code>./DARTinstall</code>
User input variables are enclosed in angle brackets.	http://<ip_address>/reports
For UNIX and Linux commands, the command prompt is implied.	<code>./DARTinstall</code> is the same as <code># ./DARTinstall</code>
File and directory names, menu commands, button names, and window names are shown in bold font.	/data/upload
Menu names separated by arrows indicate a sequence of menus to be navigated.	Utilities > Software

The following formats indicate important information:

Note: Note emphasizes important information related to the main topic.

Caution: Caution indicates potential hazards to equipment or data.

WARNING: Warning indicates potential hazards to personal safety.

Related Documents

The following Quantum documents are also available for DXi Advanced Reporting and DXi systems:

Document No.	Document Title	Document Description
6-67003	<i>Quantum DXi Advanced Reporting Release Notes</i>	Describes late-breaking information about DXi Advanced Reporting.
6-66591	<i>Quantum DXi2500-D User's Guide</i>	Describes DXi2500-D operation and administration.
81-81701	<i>Quantum DXi3500 and DXi5500 User's Guide</i>	Describes DXi3500 and DXi5500 operation and administration.
6-66904	<i>Quantum DXi4500 User's Guide</i>	Describes DXi4500 operation and administration.
6-66639	<i>Quantum DXi6500 User's Guide</i>	Describes DXi6500 operation and administration.
6-66586	<i>Quantum DXi7500 User's Guide</i>	Describes DXi7500 operation and administration.

For the most up to date information on DXi Advanced Reporting, see:

<http://www.quantum.com/ServiceandSupport/Index.aspx>

Contacts

Quantum company contacts are listed below.

Quantum Corporate Headquarters

To order documentation on DXi Advanced Reporting or other products contact:

Quantum Corporation (*Corporate Headquarters*)
1650 Technology Drive, Suite 700
San Jose, CA 95110-1382

Technical Publications

To comment on existing documentation send e-mail to:

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<http://www.quantum.com/ServiceandSupport/Services/GuardianInformation/Index.aspx>

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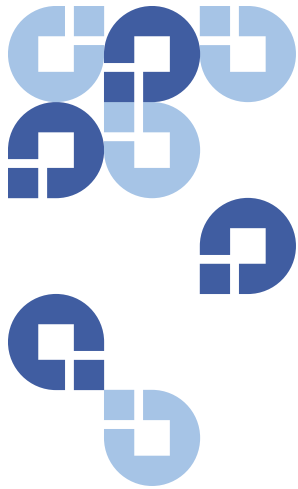
For worldwide support:

<http://www.quantum.com/ServiceandSupport/Index.aspx>

Worldwide End-User Product Warranty

For more information on the Quantum Worldwide End-User Standard Limited Product Warranty:

<http://www.quantum.com/pdf/QuantumWarranty.pdf>



Chapter 1

DXi Advanced Reporting Introduction

This chapter introduces Quantum DXi Advanced Reporting and contains the following sections:

- [About DXi Advanced Reporting](#)
- [Logging Database](#)
- [Performance Impact](#)

About DXi Advanced Reporting

Quantum DXi Advanced Reporting works with all DXi-Series disk backup systems.

DXi Advanced Reporting combines comprehensive performance data logging with powerful visual reporting and analysis tools to help you identify potential problems and optimize system operation.

See the following sections for more information about DXi Advanced Reporting:

- [Extension to DXi Remote Management](#)
- [On Demand Reports](#)
- [Historical Data](#)

Extension to DXi Remote Management

DXi Advanced Reporting is an extension to the DXi remote management interface.

With DXi Advanced Reporting, you can view an array of performance statistics for a DXi system and see how those statistics change over time. This lets you identify trends or determine when a problem began.

By showing you how various operations affect performance, DXi Advanced Reporting also helps you optimize the network ecosystem and business procedures for backup, recovery, and replication.

On Demand Reports

DXi Advanced Reporting runs on a DXi system and continually works in the background to log performance data.

To view logged data, use DXi Advanced Reporting's graphical reports. Reports are available on demand through a Web-based interface. You can check up-to-the-minute system status or view data for any time period since data logging began.

DXi Advanced Reporting reports let you view and work with a wealth of performance and system statistics, such as:

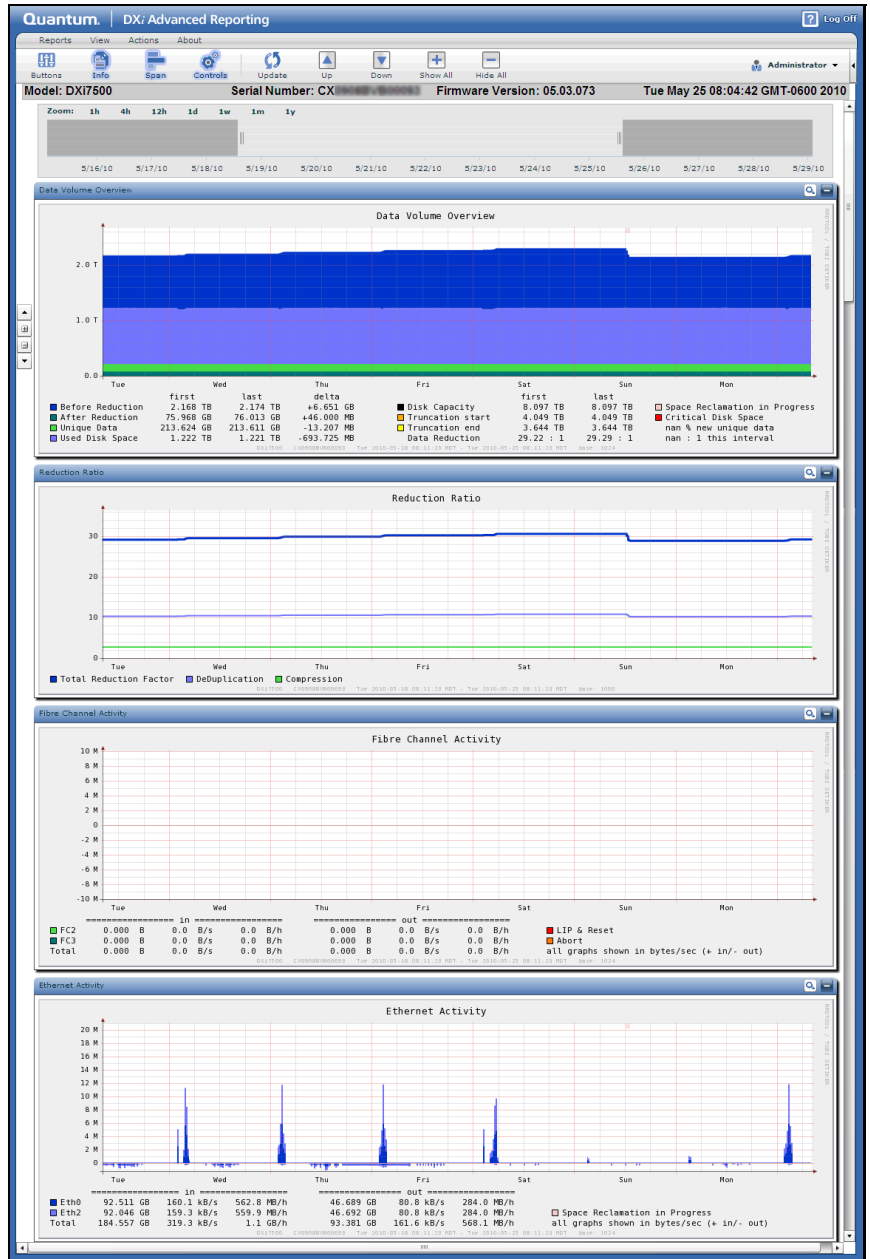
- Capacity utilization
- Ethernet and Fibre Channel activity
- Data and system disk activity
- CPU load
- Data deduplication, replication, and space reclamation activities

Each report includes one or more graphs. Use the report tools to zoom in on a graph to see just the time period you want to see, or zoom out to see data for a longer time period.

No matter what time period you select, all of the graphs in the report stay in sync. In addition, DXi Advanced Reporting maintains the current time period when you select a new report. This lets you compare performance data between graphs in the same report or between different reports. For example, you can see how CPU load is affected during deduplication or space reclamation activities.

[Figure 1](#) shows an example of the **Overview** report.

Figure 1 DXi Advanced Reporting Overview Report



Historical Data

DXi Advanced Reporting maintains approximately six years of logged data, so you can view historical reports for any time period since logging began—up to six years in the past.

DXi Advanced Reporting's historical record lets you compare current performance to past performance. It also lets you see the effect of any recent changes to system and network configuration or business processes.

Logging Database

DXi Advanced Reporting records performance data in the logging database. The database resides on the DXi system where DXi Advanced Reporting is running.

See the following sections for more information about the logging database:

- [Round Robin Database](#)
- [Database Resolution](#)

Round Robin Database

The DXi Advanced Reporting logging database is a round robin style database with a small, fixed size.

The database never grows larger than the fixed size. As new logging data is added to the database, older data is overwritten as necessary, thereby maintaining the fixed size. As a result, the logging database has a negligible impact on storage capacity on the DXi system.

Database Resolution

The logging database records performance data at two second intervals. DXi Advanced Reporting aggregates this data over time to maintain different resolutions for different time periods. The database resolution is finer (more granular) for recent events and becomes coarser (less granular) as you go back in time.

[Table 1](#) lists the database resolutions that are maintained in the logging database for each time period.

Table 1 Logging Database Resolution

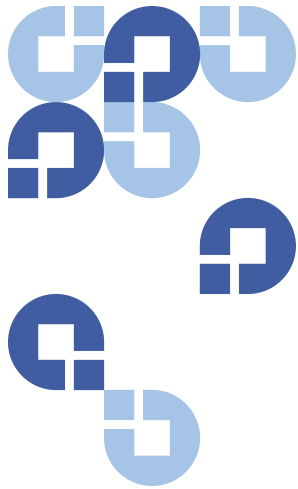
Database Resolution	Maintained For
2 seconds	Data up to 7 days old
60 seconds	Data from 7 days up to 400 days old
600 seconds	Data from 400 days up to 3 years old
3,600 seconds	Data from 3 years up to 6 years old

Performance Impact

DXi Advanced Reporting logging has a negligible impact on the operation and performance of a DXi system.

- Most data is captured once every two seconds with a typical loop time of only 2ms per capture.
- Total disk capacity used is limited to 2GB for the logging database.
- Disk contention is rare, and if it occurs DXi Advanced Reporting logging has lower priority compared to system needs.

Chapter 1: DXi Advanced Reporting Introduction
Performance Impact



Chapter 2

DXi Advanced Reporting Installation

This chapter describes how to install DXi Advanced Reporting on a Quantum DXi system and contains the following sections:

- [Verifying Version Compatibility](#)
- [Setting the Date and Time](#)
- [Obtaining DXi Advanced Reporting](#)
- [Installing DXi Advanced Reporting](#)

Verifying Version Compatibility

Before you install DXi Advanced Reporting, make sure the system software running on the DXi is a compatible version. Look at the **Home** page of the DXi remote management pages to see what version of the DXi software is installed on the system. The software version number appears under **System Details** on the **Home** page.

The following DXi software versions are compatible with DXi Advanced Reporting:

- **DXi2500-D** - Software version 1.1.1.4_25 or higher
- **DXi4500, DXi6500, and DXi7500** - Software version 1.2.1 or higher

- **DXi3500 and DXi5500** - Software version 1.7.3.1 or higher

If the DXi system is running an older software version, you must update it to a compatible version before installing DXi Advanced Reporting.

Note: For help accessing the DXi remote management pages, or for information about updating the DXi system software, see the *User's Guide* for your DXi system.

Setting the Date and Time

Because data in the DXi Advanced Reporting database is time sensitive, it is important that the date and time are correctly set on the DXi system prior to installing DXi Advanced Reporting.

If the date and time are not correct on the DXi system, it will be difficult to correlate DXi Advanced Reporting data with replication activity or to associate problems with events in the customer ecosystem. For example, the **Replication** report might show a problem starting at 6:00p.m., but because the time on the DXi system was not correct, it will not be clear that the problem is actually associated with congestion on the network that began at 5:00p.m.

To make sure the time and date are always correct, configure the DXi system to use an NTP (Network Time Protocol) server. For help with this task, see the *User's Guide* for your DXi system.

Caution: Not all Windows time servers offer NTP services. If a time server does support the NTP protocol, you cannot use it as a time source for DXi system. However, in this case, a third party NTP application for Windows should work correctly.

Obtaining DXi Advanced Reporting

DXi Advanced Reporting is pre-installed on all new DXi systems and is available for download on existing systems. See the following sections for more information:

- [Checking if DXi Advanced Reporting is Pre-Installed](#)
- [Downloading DXi Advanced Reporting](#)

Checking if DXi Advanced Reporting is Pre-Installed

If you purchased a DXi2500-D, DXi4500, DXi6500, or DXi7500 system after June 2010, DXi Advanced Reporting may already be installed and licensed on your system.

To see if DXi Advanced Reporting is already installed on your DXi, follow the procedure for accessing DXi Advanced Reporting (see [Accessing DXi Advanced Reporting](#) on page 19). If you are able to access the login screen, then DXi Advanced Reporting is pre-installed, and you do not need to install or license it.

Note: For DXi3500 and DXi5500 systems, you must install DXi Advanced Reporting.

Downloading DXi Advanced Reporting

To obtain DXi Advanced Reporting, download the DXi Advanced Reporting software from the Quantum Service and Support site:

<http://www.quantum.com/ServiceandSupport/Index.aspx>

Under **Select Your Product**, navigate to the support page for your DXi system and click the **Diagnostics** tab. Then download the DXi Advanced Reporting software for your system.

- **DXi2500-D, DXi4500, DXi6500, and DXi7500** - Download the 64-bit DXi Advanced Reporting software.
- **DXi3500 and DXi5500** - Download the 32-bit DXi Advanced Reporting software.

Note: Alternately, you can obtain the DXi Advanced Reporting software and documentation on a CD. To request a CD, contact your Quantum sales representative.

Running DXi Advanced Reporting on a DXi system requires a DXi Advanced Reporting license. To obtain a license for DXi Advanced Reporting, contact your Quantum sales representative. After you request the license, you will receive a License Certificate containing an authorization code.

Installing DXi Advanced Reporting

To install DXi Advanced Reporting on a DXi system, first add the DXi Advanced Reporting license, then upload the DXi Advanced Reporting software to the DXi.

For detailed steps, see the following sections:

- [Adding the DXi Advanced Reporting License](#)
- [Uploading the DXi Advanced Reporting Software](#)

Note: Uploading the DXi Advanced Reporting software does not change the system software on the DXi. You do not need to restart the system after installing DXi Advanced Reporting, and installing DXi Advanced Reporting does not affect system operation.

Note: Upgrading the system software on a DXi may cause DXi Advanced Reporting to stop logging performance data. Quantum recommends that you always obtain and install the latest version of DXi Advanced Reporting after upgrading the system software on a DXi.

Adding the DXi Advanced Reporting License

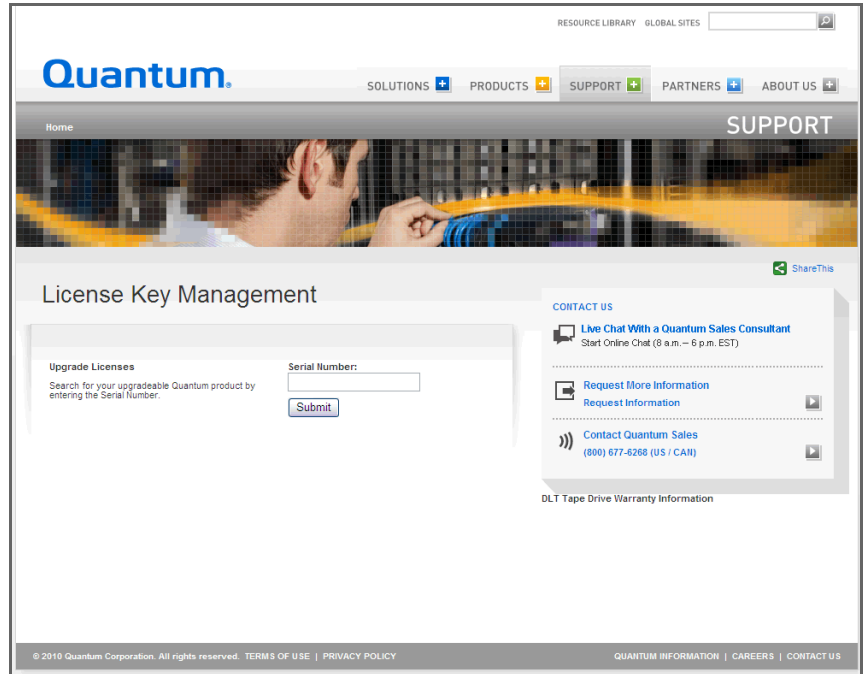
Locate the License Certificate you obtained from Quantum (see [Obtaining DXi Advanced Reporting](#) on page 9). Then perform the following steps:

Note: If you are installing DXi Advanced Reporting on a DXi2500-D running software version 1.1.1.4_25, you do not need to add a license. Instead, skip this procedure and continue with [Uploading the DXi Advanced Reporting Software](#) on page 13. If the DXi2500-D is running software version 1.4.1 or later, you must add a license.

- 1 Open a Web browser on a computer with Internet access.
- 2 Enter one of the following addresses in the browser address box.
 - For DXi3500 or DXi5500:
<http://www.quantum.com/products/disk-basedbackup/dxupgrades/index.aspx>
 - For DXi6500 or DXi7500:
<http://www.quantum.com/licensekeys/upgrades/index.aspx>
 - For DXi2500-D or DXi4500, see the *DXi Advanced Reporting Release Notes* (6-67003) for the latest information about obtaining a license key.

The **License Key Management** page or the **DXi-Series Upgrade** page displays (see [Figure 2](#)).

Figure 2 License Key Management Page



- 3 Enter the DXi system serial number in the **Serial Number** box and click **Submit**.

Note: The serial number appears under **System Details** on the **Home** page in the remote management pages.

The **Licensed Feature** page displays.

- 4 Enter the authorization code (printed on the License Certificate) and click **Get License Key**.

The **Licensed Feature** page returns a license key. Print out or write down the license key, or save it to a text file.

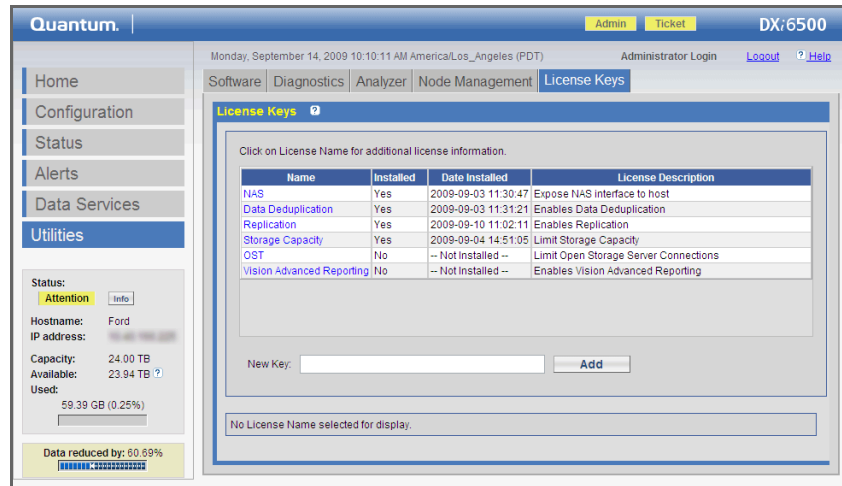
- 5 Access the DXi remote management pages.

For information about accessing the remote management pages, see the *User's Guide* for your DXi system.

- 6 From the **Utilities** menu, click the **License Keys** tab.

The **License Keys** page displays (see [Figure 3](#)).

Figure 3 License Keys Page



7 Enter the license key in the **New Key** field.

8 Click **Add**.

The DXi Advanced Reporting license key is added to the system.

Uploading the DXi Advanced Reporting Software

Locate the DXi Advanced Reporting software file you downloaded from the Quantum Web site (or that you obtained on CD). Then perform the following steps:

- 1 On a workstation that has network access to the DXi, launch a supported Web browser on the workstation, and then log on to the DXi remote management pages as an administrator.

For help logging on, see the *User's Guide* for your DXi system.

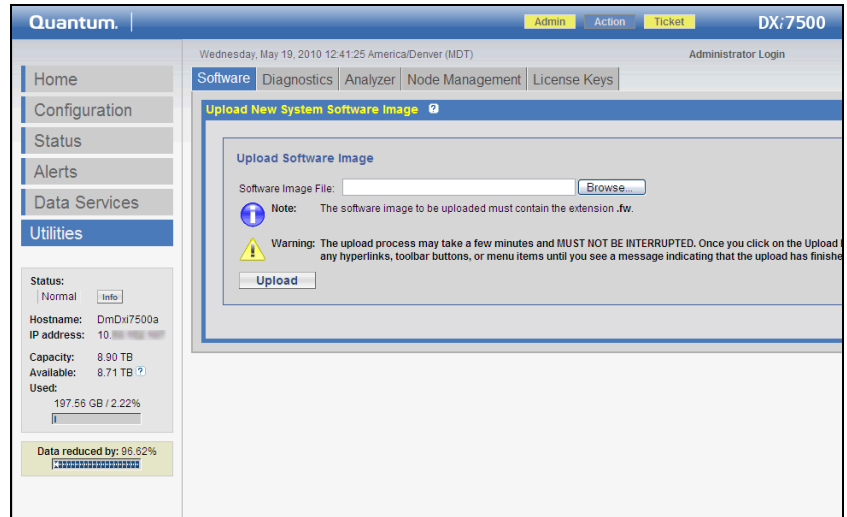
- 2 If there are any outstanding Admin Alerts, you must delete them before continuing.

For help deleting Admin Alerts, see the *User's Guide* for your DXi system.

- 3 From the **Utilities** menu, click the **Software** tab (or **Firmware** tab on some systems).

The **Software** page displays (or **Firmware** page on some systems) (see [Figure 4](#)).

Figure 4 Software Page



- 4 Click the **Browse** button and locate the DXi Advanced Reporting software file that you downloaded from the Quantum Web site. Select the software file, and then click **Open**.

Or, insert the DXi Advanced Reporting Software CD in the CD-ROM drive. The software file is located in the /ar directory.

Note: The software file ends with the .fw extension.

- 5 Click **Upload**.

A **Warning** message displays.

- 6 Click **Start** to begin the upload process.

An **Information** message displays stating the software image was uploaded successfully.

Note: If an **Error** message displays, the software upload did not complete successfully. See [Software Upload Errors](#) on page 16 for a description of errors and the correct action to take.

- 7 Click **OK**.

Take the appropriate action depending on the DXi model:

- **DXi3500 and DXi5500** - Do not complete the rest of this procedure. Instead, continue with [Activating the DXi Advanced Reporting Software \(DXi3500 and DXi5500\)](#) on page 17.

Caution: In rare cases, an **Activate/Remove New System Software Image** message might display on a DXi3500 or DXi5500 system. If this occurs, do *not* click **Activate**. Instead, click **Remove** to remove the incomplete software file, then upload the DXi Advanced reporting software again.

If you click **Activate**, the DXi system is not harmed and its system software is not changed in any way. However, the system will reboot and interrupt all operations.

- **DXi2500-D, DXi4500, DXi6500, and DXi7500** - An **Activate/Remove New System Software Image** message displays at the bottom of the **Software** page (scroll down to see the message).

Perform the following steps:

- a Click **Activate** to activate the DXi Advanced Reporting software.

A **Confirmation** message displays.

- b Click **Yes**.

On some DXi systems, a **Warning** message displays.

The warning states the activating the software will cause backup jobs to fail. However, this is only true if you are updating the DXi system software. Installing DXi Advanced Reporting will *not* affect system operation.

- c If necessary, click **Yes**.

On some DXi systems, an **Information** message displays.

The message states that the system will restart and you must log in again. However, this is only true if you are updating the DXi system software. Installing DXi Advanced Reporting will *not* affect system operation.

Installation is now complete. To access DXi Advanced Reporting, see [Accessing DXi Advanced Reporting](#) on page 19.

Software Upload Errors

If the DXi system was not able to successfully upload the DXi Advanced Reporting software, an **Error** message displays one of the following errors:

- **Error: Uploaded software image is corrupt or contains invalid data.**

This error occurs when the DXi system is unable to extract the DXi Advanced Reporting software from the .fw file.

To correct this error:

- a Click **OK** to close the **Error** message.
- b Upload the DXi Advanced Reporting software again (see [Uploading the DXi Advanced Reporting Software](#) on page 13).

If this error occurs again, the .fw file might be corrupted. Download a new copy of the DXi Advanced Reporting software (see [Obtaining DXi Advanced Reporting](#) on page 9). Then try uploading the DXi Advanced Reporting software again.

- **Error: This version can only be installed using the CD. Insert the CD into the DX and reboot. Choose Upgrade from the Boot Menu.**

This error occurs if the version of the DXi Advanced Reporting software you uploaded does not support the software version installed on the DXi system.

To correct this error:

- a Click **OK** to close the **Error** message.
- b Download the newest version of the DXi Advanced Reporting software (see [Obtaining DXi Advanced Reporting](#) on page 9).

If you already have the newest version of the DXi Advanced Reporting software, then DXi Advanced Reporting is not supported on the software version installed on the DXi system (see [Verifying Version Compatibility](#) on page 7).

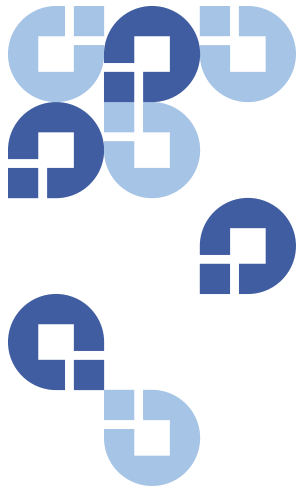
- c Upload the DXi Advanced Reporting software again (see [Uploading the DXi Advanced Reporting Software](#) on page 13).

Activating the DXi Advanced Reporting Software (DXi3500 and DXi5500)

For DXi3500 and DXi5500 systems only, the DXi Advanced Reporting software must be manually activated after it is uploaded. This procedure can be performed remotely by a Quantum Service Representative.

To request activation of the DXi Advanced Reporting software on a DXi3500 or DXi5500, contact Quantum Customer Support (see [Getting More Information or Help](#) on page xvi).

Chapter 2: DXi Advanced Reporting Installation
Installing DXi Advanced Reporting



Chapter 3

DXi Advanced Reporting Navigation

This chapter describes how to navigate in DXi Advanced Reporting and contains the following sections:

- [Accessing DXi Advanced Reporting](#)
- [Using the Report Window](#)
- [Working With Time Ranges](#)
- [Working With Graphs](#)
- [Interpreting Performance Data](#)

Accessing DXi Advanced Reporting

Access DXi Advanced Reporting using a Web browser on a workstation that is on the same network as the DXi system for which you want to view reports.

See the following sections for more information about accessing DXi Advanced Reporting:

- [Supported Browsers](#)
- [Logging On to DXi Advanced Reporting](#)
- [Logging Off of DXi Advanced Reporting](#)

Supported Browsers

DXi Advanced Reporting is designed to run in any modern Web browser that supports the Adobe Flash Player plug-in version 10.x and higher. Web browser software is not included with DXi Advanced Reporting. You must obtain and install it separately.

You must also install the correct version of the Adobe Flash Player plug-in for your operating system and browser. DXi Advanced Reporting requires Adobe Flash Player version 10.x or higher. To download and install Flash Player, go to: <http://www.adobe.com>

Note: You can also install the Adobe Flash Player plug-in using the DXi Advanced Reporting Software CD (see [Installing Flash Using the Software CD](#) on page 20).

Caution: DXi Advanced Reporting does not support the 64-bit version of the Flash Player plug-in on Linux. Instead, use the 32-bit Flash Player plug-in and a 32-bit browser.

Installing Flash Using the Software CD

If your site does not allow Internet access, use the DXi Advanced Reporting Software CD to install the Adobe Flash Player plug-in.

To install Flash Player:

- 1 Insert the DXi Advanced Reporting Software CD in the CD-ROM drive of your computer.
- 2 On the CD, open the **plugins** directory, and then open the directory for your operating system.
- 3 (Windows only) Open the **activex** directory (Internet Explorer) or open the **plugin** directory (other browsers).
- 4 Double-click the Flash Player installer, and then follow the onscreen instructions.

Logging On to DXi Advanced Reporting

To log on to DXi Advanced Reporting:

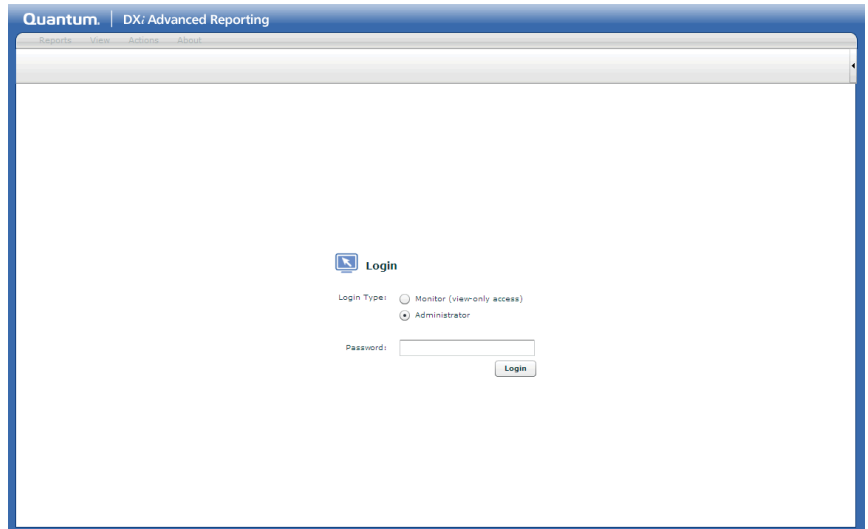
Note: This procedure assumes that DXi Advanced Reporting has been installed and configured on the DXi system by a DXi administrator.

- 1 Launch a supported Web browser on a workstation that has network access to the DXi system for which you want to view reports.
- 2 In the browser address box, type **http://<IP_address>/reports** where **<IP_address>** is the IP address of the DXi, and then press **<Enter>**.

Note: For information about setting the IP address of the DXi, see the *User's Guide* for your DXi system.

The **Login** window displays (see [Figure 5](#)).

Figure 5 Login Window



If the **Login** window does not display, verify that the IP address is correct. Also verify that you are using a supported Web browser and that the correct version of Adobe Flash Player is installed. Then try again. If you are still unable to access the **Login** window, contact your DXi administrator.

3 Select a login option:

- **Monitor** - Log on to the DXi as a monitor. A monitor can view information on the DXi but cannot make changes.
- **Administrator** - Log on to the DXi as an administrator. An administrator can view and change information on the DXi.

Note: The functionality of DXi Advanced Reporting are the same for monitors and administrators. However, when you log on to DXi Advanced Reporting, you are also logging on to the DXi system. This means it is important to log on to DXi Advanced Reporting with the appropriate user account.

Note: If you previously logged on to the DXi as a monitor or administrator, and the login session has not timed out, you do not need to log on to DXi Advanced Reporting.

4 Enter the monitor or administrator **Password** for the DXi, and then click **Login**.

Note: The default password is password. For information about changing the monitor or administrator password, see the User's Guide for your DXi system.

After a successful login, the report window displays (see [Figure 6](#)).

If you are unable to log on, verify that the password is correct, then try again. If you are still unable to log on, contact your DXi administrator.

Logging Off of DXi Advanced Reporting

When you are done working in DXi Advanced Reporting, click the user menu in the upper right of the report window, and then click **Log Off** to end your DXi Advanced Reporting session.

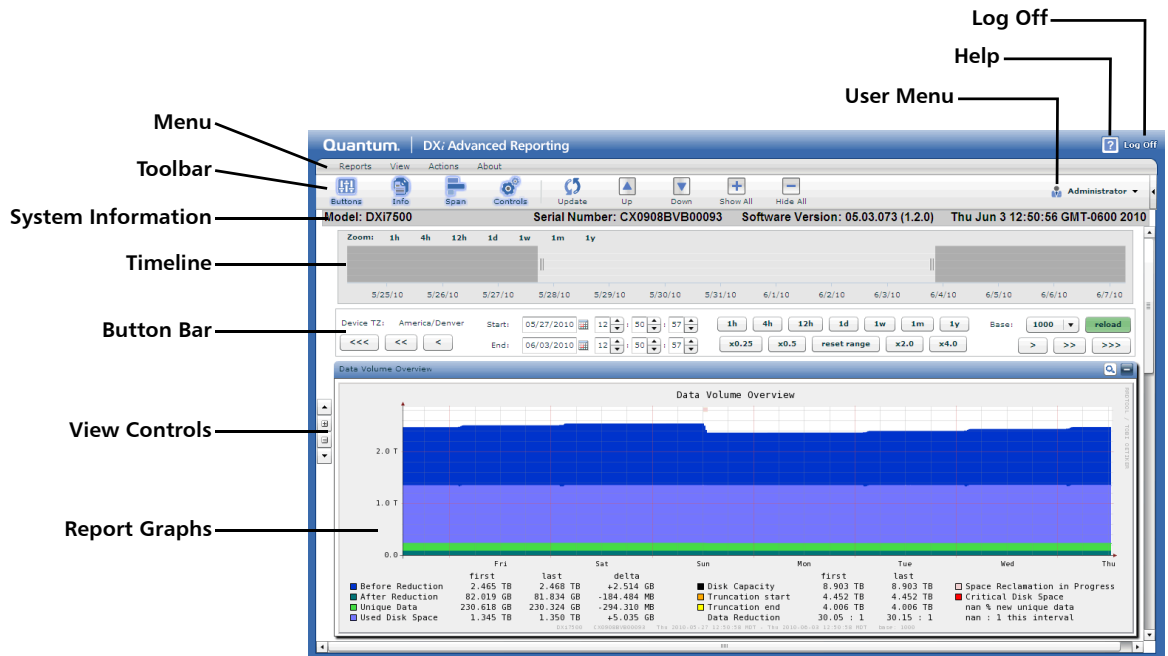
Using the Report Window

The report window displays the performance graphs for the currently selected report (see [Figure 6](#)). When you first access DXi Advanced Reporting, the **Overview** report displays. By default, the report shows data for the most recent seven days.

The report window includes the following features:

- [Menu](#)
- [Toolbar](#)
- [View Controls](#)
- [Graphs](#)

Figure 6 The Report Window



Menu

The menu displays at the top of the report window and includes the following options:

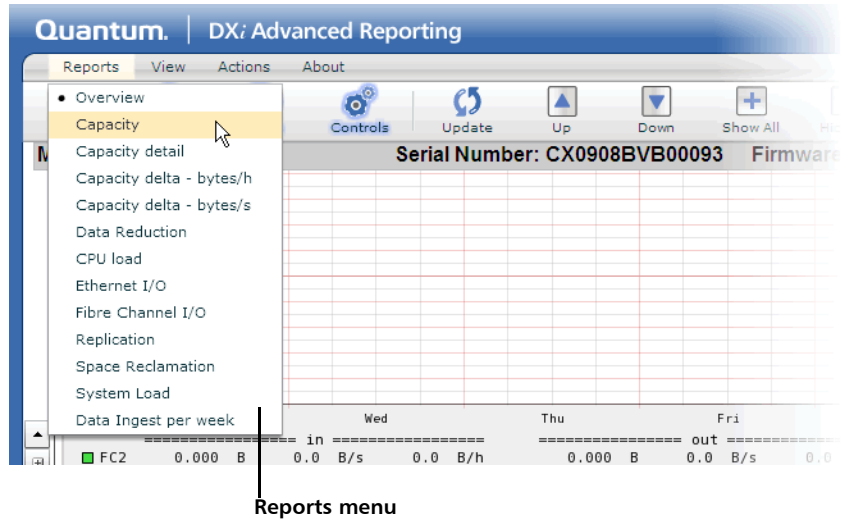
- **Reports** - Use the **Reports** menu to select a report to display (see [Figure 7](#)).

DXi Advanced Reporting maintains the currently selected time range when you choose a new report. For example, if you are currently viewing the most recent day of logging for the Overview report, DXi Advanced Reporting displays data for that same time range when you select a new report. This makes it easy to compare different performance statistics for the same time range.

Note: For more information about time ranges, see [Working With Time Ranges](#) on page 27. For a description of the available reports, see [Advanced Reports](#) on page 41.

- **View** - Use the **View** menu to show or hide the button bar (**Buttons**), system information (**Info**), the timeline (**Span**), the toolbar (**Toolbar**), or the view controls (**View Controls**).
By default, all of these items are visible except for the button bar.
- **Actions** - Use the **Actions** menu to perform graph actions.
 - **Update** - Updates the graphs in the currently displayed report with the latest logging information.
 - **Scroll Up** - Scrolls the graph order up by one graph.
 - **Scroll Down** - Scrolls the graph order down by one graph.
 - **Show All Legends** - Shows the title and legend on all graphs in the report.
 - **Hide All Legends** - Hides the title and legend on all graphs in the report.
- **About** - Use the **About** menu to display version and license information for DXi Advanced Reporting.

Figure 7 Selecting a Report



Toolbar

The toolbar displays below the menu and includes the following options:

- **Buttons** - Shows or hides the button bar. (By default, the button bar is hidden.)
- **Info** - Shows or hides the system information. (By default, the system information is visible.)
The system information includes the DXi model, serial number, software version, and the current date, time, and time zone.
- **Span** - Shows or hides the timeline. (By default, the timeline is visible.)
- **Controls** - Shows or hides the view controls. (By default, the view controls are visible.)
- **Update** - Updates the graphs in the currently displayed report with the latest logging information.
- **Up** - Scrolls the graph order up by one graph.
- **Down** - Scrolls the graph order down by one graph.
- **Show All** - Shows the title and legend on all graphs in the report.
- **Hide All** - Hides the title and legend on all graphs in the report.

- **User Menu** - Displays the user that is currently logged on to DXi Advanced Reporting. To log off, click the user menu, and then click **Log Off**.

Note: To hide the toolbar, click the arrow on the right edge of the toolbar. Click the arrow again to show the toolbar.

View Controls

The view controls display on the left edge of the report window and include the following options:

- **Scroll Up** - Scrolls the graph order up by one graph.
- **Show All Legends** - Shows the title and legend on all graphs in the report.
- **Hide All Legends** - Hides the title and legend on all graphs in the report.
- **Scroll Down** - Scrolls the graph order down by one graph.

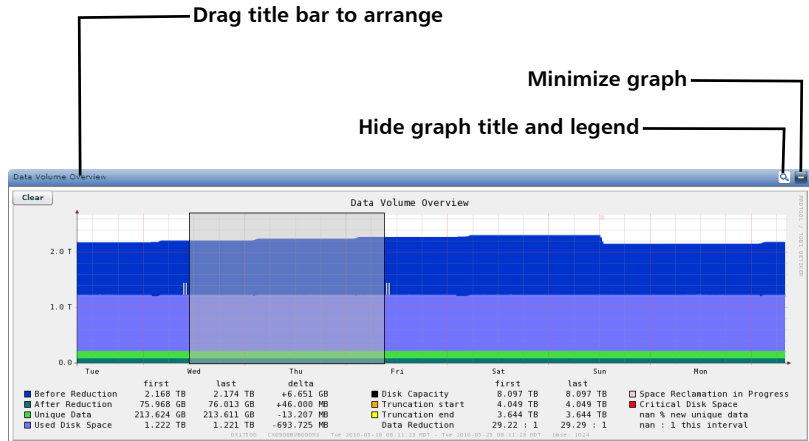
Graphs

Each report is made up of one or more graphs that show performance data for the selected time range (see [Figure 7](#)). Customize the appearance of a report by arranging the graphs in a different order.

- To change the order of the graphs, drag a graph by its title bar and move it before or after another graph.
- To minimize a graph, click the minimize button (-) on the upper right of the graph title bar. Click the minimized title bar to restore the graph to full size.
- To hide the graph title and legend, click the magnifying glass on the upper right of the graph title bar. Click the magnifying glass again to show the graph title and legend.

Note: If you log off of DXi Advanced Reporting, the graphs are restored to their default appearance the next time you log on.

Figure 8 Arranging Graphs



Working With Time Ranges

A time range is like a window through which you view performance data. Each report displays performance data for the time range you choose. All graphs in a report display data for the same time range.

By default, DXi Advanced Reporting displays data for the most recent seven days of logging. To view logged data for a different time range, use the tools at the top of the report window. You can move the time range backward and forward in time, and you can make the time range longer or shorter.

When you change the time range, DXi Advanced Reporting automatically adjusts the resolution of performance data. For example, the resolution is finer (more granular) for shorter time ranges and is coarser (less granular) for longer time ranges.

Note: No matter how long the time range is, DXi Advanced Reporting scales all graphs in the report so that the time range uses the entire width of each graph.

Changing the Time Range

To view performance data for a different time range, use one of the following methods:

- [Using the Timeline](#)
- [Selecting a Preset Time Range](#)
- [Moving Forward and Backward](#)
- [Zooming With the Dynamic Zoom Feature](#)
- [Zooming With the Preset Zoom Buttons](#)
- [Specifying Start and End Times](#)
- [Resetting the Time Range](#)

Note: The button bar displays the starting date and time and the ending date and time of the current time range, as well as the total length of the time range. It also displays the time zone of the DXi. If the button bar is not visible, select **View > Buttons**.

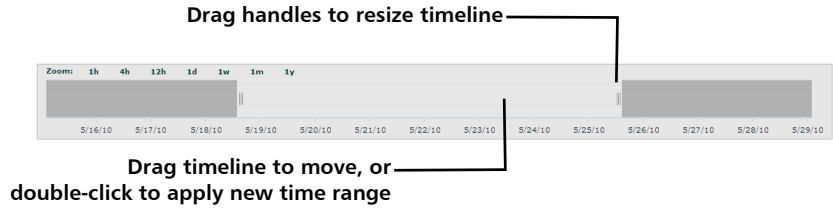
Using the Timeline

To move the time range forward or backward in time, use the timeline at the top of the report window (see [Figure 9](#)). The timeline displays the current time range used for the report.

Note: If the timeline is not visible, select **View > Span**.

- To move the time range backward or forward in time, drag the timeline to the left or right. Then double-click the timeline to apply the new time range to the report.
- To make the time range longer or shorter, drag the left and right selection handles. Then double-click the timeline to apply the new time range to the report.

Figure 9 Using the Timeline



Selecting a Preset Time Range

To quickly display performance data for a different time range, use the time range presets on the timeline (see [Figure 10](#)). Click a preset to display data for 1 hour (1h), 4 hours (4h), 12 hours (12h), 1 day (1d), 1 week (1w), 1 month (1m), or 1 year (1y). After you click a preset, double-click the timeline to apply the new time range to the report.

Note: If the timeline is not visible, select **View > Span**.

When you apply a preset, DXi Advanced Reporting resizes the time range while maintaining the center of the time range. For example, if you are currently viewing a one week time range that goes from Sunday to Saturday, applying the 1d preset displays performance data for Wednesday.

Note: You can also use the button bar to apply time range presets. If the button bar is not visible, select **View > Buttons**.

Figure 10 Selecting a Preset Time Range



Moving Forward and Backward

Move the time range forward or backward in time using the navigation buttons on the left or right of the button bar (see [Figure 11](#)). DXi Advanced Reporting shifts the time range while maintaining the length of the time range.

Note: If the button bar is not visible, select **View > Buttons**.

[Table 2](#) describes the functions of the navigation buttons.

Figure 11 Using the Navigation Buttons



Table 2 Navigation Button Functions

Button	Description
<<< or >>>	Moves the time range back or forward an amount equal to the current time range.
<< or >>	Moves the time range back or forward an amount equal to one half of the current time range.
< or >	Moves the time range back or forward an amount equal to one quarter of the current time range.

Zooming With the Dynamic Zoom Feature

Use the dynamic zoom feature to select the part of a graph you want to zoom in on and see in more detail (see [Figure 12](#)).

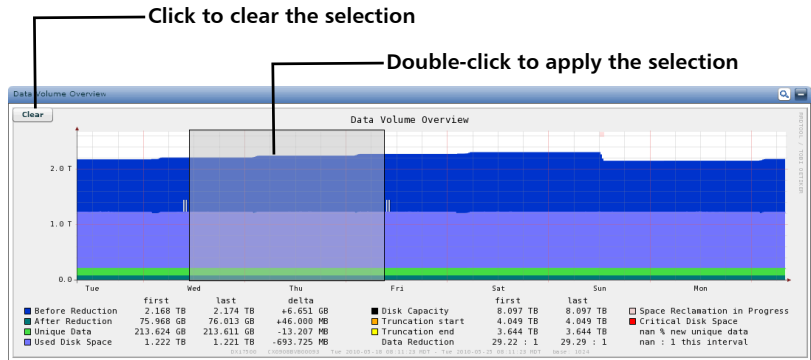
To zoom in on part of a graph:

- 1 Click and drag over the part of the graph you want to zoom in on.
DXi Advanced Reporting highlights the selected part of the graph.
- 2 (Optional) Drag the left and right selection handles to adjust the size of the selection, or drag the selection area to move it.
- 3 Double-click the selection area.

DXi Advanced Reporting zooms in on the time range so that the selected area takes up the entire width of the graph.

To cancel the action and start over, click **Clear** on the upper left of the graph.

Figure 12 Click and Drag to Zoom

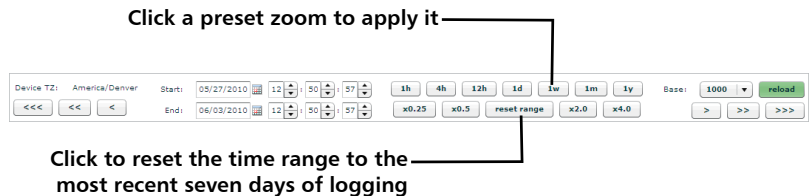


Zooming With the Preset Zoom Buttons

Use the preset zoom buttons on the button bar to zoom in or zoom out on a report by a fixed factor (see [Figure 13](#)). Click a preset zoom button to specify a zoom factor of **x0.25**, **x0.5**, **x2.0**, or **x4.0**. When you zoom in, DXi Advanced Reporting displays a shorter time range. When you zoom out, DXi Advanced Reporting displays a longer time range. DXi Advanced Reporting maintains the current center of the time range when you zoom.

Note: If the button bar is not visible, select **View > Buttons**.

Figure 13 Using the Preset Zoom Buttons



Specifying Start and End Times

The **Start** and **End** boxes on the button bar display the starting date and time and the ending date and time for the current time range.

To change the time range using exact values, specify a new date and time in the **Start** and **End** boxes, and then click **reload**. DXi Advanced

Reporting adjusts the time range to reflect the start and end times you entered.

Note: Specify the starting or ending time in hours, minutes, and seconds using a twenty four hour clock.

Note: If the button bar is not visible, select **View > Buttons**.

Resetting the Time Range

To reset the time range back to its original position, click **reset range** on the button bar (see [Figure 13](#)). DXi Advanced Reporting adjusts the time range to display the most recent seven day of logging.

Note: If the button bar is not visible, select **View > Buttons**.

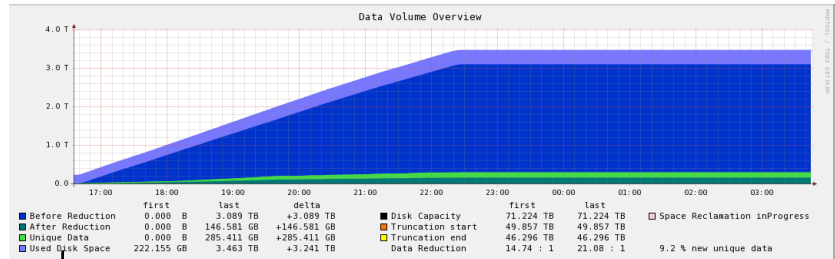
Working With Graphs

In DXi Advanced Reporting, each report is made up of one or more graphs. Each graph shows a particular type of performance data for the current time range. For example, the **Overview** report includes the following graphs: **Data Volume Overview**, **Reduction Ratio**, **Fibre Channel Activity**, and **Ethernet Activity**.

The horizontal axis of each graph represents time and displays the current time range. The vertical axis varies depending on the graph. It is often a capacity or data amount, but can also be a calculated value such as a ratio, average, or percentage.

Below each graph is a color-coded legend. Use the legend to help read and interpret the graph. For example, according to the legend for the **Data Volume Overview** graph, bright green represents unique data stored on the DXi system (see [Figure 14](#)).

Figure 14 The Graph Legend



Graph legend

See the following sections for more information about graphs:

- [Selecting the Base](#)
- [First, Last, and Delta](#)
- [Gaps in Graphs](#)
- [Stacked and Layered Graphs](#)
- [The Zero Line](#)

Selecting the Base

Different DXi models report data usage in different ways.

- **DXi2500-D, DXi4500, DXi6500, and DXi7500** - Data is reported using a base of 1000 bytes per kilobyte, or in TB. (Similar to disk and tape drives.)
- **DXi3500 and 5500** - Data is reported at 1024 bytes per kilobyte, or in TiB. (Similar to most backup applications.)

This difference results in a disparity of over 10% in reported data sizes at the terabyte level. For example, 27.3TiB reported at base 1024 becomes 30.0TB when reported at base 1000. Backup applications typically report summaries in units of 1024. Tape drives, tape cartridges, and disk drives report capacities in units of 1000.

DXi Advanced Reporting automatically selects the appropriate base for each DXi model so that numeric results most closely match what is displayed in the DXi remote management pages. To display data using a different base, select it in the **Base** list on the button bar (see [Figure 15](#)). DXi Advanced Reporting adjusts all report data to reflect the selected base.

Figure 15 Selecting a Base



First, Last, and Delta

The graph legend for some graphs includes **first**, **last**, and **delta** values for variables in the graph.

- **first** - The value of the variable at the start of the time range.
- **last** - The value of the variable at the end of the time range.
- **delta** - The net change in the value of the variable over the time range (last minus first).

DXi Advanced Reporting provides these values so you do not have to try to estimate them visually from the graph.

Gaps in Graphs

A white gap in a graph indicates an absence of logging data for a period of time. This can occur for the following reasons:

- A system reboot occurred.
- No DXi Advanced Reporting logging took place because the system was busy.
- DXi Advanced Reporting logging was turned off.

Upgrading the software on a DXi3500/5500 system turns off DXi Advanced Reporting logging. To resume logging, reinstall DXi Advanced Reporting. Reinstalling DXi Advanced Reporting does not remove or replace the existing logging database, and all previously logged data is preserved.

Note: For information about installing DXi Advanced Reporting, see [DXi Advanced Reporting Installation](#) on page 7.

Stacked and Layered Graphs

DXi Advanced Reporting often displays data for multiple variables on the same graph. This lets you see the interaction between different variables.

DXi Advanced Reporting uses two different methods for placing multiple variables on the same graph:

- [Layered Graphs](#)
- [Stacked Graphs](#)

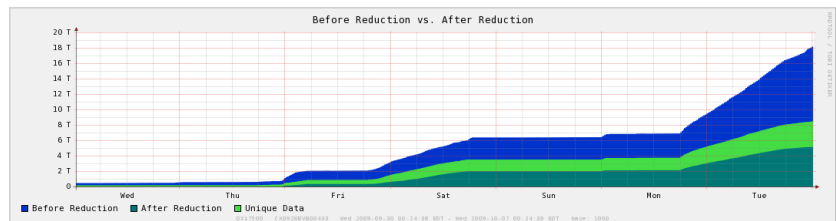
Layered Graphs

DXi Advanced Reporting uses layered graphs to compare related variables. A layered graph superimposes data for two or more variables on top of one another. DXi Advanced Reporting assigns a different color to each variable, so you can see how the values for each variable differ over time.

For example, in the **Data Volume Overview** graph (see [Figure 16](#)), DXi Advanced Reporting displays a separate value line for the variables **Before Reduction**, **After Reduction**, and **Unique Data**.

Note: DXi Advanced Reporting always displays the smaller variable in front of the larger variable. Because of this, shifts in the color pattern in a graph can occur if the variable that was smaller becomes larger at some point in time.

Figure 16 Layered Graph

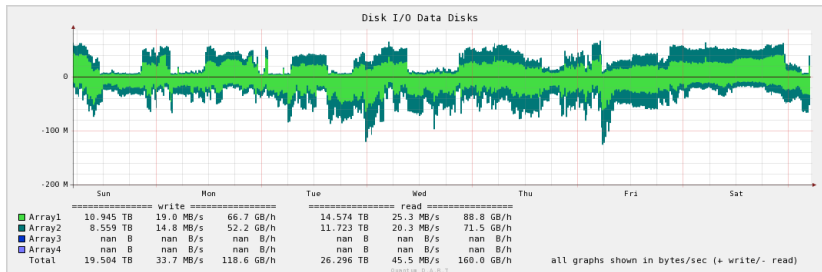


Stacked Graphs

DXi Advanced Reporting uses stacked graphs to display aggregate performance. A stacked graph adds together values for two or more variables to arrive at a total value. DXi Advanced Reporting assigns a different color to each variable, so you can see the contribution that each variable makes to the total.

For example, in the **Fibre Channel Activity** graph (see [Figure 17](#)), values for each Fibre Channel port are added together to reach a total value for each point in the time range.

Figure 17 Stacked Graph



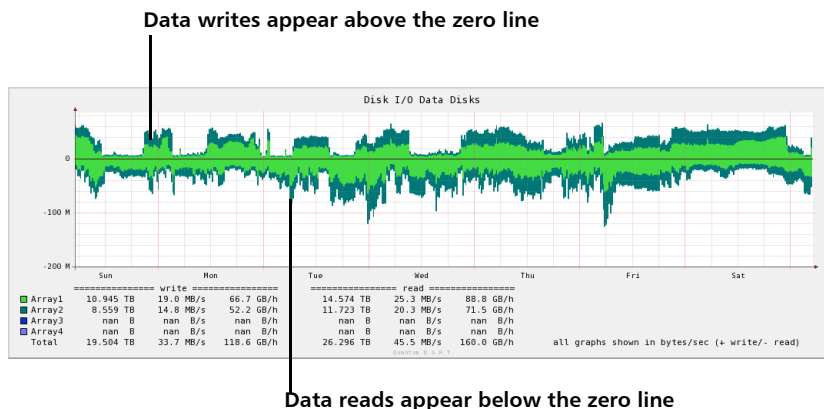
The Zero Line

DXi Advanced Reporting uses graphs with a zero line to show when the DXi system is being written to or being read from.

- Positive values (above the line) represent data being written to the system.
- Negative values (below the line) represent data being read from the system.

By using a zero line, DXi Advanced Reporting can show data reads and writes on the same graph, for example, on the **Ethernet Activity** graph (see [Figure 18](#)).

Figure 18 Graph With a Zero Line



Interpreting Performance Data

The power of DXi Advanced Reporting is that it lets you compare different types of performance data for the same time range. This lets you see patterns and trends and helps you identify relationships between events.

Keep in mind the following general concepts as you work with graphs in DXi Advanced Reporting:

- [Correlating Information Across Graphs](#)
- [Looking For Interactions Between Events](#)
- [Understanding the Effects of Time Resolution](#)

Correlating Information Across Graphs

When you view a report, try to correlate information in one graph with information in the other graphs.

Remember that all graphs in a report display the same time range and always remain in sync. That means an event that happens in the center of one graph can be correlated with an event that happens in the center of another graph in the same (or in a different) report.

In other words, if you can draw a straight vertical line between events in two graphs, then the events happened at the same time.

Looking For Interactions Between Events

As you work in DXi Advanced Reporting, look for interactions between events in different graphs.

While correlation is not the same as causation, if you consistently see that events in one graph happen at the same time as events in another graph, there is a strong possibility that the two types of events are related.

Understanding the Effects of Time Resolution

DXi Advanced Reporting displays graphs with 960 data points (pixels) along the horizontal axis. However, the logging database usually

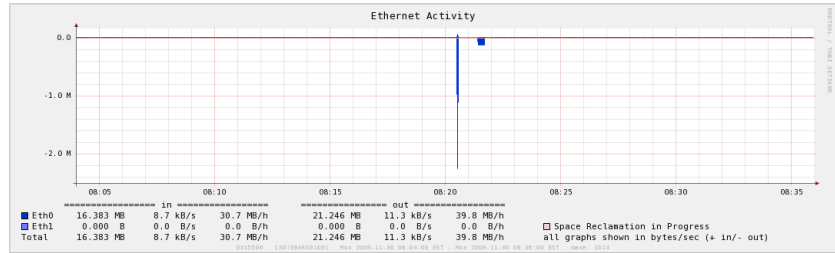
contains more than 960 data points for the currently selected time range (depending on the length of the time range).

DXi Advanced Reporting uses aggregation to convert the resolution of the database to the resolution of the graph. This means that, in many cases, each pixel in the graph is an aggregate of multiple data points in the database. Depending on how many data points are aggregated to create each pixel in the graph, the resulting value can change.

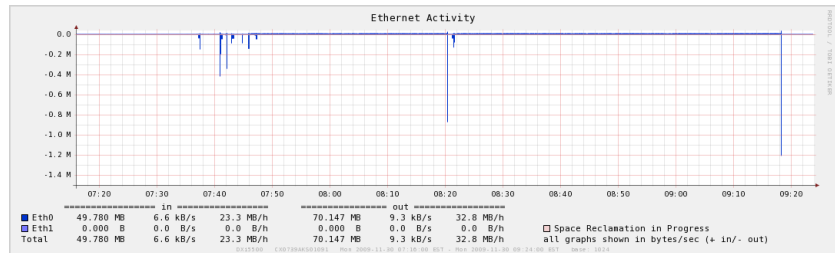
For example, consider a transfer on the **Ethernet Activity** graph that lasts for 6 seconds. First it is displayed in a 32 minute time range, and then in a 128 minute time range (see [Figure 19](#)).

- In the first example, the graph shows the transfer within a time range of 32 minutes or 1,920 seconds. In this case, each pixel in the graph represents 2 seconds of time. As a result, the transfer takes up 3 pixels in the graph and displays a peak amplitude of 2.1MB/second.
- In the second example, the graph shows the transfer within a time range of 128 minutes, or 7,680 seconds. In this case, each pixel in the graph represents 8 seconds of time. Even though the transfer is only 6 seconds long, it cannot take up less than 1 pixel in the graph. As a result, the transfer amount is averaged over 8 seconds, resulting in a lower peak amplitude of 0.9MB/second.

Figure 19 Amplitude Changes
With Resolution



32 Minute time range: Peak amplitude is 2.1MB/second

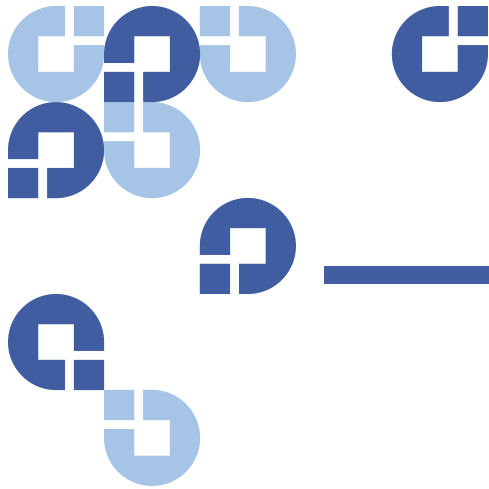


128 Minute time range: Peak amplitude is 0.9MB/second

The only difference between the two examples is the time resolution. The underlying data did not change. The difference in amplitude is due to the different number of data points DXi Advanced Reporting aggregates when calculating the value for each pixel in the graph. Be aware of this effect as you work with graphs and time ranges in DXi Advanced Reporting.

Note: DXi Advanced Reporting always uses the finest resolution of data available in the database. Finer-grained data is available for more recent time ranges as opposed to time ranges further in the past. This affects the number of data points DXi Advanced Reporting aggregates when displaying a graph, and in turn can affect amplitude.

Chapter 3: DXi Advanced Reporting Navigation
Interpreting Performance Data



Chapter 4

Advanced Reports

This chapter provides information to help you interpret the reports available in DXi Advanced Reporting and contains the following sections:

- [Reports and Graphs](#)
- [Report Descriptions](#)

Reports and Graphs

Each report available in DXi Advanced Reporting is made up of one or more graphs. Some graphs appear in more than one report. [Table 3](#) lists the graphs included in each report. For information about interpreting each report, see [Report Descriptions](#) on page 43.

Note: For information about viewing reports, see [Using the Report Window](#) on page 23.

Note: In [Table 3](#), reports are designated as (L) for layered graphs or (S) for stacked graphs. This distinction does not apply to graphs that report only a single variable.

Table 3 DXi Advanced
Reporting Reports and Graphs

Report	Graphs
Overview	Data Volume Overview (L) Reduction Ratio (L) Fibre Channel Activity (S) Ethernet Activity (S)
Capacity	Data Volume Overview (L) After Reduction vs. Used Disk Space (L) Before Reduction vs. After Reduction (L) After Reduction vs. Unique Data found (L) Reduction Ratio (L)
Capacity detail	Data Volume Overview (L) Before Reduction After Reduction Unique Data found Used Disk Space
Capacity delta - bytes/h	Data Volume Overview (L) Combined - delta in Bytes/h (L) Before Reduction - delta in Bytes/h After Reduction - delta in Bytes/h Unique Data found - delta in Bytes/h Used Disk Space - delta in Bytes/h
Capacity delta - bytes/s	Data Volume Overview (L) Combined - delta in Bytes/s (L) Before Reduction - delta in Bytes/s After Reduction - delta in Bytes/s Unique Data found - delta in Byte/s Used Disk Space - delta in Byte/s
Data Reduction	Data Volume Overview (L) Reduction Ratio (L) Deduplication Ratio Compression Ratio

Report	Graphs
CPU load	CPU Load Average CPU stats in % (S)
Ethernet I/O	Ethernet Activity (S) ethn Activity
Fibre Channel I/O	Fibre Channel Activity (S) Fibre Channel Port <i>n</i> Activity
Replication	Namespace Replication % Complete (L) Continuous Replication % Complete (L)
Space Reclamation	Space Reclamation
System Load	CPU Load Average (logarithmic scale) CPU stats in % (S) Disk I/O usage in % (S) Fibre Channel Activity (S) Ethernet Activity (S)
Data Ingest per week	Data Volume Overview (L) Data Ingest Volume per week (S) Reduction Ratio (L) Data Ingest Volume per day (S)

Report Descriptions

This section describes the graphs included in the following reports available in DXi Advanced Reporting:

- [Overview](#)
- [Capacity](#)
- [Capacity detail](#)
- [Capacity delta - bytes/h](#)

- [Capacity delta - bytes/s](#)
- [Data Reduction](#)
- [CPU load](#)
- [Ethernet I/O](#)
- [Fibre Channel I/O](#)
- [Replication](#)
- [Space Reclamation](#)
- [System Load](#)
- [Data Ingest Per Week](#)

Overview

The **Overview** report displays key statistics for a DXi system, including the amount of data processed by the system, the reduction ratio, and the levels of I/O activity. The report contains the following graphs:

- [Data Volume Overview](#)
- [Reduction Ratio](#)
- [Fibre Channel Activity](#)
- [Ethernet Activity](#)

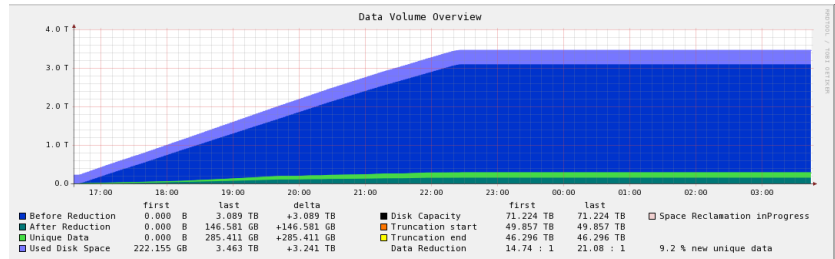
Data Volume Overview

The **Data Volume Overview** graph (see [Figure 20](#)) displays information about the amount of data processed by the system.

Note: The **Data Volume Overview** graph appears in many reports.

Note: The **Data Volume Overview** graph is a layered graph. In a layered graph, multiple variables are superimposed on top of one another (see [Stacked and Layered Graphs](#) on page 34).

Figure 20 Data Volume Overview Graph



Use the **Data Volume Overview** graph to evaluate the overall health of the system.

- **Used Disk Space** (light blue) increases as data is ingested by the system. This happens because data is truncated only when the truncation threshold is reached.

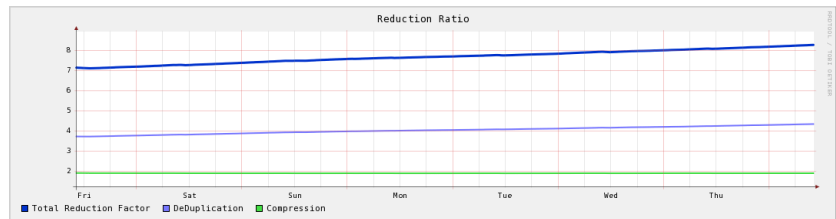
Note: On DXi3500/5500 systems, **Used Disk Space** increases less markedly as data is ingested. This happens because data is truncated immediately as it is deduplicated.

- As data is deduplicated, **Before Reduction** (dark blue), **After Reduction** (dark green), and **Unique Data** (light green) increase. If deduplication is deferred on the system, some time passes before these values begin to increase.
- If **Before Reduction** is decreasing, it means space reclamation is in progress.
- Lines on the graph indicate physical disk capacity of the system (black) and the level of disk usage at which used disk space is considered to be critical (red).
 - (DXi systems) Lines on the graph indicate the level of disk usage at which truncation of data starts (orange), and the level of disk usage at which truncation ends (yellow).
 - (DXi 3500/5500 systems) A line on the graph indicates the licensed disk capacity (yellow).
- A pink bar at the top of the graph indicates that space reclamation is in progress. Space reclamation activity is resource intensive and can affect the rate at which the system deduplicates data or performs namespace replication.

Reduction Ratio

The **Reduction Ratio** graph (see [Figure 21](#)) displays the data reduction factor for the system. The higher the reduction ratio, the less space that is used to store the same amount of ingested data.

Figure 21 Reduction Ratio Graph



Use the **Reduction Ratio** graph to evaluate the effectiveness of data reduction in the system.

- The light blue line shows the reduction factor for deduplication (**Before Reduction** divided by **Unique Data**).
- The green line shows the reduction factor for compression (**Unique Data** divided by **After Reduction**).
- The dark blue line shows the total reduction factor (**Before Reduction** divided by **After Reduction**).

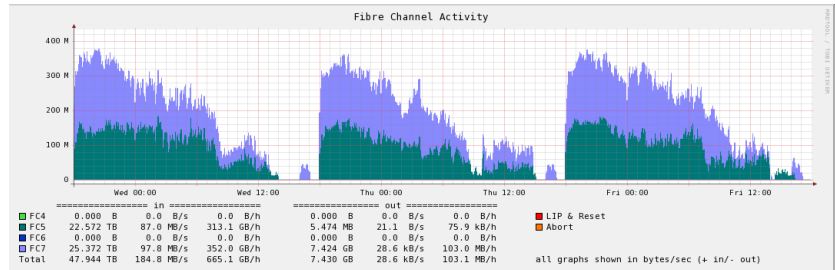
This value corresponds to the **Total Reduction Ratio** value displayed on the **Home** page in the DXi remote management pages.

Note: The reduction ratio is in flux during space reclamation or during incoming replication because these activities affect the **Before Reduction** amounts.

Fibre Channel Activity

The **Fibre Channel Activity** graph (see [Figure 22](#)) displays the amount of data passing through all of the Fibre Channel ports in the system.

Figure 22 Fibre Channel Activity Graph



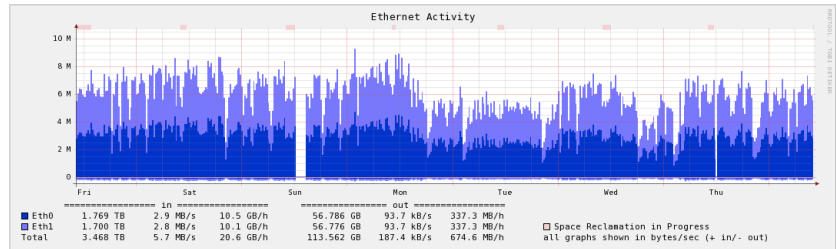
Use the **Fibre Channel Activity** graph to monitor writes to and reads from the system using the Fibre Channel ports.

- The graph shows each port in a different color.
- Fibre Channel write activity (above the zero line) occurs during backups.
 - A regular backup schedule results in repeating patterns.
 - A high amplitude left edge indicates that a large number of client backups start at the same time.
- Fibre Channel read activity (below the zero line) occurs during VTL restore operations.
- Symmetrical read and write activity (that is, mirrored patterns above and below the zero line) indicate Tivoli Storage Manager (TSM) tape reclamation.
- A red line at the top of the graph indicates a Fibre Channel loop initialization primitives (LIP) or reset occurred. An orange line at the top of the graph indicates a Fibre Channel abort occurred.

Ethernet Activity

The **Ethernet Activity** graph (see [Figure 23](#)) displays the amount of data passing through all of the Ethernet ports in the system.

Figure 23 Ethernet Activity Graph



Use the **Ethernet Activity** graph to monitor writes to and reads from the system using the Ethernet ports.

- The graph shows each port in a different color.

In the example above, the symmetry between the two shades of blue indicates the two Ethernet ports are bonded and traffic is balanced across both ports.

- Write activity (above the zero line) indicates target replication to the system, NAS backup or restore operations, or management activity.
- Read activity (below the zero line) indicates source replication from the system, NAS backup or restore operations, or management activity.
- A pink bar at the top of the graph indicates that space reclamation is in progress. Space reclamation activity is resource intensive and can affect the rate at which the system deduplicates data or performs namespace replication.

Capacity

The **Capacity** report displays information about utilized storage space, including the amount of data processed by the system and data reduction statistics. The report contains the following graphs:

- [Data Volume Overview](#)
- [After Reduction vs. Used Disk Space](#)
- [Before Reduction vs. After Reduction](#)
- [After Reduction vs. Unique Data found](#)
- [Reduction Ratio](#)

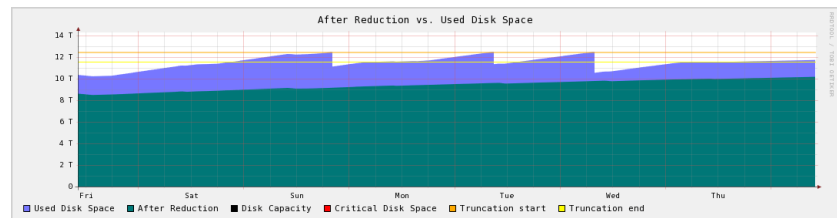
Data Volume Overview

See [Data Volume Overview](#) on page 44.

After Reduction vs. Used Disk Space

The **After Reduction vs. Used Disk Space** graph (see [Figure 24](#)) compares the data stored after reduction (including deduplication and compression) and the used disk space on the system.

Figure 24 After Reduction vs. Used Disk Space Graph



Use the **After Reduction vs. Used Disk Space** graph to monitor the amount of disk space that can be freed during space reclamation.

- **After Reduction** (dark green) increases as more unique, compressed data is stored on the system.
- **Used Disk Space** (light blue) increases until it reaches the truncation threshold (orange line), then goes down until truncation ends (yellow line).

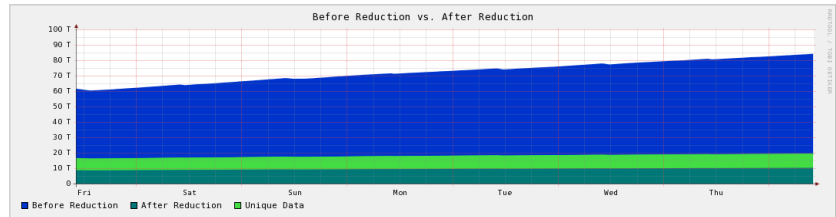
Note: DXi3500/5500 systems continuously truncate data, not just when the truncation threshold is reached. Only deduplicated data is truncated.

- If **Used Disk Space** exceeds the truncation start line (orange line) while **After Reduction** remains below the line, then there is data in the buffer that has not been deduplicated. Once the queued data is deduplicated, **Used Disk Space** will decrease as data is truncated.

Before Reduction vs. After Reduction

The **Before Reduction vs. After Reduction** graph (see [Figure 25](#)) compares the amount of data ingested by the system to the amount of unique and compressed data.

Figure 25 Before Reduction vs. After Reduction Graph



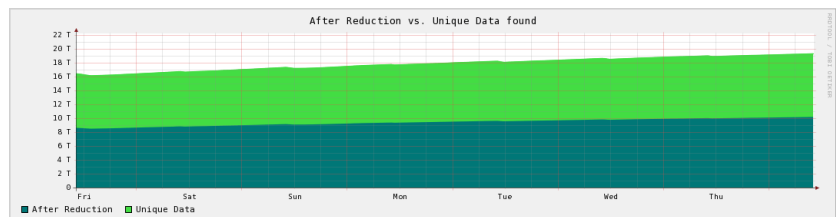
Use the **Before Reduction vs. After Reduction** graph to evaluate the effectiveness of data reduction in the system.

- **Before Reduction** (dark blue) increases as the system ingests data.
- **Unique Data** (bright green) shows the amount of data that remains after ingested data is deduplicated and pointers are substituted for redundant data. **Unique Data** increases more slowly than **Before Reduction** because, as time goes on, less of the data ingested by the system is unique.
- **After Reduction** (dark green) shows the amount of data that remains after ingested data is both deduplicated and compressed.

After Reduction vs. Unique Data found

The **After Reduction vs. Unique Data found** graph (see [Figure 26](#)) compares the amount of unique data before and after compression.

Figure 26 After Reduction vs. Unique Data found Graph



Use the **After Reduction vs. Unique Data found** graph to evaluate the effectiveness of data compression.

- **Unique Data** (bright green) shows the amount of data that remains after ingested data is deduplicated and pointers are substituted for redundant data.
- **After Reduction** (dark green) shows the amount of data that remains after ingested data is both deduplicated and compressed.

Reduction Ratio

See [Reduction Ratio](#) on page 46.

Capacity detail

The **Capacity detail** report displays information about utilized storage space, including the amount of data before and after data reduction. The report contains the following graphs:

- [Data Volume Overview](#)
- [Before Reduction](#)
- [After Reduction](#)
- [Unique Data found](#)
- [Used Disk Space](#)

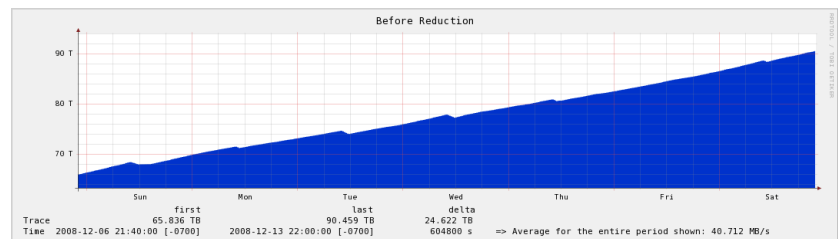
Data Volume Overview

See [Data Volume Overview](#) on page 44.

Before Reduction

The **Before Reduction** graph (see [Figure 27](#)) displays the total amount of data ingested by the system. Use the **Before Reduction** graph to see how much data the system is processing.

Figure 27 Before Reduction Graph

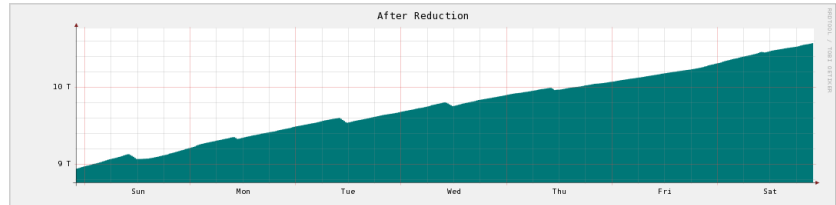


After Reduction

The **After Reduction** graph (see [Figure 28](#)) displays the amount of data that remains after ingested data is both deduplicated and compressed.

Use the **After Reduction** graph to see the amount of deduplicated, compressed data stored on the system.

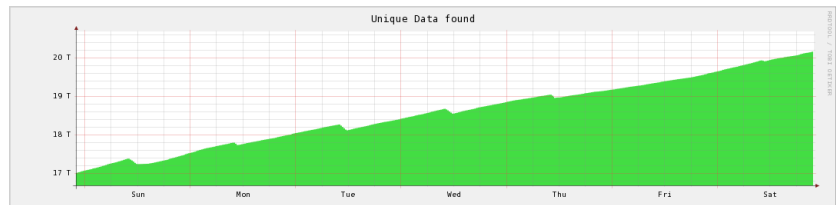
Figure 28 After Reduction Graph



Unique Data found

The **Unique Data found** graph (see [Figure 29](#)) displays the amount of data that remains after ingested data is deduplicated but before it is compressed and pointers are substituted for redundant data. Use the **Unique Data found** graph to see the amount of deduplicated data stored on the system.

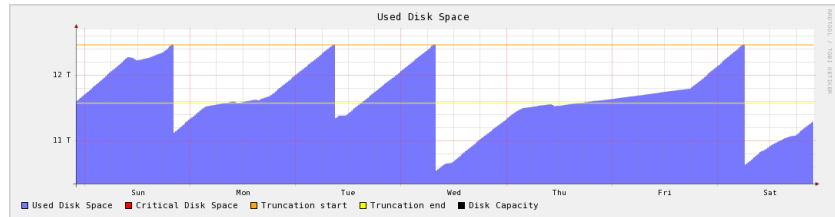
Figure 29 Unique Data found Graph



Used Disk Space

The **Used Disk Space** graph (see [Figure 30](#)) displays the amount of disk capacity that is used to store data, including deduplicated data and data that has not been deduplicated.

Figure 30 Used Disk Space Graph



Use the **Used Disk Space** graph to see the amount of used and free disk capacity on the system.

- **Used Disk Space** (light blue) increases until it reaches the truncation threshold (orange line), then goes down until truncation ends (yellow line).

Note: DXi3500/5500 systems continuously truncate data, not just when the truncation threshold is reached. Only deduplicated data.

- If **Used Disk Space** exceeds the critical disk space threshold (red line, not shown in [Figure 30](#)), the DXi enters critical disk space management mode.

Note: Note: Some lines (for example, critical disk space) may not be visible on the graph if they lie above the top of the y-axis.

Capacity delta - bytes/h

The **Capacity delta - bytes/h** report displays information about changes in the amount of data stored on the system. Amounts are reported in bytes per hour. The report contains the following graphs:

- [Data Volume Overview](#)
- [Combined - delta in Bytes/h](#)
- [Before Reduction - delta in Bytes/h](#)
- [After Reduction - delta in Bytes/h](#)
- [Unique Data found - delta in Bytes/h](#)
- [Used Disk Space - delta in Bytes/h](#)

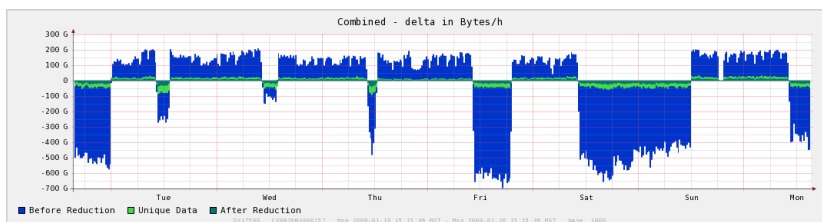
Data Volume Overview

See [Data Volume Overview](#) on page 44.

Combined - delta in Bytes/h

The **Combined - delta in Bytes/h** graph (see [Figure 31](#)) displays changes to the values for **Before Reduction**, **Unique Data**, and **After Reduction** in bytes per hour.

Figure 31 Combined - delta in Bytes/h Graph



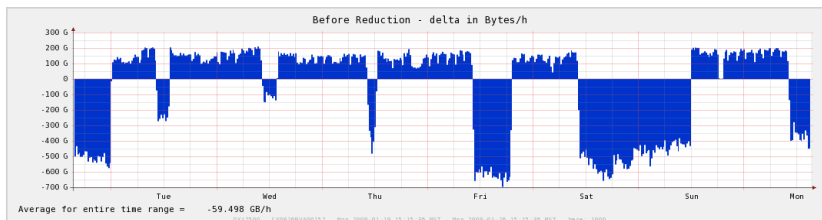
Use the **Combined - delta in Bytes/h** graph to see increases and decreases in the total amount of data stored on the system.

- Values above the zero line indicate an increase in data stored.
- Values below the zero line indicate a decrease in data stored.

Before Reduction - delta in Bytes/h

The **Before Reduction - delta in Bytes/h** graph (see [Figure 32](#)) displays changes to the value for **Before Reduction** in bytes per hour.

Figure 32 Before Reduction - delta in Bytes/h Graph



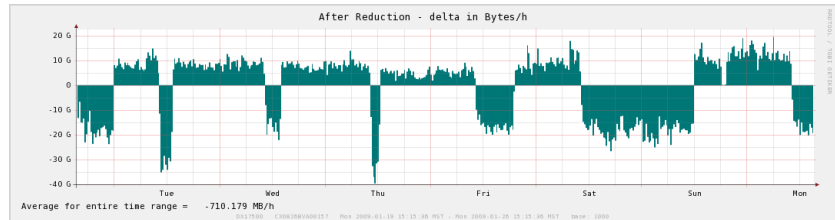
Use the **Before Reduction - delta in Bytes/h** graph to see increases and decreases in the amount of ingested (not deduplicated, not compressed) data stored on the system.

- Values above the zero line indicate an increase in data stored.
- Values below the zero line indicate a decrease in data stored.

After Reduction - delta in Bytes/h

The **After Reduction - delta in Bytes/h** graph (see [Figure 33](#)) displays changes to the value for **After Reduction** in bytes per hour.

Figure 33 After Reduction - delta in Bytes/h Graph



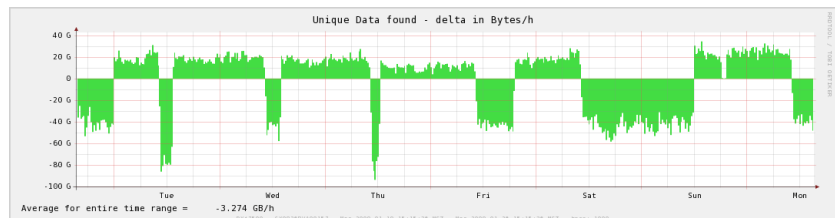
Use the **After Reduction - delta in Bytes/h** graph to see increases and decreases in the amount of deduplicated, compressed data stored on the system.

- Values above the zero line indicate an increase in data stored.
- Values below the zero line indicate a decrease in data stored.

Unique Data found - delta in Bytes/h

The **Unique Data found - delta in Bytes/h** graph (see [Figure 34](#)) displays changes to the value for **Unique Data** in bytes per hour.

Figure 34 Unique Data found - delta in Bytes/h Graph



Use the **Unique Data found - delta in Bytes/h** graph to see increases and decreases in the amount of deduplicated data stored on the system.

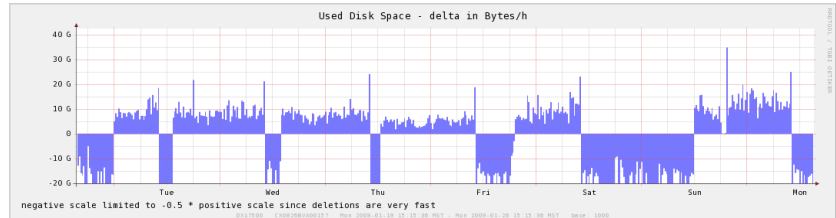
- Values above the zero line indicate an increase in data stored.

- Values below the zero line indicate a decrease in data stored.

Used Disk Space - delta in Bytes/h

The **Used Disk Space - delta in Bytes/h** graph (see [Figure 35](#)) displays changes to the value for **Used Disk Space** in bytes per hour.

Figure 35 Used Disk Space - delta in Bytes/h Graph



Use the **Used Disk Space - delta in Bytes/h** graph to see increases and decreases in the amount disk capacity that is used to store data, including deduplicated data and data that has not been deduplicated.

- Values above the zero line indicate an increase in data stored.
- Values below the zero line indicate a decrease in data stored.

Capacity delta - bytes/s

The **Capacity delta - bytes/s** report displays information about changes in the amount of data stored on the system.

This report includes the same graphs as the **Capacity delta - bytes/h** report. However, values are reported in bytes per second rather than in bytes per hour. For more information, see [Capacity delta - bytes/h](#) on page 53.

Data Reduction

The **Data Reduction** report displays detailed data reduction statistics. The report contains the following graphs:

- [Data Volume Overview](#)
- [Reduction Ratio](#)
- [Deduplication Ratio](#)
- [Compression Ratio](#)

Data Volume Overview

See [Data Volume Overview](#) on page 44.

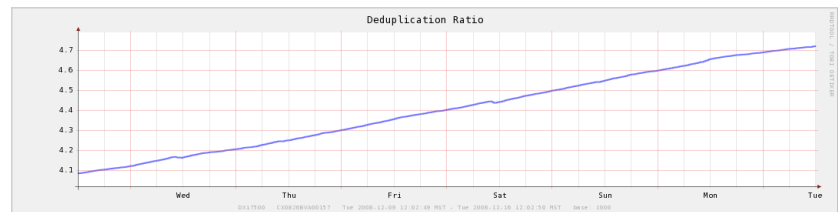
Reduction Ratio

See [Reduction Ratio](#) on page 46.

Deduplication Ratio

The **Deduplication Ratio** graph (see [Figure 36](#)) displays the deduplication factor for the system. The higher the deduplication ratio, the less space that is used to store the same amount of raw data. Use the **Deduplication Ratio** graph to evaluate the effectiveness of deduplication in the system.

Figure 36 Deduplication Ratio Graph



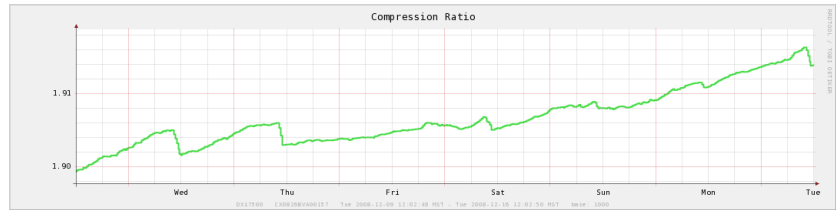
Note: The deduplication ratio is in flux during space reclamation or during incoming replication because these activities affect the **Before Reduction** amounts.

Compression Ratio

The **Compression Ratio** graph (see [Figure 37](#)) displays the compression factor for the system. The higher the compression ratio, the less space that is used to store the same amount of deduplicated data. Use the **Compression Ratio** graph to evaluate the contribution of compression to overall data reduction and space savings.

Note: The compression ratio is in flux during space reclamation or during incoming replication because these activities affect the **Before Reduction** amounts.

Figure 37 Compression Ratio
Graph



CPU load

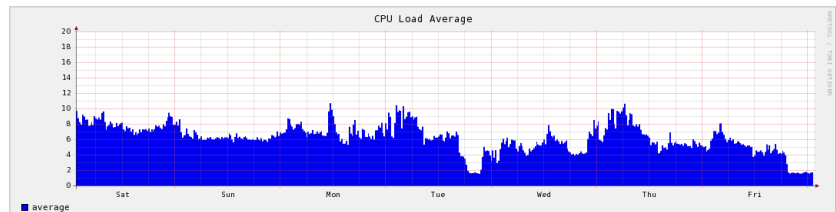
The **CPU Load** report displays information about the usage of CPU resources in the system. The report contains the following graphs:

- [CPU Load Average](#)
- [CPU stats in %](#)

CPU Load Average

The **CPU Load Average** graph (see [Figure 38](#)) displays the one minute load average for the system.

Figure 38 CPU Load Average
Graph



Use the **CPU Load Average** graph to determine if the system has adequate CPU resources.

- The load average represents the average number of processes, in a one minute time period, that were running on a CPU or that were waiting to run on a CPU.
- A load average higher than the number of CPU cores in the system indicates that the system is CPU limited.

For example, a typical DXi system has four CPUs. In this case, a load average of greater than four means that some processes had to wait for an available CPU before running. In contrast, a load average of less than four means no processes had to wait for a CPU.

Note: A CPU load higher than 8 on a DXi3500/5500 system or higher than 15 on other DXi systems indicates the system is busy. In this case, performance may be affected.

CPU stats in %

The **CPU stats in %** graph (see [Figure 39](#)) displays the relative CPU usage for seven categories of processes (see [Table 4](#)).

Figure 39 CPU stats in % Graph

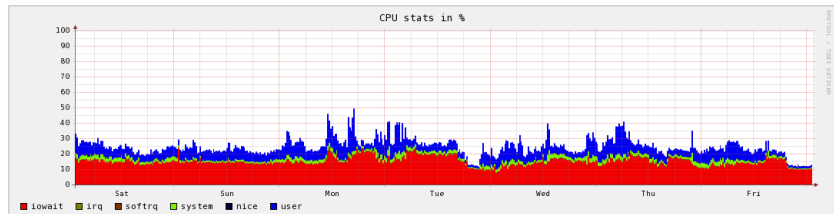


Table 4 Categories of Processes in the CPU stats in % Graph

Process Category	Description
iowait (red)	The CPU is waiting for an I/O device to respond (for example, the system is waiting on a disk).
irq (gold)	The CPU is handling an interrupt request related to I/O (for example, network, Fibre Channel, disk, keyboard, or serial port activity).
softirq (brown)	The CPU is handling a high level I/O task (for example, timer interrupts or packets in the TCP/IP stack).
system (green)	The CPU is handling a kernel process (for example, filesystem operations related to the StorNext or blocklet filesystems).
nice (black)	The CPU is handling processes that have lower priority (for example, background processes).

Process Category	Description
user (blue)	The CPU is handling processes that are not owned by the kernel (for example, deduplication as well as some space management and replication activities)
idle (not shown)	The CPU is not handling one of the other process categories.

Use the **CPU stats in %** graph to see how CPU resources are allocated among different categories of processes.

- The amount of CPU activity consumed by each category of process is expressed as a percentage. The percentages (including the value for **idle**, which is not shown in the graph) total to 100%.
- If a system has a high CPU load average (see [CPU Load Average](#) on page 58), then consider the following guidelines:
 - A high percentage of **system** (green) and **user** (blue) activity indicates the system is CPU limited. Add more CPUs to improve system performance.
 - A high percentage of **iowait** (red) activity indicates the system is I/O limited. Add more disks or arrays to improve system performance.

Ethernet I/O

The **Ethernet I/O** report displays detailed information about the amount of data passing through the Ethernet ports in the system. The report contains the following graphs:

- [Ethernet Activity](#)
- [ethn Activity](#)

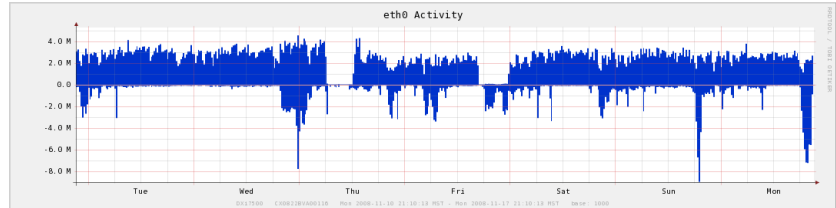
Ethernet Activity

See [Ethernet Activity](#) on page 47.

ethn Activity

The **ethn Activity** graph (see [Figure 40](#)) displays the amount of data passing through Ethernet port *n*. A graph appears for each Ethernet port in the system, for example, eth0, eth1, and so on.

Figure 40 ethn Activity Graph



Use the **ethn Activity** graph to monitor writes to and reads from the system using Ethernet port *n*.

- Write activity (above the zero line) indicates target replication to the system, NAS backup or restore operations, or management activity.
- Read activity (below the zero line) indicates source replication from the system, NAS backup or restore operations, or management activity.
- A pink bar at the top of the graph indicates that space reclamation is in progress. Space reclamation activity is resource intensive and can affect the rate at which the system deduplicates data or performs namespace replication.

Fibre Channel I/O

The **Fibre Channel I/O** report displays detailed information about the amount of data passing through the Fibre Channel ports in the system. The report contains the following graphs:

- [Fibre Channel Activity](#)
- [Fibre Channel Port *n* Activity](#)

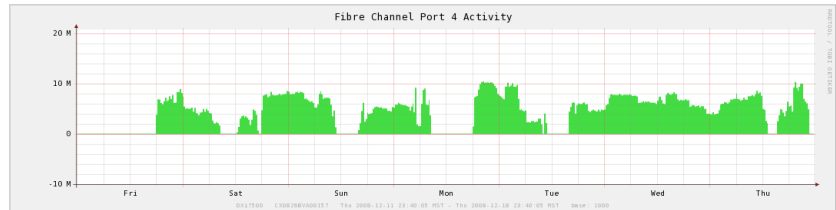
Fibre Channel Activity

See [Fibre Channel Activity](#) on page 46.

Fibre Channel Port *n* Activity

The **Fibre Channel Port *n* Activity** graph (see [Figure 41](#)) displays the amount of data passing through Fibre Channel port *n*. A graph appears for each Fibre Channel port in the system, for example, port 4, port 5, and so on.

Figure 41 Fibre Channel Port *n* Activity Graph



Use the **Fibre Channel Port *n* Activity** graph to monitor writes to and reads from the system using Fibre Channel port *n*.

- Fibre Channel write activity (above the zero line) occurs during backups.
 - A regular backup schedule results in repeating patterns.
 - A high amplitude left edge indicates that a large number of client backups start at the same time.
- Fibre Channel read activity (below the zero line) occurs during VTL restore operations.

Replication

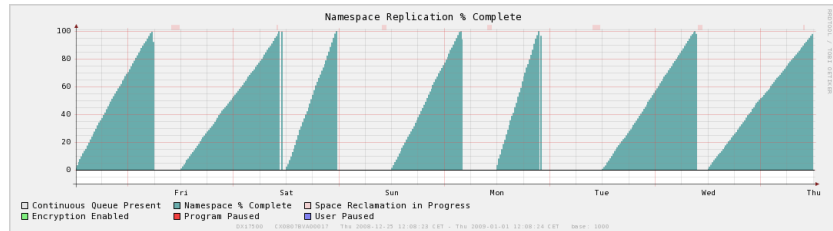
The **Replication** report displays information about the completion of namespace and continuous replication activities. The report contains the following graphs:

- [Namespace Replication % Complete](#)
- [Continuous Replication % Complete](#)

Namespace Replication % Complete

The **Namespace Replication % Complete** graph (see [Figure 42](#)) displays completion statistics for namespace replication activities.

Figure 42 Namespace Replication % Complete Graph



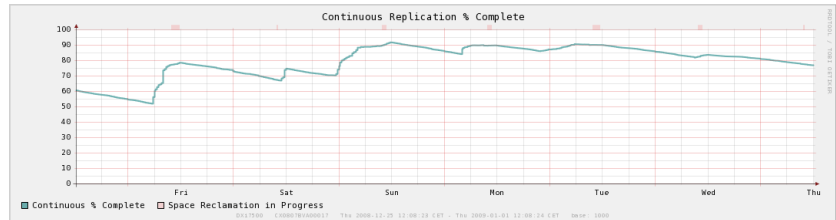
Use the **Namespace Replication % Complete** graph to monitor how long namespace replication jobs take to complete.

- The value for **Namespace % Complete** (teal) rises until it reaches 100% when the namespace replication job is complete.
- A gray background on the graph indicates that a work queue exists for continuous replication. (Continuous replication is suspended whenever namespace replication is active.)
- A pink bar at the top of the graph indicates that space reclamation is in progress. Space reclamation activity is resource intensive and can affect the rate at which the system deduplicates data or performs namespace replication.
- A blue bar at the bottom of the graph indicates that namespace replication was paused by the user.
- A red bar at the bottom of the graph indicates that a program pause occurred during namespace replication. A program pause can occur in the following situations:
 - The source or target is not reachable due to network issues.
 - The DXi system is in critical space management mode and is blocking outgoing replication traffic.
- A green bar at the bottom of the graph indicates that encryption is enabled for replication activities.

Continuous Replication % Complete

The **Continuous Replication % Complete** graph (see [Figure 43](#)) displays completion statistics for continuous replication activities.

Figure 43 Continuous Replication % Complete Graph



Use the **Continuous Replication % Complete** graph to monitor how long continuous replication jobs take to complete.

- The value for **Continuous % Complete** (teal) indicates the portion of the continuous replication queue that has been completed.

Because continuous replication is an ongoing activity, the value may rise or fall as more data is successfully replicated or is added to the queue.

- A pink bar at the top of the graph indicates that space reclamation is in progress. Space reclamation activity is resource intensive and can affect the rate at which the system deduplicates data or performs namespace replication.

Space Reclamation

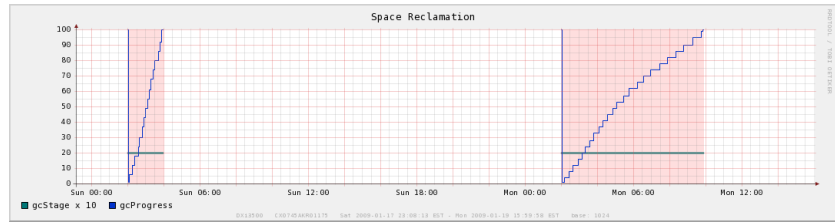
The **Space Reclamation** report displays information about the completion of space reclamation activities. The report contains the following graph:

- [Space Reclamation](#)

Space Reclamation

The **Space Reclamation** graph (see [Figure 44](#)) displays completion statistics for space reclamation activities (also known as garbage collection).

Figure 44 Space Reclamation Graph



Use the **Space Reclamation** graph to monitor how long space reclamation activities take to complete.

- A pink background on the graph indicates that space reclamation is in progress. Space reclamation activity is resource intensive and can affect the rate at which the system deduplicates data or performs namespace replication.
- The value for **gcProgress** (blue) rises until it reaches 100% when space reclamation is complete.
- The value for **gcStage x 10** represents the current stage of the space reclamation activity. Garbage collection occurs in multiple (typically four) stages. To make it easier to read the graph, the stage number is multiplied by 10.

For example, stage 2 of garbage collection appears as 20 on the graph.

System Load

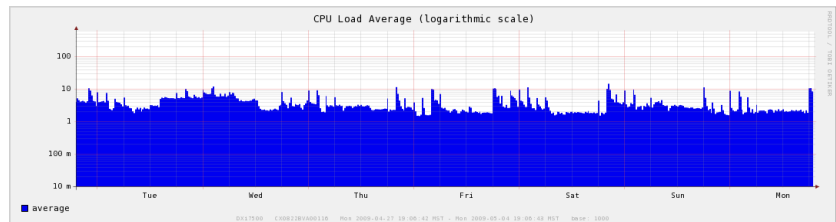
The **System Load** report displays information about the usage of CPU, disk, and I/O resources in the system. The report contains the following graphs:

- [CPU Load Average \(logarithmic scale\)](#)
- [CPU stats in %](#)
- [Disk I/O usage in %](#)
- [Fibre Channel Activity](#)
- [Ethernet Activity](#)

CPU Load Average (logarithmic scale)

The **CPU Load Average (logarithmic scale)** graph (see [Figure 45](#)) displays the one minute load average for the system using a logarithmic scale.

Figure 45 CPU Load Average Graph



Use the **CPU Load Average** graph to determine if the system has adequate CPU resources.

- The load average represents the average number of processes, in a one minute time period, that were running on a CPU or that were waiting to run on a CPU.
- A load average higher than the number of CPU cores in the system indicates that the system is CPU limited.

For example, a typical DXi system has four CPUs. In this case, a load average of greater than four means that some processes had to wait for an available CPU before running. In contrast, a load average of less than four means no processes had to wait for a CPU.

Note: A CPU load higher than 8 on a DXi3500/5500 system or higher than 15 on other DXi systems indicates the system is busy. In this case, performance may be affected.

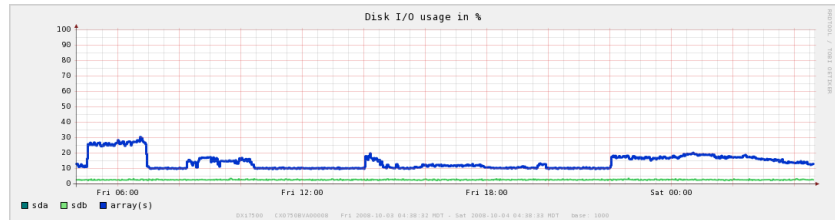
CPU stats in %

See [CPU stats in %](#) on page 59.

Disk I/O usage in %

The **Disk I/O usage in %** graph displays information about the average load on the disk arrays in the system.

Figure 46 Disk I/O usage in %
Graph



Use the **Disk I/O usage in %** graph to determine if disk I/O activity is correctly balanced and optimized across disk arrays.

- For DXi systems:
 - Because the system can contain a large number of arrays, disk usage values for all arrays are combined into a single value called **array(s)** (blue).
 - Disk usage for the system partitions are represented by the values for **sda** and **sdb**.
- For DXi3500/5500 systems:
 - The graph shows each array in a different color.
 - The system partition is part of the first storage array. As a result, disk I/O on the system partition can affect usage values for **Array 1** (green). Similarly, disk I/O on the first array can affect usage values for **System Partition** (black).
- The usage percentage represents the portion of the total I/O capacity that is being used by the array or arrays.
- If, during data ingest, some arrays show high utilization rates (90% or more) while others show lower utilization rates, it means that disk I/O is not balanced in the system.

In this case, to improve system performance, configure the system to match disk I/O across arrays. If necessary, add more disks to balance disk I/O activity.

Note: To determine when data ingest is occurring, use the **Fibre Channel Activity** graph in the **Overview** report (see [Fibre Channel Activity](#) on page 46).

Fibre Channel Activity

See [Fibre Channel Activity](#) on page 46.

Ethernet Activity

See [Ethernet Activity](#) on page 47.

Data Ingest Per Week

The **Data Ingest per week** report displays information about the volume of data ingested by the system, including weekly volume, daily volume, and the data reduction ratio. The report contains the following graphs:

- [Data Volume Overview](#)
- [Data Ingest Volume per week](#)
- [Reduction Ratio](#)
- [Data Ingest Volume per day](#)

Data Volume Overview

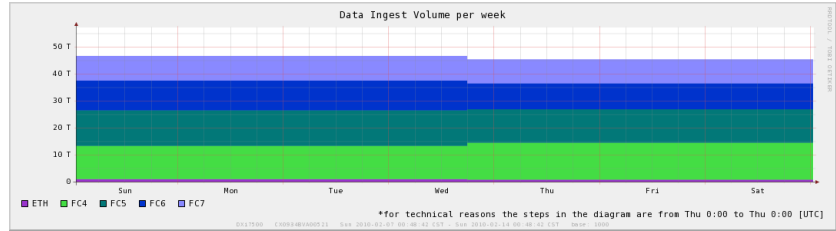
See [Data Volume Overview](#) on page 44.

Data Ingest Volume per week

The **Data Ingest Volume per week** graph (see [Figure 47](#)) displays the amount of data ingested by the system each week. The amount of data ingested by each Ethernet and Fibre Channel port is displayed in a different color. Use the **Data Ingest Volume per week** graph to view how much data the system is ingesting on a weekly basis.

Note: Weeks are measured beginning at midnight on Thursdays (UTC). Because of the time offset between Coordinated Universal Time (UTC) and the local time of the DXi, data ingest may be reported for the week preceding or the week following the week when it actually occurred. This does not affect the purpose of the graph, which is to identify long term trends in data ingest volume.

Figure 47 Data Ingest Volume per week Graph



Reduction Ratio

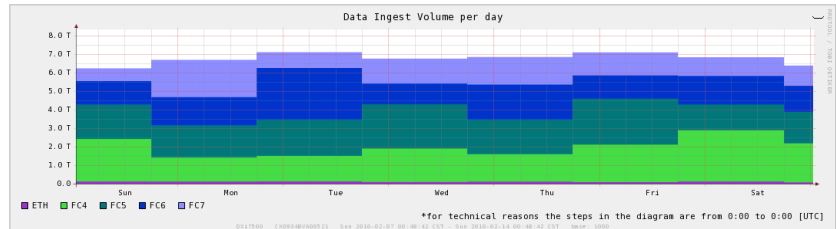
See [Reduction Ratio](#) on page 46.

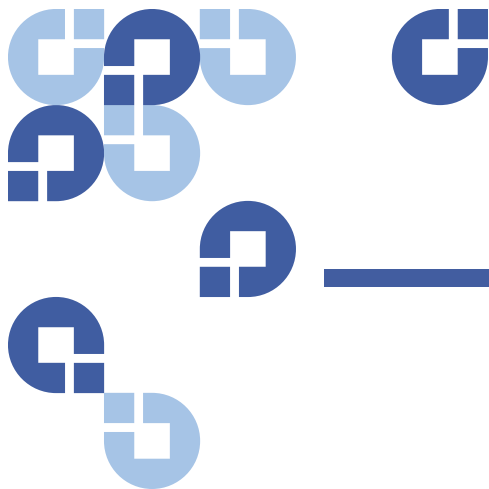
Data Ingest Volume per day

The **Data Ingest Volume per day** (see [Figure 48](#)) graph displays the amount of data ingested by the system each day. The amount of data ingested by each Ethernet and Fibre Channel port is displayed in a different color. Use the **Data Ingest Volume per day** graph to view how much data the system is ingesting on a daily basis.

Note: Days are measured beginning at midnight (UTC). Because of the time offset between Coordinated Universal Time (UTC) and the local time of the DXi, data ingest may be reported for the day preceding or the day following the day when it actually occurred. This does not affect the purpose of the graph, which is to identify long term trends in data ingest volume.

Figure 48 Data Ingest Volume per day Graph





Glossary

A

Adaptive Deduplication The mode of deduplication which allows data deduplication to run concurrent with the backup being ingested. The deduplication process will adapt to the speed of the ingest.

B

Bit The basic unit of data in a binary numbering system (*binary digit*), represented by a 0 or a 1. Eight bits equals one byte.

Block During deduplication, data is divided into variable length blocks (also called blocklets). Redundant blocks are removed and replaced with pointers to the original copy of the block.

Blockpool See **Deduplication Pool**.

Byte The basic unit of computer memory which is large enough to hold one character.

C

Compress A process of removing fine-grained redundancy from data prior to storing or transmitting it. The granularity may vary, but generally compression deals with redundancy in grains of a few bytes.

Continuous Replication Data replication is the process of creating and managing duplicate versions of your data. Once a data set

has been deduplicated, it may be replicated (nonredundant data is transmitted from a source system to a target). Deduplication tags representing files with a high probability of being replicated (for example, NAS share marked for replication) are queued for replication after deduplication is complete without regard to the replication schedule. This continuous transmission of data is an optimization allowing replication to be used with low bandwidth networks.

D

Deduplicate A process of removing coarse-grained redundancy from data prior to storing or transmitting it. The granularity may vary, but generally deduplication deals with redundancy in grains of several kilobytes.

Deduplication Pool The term used to refer to the collection of unique data stored in a DXi deduplication appliance. The size of the deduplication pool is reported as the After Reduction statistic on the DXi GUI and is a measure of the disk space occupied by all data backed up to the DXi after the data has been deduplicated and compressed.

Deferred Deduplication The mode of deduplication which begins only after the **deferred deduplication window**. Typically, deferred deduplication begins after the backup ingest is complete.

Deferred Deduplication Window A defined window during which no deduplication will take place. This allows maximum system resources to be devoted to data ingest thus allowing a faster backup. The deferred deduplication window applies only to the share/partition for which it is defined. It is possible to define a second share/partition and perform backups that overlap the same time period. The data written to the share without a defined deferred deduplication window will be subjected to adaptive deduplication.

F

File or Cartridge Replication File or cartridge replication (FCR) extends continuous and namespace replication from operating at a share/partition level and zooms in to the file-directory/virtual cartridge level. FCR can be used to synchronize the

content of a share or partition that is concurrently accessible at both source and target DXi.

I

Ingest The process of writing data from an external system or application to disk in a DXi system.

L

LUN Logical Unit Number. A logical storage unit that corresponds to a storage volume. A storage array can be partitioned into multiple LUNs.

N

Namespace The term that applies to metadata required to reconstruct deduplicated data back into its native application format. It is used in phrase combinations such as “namespace replication” or “synchronize the namespace.”

Namespace Replication When a replication set is scheduled for transmission, the system scans the files comprising the replication set and a **namespace** file is created. A **namespace** file contains the complete set of deduplication tags for the replication set. Data that is active (a NAS file that is open) or data that is not yet deduplicated is not included in the namespace file. The **namespace** file is then deduplicated and transmitted to the target system after the data transmission of the replication set is complete. Once both the replication set and **namespace** file have been transmitted to the target system, the replication can be recovered.

NTP Network Time Protocol. A protocol used to synchronize time between devices over a network.

P

Partition A DXi storage destination for data transferred by FC or iSCSI where the structure is considered to be a virtual tape library (VTL) and the content is written to virtual tape cartridges.

R

Recover The DXi procedure to make replicated and namespace data accessible on the DXi to which it had been replicated. If a share was replicated, then a share is recovered. If a partition is replicated, then a partition is recovered. It is not possible to convert a share to a partition (or vice-versa) during the recovery procedure.

S

Share A DXi storage destination for data transferred by NAS where the content is treated as files and directories.

Source The term often applied to the DXi that is sending a copy of deduplicated data to a second DXi.

Space Reclamation A multi phase process used to recover disk space on a DXi system. During space reclamation, the system searches for redundant blocks that were not captured during deduplication. The system also deletes blocks associated with expired virtual tape cartridges (VTCs) and files that have been deleted from NAS shares.

T

Tag A unit of ingested data. During deduplication, a tag is divided into variable length blocks (also called blocklets).

Target The label often applied to the DXi that is receiving a copy of deduplicated data.

Truncation A process used to recover disk space on a DXi system. When deduplicated data is truncated, only the metadata is available on the filesystem. This reduces the amount of capacity required in the filesystem. Once truncated, the file must be reconstituted using its tag before you are able to access the file.

V

Virtual Tape Cartridge (VTC) An emulation of a real, physical tape cartridge, including a type, any nonvolatile memory associated with the case housing, and that recording medium. Also referred to as a virtual tape volume or a virtual volume.