Quantum

User's Guide

DXi Advanced Reporting 2.3.1

6-67353-09 Rev A

Quantum DXi Advanced Reporting User's Guide, 6-67353-09 Rev A, March 2014, Product of USA.

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Preface

Quantum® DXi™ Advanced Reporting 2.3.1 provides performance data logging and visual reporting and graphing features for Quantum DXi™-Series systems. DXi Advanced Reporting is pre-installed on all new DXi systems.

For DXi systems prior to DXi 2.3.1, DXi Advanced Reporting is available for download. For information regarding version compatibility, software downloads, and upgrade and installation procedures, refer to the DXi Advanced Reporting Release Notes and User's Guide associated with your DXi system on the Quantum Service and Support site: http://www.quantum.com/ServiceandSupport/Index.aspx

> Under **Select Your Product**, select **Disk-Based Backup Products** and navigate to the support page for your DXi system: click the **Diagnostics** tab for software or the **Documentation** tab (navigate the **Filter Documents by DXi Software Version** drop-down to DXi Advanced Reporting).

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

- 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 Navigation describes how to access and work with the Web-based user interface of DXi Advanced Reporting.
- Chapter 3, 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.	`./DARTinstall`
User input variables are enclosed in angle brackets.	**http://<ip_address>/reports/**

For UNIX and Linux commands, the command prompt is implied.	`./DARTinstall`
	`is the same as`
	`# ./DARTinstall`

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
6-67539	*Quantum DXi-Series Release Notes*	Describes information specific to the current release of DXi Advance Reporting software.
6-67612	*DXi V-Series User's Guide*	Describes the operation and administration of the DXi V1000 and DXi V4000 virtual appliances.
6-67092	*Quantum DXi4000 User's Guide*	Describes DXi4500, DXi4600, and DXi4700 operation and administration.
6-67199	*Quantum DXi6000 User's Guide*	Describes DXi6500, DXi6700, and DXi6800 operation and administration.
6-67205	*Quantum DXi8500 User's Guide*	Describes DXi8500 operation and administration.

Contacts

For information about contacting Quantum, including Quantum office locations, go to:

http://www.quantum.com/aboutus/contactus/index.aspx

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- **eSupport** – Submit online service requests, update contact information, add attachments, and receive status updates via e-mail. Online Service accounts are free from Quantum. That account can also be used to access Quantum's Knowledge Base, a comprehensive repository of product support information. Sign up today at:

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- **StorageCare Guardian** – Securely links Quantum hardware and the diagnostic data from the surrounding storage ecosystem to Quantum's Global Services Team for faster, more precise root cause diagnosis. StorageCare Guardian is simple to set up through the internet and provides secure, two-way communications with Quantum's Secure Service Center. More StorageCare Guardian information can be found at:

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

- **DXi Advanced Reporting Essential Training (online self-paced course)** – This free online course provides information on how to install/upgrade software, navigate the GUI, work with time ranges, and interpret reporting data. To access the online course, go to

http://www.quantum.com/ServiceandSupport/Index.aspx, select your DXi system, click **Documentation**, and select **DXi Advanced Reporting Essential Training**.

For further assistance, or if training is desired, contact Quantum Customer Support Center:

United States	Toll Free: 1-800-284-5101 Toll: +1-720-249-5700
Europe, the Middle East, and Africa (EMEA)	Toll Free: +800-7826-8888 Toll: +49-6131-3241-1164
Asia and Pacific (APAC)	Toll Free: +800-7826-8887 Toll: +603-7953-3010
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/serviceandsupport/warrantyinformation/index.aspx

Chapter 1

DXi Advanced Reporting Introduction

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

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

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:

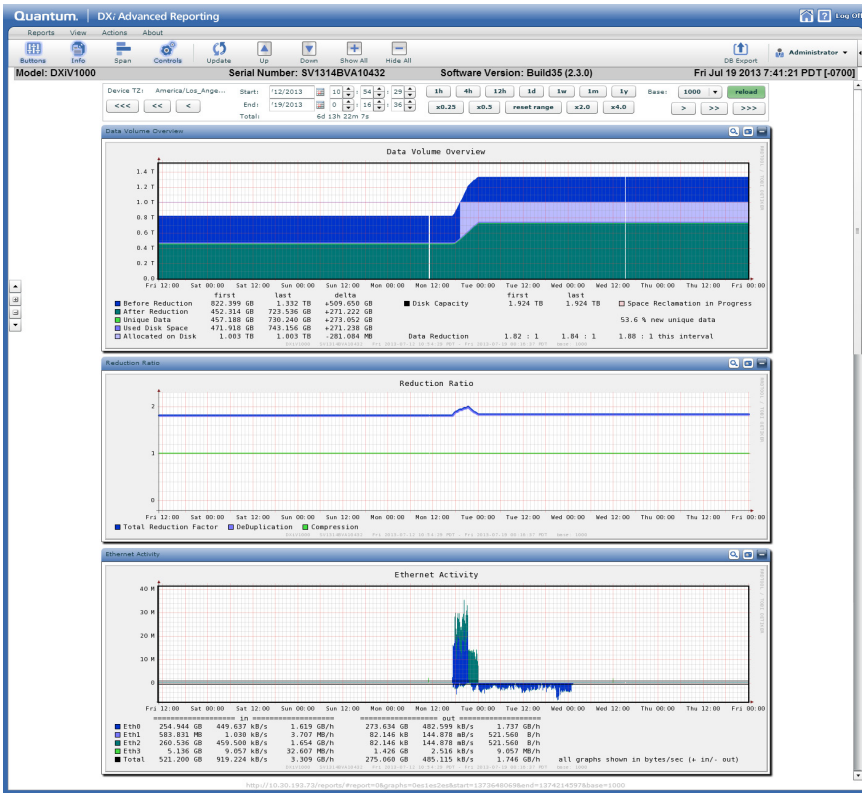
- Capacity utilization
- Ethernet and Fibre Channel activity
- CPU load
- System load
- Data deduplication
- Space reclamation activities
- OST and Accent backups
- Per Share and Partition Information (Chargeback)

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 a maximum of six years of logged data, so you can view historical reports for previous time periods.

DXi Advanced Reporting's historical record lets you compare current performance to past performance. It also lets you see the effect of any network configuration or business processes as they affect the DXi compared to earlier configurations or 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
- Performance Impact

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 older than 7 days

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.

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, a report might show a problem starting at 6:00 p.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 5:00 p.m.

To make sure the time and date are always correct, configure the DXi system to use a Network Time Protocol (NTP) 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 not support the NTP protocol, you cannot use it as a time source for the DXi. However, in this case, a third party NTP application for Windows should work correctly.

Chapter 2

DXi Advanced Reporting Navigation

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

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

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

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.

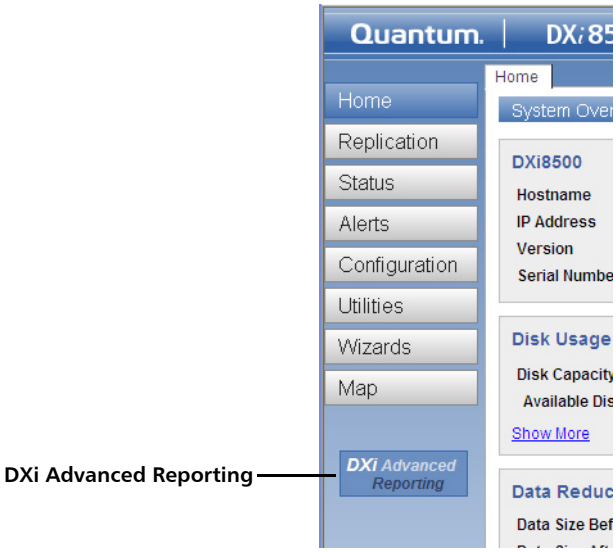
Logging On to DXi Advanced Reporting

To log on to DXi Advanced Reporting:

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. You can access DXi Advanced Reporting by either of two ways:
   - On the DXi Home page, click **DXi Advanced Reporting** (see Figure 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**.

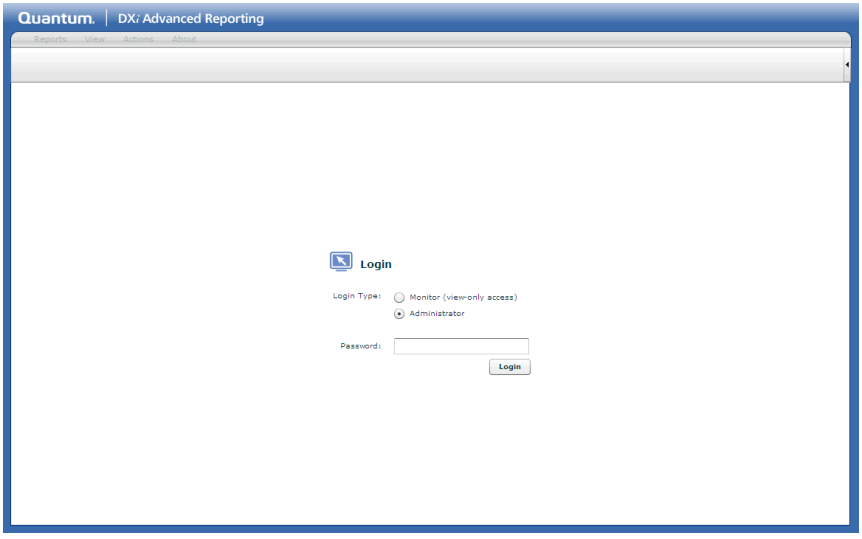
Note: If you do not include the forward slash (/) at the end of the URL, the DXi Advanced Reporting **Login** window may not display. For information about setting the IP address of the DXi, see the user's guide for your DXi.

Figure 2 DXi Advanced Reporting



The **Login** window displays (see Figure 3).

Figure 3 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. If you logged on to the DXi as a monitor, you are automatically logged into DXi Advanced Reporting as a monitor. If you logged on to the DXi as an administrator, you are automatically logged into DXi Advanced Reporting as an administrator.

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

Note: The default password is **password**. Passwords are limited to 15 characters. Alphanumeric characters and special characters are allowed. 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 4).

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.

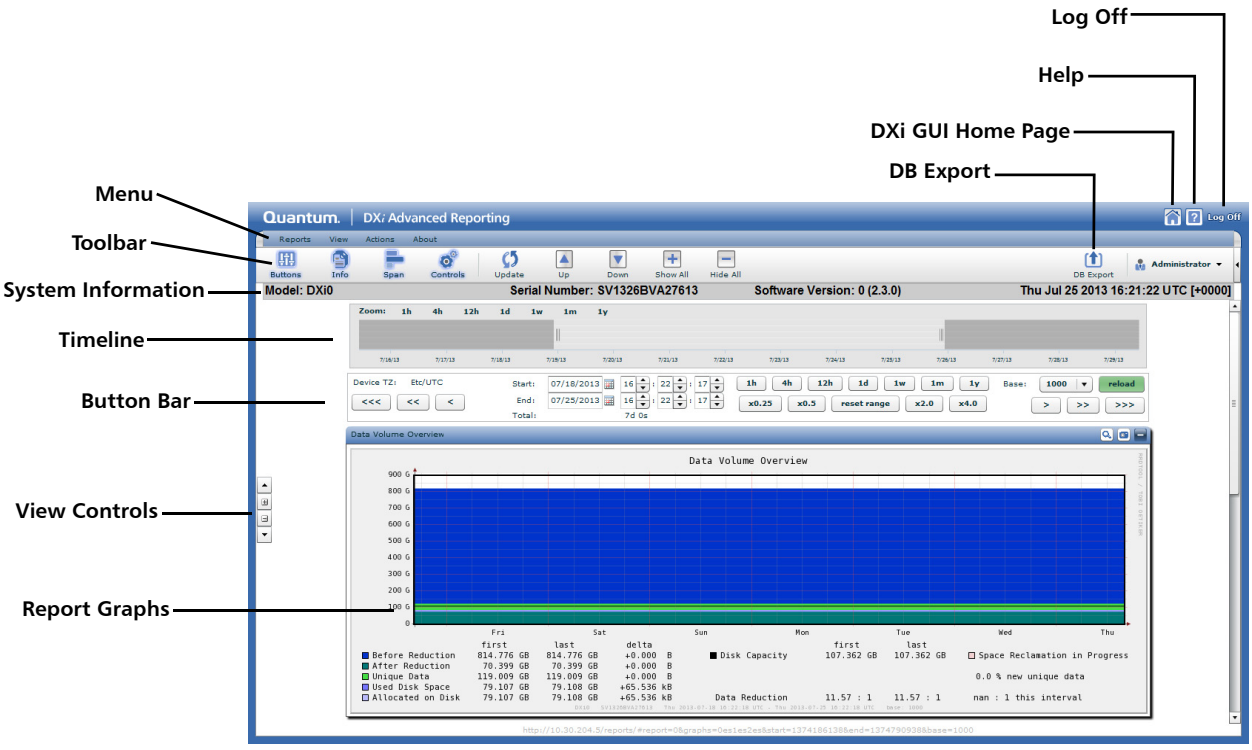
Using the Report Window

The report window displays the performance graphs for the currently selected report (see Figure 4). 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:

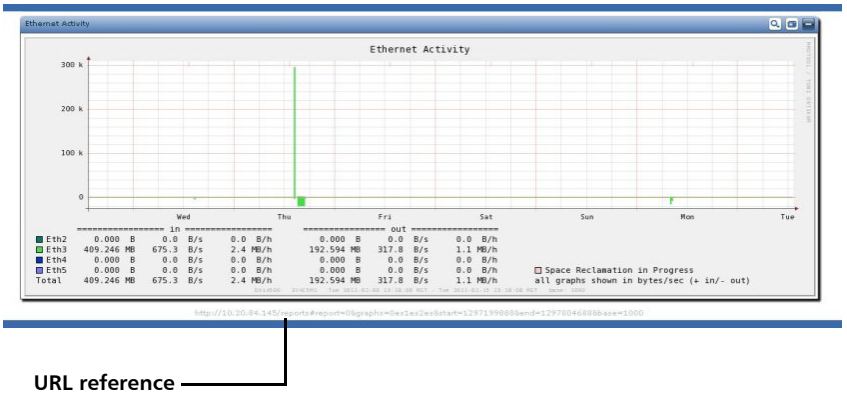
- Menu
- Toolbar
- View Controls
- Graphs

Figure 4 The Report Window



Note that at the bottom of every report window is a link that provides a URL reference to the current report (see Figure 5). The URL can be copied and sent to a third party, such as a coworker, and then viewed in a different browser.

Figure 5 URL Reference

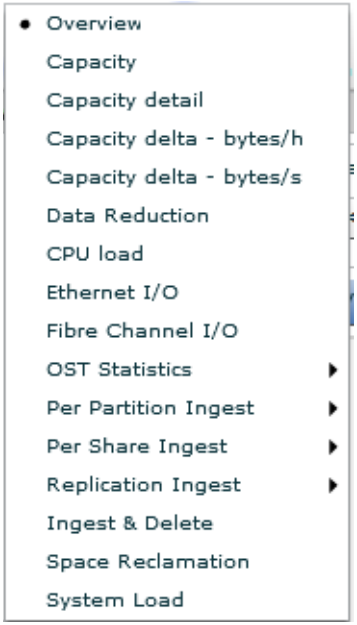


Menu

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 6).

Figure 6 Reports Menu



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.

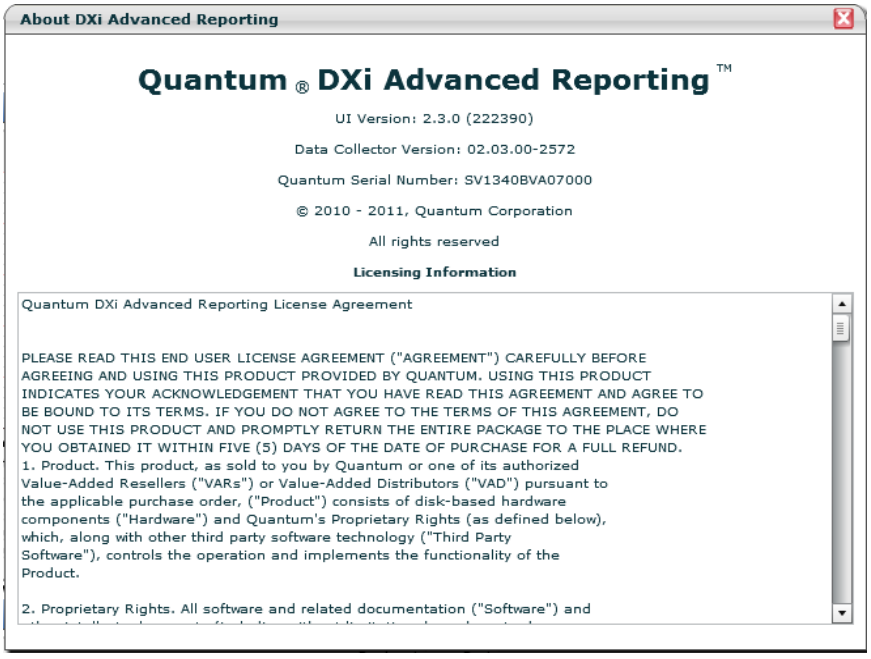
Note: For more information about time ranges, see Working With Time Ranges on page 18. For a description of the available reports, see Advanced Reports on page 31.

- **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 enabled except for **Span**.

- **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 (see Figure 7).

Figure 7 About Menu



Toolbar

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

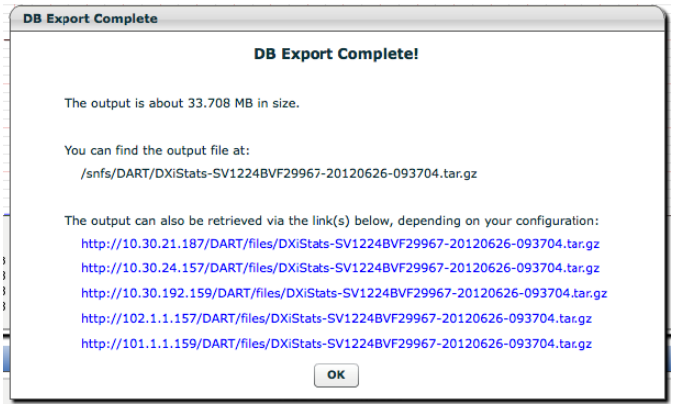
- **Buttons** – Shows hides the button bar. (By default, the button bar is hidden.)
- **Info** – Shows or hides the system information. (By default, the system information is visible.)

  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 not 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.
- **DB Export** - Exports the statistical database (data from which DXi Advanced Reporting graphs are generated) to a file that can then be used for offline viewing. Click **DB Export** to begin the database export. The data can be accessed by following the links displayed in the **DB Export Complete** dialog box (see Figure 8).
- **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.

Figure 8 DB Export



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.

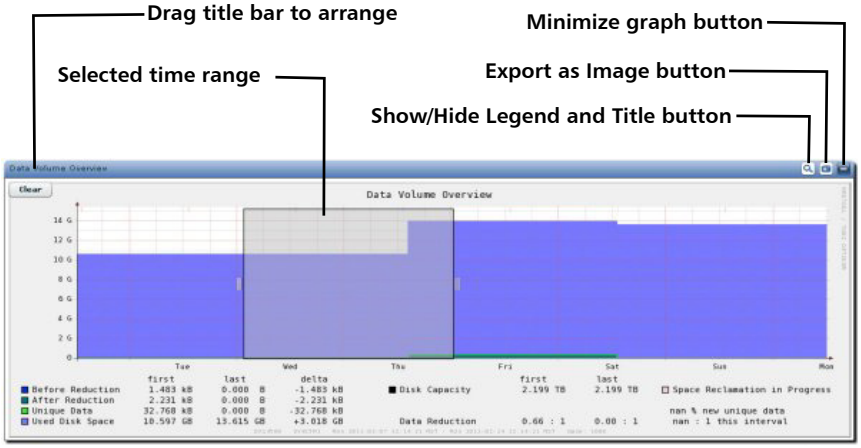
Graphs

Each report is made up of one or more graphs that show performance data for the selected time range (see Figure 9). 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** (–) graph button on the right side of the graph title bar. To restore the graph to full size, click the minimized title bar, located towards the bottom of the window.
- To export a screen capture (.JPG or .PNG image) of the graph, click the **Export as Image** button on the right side of the graph title bar, located next to the **Minimize** button.
- To display or hide the graph title and legend, click the **Show/Hide Legend and Title** button (magnifying glass) on the right side of the graph title bar.

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

Figure 9 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 10). 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 10 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 11). 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 11 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 12). 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 12 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 13).

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.

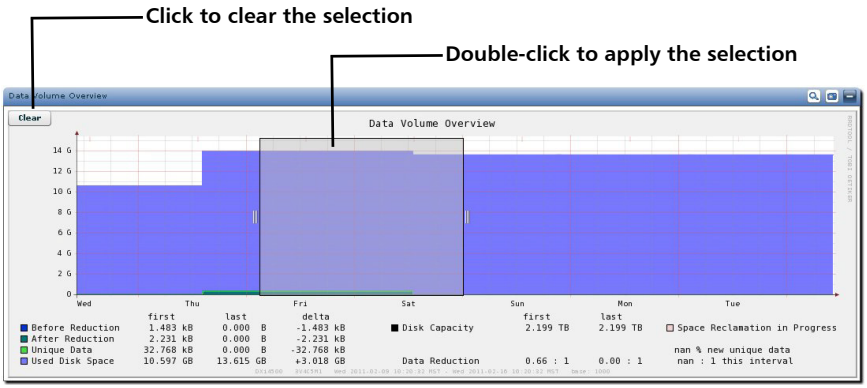
2. (Optional) Drag the left and right selection handles to adjust the size of the selection, or drag the selection area to move it.

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 13 Click and Drag to Zoom

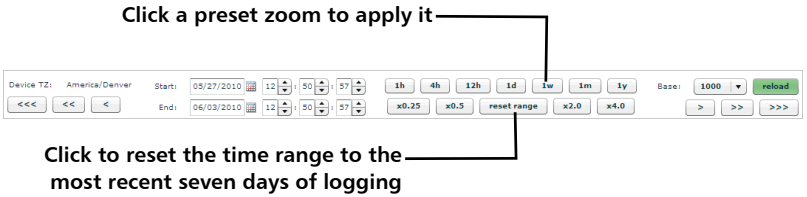


Zooming With the Preset Zoom Buttons

Use the preset zoom buttons on the button bar to zoom in or zoom out on a report by a fixed factor (see Figure 14). 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 14 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 14). 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**.

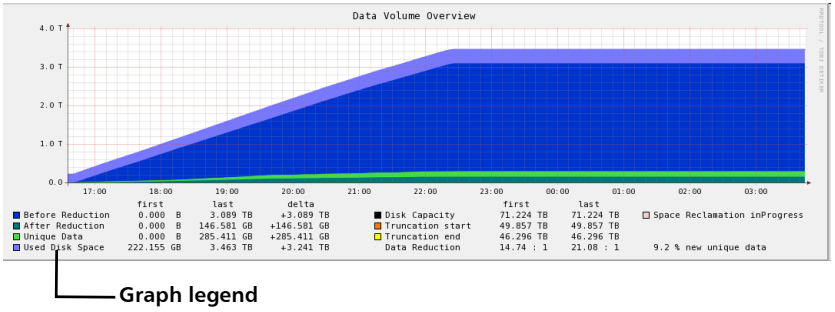
Working With Graphs

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 15).

Figure 15 The 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 systems report data usage in different ways. DXi models report data usage using a base of 1000 bytes per kilobyte, or in TB. (Similar to disk and tape drives.)

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 16). DXi Advanced Reporting adjusts all report data to reflect the selected base.

Figure 16 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.

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

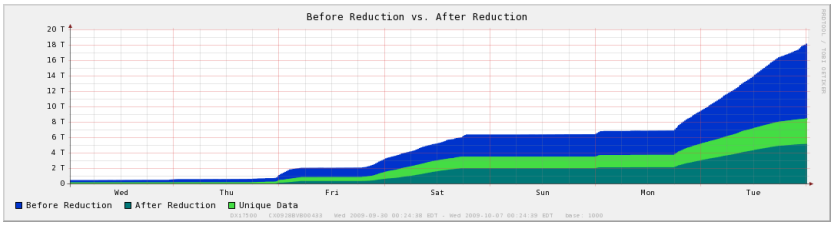
Layered Graphs

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 17), 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 17 Layered Graph

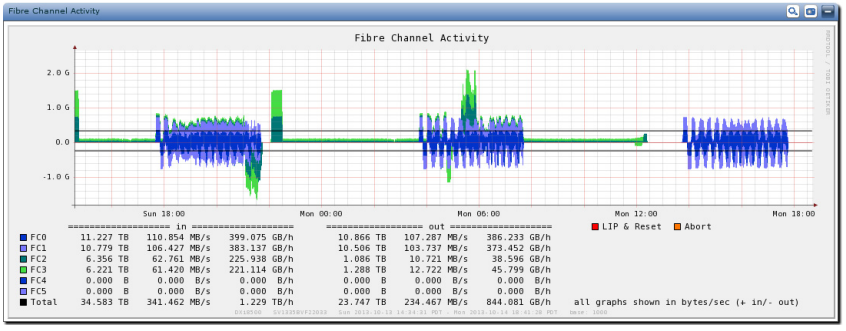


Stacked Graphs

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 18), values for each Fibre Channel port are added together to reach a total value for each point in the time range.

Figure 18 Stacked Graph



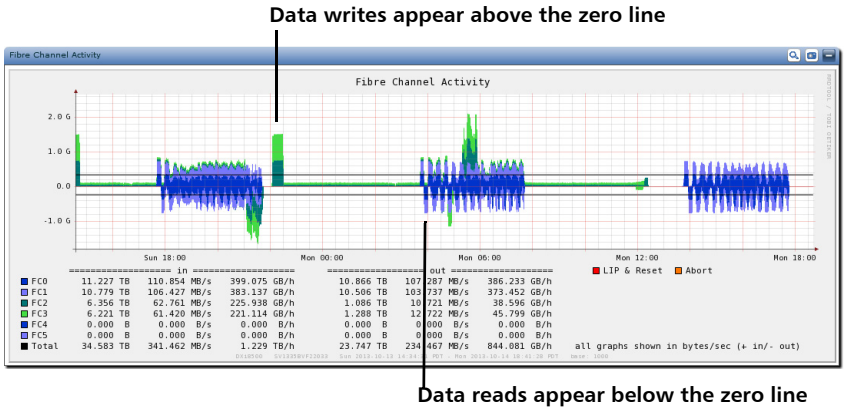
The Zero Line

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 19).

Figure 19 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

Note: If DXi Advanced Reporting reports a value as **NaN**, this means **N**ot **a** **N**umber. This will occur when a value cannot be calculated.

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).

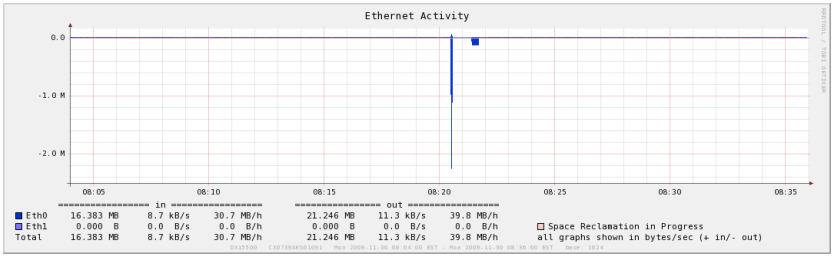
DXi Advanced Reporting uses aggregation to convert the resolution of the database to the resolution of the graph. This means that, in many cases, each pixel in the graph is an aggregate of multiple data points in the database. Depending on how many data points are aggregated to create each pixel in the 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 20).

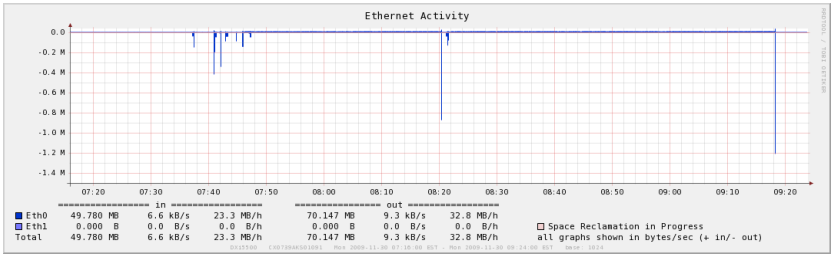
- In the first example, the graph shows the transfer within a time range of 32 minutes or 1,920 seconds. In this case, each pixel in the graph represents 2 seconds of time. As a result, the transfer takes up 3 pixels in the graph and displays a peak amplitude of 2.1MB/second.

- 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 20 Amplitude Changes With Resolution



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



128 Minute rime 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

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 34. For information about viewing reports, see Using the Report Window on page 11.

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.

Note: Depending on the user authentication level, platform, or software version being used, some of the reports in Table 3 may not display in the **Reports** menu.

Table 3 DXi Advanced Reporting Reports and Graphs

Report	Graphs
Overview	• Data Volume Overview (L) • Reduction Ratio (L) • Ethernet Activity (S) • Fibre Channel Activity (S)
Capacity	• Data Volume Overview (L) • Disk Usage (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 • Allocated Disk Space • Data not intended for deduplication
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 • Allocated Disk Space - delta in Bytes/h

Report	Graphs
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 • Allocated Disk Space - delta in Byte/s
Data Reduction	• Data Volume Overview (L) • Reduction Ratio (L) • Deduplication Ratio • Compression Ratio
CPU load	• CPU Load Average • CPU stats in % (S)
Ethernet I/O	• Ethernet Activity (S) • eth*n* Activity
Fibre Channel I/O	• Fibre Channel Activity (S) • Fibre Channel Port *n* Activity

OST Statistics	• Combined
	  • OST Statistics - Accent
	  • OST Statistics - Ethernet
	• Accent Node *n*

Per Partition Ingest (Chargeback)	• Export Partition Chargeback • Total Per Ingest - Capacity and Ingest • Per Partition (1 - n) - Capacity and Ingest
Per Share Ingest (Chargeback)	• Export Share Chargeback • Total Per Ingest - Capacity and Ingest • Per Share (1 - n) - Capacity and Ingest
Replication Ingest (Chargeback)	• Export Replication Chargeback • Total Per Replication - Capacity and Ingest • Per Share (1 - n) - Capacity and Ingest

Report	Graphs
Ingest & Delete	• Ingest & Deletions
Space Reclamation	• Space Reclamation Progress • Space Reclamation Bytes • Space Reclamation/Compaction
System Load	• CPU Load Average • CPU stats in % (S) • Ethernet Activity (S) • Fibre Channel Activity (S)

Report Descriptions

This section provides detailed information about the DXi Advanced Reporting 2.0 reports and the corresponding graphs within each report:

- Ingest & Delete on page 71
- Space Reclamation on page 72
- System Load on page 75

Note: Depending on the user authentication level, platform, or software version being used, some of these reports may not display in the **Reports** menu.

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:

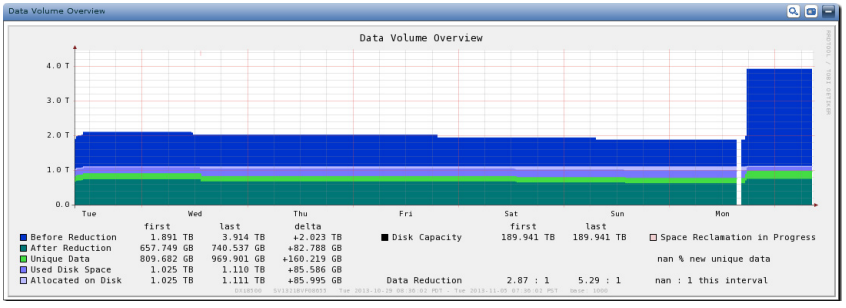
- Data Volume Overview
- Reduction Ratio
- Ethernet Activity
- Fibre Channel Activity

Data Volume Overview

The **Data Volume Overview** graph (see Figure 21) displays information about the amount of data processed by the system. You can use this graph to evaluate the overall health of the system and to quickly identify if a DXi system is full or nearing capacity.

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 25.

Figure 21 Data Volume Overview Graph



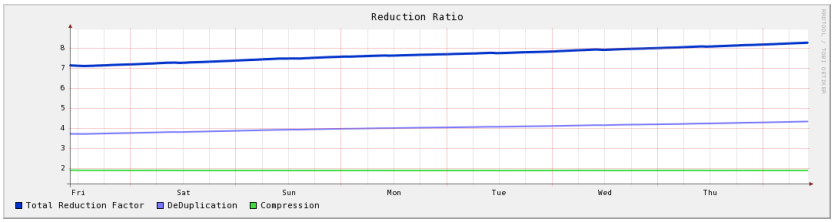
The **Data Volume Overview** graph legend consists of the following elements:

- **Before Reduction** (dark blue) is the total amount of data ingested by the system. Use this information to see how much data the system is processing.
- **After Reduction** (dark green) is the amount of data that remains after the ingested data has been deduplicated and compressed. This is the amount of data consumed by the blockpool. Use this information to see the amount of deduplicated, compressed data stored on the system.
- **Unique Data** (light green) is the amount of data that remains after the ingested data has been deduplicated and pointers have been substituted for redundant data, but before the ingested data is compressed. Use this information to see the amount of deduplicated data stored on the system.
- **Used Disk Space** (light blue) and **Allocated on Disk** (blue-gray) each show different views of how the DXi has allocated disk space for data. **Allocated on Disk** shows how much disk space has been allocated for all types data on the DXi and includes disk space that is free to be reclaimed for storing new backup data. **Used Disk Space** shows how much disk space is actively being consumed by active data on disk and does not include disk allocations that can be reclaimed for new backup data. The types of data include: deduplicated data, data that has not been deduplicated, expired data, and system metadata. Use this information to see the amount of allocated/used and free disk capacity on the system.
- **Disk Capacity** (black) is the overall capacity of the system.
- Average transfer rate (thin horizontal black line) shows the average data transfer rate for the displayed time period.

Reduction Ratio

The **Reduction Ratio** graph (see Figure 22) 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 22 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**).

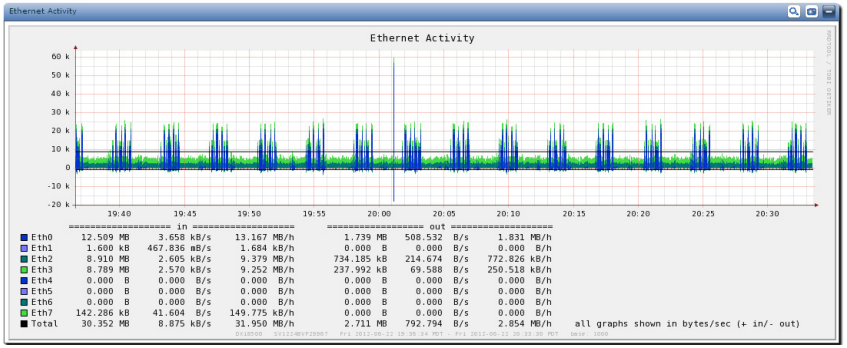
  This value corresponds to the **Total Reduction Ratio** value displayed on the **Home** page in the DXi remote management pages.

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

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. Four colors, repeated cyclically, are used to display Ethernet activity: dark blue, light blue, dark green, light green. Yellow and red tones are reserved for alerts (partially the grid) and black lines are used for markers.

  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.

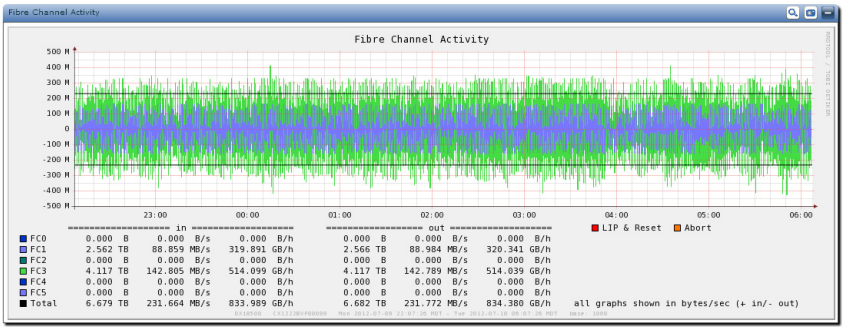
- Write activity (above the zero line) indicates target replication to the system, NAS backup or restore operations, or management activity.
- Read activity (below the zero line) indicates source replication from the system, NAS backup or restore operations, or management activity.
- A pink bar at the 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.
- Average transfer rate (thin horizontal black line) shows the average Ethernet data transfer rate for the displayed time period.

Fibre Channel Activity

The **Fibre Channel Activity** graph (see Figure 24) displays the amount of data passing through all of the Fibre Channel ports in the system.

Note: Depending on the user authentication level, platform, or software version being used, this graph may not display in the **Overview** report.

Figure 24 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. Four colors, repeated cyclically, are used to display Fibre Channel activity: dark blue, light blue, dark green, light green. Yellow and red tones are reserved for alerts (partially the grid) and black lines are used for markers.
- 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.
- Average transfer rate (thin horizontal black line) shows the average Fibre Channel data transfer rate for the displayed time period.

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
- Disk Usage
- Before Reduction vs. After Reduction
- After Reduction vs. Unique Data found
- Reduction Ratio

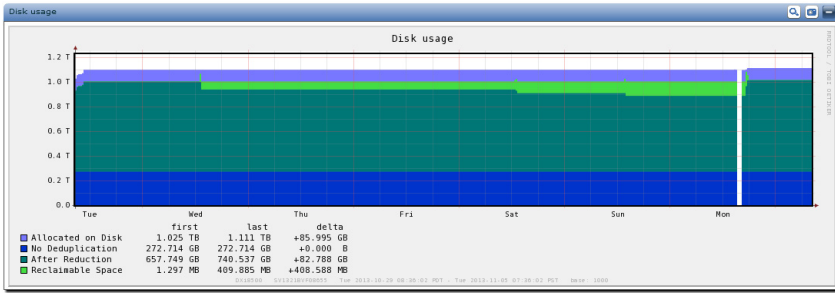
Data Volume Overview

See Data Volume Overview on page 35.

Disk Usage

The **Disk Usage** graph (see Figure 25) compares the data stored after reduction (including deduplication and compression) and the allocated disk space on the system.

Figure 25 Disk Usage Graph



Use the **Disk Usage** graph to monitor the amount of disk space that can be freed during space reclamation.

- **Allocated on Disk** (light blue) is the amount of disk capacity that is allocated for all types data on the DXi and includes disk space that is free to be reclaimed for storing new backup data.
- **No Deduplication** (dark blue) is data not intended for deduplication and is the amount of disk space used by shares or partitions that are not configured for deduplication.

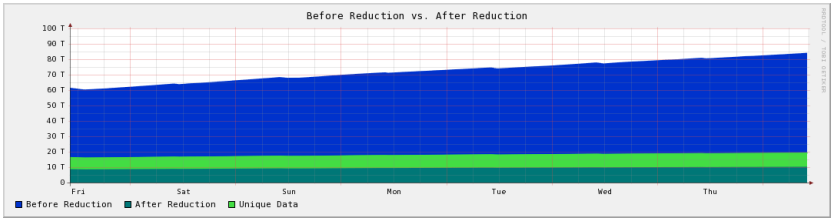
- **After Reduction** (dark green) is the amount of data that remains after the ingested data has been deduplicated and compressed. This is the amount of data consumed by the blockpool. Use this information to see the amount of deduplicated, compressed data stored on the system.
- **Reclaimable Space** (light green) is the amount of disk space available for new backup data. This data has been previously been expired or deleted from the DXi. For non-deduplicated shares and partitions, the DXi may automatically free reclaimable space to create needed free space when all free space is allocated for **Allocated on Disk**.

Note: Space Reclamation for DXi 2.3 and above frees space for deduplicating shares and partitions within the blockpool, but will leave the space available for subsequent Deduplication. This data freed for deduplicating shares is known as Reclaimable Space.

Before Reduction vs. After Reduction

The **Before Reduction vs. After Reduction** graph (see Figure 26) compares the amount of data ingested by the system to the amount of unique and compressed data.

Figure 26 Before Reduction vs. After Reduction Graph



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

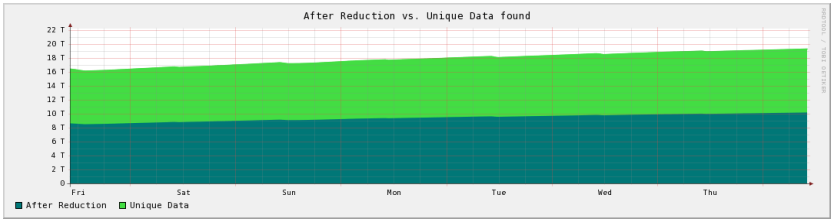
- **Before Reduction** (dark blue) increases as the system ingests data.
- **Unique Data** (bright green) shows the amount of data that remains after ingested data is deduplicated and pointers are substituted for redundant data. **Unique Data** increases more slowly than **Before Reduction** because,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

- **After Reduction** (dark green) is the amount of data that remains after the ingested data has been deduplicated and compressed. This is the amount of data consumed by the blockpool. Use this information to see the amount of deduplicated, compressed data stored on the system.

After Reduction vs. Unique Data found

The **After Reduction vs. Unique Data found** graph (see Figure 27) compares the amount of unique data before and after compression.

Figure 27 After Reduction vs. Unique Data found Graph



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

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

Reduction Ratio

See Reduction Ratio on page 36.

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
- Allocated Disk Space
- Data not intended for deduplication

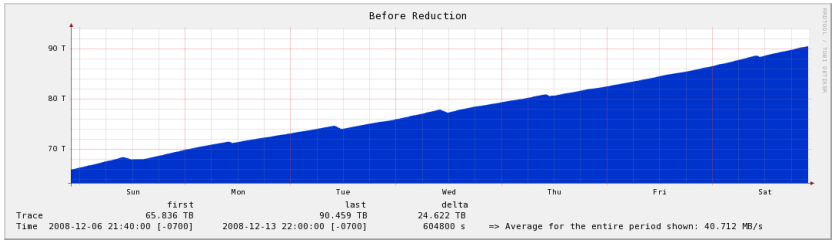
Data Volume Overview

See Data Volume Overview on page 35.

Before Reduction

The **Before Reduction** graph (see Figure 28) displays the total amount of data ingested by the system. Use the **Before Reduction** graph to see how much data the system is processing.

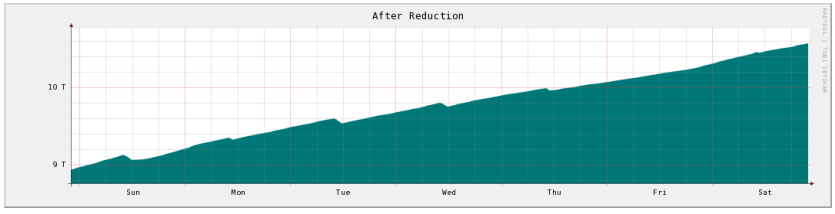
Figure 28 Before Reduction Graph



After Reduction

The **After Reduction** graph (see Figure 29) 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.

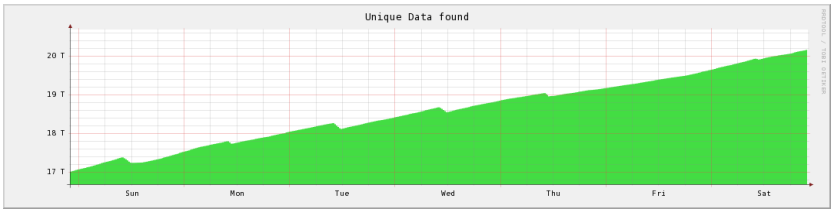
Figure 29 After Reduction Graph



Unique Data found

The **Unique Data found** graph (see Figure 30) 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.

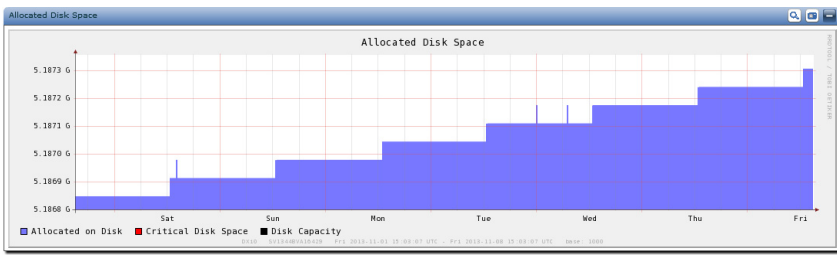
Figure 30 Unique Data found Graph



Allocated Disk Space

The **Allocated Disk Space** graph (see Figure 31) displays the amount of disk capacity that is currently being used to store data. Use the **Allocated Disk Space** graph to see how much active and reclaimable data is allocated to disk. This shows both the data on disk that is available for reuse and the data that is being actively used by the DXi.

Figure 31 Allocated Disk Space Graph



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.

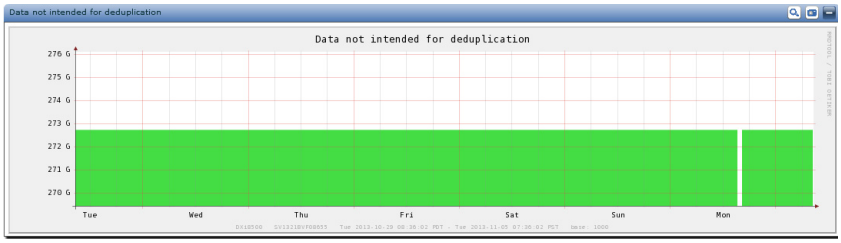
- **Allocated on Disk** (light blue) is the amount of disk capacity that is allocated for all types data on the DXi and includes disk space that is free to be reclaimed for storing new backup data.

- **Critical Disk Space** (red) is the level of disk usage at which allocated disk space is critically low and ingest is stopped.
- **Disk Capacity** (black) is the overall capacity of the system.

Data not intended for deduplication

The **Data not intended for deduplication** graph (see Figure 32) displays the amount of disk space used by the sum of the **UserDataSize** values for all non-deduplicated shares or partitions, i.e., the amount of data that will not be deduplicated (data on shares or partitions that do not have deduplication enabled.

Figure 32 Data not Intended for Deduplication



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
- Allocated Disk Space – delta in Bytes/h

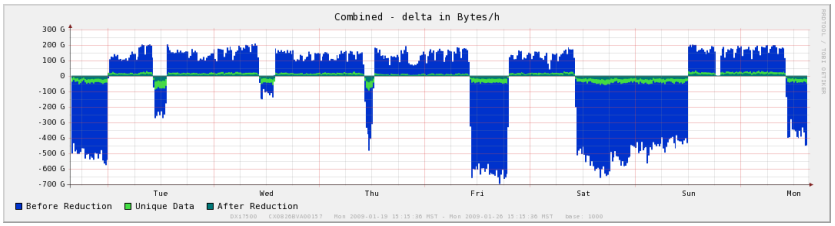
Data Volume Overview

See Data Volume Overview on page 35.

Combined – delta in Bytes/h

The **Combined – delta in Bytes/h** graph (see Figure 33) displays changes to the values for **Before Reduction**, **Unique Data**, and **After Reduction** in bytes per hour.

Figure 33 Combined – delta in Bytes/h Graph



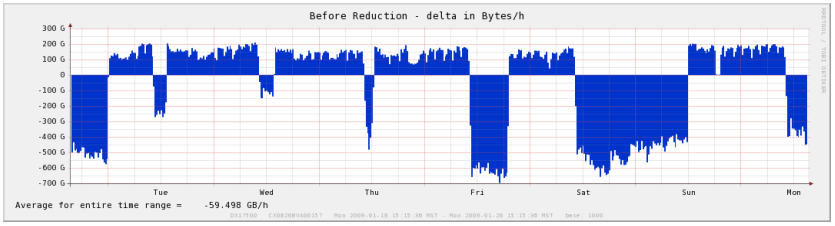
Use the **Combined – delta in Bytes/h** graph to see increases and decreases in the total amount of data stored on the system.

- 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 34) displays changes to the value for **Before Reduction** in bytes per hour.

Figure 34 Before Reduction – delta in Bytes/h Graph



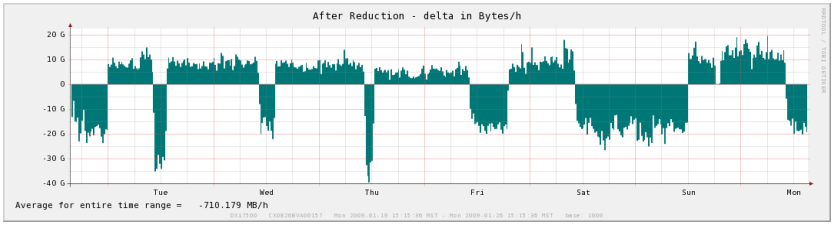
Use the **Before Reduction – delta in Bytes/h** graph to see increases and decreases in the amount of ingested (not deduplicated, not compressed) data stored on the system.

- 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 35) displays changes to the value for **After Reduction** in bytes per hour.

Figure 35 After Reduction – delta in Bytes/h Graph



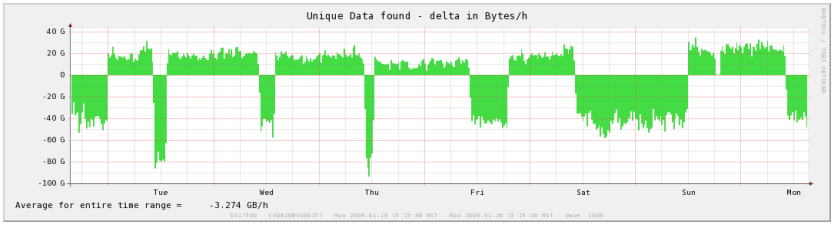
Use the **After Reduction – delta in Bytes/h** graph to see increases and decreases in the amount of deduplicated, compressed data stored on the system.

- 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 36) displays changes to the value for **Unique Data** in bytes per hour.

Figure 36 Unique Data found – delta in Bytes/h Graph



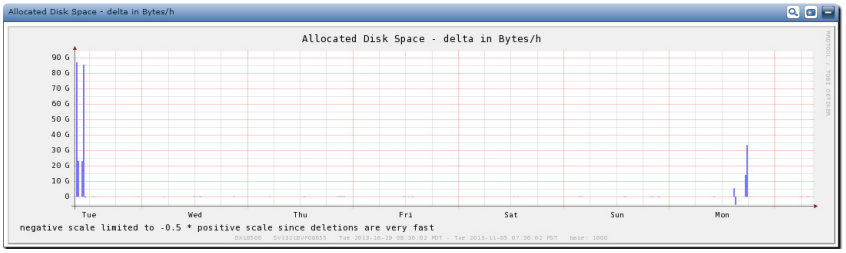
Use the **Unique Data found – delta in Bytes/h** graph to see increases and decreases in the amount of deduplicated data stored on the system.

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

Allocated Disk Space – delta in Bytes/h

The **Allocated Disk Space – delta in Bytes/h** graph (see Figure 37) displays changes to the value for **Allocated Disk Space** in bytes per hour.

Figure 37 Allocated Disk Space – delta in Bytes/h Graph



Use the **Allocated 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, data that has not been deduplicated, and system metadata. This does not include any data on disk that is available for reuse as this is data that has been previously expired or deleted.

- 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 45.

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 35.

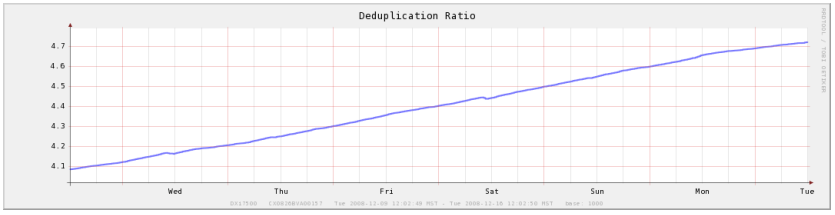
Reduction Ratio

See Reduction Ratio on page 36.

Deduplication Ratio

The **Deduplication Ratio** graph (see Figure 38) 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 38 Deduplication Ratio Graph



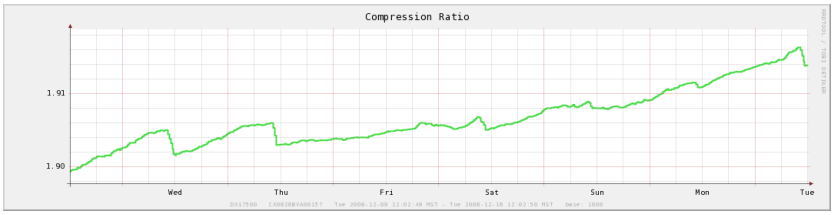
Note: The deduplication ratio is in flux during space reclamation or during incoming replication because these activities affect the **Before Reduction** amounts.

Compression Ratio

The **Compression Ratio** graph (see Figure 39) 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 39 Compression Ratio Graph



CPU load

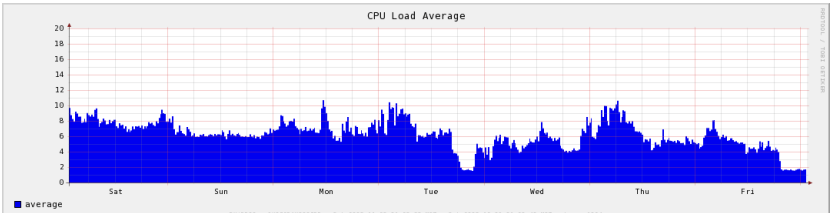
The **CPU load** report displays information about the usage of CPU resources in the system. The report contains the following graphs:

- CPU Load Average
- CPU stats in %

CPU Load Average

The **CPU Load Average** graph (see Figure 40) displays the one minute load average for the system.

Figure 40 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 15 on DXi systems indicates the system is busy. In this case, performance may be affected.

CPU stats in %

The **CPU stats in %** graph (see Figure 41) displays the relative CPU usage for seven categories of processes (see Table 4).

Figure 41 CPU stats in % Graph

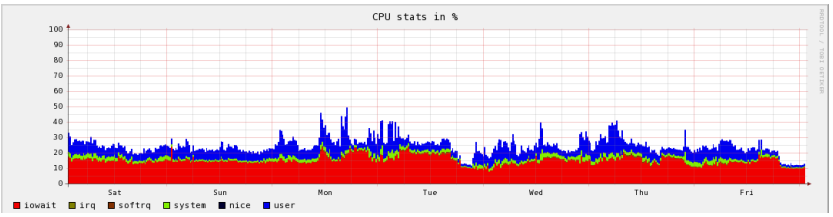


Table 4 Categories of Processes in the CPU stats in % Graph

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 50), 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

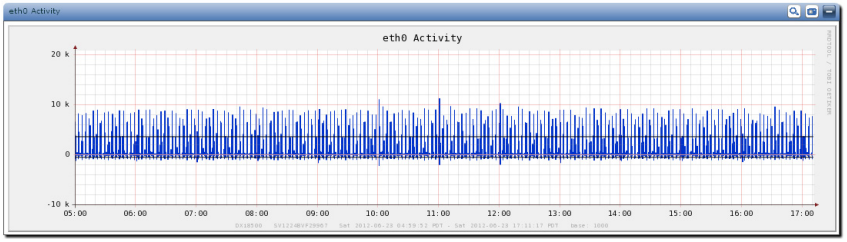
Ethernet Activity

See Ethernet Activity on page 37.

eth*n* Activity

The **ethn Activity** graph (see Figure 42) 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 42 eth*n* 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.
- Average transfer rate (thin horizontal black line) shows the average data transfer rate for ethn for the displayed time period.

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.

Note: Depending on the user authentication level, platform, or software version being used, this report may not display in the **Reports** menu.

The report contains the following graphs:

- Fibre Channel Activity

- Fibre Channel Port n Activity

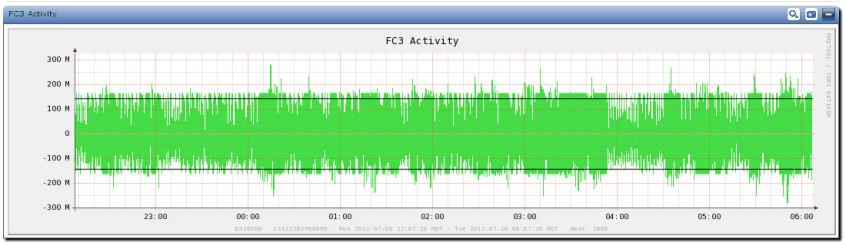
Fibre Channel Activity

See Fibre Channel Activity on page 38.

Fibre Channel Port *n* Activity

The **Fibre Channel Port n Activity** graph (see Figure 43) 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 43 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.
- Average transfer rate (thin horizontal black line) shows the average data transfer rate for Fibre Channel Port n for the displayed time period.

OST Statistics

The **OST** report is used to understand the bandwidth savings and performance benefits that customers are achieving with DXi Accent

software, which accelerates backups and reduces network bandwidth requirements by distributing deduplication between the backup server and DXi appliances. With DXi Accent, backup windows are reduced and network bottlenecks are eliminated. When DXi Accent is enabled, only unique and compressed data is sent over the network.

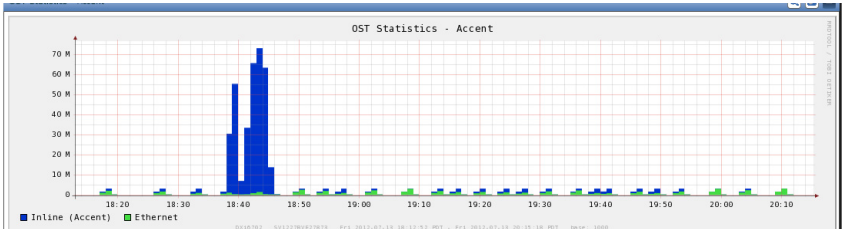
The report contains the following graphs:

- Combined
  - OST Statistics – Accent
  - OST Statistics – Ethernet
- OST Statistics – Accent Node n (the IP address of each Accent node)

OST Statistics – Accent

The **OST Statistics – Accent** graph (see Figure 44) is used to understand and display the bandwidth savings and performance benefits that you are achieving with Accent. Compare the **Inline (Accent)** to the **Ethernet In** to see the amount of network bandwidth savings that Accent is achieving. You can compare the rate of **Inline (Accent)** to overall performance of the DXi in the **Data Volume Overview** graph. Note that this graph only shows data when Accent is enabled.

Figure 44 OST Statistics - Accent Graph



Use the **OST Statistics – Accent** graph to display bandwidth savings achieved by the Accent feature of the DXi.

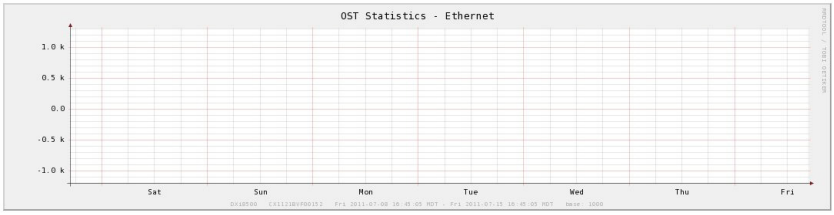
- The **Inline (Accent)** value (blue) displays the data arriving at the DXi from an Accent-enabled OST server.
- The **Ethernet** value (green) displays the data arriving at the DXi via Ethernet.
- The tick marks at the top show if Accent is enabled (blue) or not (green).

OST Statistics – Ethernet

The **OST Statistics – Ethernet** graph (see Figure 45) displays the amount of data being backed up to the DXi appliance through OST servers. You can compare the amount and performance of OST to the overall values in the **Data Volume Overview** graph.

If DXi Accent is enabled, the **OST Statistics – Ethernet** graph will not display data, as shown in the following example.

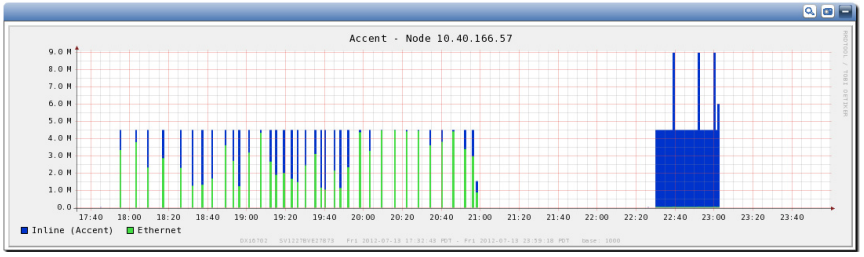
Figure 45 OST Statistics - Ethernet Graph



OST Statistics – Accent Node *n*

The **OST Statistics – Accent Node** graph (see Figure 46) is used to understand and display the bandwidth savings and performance benefits that you are achieving with each Accent node. Compare the **Inline (Accent)** to the **Ethernet In** to see the amount of network bandwidth savings that Accent is achieving. You can compare the rate of **Inline (Accent)** to overall performance of the DXi in the **Data Volume Overview** graph. Note that this graph only shows data when Accent is enabled.

Figure 46 Accent Node Graph



Per Partition Ingest (Chargeback)

The Per Partition Ingest (Chargeback) report displays related ingest statistics from a data source to the DXi.

Capacity data is the **UserDataSize** for each observation, and Per Partition Ingest is data coming into the DXi directly onto a partition.

You can display the data based on **Total Capacity** and **Total Ingest** for the DXi (see Figure 47 and Figure 48) or on a per partition basis (capacity and ingest) for each partition on the DXi (see Figure 49 and Figure 50).

When working with graphs, you can remove a zoom selection (before applying it) by clicking **Clear** (see Figure 63).

A partition refers to a container of data on a DXi. Where not specified, it could refer to either:

- VTL partition
- Cartridge based replication partition

When viewing chargeback data, keep the following in mind:

- All reported statistics are for your selected Advanced Reporting timeframe.
- The numbers are subject to timing. Chargeback is reported by the DXi in one or five minute intervals; hence, the display will always lag by at least by one or five minutes. Hold the cursor over the graph to see a tooltip describing how timing can affect data in the graph.
- Changes in rounding and granularity can cause small differences in the values displayed in the GUI, graph summaries and CSV output. There may also be small differences in graph summary values as the time granularity is changed. This is normal behavior.
- The DXi Advanced Reporting 2.3.1 software accepts and retains values for 256 ingest partitions. Any statistics for partitions beyond this maximum will be ignored. When this maximum has been exceeded, a one time per boot log message is displayed.
- Chargeback is not meant to be used for short time intervals. Because of the way the statistics are estimated, chargeback yields the best results when the time span is greater than 7 days.

Capacity Graphs

For Capacity, the graphs display **User Data Size: first**, **last**, and **delta** (first and last data points and the delta between them).

The Capacity report shows the **User Data Size** over each minute of the selected timeframe.

Capacity in the last minute of the graph corresponds to the **UserDataSize** value in the Exported CSV file.

Figure 47 Total Capacity

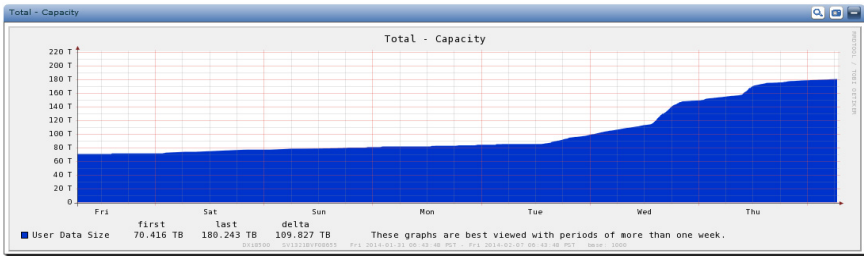
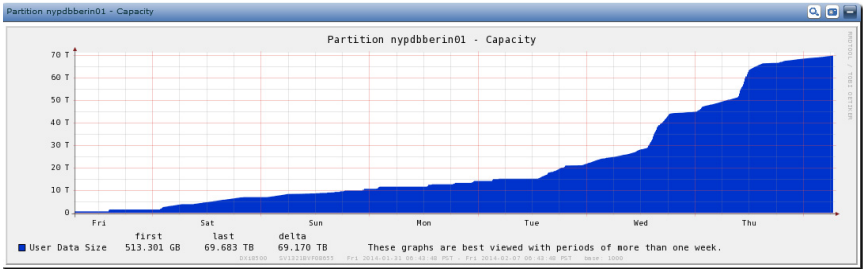


Figure 48 Partition Capacity



Ingest Graphs

For Ingest, the graphs display, **InputBytes** (dark blue), **UniqueBytesPreCompression** (green), and **UniqueBytesPostCompression** (blue-green).

On a partition basis, the data shown is data ingested prior to reduction or compression (**InputBytes**), data after deduplication (**UniqueBytesPreCompression**), and data after compression and deduplication (**UniqueBytesPostCompression**).

Ingest totals in the legend of the graphs correspond to the values with the same names in the Exported CSV file.

Figure 49 Total Ingest

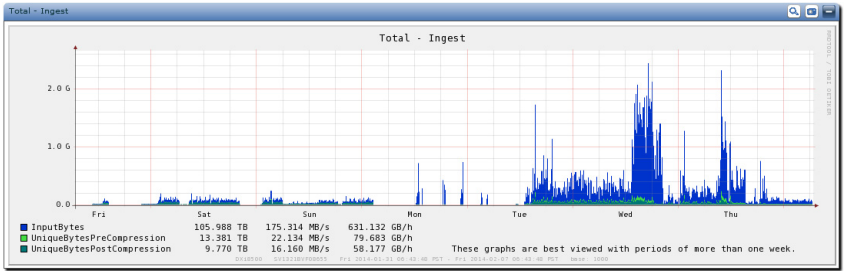
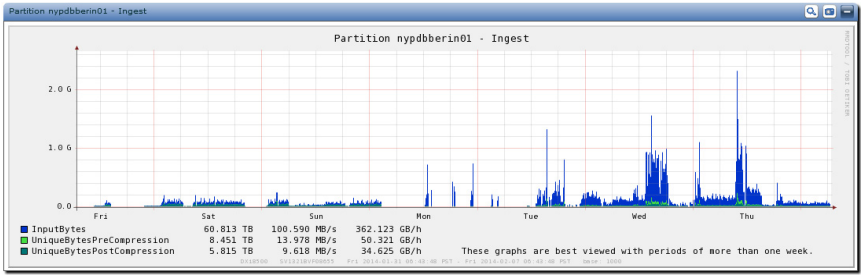


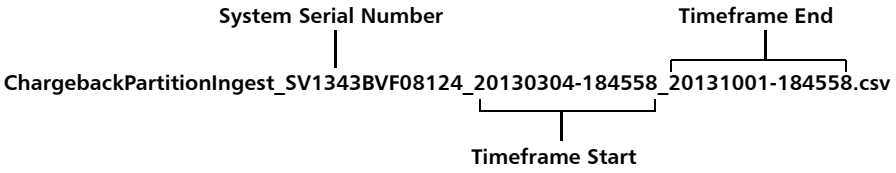
Figure 50 Partition Ingest



Export Ingest Chargeback

To export the ingest chargeback calculations to a CSV file, select **Per Partition Ingest > Export Partition Chargeback** on the **Reports** drop-down menu. The Chargeback Ingest CSV filename is an aggregate of the **SystemSerialNumber** and the **Start** and **End** times of the selected timeframe (see Figure 51).

Figure 51 Chargeback Ingest CSV Filename



Note: The deduplication ratio per partition is based on the average total reduction of all data ingested during the timeframe against all the data stored on the DXi. Because it is an average, the accuracy will increase as the timeframe increases. The average is based on 1 minute measures throughout the timeframe; 1 hour will contain 60 observations and 1 day will contain 1440 observations. The more observations with data during the timeframe the better the statistical accuracy. Also, if two partitions have a large amount of similar data, the first partition to ingest it will have a lower deduplication ratio because all deduplicated data resides in the same blockpool.

The ingest chargeback CSV file contains the following:

Table 5 Ingest Chargeback CSV File Fields

Field	Description
Hostname	System hostname.
SystemSerialNumber	System Serial Number.
Start	The start time of the timeframe selected.
End	The end time of the timeframe selected.
Name	VTL partition names configured in the DXi as shown in the DXi GUI for the ingest CSV. Partition replicated to the target DXi. **Note:** An entry with a **P_** prefix is a VTL partition; an entry with a **S_** prefix is a NAS or OST share.

Field	Description
UserDataSize	**UserDataSize** represents the amount of user data at the end of the selected timeframe. This is for the share or partition and represents the sum of the file sizes in the share/partition prior to data reduction. For replication target the value also includes the size of the replication copies in the share.
UserDataSizeAvg	**UserDataSizeAvg** is a calculated value determined by dividing the sum of all observed **UserDataSize** by the number of observations for the period.
UserDataSizeMax	**UserDataSizeMax** is the maximum observation of **UserDataSize** in the selected timeframe.
InputBytes	**InputBytes** is the size of the data as it arrives at the DXi during the selected timeframe. **Note:** This is only ingested data and does not take into account deletes. Appears on the share ingest graph.
UniqueBytesPreCompression	**UniqueBytesPreCompression** is the total amount of data ingested after deduplication only during the selected timeframe. **Note:** This is only ingested data and does not take into account deletes.
UniqueBytesPostCompression	**UniqueBytesPostCompression** is the total amount of data after total reduction during the selected timeframe. **Note:** This is only ingested data and does not take into account deletes.
ReductionRatio	**ReductionRatio** is a calculated value determined by dividing the sum of all observed **UserData** by the sum of all **UniqueBytesPostCompression**.
DedupRatio	**DepupRation** is a calculated value determined by dividing the sum of all observed **UserData** by the sum of all **UniqueBytesPreCompression**.
CompressionRatio	**CompressionRatio** is a calculated value determined by dividing **ReductionRatio** by **DedupRatio**.
OnDisk	**OnDisk** reflects the effective disk usage at the end of the selected timeframe.
OnDiskAvg	**OnDiskAvg** is the average data **OnDisk** during the selected timeframe.
PercentOfTotalCapacity	The percent of the total capacity the data **OnDisk** is using for the selected timeframe.

Per Share Ingest (Chargeback)

The Per Share Ingest (Chargeback) report displays related ingest statistics from a data source to the DXi.

Capacity data is the **UserDataSize** for each observation, and Per Share Ingest is data coming into the DXi directly onto a share.

You can display the data based on **Total Capacity** and **Total Ingest** for the DXi (see Figure 52 and Figure 54) or on a per share basis (capacity and ingest) for each share on the DXi (see Figure 53 and Figure 55).

When working with graphs, you can remove a zoom selection (before applying it) by clicking **Clear** (see Figure 63).

A share refers to a container of data on a DXi. Where not specified, it could refer to any of:

- CIFS share
- NFS share
- OST (the container is the storage server)
- Directory/File based replication target share
- Replication snapshots on a target

When viewing chargeback data, keep the following in mind:

- All reported statistics are for your selected Advanced Reporting timeframe.
- The numbers are subject to timing. Chargeback is reported by the DXi in one or five minute intervals; hence, the display will always lag by at least by one or five minutes. Hold the cursor over the graph to see a tooltip describing how timing can affect data in the graph.
- Changes in rounding and granularity can cause small differences in the values displayed in the GUI, graph summaries and CSV output. There may also be small differences in graph summary values as the time granularity is changed. This is normal behavior.
- The DXi Advanced Reporting 2.3.1 software accepts and retains values for 256 ingest shares. Any statistics for shares beyond this maximum will be ignored. When this maximum has been exceeded, a one time per boot log message is displayed.
- Chargeback is not meant to be used for short time intervals. Because of the way the statistics are estimated, chargeback yields the best results when the time span is greater than 7 days.

Capacity Graphs

For Capacity, the graphs display **User Data Size: first**, **last**, and **delta** (first and last data points and the delta between them).

The Capacity report shows the **User Data Size** over each minute of the selected timeframe.

Capacity in the last minute of the graph corresponds to the **UserDataSize** value in the Exported CSV file.

Figure 52 Total Capacity

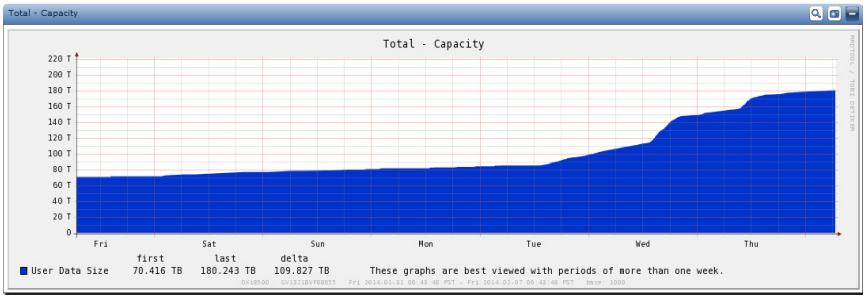
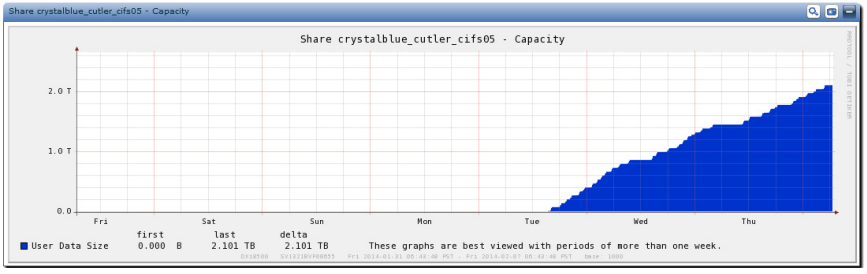


Figure 53 Share Capacity



Ingest Graphs

For Ingest, the graphs display, **InputBytes** (dark blue), **UniqueBytesPreCompression** (green), and **UniqueBytesPostCompression** (blue-green).

On a per share basis, the data shown is data ingested prior to reduction or compression (**InputBytes**), data after deduplication (**UniqueBytesPreCompression**), and data after compression and deduplication (**UniqueBytesPostCompression**).

Ingest totals in the legend of the graphs correspond to the values with the same names in the Exported CSV file.

Figure 54 Total Ingest

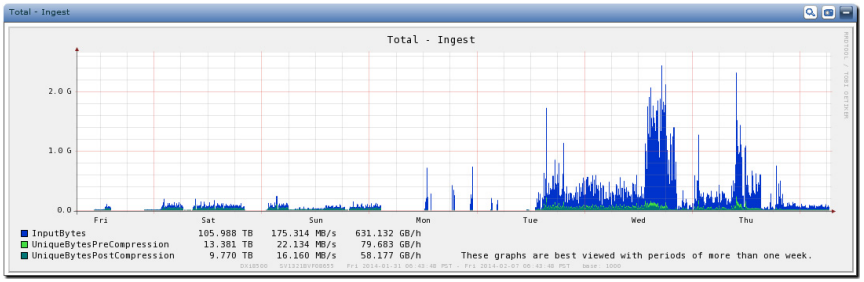
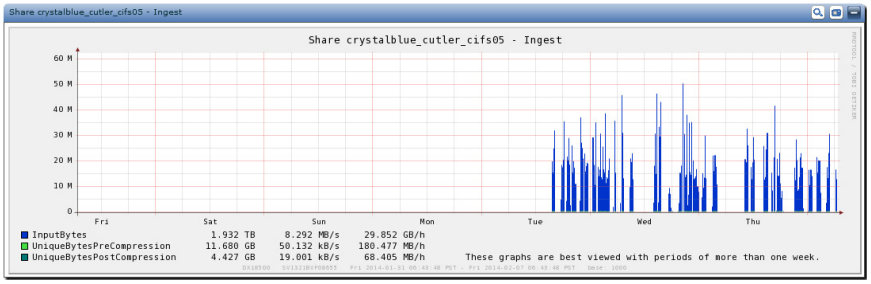


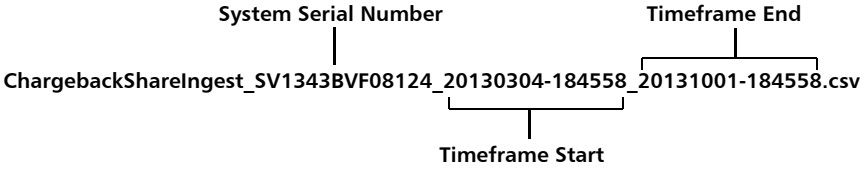
Figure 55 Share Ingest



Export Ingest Chargeback

To export the ingest chargeback calculations to a CSV file, select **Per Share Ingest > Export Share Chargeback** on the **Reports** drop-down menu. The Chargeback Ingest CSV filename is an aggregate of the **SystemSerialNumber** and the **Start** and **End** times of the selected timeframe (see Figure 56).

Figure 56 Chargeback Ingest CSV Filename



Note: The deduplication ratio per share is based on the average total reduction of all data ingested during the timeframe against all the data stored on the DXi. Because it is an average, the accuracy will increase as the timeframe increases. The average is based on 1 minute measures throughout the timeframe; 1 hour will contain 60 observations and 1 day will contain 1440 observations. The more observations with data during the timeframe the better the statistical accuracy. Also, if two shares have a large amount of similar data, the first share to ingest it will have a lower deduplication ratio because all deduplicated data resides in the same blockpool.

The ingest chargeback CSV file contains the following:

Table 6 Ingest Chargeback CSV File Fields

Field	Description
Hostname	System hostname.
SystemSerialNumber	System Serial Number.
Start	The start time of the timeframe selected.
End	The end time of the timeframe selected.
Name	NAS share names configured in the DXi as shown in the DXi GUI for the ingest CSV. Share replicated to the target DXi. **Note:** An entry with a **P_** prefix is a VTL partition; an entry with a **S_** prefix is a NAS or OST share.
UserDataSize	**UserDataSize** represents the amount of user data at the end of the selected timeframe. This is for the share or partition and represents the sum of the file sizes in the share/partition prior to data reduction. For replication target the value also includes the size of the replication copies in the share.
UserDataSizeAvg	**UserDataSizeAvg** is a calculated value determined by dividing the sum of all observed **UserDataSize** by the number of observations for the period.
UserDataSizeMax	**UserDataSizeMax** is the maximum observation of **UserDataSize** in the selected timeframe.

Field	Description
InputBytes	**InputBytes** is the size of the data as it arrives at the DXi during the selected timeframe. **Note:** This is only ingested data and does not take into account deletes. Appears on the share ingest graph.
UniqueBytesPreCompression	**UniqueBytesPreCompression** is the total amount of data ingested after deduplication only during the selected timeframe. **Note:** This is only ingested data and does not take into account deletes.
UniqueBytesPostCompression	**UniqueBytesPostCompression** is the total amount of data after total reduction during the selected timeframe. **Note:** This is only ingested data and does not take into account deletes.
ReductionRatio	**ReductionRatio** is a calculated value determined by dividing the sum of all observed **UserData** by the sum of all **UniqueBytesPostCompression**.
DedupRatio	**DepupRation** is a calculated value determined by dividing the sum of all observed **UserData** by the sum of all **UniqueBytesPreCompression**.
CompressionRatio	**CompressionRatio** is a calculated value determined by dividing **ReductionRatio** by **DedupRatio**.
OnDisk	**OnDisk** reflects the effective disk usage at the end of the selected timeframe.
OnDiskAvg	**OnDiskAvg** is the average data **OnDisk** during the selected timeframe.
PercentOfTotalCapacity	The percent of the total capacity the data **OnDisk** is using for the selected timeframe.

Replication Ingest (Chargeback)

The Replication Ingest (Chargeback) report displays related replication ingest statistics (which can include OST optimized duplication data) to the DXi. Replication Ingest is data coming into that DXi indirectly (from another DXi) through replication. Chargeback for replication tracks the data ingest, compressed, deduplicated, and protected for a share or partition that has been replicated to the DXi. **Total Capacity** and **Total Ingest** are shown for the DXi (see Figure 57 and Figure 59) or on a per share basis (capacity and ingest) (see Figure 58 and Figure 60).

When viewing chargeback data, keep the following in mind:

- All reported statistics are for your selected Advanced Reporting timeframe.
- The numbers are subject to timing. Chargeback is reported by the DXi in one or five minute intervals; hence, the display will always lag by at least by one or five minutes. If a replication starts and completes between one 5 minute reporting point and the next 5 minute reporting point, no Ingest data will show up on the graph or legend. Hold the cursor over the graph to see a tooltip describing how timing can affect data in the graph.
- Chargeback is not meant to be used on short time intervals. Because of the way the statistics are estimated, chargeback yields the best results when the time span is greater than 7 days.

When working with graphs, you can remove a zoom selection (before applying it) by clicking **Clear** (see Figure 63).

Capacity Graph

For Capacity, the graph displays **User Data Size: first**, **last**, and **delta** (first and last data points and the delta between them.)

The Capacity report shows the **User Data Size** over each minute of the selected timeframe.

Capacity in the last minute of the graph corresponds to the **UserDataSize** value in the Exported CSV file.

Figure 57 Total Capacity - Replication

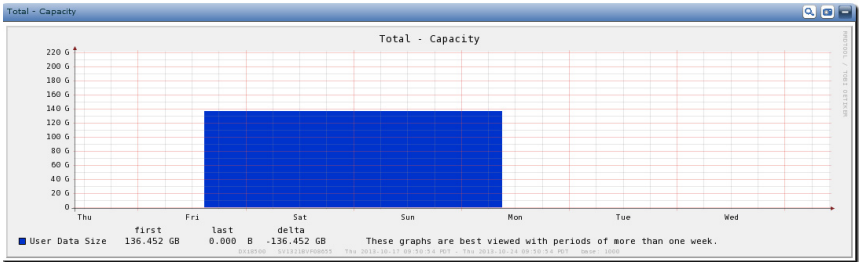
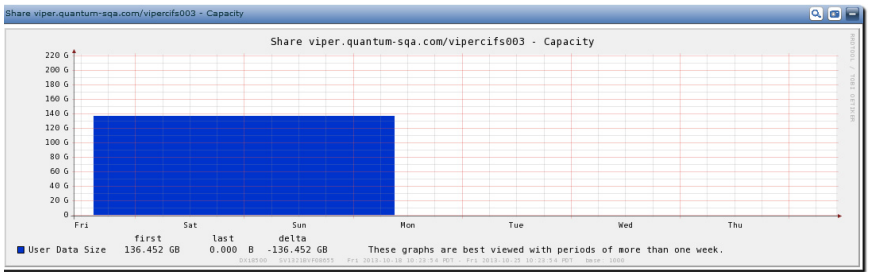


Figure 58 Share Capacity - Replication



Ingest Graph

For Ingest, the graph displays, **InputBytes** (dark blue), **UniqueBytesPreCompression** (green), and **UniqueBytesPostCompression** (blue-green).

On a per share basis, the data shown is data ingested prior to reduction or compression (**InputBytes**), data after deduplication (**UniqueBytesPreCompression**), and data after compression and deduplication (**UniqueBytesPostCompression**).

Ingest totals in the legend of the graphs correspond to the values with the same names in the Exported CSV file.

Figure 59 Total Ingest - Replication

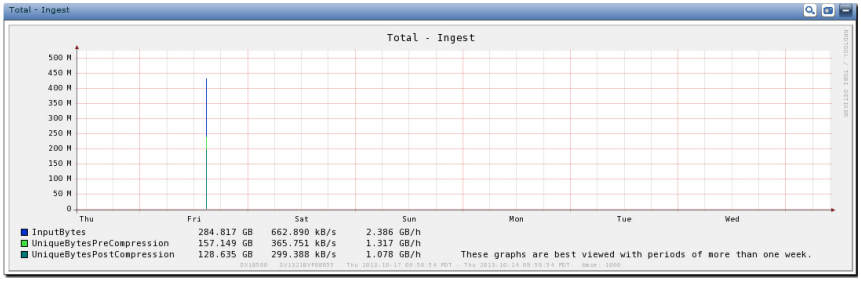
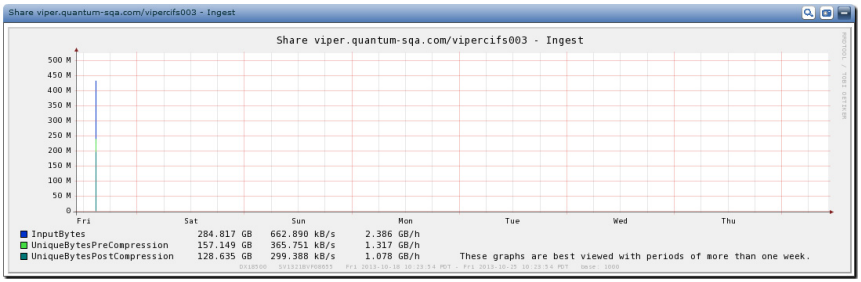


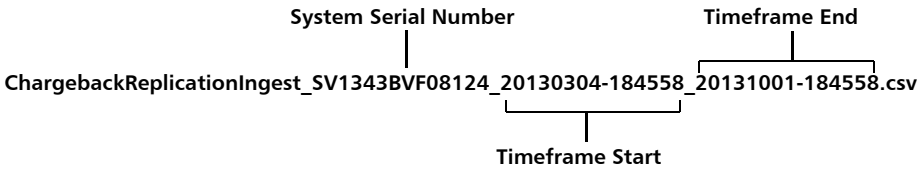
Figure 60 Share Ingest - Replication



Export Replication Chargeback

To export the replication chargeback calculations to a CSV file, select **Replication Ingest > Export Replication Chargeback** on the **Reports** drop-down menu. The Chargeback Replication CSV filename is an aggregate of the **SystemSerialNumber** and the **Start** and **End** times of the selected timeframe (see Figure 61).

Figure 61 Replication Ingest CSV Filename



Note: The deduplication ratio per share is based on the average total reduction of all data ingested during the timeframe against all the data stored on the DXi. Because it is an average, the accuracy will increase as the timeframe increases. The average is based on 1 minute measures throughout the timeframe; 1 hour will contain 60 observations and 1 day will contain 1440 observations. The more observations with data during the timeframe the better the statistical accuracy. Also, if two shares have a large amount of similar data, the first share to ingest it will have a lower deduplication ratio because all deduplicated data resides in the same blockpool.

The replication chargeback CSV file contains the following:

Table 7 Replication Chargeback CSV File Fields

Field	Description
Hostname	System hostname.
SystemSerialNumber	System Serial Number.
Start	The start time of the timeframe selected.
End	The end time of the timeframe selected.
Name	NAS share or VTL partition names configured in the DXi as shown in the DXi GUI for the ingest CSV. Share or partition replicated to the target DXi. **Note:** An entry with a **P_** prefix is a VTL partition; an entry with a **S_** prefix is a NAS or OST share.
UserDataSize	**UserDataSize** represents the amount of user data at the end of the selected timeframe. This is for the share or partition and represents the sum of the file sizes in the share/partition prior to data reduction. For replication target the value also includes the size of the replication copies in the share.
UserDataSizeAvg	**UserDataSizeAvg** is a calculated value determined by dividing the sum of all observed **UserDataSize** by the number of observations for the period.
UserDataSizeMax	**UserDataSizeMax** is the maximum observation of **UserDataSize** in the selected timeframe.
InputBytes	**InputBytes** is the size of the data as it arrives at the DXi during the selected timeframe. **Note:** This is only ingested data and does not take into account deletes. Appears on the share ingest graph.
UniqueBytesPreCompression	**UniqueBytesPreCompression** is the total amount of data ingested after deduplication only during the selected timeframe. **Note:** This is only ingested data and does not take into account deletes.
UniqueBytesPostCompression	**UniqueBytesPostCompression** is the total amount of data after total reduction during the selected timeframe. **Note:** This is only ingested data and does not take into account deletes.

Field	Description
ReductionRatio	**ReductionRatio** is a calculated value determined by dividing the sum of all observed **UserData** by the sum of all **UniqueBytesPostCompression**.
DedupRatio	**DepupRation** is a calculated value determined by dividing the sum of all observed **UserData** by the sum of all **UniqueBytesPreCompression**.
CompressionRatio	**CompressionRatio** is a calculated value determined by dividing **ReductionRatio** by **DedupRatio**.
OnDisk	**OnDisk** reflects the effective disk usage at the end of the selected timeframe.
OnDiskAvg	**OnDiskAvg** is the average data **OnDisk** during the selected timeframe.
PercentOfTotalCapacity	The percent of the total capacity the data **OnDisk** is using for the selected timeframe.

Ingest & Delete

Ingest and Delete displays three graphs:

- **Ingest & Deletions per hour**
- **Ingest & Deletions per day**
- **Ingest & Deletions per week**

All three graphs display **UniqueBytesIngest** (green) and **UniqueBytesDeleted** (blue). The **Ingest & Deletions per hour** graph is shown as a representative example or the Ingest and Delete graphs (see Figure 62).

These graphs allow you to see the amount of unique data, after compression and deduplication, that is backed up and deleted from the DXi on an hourly, daily, and weekly basis. This information can be used to determine how close to steady state, that is the balance between backup and expiration, the DXi is during the selected timeframe. Some examples:

- When the DXi is new and the expiration policies are not running on a regular basis, you will see much more data ingested than deleted.
- When the DXi is in steady state, the data deleted and ingested over the period should be about the same.

Note: The average difference between ingest and deletion over long periods of steady state will help you estimate your true data growth (or loss).

You can also use these graphs to determine how much data you are backing up to the DXi on a regular basis, which determines the overall workload you are placing upon the DXi. This gives you the total data arriving at the DXi. Compare this to the **Data Volume Overview** graph (see Figure on page 35) that shows the net (ingest minus deletions) data arrival at the DXi.

Figure 62 Ingest and Delete

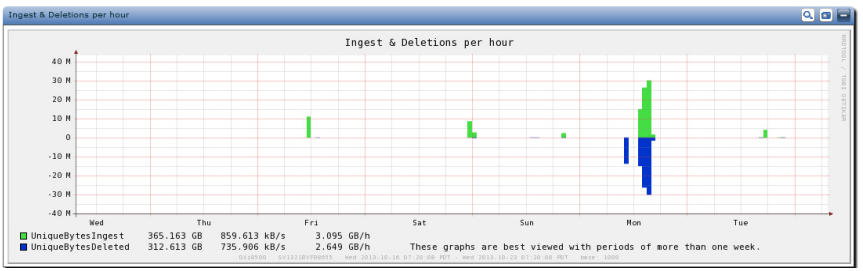
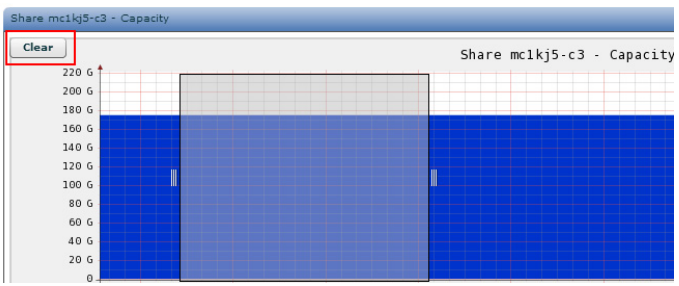


Figure 63 Clear the Graph



Space Reclamation

The **Space Reclamation** report displays information about the overall progress of space reclamation activities and also contains details about the underlying data as it is being reclaimed. This report allows you to monitor the performance of space reclamation directly, which can be used to understand if there are issues with overlapping processes or

performance issues in the RAID subsystem (file system, Fibre Channel path, etc.).

The report contains the following graphs:

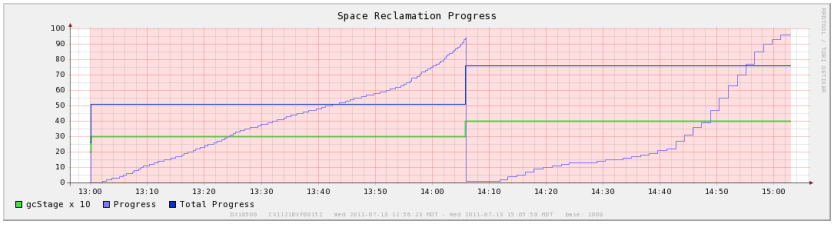
- Space Reclamation Progress
- Space Reclamation Bytes
- Space Reclamation/Compaction

Space Reclamation Progress

The **Space Reclamation Progress** graph (see Figure 64) shows the progress of each of the four space reclamation stages:

- **Stage 1** – Compact (deletes any tags with a reference count of zero). Compaction is the term used to describe the stage where data is actually deleted. This stage is in place to delete data that was identified for deletion during a previous space reclamation operation. This allows customers to cancel reclamation and recover data without running through the entire operation cycle.
- **Stage 2** – Reconcile (gets a list of tags to expire and their reference counts).
- **Stage 3** – Delete (decrements the reference count of tags that have expired).
- **Stage 4** – Compact (deletes any tags with a reference count of zero). This is the same as stage 1.

Figure 64 Space Reclamation Progress Graph



The **Space Reclamation Progress** graph provides the following data:

- The value for **gcStage x 10** (green) represents the current stage of the space reclamation activity. Space reclamation occurs in four stages. To make it easier to read the graph, the stage number is

multiplied by 10. For example, stage 2 of space reclamation appears as 20 on the graph.

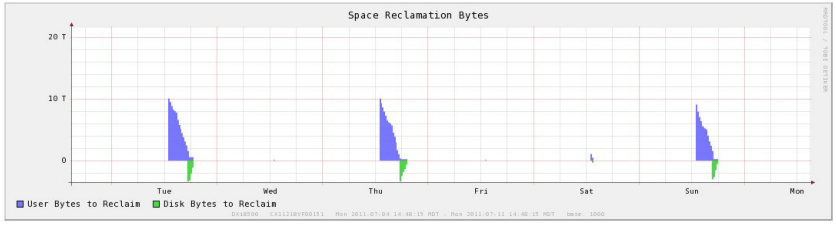
- The **Progress** (light blue) line indicates the completion status of each stage.
- The **Total Progress** (dark blue) line indicates the space reclamation percentage completed over time.

Note: In the **Space Reclamation Progress** graph, the **Progress** and **Total Progress** lines may never reach 100% because sampling is performed at specific intervals, and when reclamation completes, no additional data is returned. When the 100% complete point is reached, the process is done, and the 100% point data is not sent to be collected by DXi Advanced Reporting.

Space Reclamation Bytes

The **Space Reclamation Bytes** graph (see Figure 64) displays details about the data that is being reclaimed.

Figure 65 Space Reclamation Bytes Graph



The **Space Reclamation Bytes** graph contains the following statistics:

- The **User Bytes to Reclaim** (dark blue) variable displays the "before reduction" data being reduced over time.
- The **Disk Bytes to Reclaim** (light green) variable displays the actual space that is reclaimed during stage 4 of space reclamation.

Space Reclamation/Compaction

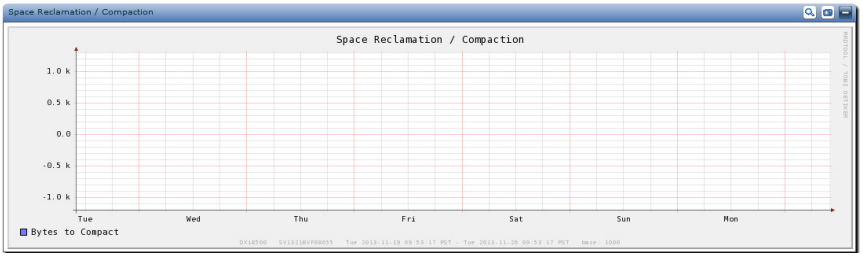
Compaction is the process that frees disk space allocated to the blockpool on the DXi. The **Space Reclamation/Compaction** graph (see

Figure 66) shows the number of bytes freed by compaction: **Bytes to Compact** (blue).

The beginning of compaction will show the total number of bytes of disk space that will be freed from the blockpool. The number of bytes will be reduced as compaction proceeds until there is no more disk space to be freed.

Note: Compaction only runs under certain circumstances, including when disk space is extremely low, so there may be long periods when no data is shown on this graph.

Figure 66 Space Reclamation/ Compaction Graph



System Load

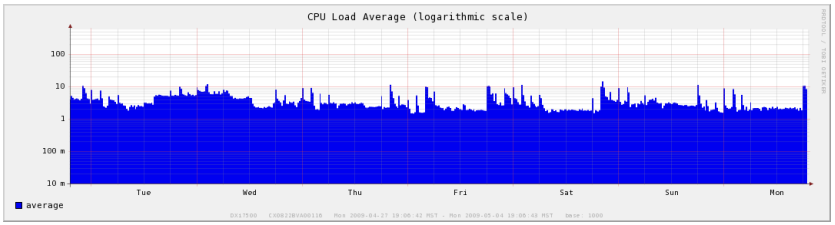
The **System Load** report displays information about the usage of CPU, disk, and I/O resources in the system. The report contains the following graphs:

- CPU Load Average
- CPU stats in %
- Ethernet Activity
- Fibre Channel Activity

CPU Load Average

The **CPU Load Average** graph (see Figure 67) displays the one minute load average for the system using a logarithmic scale.

Figure 67 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 15 on DXi systems indicates the system is busy. In this case, performance may be affected.

CPU stats in %

See CPU stats in % on page 51.

Fibre Channel Activity

See Fibre Channel Activity on page 38.

Note: Depending on the user authentication level, platform, or software version being used, this graph may not display in the **System Load** report.

Ethernet Activity

See Ethernet Activity on page 37.

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 (*bi*nary digi*t*), 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

Chargeback A method that provides the functionality to calculate the storage capacity used by each share in a DXi.

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.

Inline deduplication The removal of redundancies from data before or as it is being written to a backup device.

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.

O

OST OpenStorage (OST) technology

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 united 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.