

EMC<sup>®</sup>

# VNX Family Monitoring and Reporting

Version 2.0

## User Guide

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# PREFACE

As part of an effort to improve its product lines, EMC periodically releases revisions of its software and hardware. Therefore, some functions described in this document might not be supported by all versions of the software or hardware currently in use. The product release notes provide the most up-to-date information on product features.

Contact your EMC technical support professional if a product does not function properly or does not function as described in this document.

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## Purpose

This document describes how to configure and use the EMC® Monitoring and Reporting Suite.

## Audience

This document is intended for VNX and VNXe storage administrators and IT generalists who will be involved in managing VNX Family Monitoring and Reporting.

## Conventions used in this document

EMC uses the following conventions for special notices:



**DANGER** indicates a hazardous situation which, if not avoided, will result in death or serious injury.

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**WARNING** indicates a hazardous situation which, if not avoided, could result in death or serious injury.

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**CAUTION**, used with the safety alert symbol, indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

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**NOTICE** is used to address practices not related to personal injury.

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**Note:** A note presents information that is important, but not hazard-related.

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## **IMPORTANT**

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An important notice contains information essential to software or hardware operation.

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## **Typographical conventions**

EMC uses the following type style conventions in this document:

<b>Bold</b>	Use for names of interface elements, such as names of windows, dialog boxes, buttons, fields, tab names, key names, and menu paths (what the user specifically selects or clicks)
<i>Italic</i>	Use for full titles of publications referenced in text
Monospace	Use for: <ul style="list-style-type: none"><li>• System output, such as an error message or script</li><li>• System code</li><li>• Pathnames, filenames, prompts, and syntax</li><li>• Commands and options</li></ul>
<i>Monospace italic</i>	Use for variables.
<b>Monospace bold</b>	Use for user input.
[ ]	Square brackets enclose optional values
	Vertical bar indicates alternate selections — the bar means “or”
{ }	Braces enclose content that the user must specify, such as x or y or z
...	Ellipses indicate nonessential information omitted from the example

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**Product information** — For documentation, release notes, software updates, or information about EMC products, go to EMC Online Support at:

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**Technical support** — Go to EMC Online Support and click Service Center. You will see several options for contacting EMC Technical Support. Note that to open a service request, you must have a valid support agreement. Contact your EMC sales representative for details about obtaining a valid support agreement or with questions about your account.

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# CHAPTER 1

## Introduction

This introduction includes the following topics:

- ◆ [Summary of VNX Family Monitoring and Reporting .....](#) 8
- ◆ [Architectural Overview .....](#) 10

## Summary of VNX Family Monitoring and Reporting

EMC VNX Family Monitoring and Reporting is a software solution that extends Unisphere element manager capabilities by providing unified performance and capacity trending information of VNX and Next-Generation VNXe storage systems. This solution complements Unisphere health alerts and Unisphere Analyzer.

VNX Family Monitoring and Reporting automatically collects Block, File, and VNXe storage statistics. It also collects configuration data and stores it in a database that can be viewed through dashboards and reports. This solution can retrieve information from one or several VNX®, Next-generation VNXe®, CLARiiON®, and Celerra® storage systems qualified for support. Monitoring and Reporting is a versatile solution to help you understand storage utilization and workload patterns. It also helps with problem diagnosis, trend analysis, and capacity planning.

The VNX Family Monitoring and Reporting web portal is a comprehensive dashboard that provides multiple ways to access reports quickly and effectively using the navigation tree, search engine, global views, and drill-down facilities. For example, the **System Summary** shows the hardware model, operating environment version, system-level aggregated capacity utilization, and performance overview. Drill-down into Block storage shows lower level reports such as pools, LUNs, FAST Cache, and FAST VP. The graphical user interface allows you to filter, sort, search, and link to other views to determine the cause-and-effect relationships.

The dashboard views are categorized by key topics such as Inventory, Performance, Capacity, Situations to Watch, Top N Reports, Service Levels, and Trending and Forecasting. These views include targeted and most active reports, technical graphs and tables, visual alerts against thresholds, key performance indicators, deviation analysis, and forecasting to help you plan for future growth. All reports display the latest available collected data and historical data. Historical data is aggregated over time as it ages according to the retention policy.

VNX Family Monitoring and Reporting provides a set of preconfigured reports, known as the ReportPack. You can export reports into various formats, change the report configurations, change the dashboard views, and save reports to your favorites.

## Dashboards and Reports

VNX Family Monitoring and Reporting includes the following features:

- ◆ **Out-of-the box Dashboards** summarize information in the form of graphs, charts, and tables. Dashboards enable you to quickly pinpoint utilization and performance problems. From this top perspective, you can drill down to underlying reports to get more detailed views of a selected component. Individual users can arrange the layout of the dashboard to suit business requirements.
- ◆ **A multitude of specific reports** present information specific to one component or a group of components. The web portal provides users with several tools to refine the presented data and visualize it from different angles for better troubleshooting.

Reports can run on-demand. Report options include graphs and tables and output formats include CSV, XLS, XML, and PDF.

Built-in dashboards and reports include:

VNX Block Reports	VNX File Reports
Capacity utilization of one or multiple VNX systems	File storage capacity utilization of one or multiple VNX systems
Block services summary of one or multiple VNX systems	File services summary of one or multiple VNX systems
SP utilization and performance	(File) Storage pool capacity
Cache performance	File system capacity, including snapshot utilization and compress/deduplication savings
FAST Cache performance	File system capacity forecast
FAST VP performance by tier	DataMover CPU utilization and performance (CIFS/NFS)
Storage pool capacity and performance, including thin oversubscription	DataMover file system capacity, including snapshot utilization and compress/deduplication savings
RAID group capacity and performance	VDM file system capacity, including snapshot utilization and compress/deduplication savings
LUN capacity and performance	Top N users performance (DataMover, CIFS/NFS)
Disk capacity and performance	Top N file systems performance (DataMover)
Port utilization and performance	Replication session (DataMover, VDM)
Top N active hot spots	
Performance baseline deviation	
Compressed LUNs Summary	
SnapShots Summary	

For a summary of VNXe reports, refer to [Appendix A](#).

## Database and Analytics

As hundreds of raw metrics are collected from storage systems and stored in the database for aggregation, normalization, and correlation, Monitoring and Reporting continuously processes the data to perform statistical analysis and evaluate pre-configured KPI thresholds as Block, File, and VNXe metrics are collected.

## Administration

The **Administration** area is where the Monitoring and Reporting administrator manages day-to-day tasks from a simple web interface. This allows you to manage user roles and profiles, monitor the health of the Monitoring and Reporting server, see the status of servers, execute tasks, configure Alerts and Chargeback, and perform install and upgrade operations.

## Architectural Overview

The Monitoring and Reporting architecture includes the following components:

The Data Collector	Collects data, in an agentless way, from one of multiple systems.
The Data Repository	Stores the data collected from the data sources. The database module is self-maintaining and provides multiple automations. For example, data aggregation is performed for report acceleration and data retention is managed for storage optimization.
The Web Portal	Displays operations, engineering, and management dashboards to users. Users have multiple ways to access information quickly and efficiently using a navigation tree, search engine, report wizard, or drill-down facilities.

Please refer to [Appendix B, “Communication Ports,”](#) for the list of ports used by the application.

# CHAPTER 2

## Installing

This chapter discusses information and procedures for the following topics:

- ◆ Environment and system requirements ..... 12
- ◆ Windows Installation..... 13
- ◆ Linux Installation ..... 13
- ◆ System start..... 15
- ◆ Uninstalling ..... 16
- ◆ Upgrading..... 16

## Environment and system requirements

The host system on which VNX Family Monitoring and Reporting is installed must meet the minimum requirements outlined in the following sections.

### Host system requirements

The VNX Family Monitoring and Reporting software must be installed on a Windows Server 2008 R2, Windows Server 2012, or a Linux (RedHat or CentOS) dedicated server. The operating system should be the latest version recommended by the vendor.

Navisecli must be installed on the VNX Family Monitoring and Reporting host system for VNX systems as Navisecli commands are used to communicate with the storage array. EMC recommends installing the latest version of Navisecli for the latest storage system model which you are monitoring with Monitoring and Reporting. For more information on Navisecli and operating environment compatibility, refer to the release notes for your storage system or the E-Lab Interoperability Matrix on EMC Online Support.

The host system must meet the following hardware requirements:

1 system	2 CPU cores, 8GB RAM, 200GB of disk space.
2-3 systems	4 CPU cores, 16 GB RAM, 400 GB of disk space.
Up to 10 systems	8 CPU cores, 32 GB RAM, 600 GB of disk space.

Monitoring and Reporting can run as a guest VM in a virtualized environment.

### Browser Requirements

The VNX Family Monitoring and Reporting web portal is compatible with the following browsers:

- ◆ Internet Explorer 9 and 10
- ◆ Firefox (latest)
- ◆ Chrome (latest)
- ◆ Safari 5.1.1 or later

### Supported Platforms

VNX Family Monitoring and Reporting is compatible with array products listed in the following table:

Model	Operating Environment
VNXe 3200	VNXe OE 3.0
VNX 5200, 5400, 5600, 5800, 7600, 8000	OE for File 8.1 OE for Block 5.33
VNX 5100, 5300, 5500, 5700, 7500	OE for File 7.0, 7.1 OE for Block 5.31, 5.32

Model	Operating Environment
VNX Gateways VG10, VG50	OE for File 8.1
VNX Gateways VG2, VG8	OE for File 7.0, 7.1
CLARiiON CX4-120, CX4-240, CX4-480, CX4-960	FLARE OE 4.30
Celerra NX4, NS-120, NS-480, NS-960	DART OE 5.6, 6.0

## Windows Installation

### To install Monitoring and Reporting on Windows:

1. Double-click the install icon.
2. On the Welcome screen, click Next.
3. Read the license agreement and click **I Agree**.
4. Confirm the default location of the program files or click Browse to choose a different location.
5. When the installation completes successfully, click **Next**.
6. Click **Finish** to close the set up wizard and to launch Monitoring and Reporting.

## Linux Installation

### To install Monitoring and Reporting on Linux:

1. Open a terminal session with the root user on your server.
2. Locate the installation package you downloaded.
3. Change the permissions of the installer so you can execute it. This example is for Linux 64 bit:

```
# chmod +x setup-linux-x86_64-v20.sh
```
4. Run the script:

```
# ./setup-linux-x86_64-v20.sh
```
5. Read the EULA and press **y** to accept it. To scroll through the EULA, use the space bar.
6. Press **Enter** to accept the default directory or enter another location and **y** to confirm.

```
Enter the installation directory [/opt/VNX]:
```
7. Press **Enter** to accept the default account name or enter another one if you prefer.

```
Enter the user account we should create and use [vnx]:
```
8. Press **Enter** to accept the default location of service scripts or enter another location.

```
Enter the service scripts directory [/etc/init.d]:
```
9. Press **Enter** to accept the default location of runlevels scripts or enter another location.

```
Enter the runlevels base directory (containing rc[0-6].d/) [/etc]:
```

10. After the installation completes, read the Readme.

## Configuring the user process limits for Linux

For large deployments, increase the user process limits for the Monitoring and Reporting user account to a maximum of 65534. This modification enables Monitoring and Reporting services to open 65534 files and 65534 processes when needed.

1. Open a terminal session with the root user on your server.
2. Open the `/etc/security/limits.conf` file.
3. Add the following lines for the Monitoring and Reporting user (vnx or another name):

```
vnx hard nofile 65534
vnx soft nofile 65534
vnx hard nproc 65534
vnx soft nproc 65534
```

4. Save the file.
5. Type the following commands from the `/bin` directory of the installation to restart Monitoring and Reporting services (for example, from the `/opt/VNX/bin` directory):

```
./manage-modules.sh service stop all
./manage-modules.sh service start all
```

5. Issue the following command to verify the changes:

```
# su vnx -c 'ulimit -n -u'
```

## System start

At the end of the installation process, system services are started and your default browser is opened to the URL where you can start configuring your system for data collection.

If you installed VNX Family Monitoring and Reporting on a Linux server, your browser will not open automatically. Point your browser to `http://<server-name>:58080/VNX-Config` to access the configuration page, replacing `<server-name>` with the name or IP address of the server where you installed the software. Monitoring and Reporting is a web application. You can access the web portal from systems on the network that can communicate with the Monitoring and Reporting server at this URL: `http://<server-name>:58080/VNX-MR`.

### **IMPORTANT**

---

The first time you log in, the default user name is *admin* and the default password is *changeme*.

---

See [Chapter 3, “Administration tasks,”](#) for detailed information on how to configure and troubleshoot your system.

## Uninstalling

### To uninstall Monitoring and Reporting for Windows:

1. Go to **Start > Control Panel > Uninstall a program**.
2. Double-click on the program icon. Proceed through the uninstall wizard.

### To uninstall Monitoring and Reporting for Linux:

1. Go to the executable directory
 

```
cd /opt/VNX/bin:
```
2. Stop services
 

```
./manage-modules.sh service stop all
```
3. Remove services
 

```
./manage-modules.sh service remove all
```
4. Remove the distribution
 

```
cd /opt
rm -Rf VNX
```

## Upgrading

### Version 1.x to 2.x

There are two different methods of upgrading from a 1.x to 2.x version of Monitoring and Reporting: **“In-place upgrade”** and **“Fresh Installation”** (on a new host system). Select the method that best suits your needs.

---

**Note:** Chargeback will need to be reconfigured when upgrading to 2.x through either method.

---

#### In-place upgrade

The in-place upgrade for 1.x to 2.x versions of Monitoring and Reporting will preserve custom configuration settings including system settings, alerts, users, and scheduled reports, but will not preserve historical data collected by the 1.x version of Monitoring and Reporting.

1. Download Monitoring and Reporting for the VNX Family 2.0 from EMC Online Support.
2. Follow the procedures for installation for your host system, as described in **“Windows Installation”** or **“Linux Installation”**.
3. Reconfigure Chargeback, if previously set up on the 1.x instance.

**IMPORTANT**

Historical data from 1.x will be preserved on the 1.x host system in the following location: `Databases/MySQL/Default/data/apg_bak`. This data will not be fully readable by the 2.x instance of Monitoring and Reporting, but can be later moved to and accessed by a host system running Monitoring and Reporting 1.x. As this folder can take up considerable file space, it is recommended that you remove or archive this folder if you do an in-place upgrade to 2.x.

## Fresh Installation

Fresh installation of Monitoring and Reporting 2.x will require a separate host system from that which is running Monitoring and Reporting 1.x. Running Monitoring and Reporting 1.x and 2.x on two separate systems is recommended if you need to preserve and access historical data from 1.x. You can discontinue use of the first host running 1.x once the 2.x instance has collected sufficient historical data for your system(s).

1. On the 1.x host system, stop the VNX Collector service. Leave all other services running.
2. On a new system, download Monitoring and Reporting 2.x from EMC Online Support.
3. Follow the procedures for installation for your host system, as described in [“Windows Installation”](#) or [“Linux Installation”](#).
4. Reconfigure all previously customized settings, including system settings, alerts, user settings, Chargeback, and scheduled reports.

## Version 1.x to 1.x and 2.x to 2.x

To upgrade Monitoring and Reporting, follow the same procedure used for installation. The system will automatically recognize that a previous version of Monitoring and Reporting is already installed and will proceed in Upgrade Mode.

**Note:** After an upgrade, you will need to use the default credentials, user name *admin* and password *changeme*, when you initially log in.



# CHAPTER 3

## Administration tasks

This chapter discusses administration tasks including:

- ◆ [About Home Page](#) ..... 20
- ◆ [Managing licenses](#) ..... 21
- ◆ [Managing User Accounts](#) ..... 22
- ◆ [Viewing Storage Systems](#) ..... 23
- ◆ [Adding/Editing a System](#)..... 23
- ◆ [Alerting](#)..... 25
- ◆ [Data Enrichment](#) ..... 28
- ◆ [Backing up your system](#) ..... 32
- ◆ [Retention parameters](#)..... 33

These functions are available only to the VNX Family Monitoring and Reporting administrator

## About Home Page

The home page is where you conduct certain administrative tasks related to your VNX Family Monitoring and Reporting software solution. These tasks include adding and managing systems and licenses, configuring global mail settings, and starting/stopping services. The home page shows the server system resource utilization, database storage utilization, and status of services that are performing various Monitoring and Reporting tasks.

The screenshot displays the home page of the VNX Family Monitoring and Reporting software. The top navigation bar includes 'Welcome (logged as admin)', 'VNX Family - Monitoring and Reporting', and the date 'Tuesday, May 27, 2014'. The left sidebar contains navigation options: Home, Licenses, Systems (with 'Add New' and 'VNX5200' sub-items), and a 'Retrieve Diagnostic Files' button at the bottom.

The main content area is divided into several sections:

- System Resource Utilization:** A summary of system resources including CPU (8 processor(s) available, load average: -1.0), Memory (JVM: 82 MB in use out of 3,640 MB available; System: 4,349 MB in use out of 12,287 MB available), and Virtual Machine (Java HotSpot(TM) 64-Bit Server VM, Sun Microsystems Inc. v20.45-b01).
- Database Storage Utilization:** A pie chart showing storage usage for different categories: master (1.6 M), main (0.8 M), performan, events (0.1), and other (62.9 G).
- VNX Family Monitoring and Reporting Services:** A table listing the status of various services.

Module	Version	Status	Since
Alerting	3.6u1	started	May 27, 2014 1:15:25 PM
Backend	5.6u1	started	May 27, 2014 1:15:25 PM
Collecting	5.4	started	May 27, 2014 1:19:51 PM
Database	5.5u2	started	-
Event Processing	1.3	started	May 27, 2014 1:17:14 PM
Gateway	1.2	started	May 27, 2014 1:15:25 PM
Scheduler	1.4u1	started	May 27, 2014 1:15:25 PM
Topology	1.0u2	started	May 27, 2014 1:15:25 PM
Topology Mapping	1.0u2	started	May 27, 2014 1:16:44 PM
Web Portal	6.0u37	started	May 27, 2014 1:15:25 PM

Showing 1 to 10 of 10 entries

The navigation on the left allows you to quickly go to the page dedicated to the specific action.

Home	View system status, system storage consumption, and service statuses. From the service section, you can click a given service to start or stop it.
Licenses	Request permanent licenses, install and delete licenses.
Systems	List configured systems with their main properties. From this section, you can click on a given system to edit it.
Add New	Create a new system entry and open the corresponding configuration page.

The home page also shows data storage usage and allows you to control the services required to operate the application. The following table lists the system services and their functions.

Alerting	Controls alert services
Backend	Receives raw data from the collection service and prepares data to be stored in the database.
Collecting	Controls data collection.
Database	Database service.
Event Processing	Receives raw data from collectors and computes TopN aggregates.
Gateway	Communication gateway for Monitoring and Reporting services.
Scheduler	Used to control processes that need to be run on a regular schedule.
Web Portal	Web container hosting the user interface.

## Managing licenses

When you first install Monitoring and Reporting software, temporary licenses allow you to work for 90 days. During this period, you must request permanent licenses and install them for continuous monitoring and reporting of your storage systems.

From the management page, click **Licenses** on the navigation tree to access licensing options.

From the licensing page, you can **Request Permanent Licenses**, **Upload Licenses** that you have received, see which licenses are installed, and **Delete** licenses if needed. The search box allows you to look for specific words in the license names or descriptions.

---

### To add a license

1. Click **Upload licenses**.
2. Browse and select the zip file that you have received from EMC.
3. Click **Ok**.

---

### To delete a license

1. Click the corresponding checkbox to select the license, or use **All / Invert / None** to refine your selection.
2. Click **Delete**.

## Managing User Accounts

VNX Family Monitoring and Reporting allows the creation of up to nine user accounts in addition to the default admin account, for a maximum of up to 10 users. Simultaneous user connections are unlimited.

There are two types of users: Normal User and Global Administrator. There can be only one Global Administrator for each Monitoring and Reporting license. The Global Administrator role is the default role created when you install Monitoring and Reporting. The administrator can create and manage other users.

---

### Adding a new user

1. To add a new user, navigate to the **Administration** page and click **Users**.
2. Click **New User**.
3. Enter the required **User Data** fields. Note that **Title**, **First Name**, **Last Name**, and **Email Address** are optional fields. In order for a user to receive automated emails from Monitoring and Reporting, such as Schedule Reports, the **Email Address** field must be complete.

---

### Edit an existing user

1. To edit an existing user, click on the user in the users list.
2. Click **Edit**.
3. From the **User Modification** page, edit the **User Data** fields.

Additional User Account Management tasks are described in [Table 1, “User Account Management Tasks”](#).

**Table 1** User Account Management Tasks

User Management Task	Description
<b>Edit</b>	Edit User Data.
<b>Copy</b>	Copy a user to a new row. You will be required to enter the User Data.
<b>Test User</b>	Test and preview user settings by logging in as if you were that user.
<b>Disable</b>	Disable a user. Disabled users cannot log into the system.
<b>Delete</b>	Delete the user.

### IMPORTANT

To reset user passwords, follow the instructions in [“Edit an existing user”](#) to update the password fields under **User Data**.

---

## Viewing Storage Systems

The **Systems** section presents you with a global picture of the storage systems that are monitored by your application. Each defined system will have its entry in this table.

Click on a system to view detailed information or edit a system's characteristics. The **Add a New System** button on the Registered Systems page or the **Add New** option of the navigation tree will open an empty configuration page where you can define a new system.

## Adding/Editing a System

The **Adding a System** and **Editing a System** pages are where you specify the information required in order for Monitoring and Reporting to access your storage systems. You need to specify a unique name that will be used to identify this storage system and the type of data collection - Integrated Unified, Unified, Block-only or File-only - that should be applied to this unit. For Gateway systems, the data collection type should be File. Unified data only applies to integrated VNX systems that contain both block storage (SAN) and file storage (NAS) hardware components. Integrated Unified systems applies only to Next-Generation VNXe systems (VNXe3200). Mandatory fields are indicated with a red asterisk. Supported legacy CLARiiON CX4 and Celerra NS systems can also be added from this screen.

Note that it can take a few minutes before you can see information from a newly added system in the reporting portal. The software needs to poll the new system at least once to add metric information to the database.

When adding a system to Monitoring and Reporting, a Block or VNXe user account with the role of *Operator* is required to collect the configured Block data. A File local user account (such as *nasadmin*) is required to collect the configured File data. The selected user must be able to connect to the system using ssh for the collection mechanism to work, using group (role) administrator, fullnas, root, or storage. The VNX or CLARiiON array must be configured with "Statistics logging" enabled in order to provide all metrics to VNX Monitoring and Reporting.

### Block Collecting Information:

SP A/B IP	The IP address of each storage processor (A and B).
User Scope	Authentication scope. Global, local or LDAP.
Navisecli Username	Username to be used to connect to Unisphere.
Navisecli Password	Password to be used to connect to Unisphere.

### File Collecting Information:

Control station IP	The IP address of the Control Station.
Username	Username to be used to connect to the Control Station.
Password	Password to connect to the Control Station.

## VNXe Collecting Information

Host	The IP address used to reach the VNXe server.
Username	VNXe username.
Password	VNXe password.

## Registered Systems Page

The **Registered Systems** page allows you edit the Navisecli path and edit the polling intervals for both capacity and performance metrics (in milliseconds). The polling interval determines how often Monitoring and Reporting queries the storage systems for updated metrics. You can also **Add a New System** from this page, and manually refresh the data using the Retrieve missing information button.

**Registered Systems** + Add a New System

*i* This lists the systems that have been registered. You can register a maximum of 10 systems.

⌂ Retrieve missing information

System Name	Serial Number	Model	Data Collection
VNX5200	FNM00133600450	VNX5200	unified

*i* Manage the configuration for VNX data collection.

\* Navisecli path  ?

\* Capacity polling period  ?

\* Performance polling period  ?

Save and Apply

## Configuring Mail

VNX Family Monitoring and Reporting offers the option of emailing reports and alerts to users. This requires configuration of a valid SMTP (mail) server.

1. In the main configuration page, click the **Global Settings** button.
2. In the **SMTP Host** box, enter the name or IP address of the mail server. This may require the help of your local system administrator, especially if the default port 25 does not work or if the mail server requires a specific authentication scheme.

### IMPORTANT

In order to receive emails, user profiles must include a valid email address.

# Alerting

There are a variety of predefined alerts, which you can configure to trigger based on when certain performance thresholds are violated. You can also configure the alerts to trigger for only certain components, such as specific LUNs or SPs. Alerts are sent to Monitoring and Reporting users by email or captured by SNMP trap.

For example, for the LUN Response Time alert, you can set up an alert to trigger whenever a LUN response time is greater than 1 millisecond. Although the alerts are pre-defined, the threshold value and operator are set by the user. You can further configure this alert to trigger only when this threshold is surpassed for specific LUNs on specific systems.

There are five main components to configuring alerts: **Configurable Data Filtering**, where you can apply the alert to only certain components, **Constant Comparator Operation**, where the threshold condition is configured, **Mail Action**, where the email action is configured, **SNMP v1Trap: SNMP Trap - Set**, where the SNMP trap information is set, and **SNMP v1 Trap: SNMP Trap - Clear**, where the SNMP information is re-entered in order to clear the trap when the alert condition is no long occurring.

**Note:** Monitoring and Reporting does not support customization of community strings. The community string is enforced as “default”.

## IMPORTANT

In order to receive email alerts, you must have email configured. Refer to [“Registered Systems Page”](#) for more information.

---

## Enabling Alerts

1. Go to the **Administration** page.
2. Select **Alerting** under **Modules > Miscellaneous**. A new browser window will appear.
3. Click **Alert definitions** in the menu tree on the left, or click **Local Manager** in the central pane.
4. Click directly on the row for the alert and select **Enable**. You will see an *Operation Successful* pop-up message when the alert has been enabled.

You will also notice that when clicking on the alert again, the **Enable** option will be replaced by the **Disable** option.

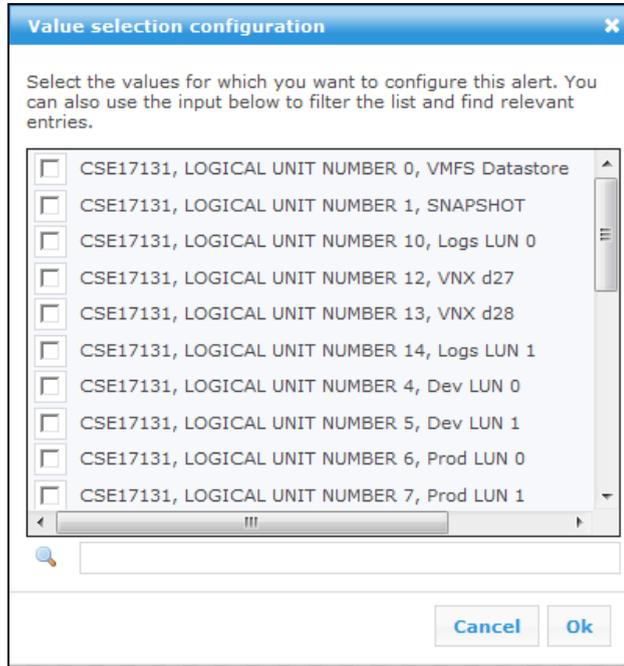
---

## Configuring Alerts

1. Click on the alert name on the Alert Definitions page and select **Configure**. You can also click on the alert name in the alert tree to go to the configuration page for that alert.
2. In the **Configurable Data Filtering** section, you can enter the specific components to which to apply the alert threshold.
  - a. To apply the an alert to all components, leave the **Selection** drop-down option set to **all**.

- b. To apply the alert to only certain components, set the **Selection** drop-down to **some**. Click the **Add values** button. A pop up window will appear, displaying all components to which you can apply the alert. Use the checkboxes to select the components and click **Ok**. This window also has a search bar which enables you to search for your components more quickly.

For example, for the LUN Response Time alert, you can select which LUNs to which you want to apply the alert.



- 3. In the **Constant Comparator Operation** section, enter the **Constant value** of the threshold condition and the **Operator**. For the list of available operators, refer to [Table 2, “Available Operators,”](#). For the list of constant value units for each alert, refer to [Table 3, “Alert Constant Value Units,”](#).

**Table 2 Available Operators**

Operator	Description
<	Less than
<=	Less than or equal to
=	Equal to
>	Greater than
>=	Greater than or equal to
!=	Not equal to

- 4. In the **Mail Action** section, enter the email address of the user(s) to whom the alert should be sent. Recipient email addresses should be separated by a comma.

5. In the **SNMP v1 Trap: SNMP Trap - Set** section, enter the **Host** IP address and **Port** for the SNMP Trap.
6. In the **SNMP v1 Trap: SNMP Trap - Clear** section, reenter the **Host** IP address and **Port**. This will clear the trap when the alert condition is no longer being met.
7. Click **Save**.

### **IMPORTANT**

Generally, you should not change the default **Message** template for the Alert emails. The contents of the message are designed to tell you exactly where the alert condition has been violated and the actual value which triggered the alert. For information on how to reset the Alert email message, refer to [“Resetting the Alert email text” on page 49](#).

---

## Available Alerts

**Table 3** Alert Constant Value Units

Alert Name	Unit
Data Mover Processor Utilization	%
File System Percent Subscribed	%
LUN Response Time	milliseconds
Storage Pool Percent Subscribed	%
Storage Processor Dirty Pages Utilization	%
Storage Processor Utilization	%

## Data Enrichment

Data Enrichment allows you to add metadata to the metrics collected by Monitoring and Reporting in order to enhance, or enrich, the data. Data Enrichment is located on the **Administration** page under **Centralized Management**.

## Chargeback

Chargeback is a feature which uses Data Enrichment to determine the data cost-of-service of a business unit or application and displays it in the form of Chargeback Reports. There are two main components to configuring Chargeback: **Business Unit** and **Cost**. You can associate particular LUNs on an array with a business unit, application, and application owner. You then assign a cost value per gigabyte used for LUNs belonging to a certain RAID type and tier. Optionally, you can also specify cost per LUNs of a certain RAID type and tier on a specific array model. Chargeback will apply this cost to each gigabyte of data used by a LUN that meets the criteria you have defined for each business unit.

For example, logical unit number (LUN) 0 can be associated with the Development Business Unit. In the Cost section, you can configure any LUNs on a VNX5700 array with a RAID5 RAID Type which are part of the Performance Tier to incur a cost of \$3.14 per GB used. If LUN 0 is a RAID5 LUN on the Performance tier on a VNX5700 array, the cost-of-service of the Development Business Unit will be \$3.14 per GB used. The Chargeback Reports display the cost of service over time.

Multiple LUNs can be associated with a single business unit. Chargeback reports calculate the total cost-of-service of each business unit. For example, if a business unit is configured to have multiple LUNs, the cost per GB of each of those LUNs will be added to the total cost of service of the business unit.

You can also associate mixed LUNs with a particular business unit. Chargeback will calculate cost based on the percentage of storage allocated for that LUN by tier and RAID type.

There are several Chargeback reports which represent cost-of-service. These include **Top 10 Applications by Cost**, **Top 10 Applications by capacity**, **Cost distribution by business unit**, **Cost per Business Unit**, and **Cost per Business Unit and Application**.

To add a new Business Unit or Application to Chargeback:

1. Go to the **Administration** page.
2. Select **Data Enrichment** under **Centralized Management**.
3. Click **localhost :: Default :: Data-Enrichment** from the navigation tree on the left.
4. Expand the **Business Unit** section.
5. Add a new row by clicking the add/delete rows icon in the left-most column of an existing row and selecting **Insert before** or **Insert after**, depending on your preference

6. Complete the rows according to the following table:

**Table 4** Adding a Business Unit and Application

Column Label	Value
System Name	Add the name of the system.
Object Name	Add the name of the LUN. Use the format “Logical Unit Number X” where X is the LUN number.
Business Unit	Add the name of the Business Unit.
Application Name	Add the name of the application.
Application Owner	Add the name of the application owner.

7. Click **Save**.

To enter Cost:

1. Expand the **Cost** section. Rows will be pre-populated for each RAID Type and Tier combination. You will need to update the **System Model** and **Cost** column entries for each row.

**Module 'Default :: VNX-PTFMR' on server 'localhost'**

disk\_cost\_per\_gigabyte\*

Name: disk\_cost\_per\_gigaby

Show 10 entries

Search:

	Keys			Properties	
	datatype	System Model	RAID Type	Tier Name	Cost
Block	VNX7600	RAID5	Extreme Performance	3	
Block	VNX7600	RAID-5	Capacity	7	
Block	VNX7600	RAID6	Extreme Performance	3	
@EMPTY	@EMPTY	RAID10	Extreme Performance	3	
Block	.*	dgd	fldfjd	2	
Block	.*	RAID6	Performance	2	
Block	.*	RAID10	Performance	2	
Block	.*	RAID5	Capacity	1	
Block	.*	RAID6	Capacity	1	
Block	.*	RAID10	Capacity	1	

Showing 1 to 10 of 11 entries

First Previous 1 2 Next Last

Import CSV Import XLS Save and ... Export CSV Export XLS

2. Click an existing row in the **System Model** column. Enter the device model of the array. To apply the same Chargeback costs to each RAID type and tier for all array models, leave the default value of **.\*** in this column.

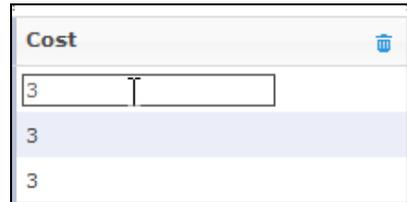
**System Model**

VNX5700

.\*

.\*

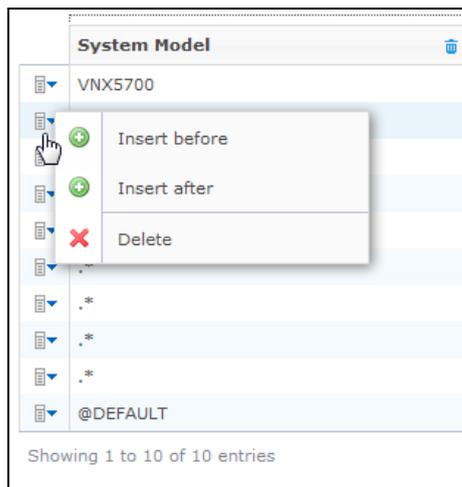
- Click an existing row in the **Cost** column. Edit the default value to the appropriate cost per GB used for a LUN on that model and Tier with that RAID type.



- Repeat steps 1-3 for the remaining rows as needed.
- Click **Save**.

To add new rows to Cost:

- Add a new row by clicking the add row icon in the first column of an existing row and selecting **Insert before** or **Insert after**, depending on your preference.



- Complete the rows according to the following table:

**Table 5 Adding Cost**

Column Label	Value
System Model	Enter the device model of the array.
RAID Type	Enter the RAID Type of the LUNs to which you are applying a cost value: <ul style="list-style-type: none"> <li>• RAID5</li> <li>• RAID6</li> <li>• RAID10</li> </ul>
Tier Name	Enter the Disk Type of the LUN to which you are applying a cost value: <ul style="list-style-type: none"> <li>• Capacity</li> <li>• Performance</li> <li>• Extreme Performance</li> </ul>
Cost	Enter the cost value per gigabyte used by LUNs on that model and Tier with that RAID type.

3. Click **Save**.

### **IMPORTANT**

---

If you are configuring Chargeback for mixed LUNs, be sure to associate costs with each tier and RAID type combination for those LUNs in the **Cost** section.

---

### **⚠ WARNING**

Do not use the delete buttons to remove any existing columns from Chargeback. Doing so may prevent the Chargeback reports from working correctly. Do not use the **New Tagging**, **Add new key** or **Add new property** buttons.

---

## Backing up your system

It is essential that you back up the VNX Family Monitoring and Reporting solution on a regular basis. We recommend you back up data at the end of every business day and save the backed up information off-site.

The backup of the Monitoring and Reporting solution consists of two important parts: backing up the database and backing up the configuration files.

### Backing up the database

Backing up the database requires the tables to be locked while the backup engine reads them. This can be done by using a script within the solution (in the bin directory) and periodically scheduling the task according to your needs. This process should be run overnight as the tables will not be updated with new values until the backup is finished. The script will lock the tables for two hours and unlock them automatically when the timer expires. Data collected during the backup operation is queued by the backend process and inserted in the database as soon as the lock is released.

Here is the list of recommended databases to back up:

- ◆ apg
- ◆ master
- ◆ storage
- ◆ topology

### Backing up the configuration files

The second important part of the solution is the set of configuration files. The following is a list of sensitive directories to consider for backups:

- ◆ Databases
- ◆ Custom

Backing up these two directories will back up the following configuration files:

- ◆ Retention parameters
- ◆ Collector configurations
- ◆ Filters
- ◆ Listener configurations
- ◆ Databases connection strings
- ◆ Third party connections parameters
- ◆ Scripts
- ◆ Logs
- ◆ Temporary files

## Retention parameters

Monitoring and Reporting collects new metrics every 5 minutes. This raw data is accumulated in hourly, daily and weekly aggregates that are used to display data on various time horizons. The retention policy for raw data and aggregates can be found in the table below. For example, Monitoring and Reporting allows you to report on weekly data for up to four years in the past.

Accumulation period	Retention period
<b>5 minutes (raw data)</b>	15 days
<b>hourly</b>	92 days
<b>daily</b>	365 days
<b>weekly</b>	4 years



# CHAPTER 4

## Viewing Reports

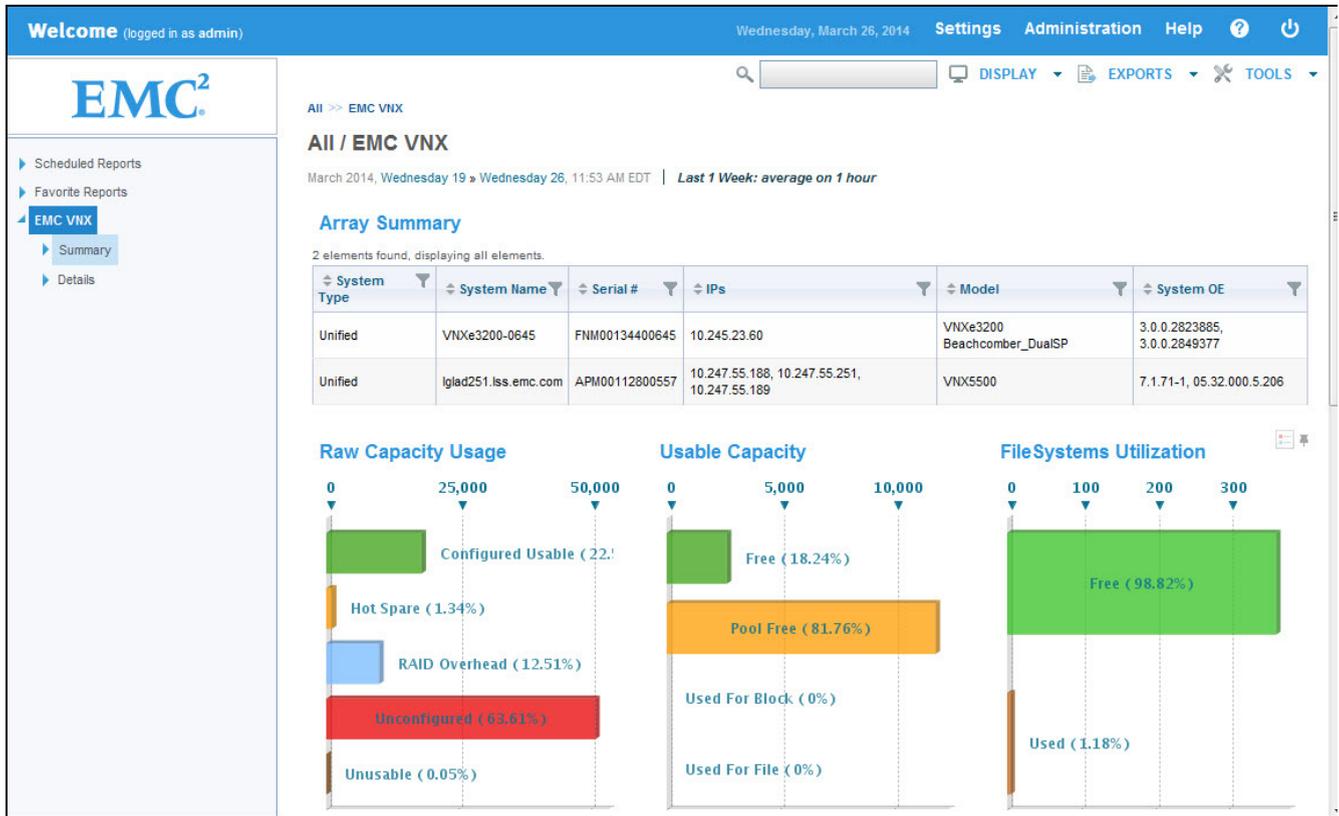
This chapter discusses the following topics:

- ◆ The web portal ..... 36
- ◆ Search for reports ..... 38
- ◆ Display options ..... 39
- ◆ Export reports ..... 41
- ◆ Report tools ..... 42
- ◆ Scheduling Reports ..... 45

These features are available to all VNX Family Monitoring and Reporting users.

## The web portal

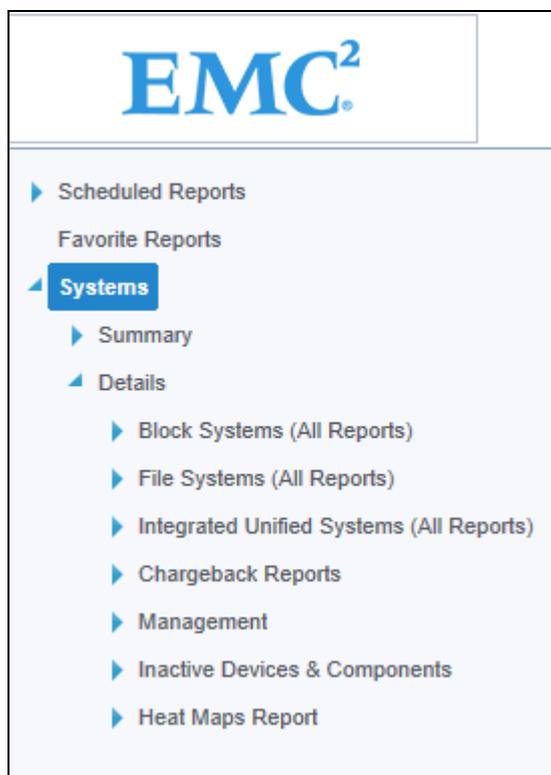
On the left panel of the main page is a report tree where reports are organized into parent and child relationships. You can click any report name in the tree to display the corresponding report on the right.



The menu bar on the top right of your display offers a collection of tools:

Search for reports	Look for a specific report using a combination of keywords.
Display options	Change the report time and time range settings
Export reports	Export the currently displayed report into a common format.
Report tools	Access the wizard and control favorites.

## The report tree



The report tree on the left of the page is a dynamic hierarchical tree you use to navigate nodes.

You can browse the tree by clicking each entry, node icon, or node name, which displays that report in the main page area.

To expand or collapse nodes to view or hide their children, click the arrow for the entry or double-click the node icon or name.

You can resize the report tree panel by dragging the border.

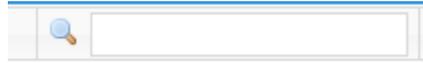
Double-click the right edge of border to minimize or restore the panel to its default size.

### Report tree elements:

Favorite reports	Links to other reports in the template section of the report tree. You can add favorites as you browse the tree.
Summary and Details	Preconfigured templates accessed by all users. Each of these reports is common to all users who access them.
Scheduled Reports	Reports that are automatically generated at specified times.
My Reports	Displays user-configured reports. For example, reports with customized visual thresholds.

## Search for reports

You can use Search to quickly access a report without browsing the report tree. The Search box is at the top of the dashboard. The search engine relies on an index that is generated once a day. The search functionality becomes available at 5 AM the day after you install Monitoring and Reporting. The search index is updated nightly with any new information added to Monitoring and Reporting on that calendar day.



### To search for reports

1. In the **Search** box, type the keywords for the report and press **Enter**.  
For example, if you are looking for information on a RAID group and you do not know where to look in the tree, type “raid” in the Search box, and press **Enter**. Each result is displayed on a line. You can use Boolean search operators such as AND, OR and NOT to refine your results.
2. To access a report, click the report title.

### Results for raid

Page 1 next ▶

---



**RAID Groups**  
A logical association of between 2 to 16 drives with the same RAID level  
[All](#) >> [VNX](#) >> [Details](#) >> [VNX Block \(All Reports\)](#) >> [Inventory](#) >> [RAID Groups](#)

---



**RAID Groups**  
A logical association of between 2 to 16 drives with the same RAID level  
[All](#) >> [VNX](#) >> [Details](#) >> [VNX Block \(All Reports\)](#) >> [Inventory](#) >> [Arrays](#) >> [List of arrays](#) >> [VNX5500](#) >> [VNX5500 RAID Groups](#)

---



**RAID Groups**

If, for example, you want a report for controller sp a, search with keywords “controller sp a”.

### Results for controller sp a

Page 1 next ▶

---



**SP A**

- Read Bandwidth (MB/s): The average amount of host read data in Mbytes that is passed through the SP per second.
- Write Bandwidth (MB/s): The average amount of host write data in Mbytes that is passed through the SP per second.
- Read Throughput (I/O/sec): The average number of host read requests that is passed through the SP per second.
- Write Throughput (I/O/sec): The average number of host write requests that is passed through the SP per second.

[All](#) >> [VNX](#) >> [Summary](#) >> [VNX Summary](#) >> [Block, APM00121301070](#) >> [Block, APM00121301070](#) >> [VNX Block Arrays Summary](#) >> [Iglad035](#) >> [SP](#) >> [Iglad085, SP A](#) >> [Bandwidth & Throughput](#) >> [SP A](#)

---



**SP A**

- Read Bandwidth (MB/s): The average amount of host read data in Mbytes that is passed through the SP per second.
- Write Bandwidth (MB/s): The average amount of host write data in Mbytes that is passed through the SP per second.
- Read Throughput (I/O/sec): The average number of host read requests that is passed through the SP per second.
- Write Throughput (I/O/sec): The average number of host write requests that is passed through the SP per second.

[All](#) >> [VNX](#) >> [Summary](#) >> [VNX Summary](#) >> [Block, APM00121301070](#) >> [Block, APM00121301070](#) >> [VNX Block Arrays Summary](#) >> [Iglad035](#) >> [SP](#) >> [Iglad086, SP A](#) >> [Bandwidth & Throughput](#) >> [SP A](#)

---

**SP A**

## Display options

Information is presented in pre-configured graphics or tabular reports. The **Display** menu on the top of the dashboard allows you to change the display options for finer examination.

### To change the report display options

1. From the **Time Selection** area, choose the type of aggregation the report uses and the time range it covers.

2. From the **Display \_\_\_ values** list, choose an aggregate time period. Real-time values are aggregated as they are collected. Other aggregation time periods are available. The defaults can be changed by your administrator. The defaults are:
  - **real-time:** the real collected values
  - **1 hour:** 1 hour aggregates
  - **1 day:** 1 day aggregates
  - **1 week:** 1 week aggregates
3. From the **Using \_\_\_ Aggregation** list choose the type of aggregation you want to use.
4. From the time range list, select the time period the report will cover. You can use the **Time Range Quick Switch** arrows to choose the previous or next periods.
5. Choose a value from the **Over** field if you are using a custom range.
  - **Previous:** selects the entire previous range. For example, the previous day is from midnight to the midnight the day before, and the previous one month includes the entire month's time, so if it is now September 10th the period would include all of August.
  - **Last:** selects one range back from now. For example, the last day extends from the current time back 24 hours, and the last month extends from the current day back a period of one month.
  - **Current:** selects the current range. For example, the current day extends from the last midnight through to the current time and forward to the next midnight, and the current month extends from the first of the current month to the last day of the month.
6. From the second field, select a time range. You can choose a pre-defined value or period. For greater accuracy, you can select **custom** or **calendar**.
  - For **calendar**, specify the start and end times of the report.

- For **custom**, specify a duration using numbers and units. There is no limit to the number of units, but each unit can be present only once. For example, 1h45m is translated as 1 hour and 45 minutes.
7. To lock the time frame, click the lock icon. If you lock the time frame, the time selection parameters that you chose are applied to every report you view during the current session. This can be used for obtaining snapshots-in-time in order to compare equivalent graphs for a device.
  8. From the **Actions** area, choose the actions you want to take. Click **Apply** or your changes will not take effect.
    - Choose **View in Full Page** to display only the contents of the reports currently in the page area in a new browser tab or window. Other user interface elements, including the report menu, do not appear.
    - Choose **Revert to Default** to revert the report to its default settings. The **Revert to Default** option can also be used to refresh the report that is currently displayed.

---

**Note:** For Heat Map reports, you cannot click directly on the graphical interface to change the view or parameters. The default view is static.

---

## Export reports

Reports can be exported into various formats. The export formats available will vary slightly from report to report. Unavailable export options will be greyed-out.

### To export a report

1. Select the node for the report you want to export.
2. On the Report menu, click **Export**.

### Export formats

PDF document	Creates a PDF and opens it in a window where you can save it or print it.
CSV format	Exports the report in a CSV file. If this is a multipart report, each part is prepended with a commented line containing the title of the part. For graphs, data is exported according to the graph type.
XLS format	Exports the report in an XLS file. If it is a multipart report, each part is exported in a separate sheet. For graphs, data is exported according to the graph type. If you choose XLS 1 column, all of the values are displayed in one column.
PNG, JPEG or SVG image	Creates an image of the report's first graph. If there is no graph on the exported report, an empty image is generated.
XML format	Exports the report as an XML file.

## Report tools

The Tools menu gives you access to the Report Wizard and has tools for printing, emailing reports and adding them to your Favorites.

To access report tools

1. Select a report node from the tree.
2. On the Report menu, click **Tools**.

### Report tools

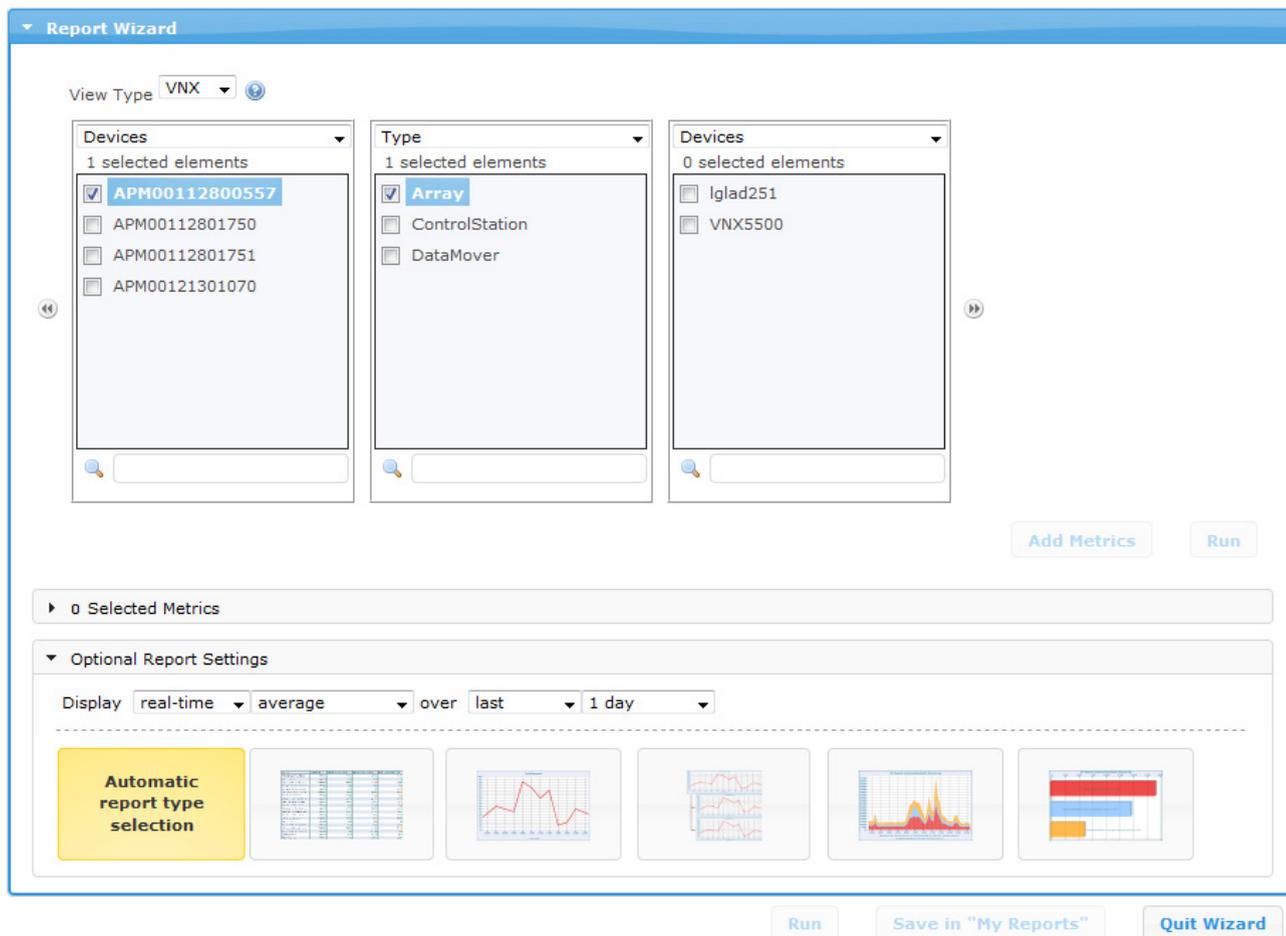
Report Wizard	Opens the Report Wizard from which you can create a new report.
Show Report URL	Replaces the current URL with the complete report URL. This enables you to create a bookmark for this page or directly link to it.
Print this Report	Generates the report in printable format.
Add to Favorite Reports	Adds the current report to the <b>Favorite Reports</b> . These reports are listed on the top of the tree for quick access.
E-mail me this Report	Generates the report and sends it as a PDF attachment to the email address configured in your settings.
Schedule this Report	Generates the report at scheduled intervals and sends it as a PDF attachment to the email address configured in your settings.

## The Report Wizard

You can use the Report Wizard if you are troubleshooting an issue and you want to access data quickly. This is also a helpful tool to compare metrics for troubleshooting purposes.

### To use the Report Wizard

1. On the **Tools** menu click **Report Wizard**.

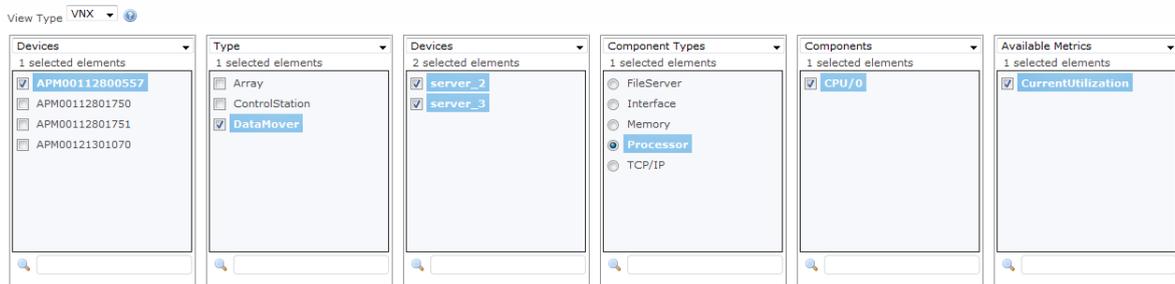


2. From the **View Type** list select a view type. The available views are defined by the system's administrator.
3. In the Available Elements area, select elements to filter on. You can click the filter icon and start typing the name of an element to filter the list. Continue to choose elements until you define all the elements you want included.
4. If you can select more metrics to add to the report, the **Add Metrics** button becomes available. You can click it and repeat steps 3 and 4 until you have all the metrics you want to add to your report.
5. Click **Run** to generate the report.

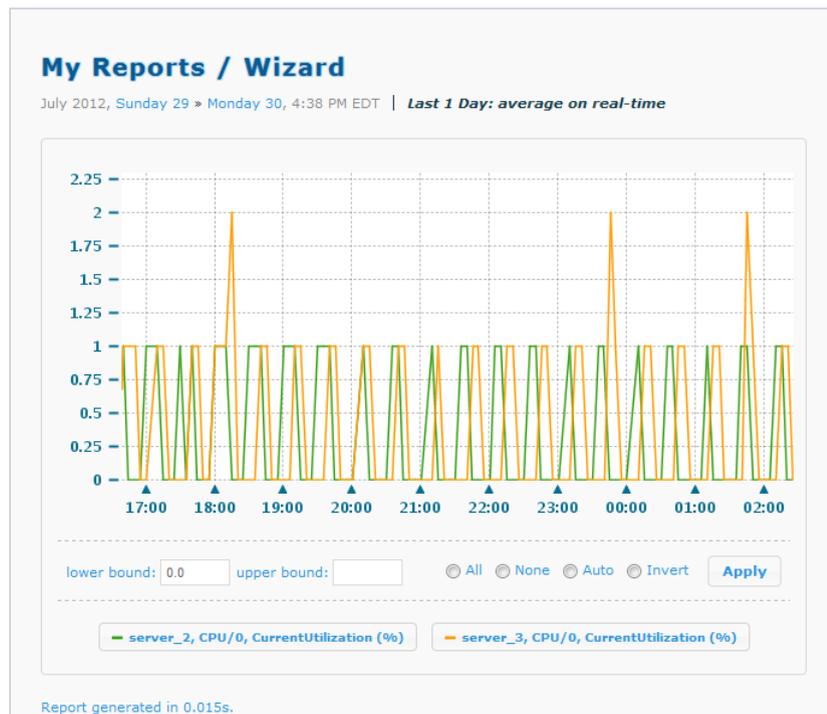
## Example of creating a report with the Report Wizard

This example shows how to create a report that displays CPU utilization for a number of Data Movers.

1. On the **Tools** menu click **Report Wizard**.
2. Choose these options:
  - **Devices:** Select a serial number.
  - **Type:** DataMover.
  - **Devices:** Select all.
  - **Component Types:** Processor.
  - **Components:** CPU/0.
  - **Available Metrics:** CurrentUtilization.



3. Click **Run**. You can save the report to My Reports to rerun it.

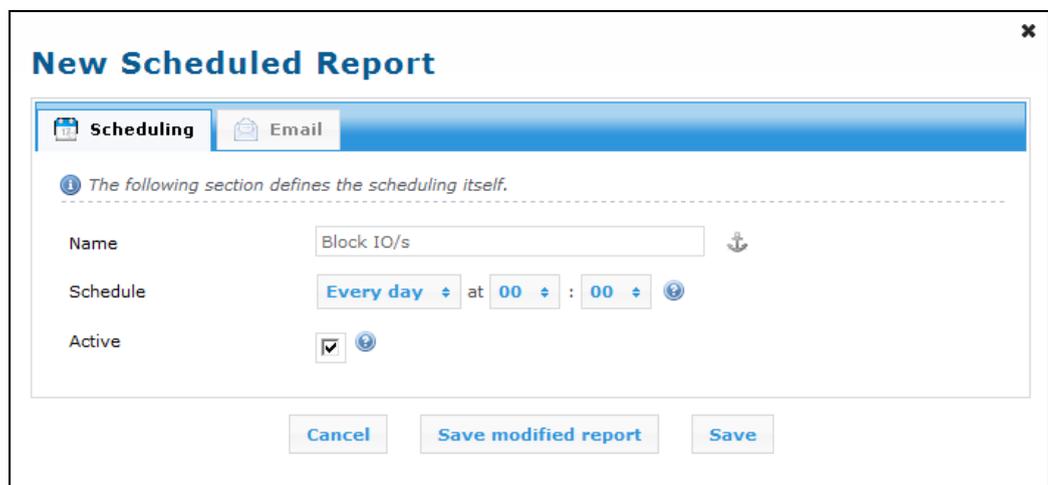


## Scheduling Reports

Reports can be scheduled to be generated at specific times and delivered by email to recipients as PDFs. Whenever a report is scheduled to be generated, it queries the database for the latest data.

To schedule a report:

1. Browse to the report you would like to schedule using the Report Tree.
2. Go to **Tools > Schedule this Report**.
3. On the **Scheduling** tab of the **New Scheduled Report** window, enter the name of the scheduled report, select how frequently the scheduled report should generate, and select the time zone.



The screenshot shows a window titled "New Scheduled Report" with a close button (X) in the top right corner. The window has two tabs: "Scheduling" (selected) and "Email". Below the tabs, there is an information icon and the text: "The following section defines the scheduling itself." Below this, there are three fields: "Name" with the value "Block IO/s" and an anchor icon; "Schedule" with a dropdown menu set to "Every day", followed by "at", two time dropdown menus set to "00", and a colon separator; and "Active" with a checked checkbox and a help icon. At the bottom of the window, there are three buttons: "Cancel", "Save modified report", and "Save".

- On the **Email** tab, enter the email addresses of the recipients for the scheduled report.

The screenshot shows a dialog box titled "New Scheduled Report" with a close button (X) in the top right corner. The dialog has two tabs: "Scheduling" and "Email". The "Email" tab is selected. Below the tabs, there is an information icon and a note: "The email that will be sent can be customized below. Exports will be attached to it." Below this note are three input fields: "Recipients" (a text area), "Subject" (a text box containing "Block IO/s"), and "Message" (a text area containing "Block IO/s"). At the bottom of the dialog are three buttons: "Cancel", "Save modified report", and "Save".

- Click **Save**.

**Note:** Scheduled reports maintain the default display settings. To schedule a report with modified display settings, such as a custom time range, click **Save modified report** rather than **Save**.

## Modifying a scheduled report

- In the report tree, click **Scheduled Reports**. A list of scheduled reports will display in the main window.
- Click on the name of the report you want to modify. A list of several options will appear, including **Edit**. Click **Edit** to modify the report settings.
- On the **Editing Scheduled Report** screen, update the report name, schedule, and email recipients as needed. Click **Save**.

# CHAPTER 5

## Troubleshooting

The content of this document describes the paragraph tags, character tags, and cross-reference formats supported in this chapter template.

- ◆ [Common Issues](#) ..... 48
- ◆ [Resetting Alerts](#)..... 48

## Common Issues

The following table lists common issues:

<p><b>No data or partial data is showing in the reports</b></p>	<p>Ensure that:</p> <ul style="list-style-type: none"> <li>• No firewall is blocking access between the server running data collection and storage systems</li> <li>• All Monitoring and Reporting services are up and running,</li> <li>• Database storage has disk capacity</li> <li>• The server date and time are accurate</li> <li>• Your storage systems are available and accessible for the application</li> </ul>
<p><b>Cannot login to the portal</b></p>	<p>Ensure that:</p> <ul style="list-style-type: none"> <li>• You are accessing the right URL and port: http://portal_ip:58080/VNX-MR</li> <li>• All passwords are case sensitive. Confirm that you do not have CAPS LOCK on and that you are entering your password with the correct case.</li> </ul>
<p><b>The portal page does not appear</b></p>	<p>Ensure that:</p> <ul style="list-style-type: none"> <li>• All Monitoring and Reporting services are up and running</li> <li>• You tried the portal IP instead of its hostname in the URL</li> <li>• Your browser proxy settings are correct (check with your local administrator)</li> </ul>
<p><b>A licence error appears at login page</b></p>	<p>Note the error message and contact support.</p>

## Resetting Alerts

Resetting alerts can be used to reset the configuration for all alerts, including the alert email template. To reset only the alert email text, refer to [“Resetting the Alert email text” on page 49](#).

### **IMPORTANT**

Resetting the alerts will remove any existing alert configuration. For example, if you have configured some alerts to trigger for only certain components, such as only certain LUNs, this configuration will be removed when you reset all alerts.

On Linux:

1. Remove the existing alert configuration file:

```
rm /opt/VNX/Backends/Alerting-Backend/Default/conf/alerting.xml
```

2. Update the module, which will reinstall the configuration file:

```
/opt/VNX/bin/manage-modules.sh update alerting-backend
```

3. Stop and restart Alerting services. From the Monitoring and Reporting Home page, Select **Alerting > Stop Process**.
4. Select **Alerting > Start Process**.

## On Windows

1. In Windows Explorer, navigate to **Program Files > VNX > Backends > Alerting-Backend > Default > conf**.
2. Delete the existing alert configuration xml file **alerting.xml**.
3. Create a new alert configuration file by opening a command prompt window and entering the following command:

```
/opt/VNX/bin/manage-modules.sh update alerting-backend
```

4. Stop and restart Alerting services. From the Monitoring and Reporting Home page, Select **Alerting > Stop Process**.
5. Select **Alerting > Start Process**.

## Resetting the Alert email text

1. Select the alert for which you want to reset the email text.
2. Expand **Mail Action: Mail template**. Enter the following text in the **Message** field:

```
PROP.'device' PROP.'parttype' PROP.'part' has exceeded the  
threshold, the current value is VALUE PROP.'unit'
```

3. Click **Save**.

**Table 6** Alert email template variables

Variable	Description	Example
device	System Name	Array 123
parttype	Component type	LUN
part	Specific component	LUN 101
unit	Current value which violated the alert condition, triggering the alert	If alert condition is LUN Response Time greater than 1 millisecond, the actual unit value would be any value over 1 ms

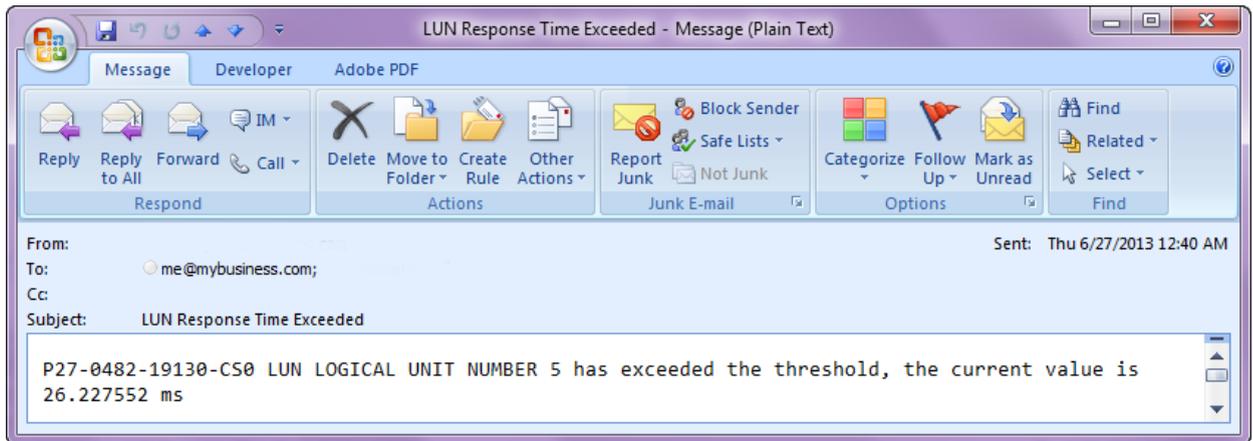


Figure 1 Alert email example

# APPENDIX A

## Available reports and metrics

### VNX Block/CLARiiON (All Reports)

Parent	Report Name	Description
VNX Block / CLARiiON	Storage Processor Utilization (%)	Percentage of time that the SP was busy serving incoming requests.
Storage Processor Utilization (%)	Dynamic expansion on all controllers	Per controller CPU usage for both Storage Processors A and B.
VNX Block / CLARiiON	VNX Block Arrays Summary	Raw Capacity Total, Raw Capacity Free, Usable Capacity, Logical Free Capacity and Element in Problem.
VNX Block Arrays Summary	Block Usable Capacity	Distribution of used and free space for all arrays.
VNX Block Arrays Summary	Distribution by Model	Distribution of arrays according to their model (CX, VNX,...).
VNX Block Arrays Summary	Distribution by Version	Distribution of arrays according to their FLARE or Block OE version.
VNX Block Arrays Summary	Dynamic expansion on all arrays	A complete report showing volume distribution per array.
VNX Block / CLARiiON	Inventory	Complete inventory of all monitored components.
Inventory	Dynamic expansion on device types	Inventory of all Arrays, SPs, LUNs, RAID Groups, Storage Pools, Storage Groups, Disks, Hosts, Ports and Applications.
VNX Block / CLARiiON	Performance	Storage Pools IOPS Bottleneck, LUN Performance Bottleneck, Storage Processor Write Cache, LUN Read Cache, TopN & Exceptions.
Performance	Storage Pools IOPS Bottleneck	Read / Write IOPS Capability.
Performance	LUN Performance Bottleneck	Performance report listing all Logical Unit numbers' Utilization and queue length.
Performance	Storage Processor Write Cache	A mixed report combining Write Cache Utilization, Storage Processors Flush Ratio, Watermark Flush Rate, LUN Hit Ratio.
Performance	LUN Read Cache	Pre-fetched percentage used and hit ratio per LUN.
Performance	TopN & Exceptions	IOPS, Performance Analysis, Disk and LUNs Errors, Disk Fragmentation.
Performance	Disk Utilization Heat Map	This report shows disk utilization for a given array.
Performance	SP Utilization Heat Map	This report shows SP utilization by array.
VNX Block / CLARiiON	Capacity Planning	Space Capacity Planning, Storage Pool Capacity Planning.

Parent	Report Name	Description
Capacity Planning	Space Capacity Planning	This report shows Provisioned Usable Capacity.
Capacity Planning	Storage Pool Capacity Planning	This report shows when you should expect an array to reach its full disk capacity.
VNX Block / CLARiiON	Health	Arrays Compliance Forecast, Broken Disks.
Health	Arrays Compliance Forecast	This report shows disk arrays availability and offers SLA results for the last month.
Health	Broken Disks	List of all broken disks. If no data is available in this list, there are no known broken disks.
VNX Block / CLARiiON	Chargeback Reports	Calculates cost-of-service of business units
Chargeback Reports	Top 10 Application by Cost	This report displays the top 10 most costly applications.
Chargeback Reports	Top 10 Application by Capacity	This report displays the top 10 applications by provisioned usable capacity.
Chargeback Reports	Cost distribution by Business Unit	This report shows the distribution of overall cost among the business units.
Chargeback Reports	Cost per Business Unit	This report displays the cost per business unit over the last four months.
Chargeback Reports	Cost per Business Unit and Application	This report displays the cost per business unit, application, and application owner over the last four months.

## VNX File / Celerra (All Reports)

Parent	Report Name	Description
VNX File / Celerra	VNX File CPU Utilization (%)	Per File/Celerra Server Processor Utilization in percentage.
VNX File CPU Utilization (%)	Dynamic expansion on all servers	Graph report showing CPU usage of each File/Celerra server.
VNX File / Celerra	Protocol Overview / DM	Number of opened files, total calls (ops/s) per server, according to protocol.
Protocol Overview / DM	Dynamic expansion on all servers	Number of opened files, total calls (ops/s) per server, according to protocol.
VNX File / Celerra	VNX File Summary	Displays a report on Total IO and severity per Serial Number/Device.
VNX File Summary	Dynamic expansion on serial numbers	Dashboard showing Data Movers, Storage pools, File Systems, IO and Throughput.
VNX File / Celerra	Capacity	File system usage forecast.
Capacity	All Filesystems	Usage forecast and prediction per File System.
Capacity	Deduplication	Report showing saved space due to deduplication per File System.
Capacity	Filesystems and Savvol Utilization	Utilization and Savvol stats for all File Systems.
Capacity	Filesystem Used Forecast	Total File System usage trending for the last week.
Capacity	Savvol	Defined Savvols and their capacity.
VNX File / Celerra	Performance	Celerra's IO and throughput information, per server.
Performance	CIFS open Connections	The number of open connections over the last day.
Performance	CIFS open Files	The number of open files over the last day.
Performance	CIFS Ops/s	CIFS operations per second over the last day.
Performance	NFS Ops/s	NFS operations per second over the last day.
Performance	Top 5 CIFS users	This table report shows a list of top CIFS Read/Write users.
Performance	Top 5 NFS clients	This table report shows a list of top NFS Read/Write users.
VNX File / Celerra	Inventory	Number of Data Movers, File systems, Shares and CS.
Inventory	Data Movers	Status, uptime, CPU and memory utilization.
Inventory	FileSystems	Utilization, size and throughput.
Inventory	NFS Shares	Name, path and server for each share.
Inventory	CIFS Shares	Name, maximum users, path and server.
Inventory	ControlStation	Control stations with their availability.
Inventory	System	Systems with their availability.

## VNXe (All reports)

Parent	Report Name	Description
VNXe	Capacity	
Capacity	Raw Capacity	<p>Displays raw capacity by:</p> <ul style="list-style-type: none"> <li>• <b>Configured Usable:</b> Configured capacity that is available for data storage.</li> <li>• <b>Hot Spare:</b> Capacity of all hot spares on the array.</li> <li>• <b>RAID Overhead:</b> Array capacity used to support RAID protection overhead.</li> <li>• <b>Unconfigured:</b> Total capacity that is available for the creation of LUNs, RAID groups, storage pools or hot spares.</li> </ul>
Capacity	Usable Capacity	<p>Displays usable capacity by:</p> <ul style="list-style-type: none"> <li>• <b>Free:</b> Unbound data devices and SAVE devices, unmapped and/or unmasked thick LUNs.</li> <li>• <b>Pool Free:</b> Unwritten space within pools and unbound capacity within RAID groups.</li> <li>• <b>Used For Block:</b> Capacity that is made available to storage area network.</li> <li>• <b>Used For File:</b> Capacity that is made available to network attached storage.</li> </ul>
Capacity	Used Capacity by Purpose	<p>Displays the capacity of the system as used for the following purposes:</p> <ul style="list-style-type: none"> <li>• <b>Local Replica Used:</b> Array capacity that has been mapped, masked, and configured as local replicas. This capacity is commonly used for testing and backup.</li> <li>• <b>Primary Used:</b> Array capacity that has been mapped, masked, and configured for the primary storage of application data. This does not include copies.</li> <li>• <b>Remote Replica Used:</b> Capacity used for remote copies, commonly for disaster recovery.</li> <li>• <b>System Used:</b> Capacity reserved for use by the array for internal operations.</li> </ul>
Capacity	Usable Capacity Trend	<p>Displays the following capacity types over time:</p> <ul style="list-style-type: none"> <li>• <b>Block Used Capacity:</b> Total capacity used by Block Services.</li> <li>• <b>File Used Capacity:</b> Total capacity used by File Services.</li> <li>• <b>Free Capacity:</b> Total free capacity.</li> <li>• <b>Pool Free Capacity:</b> Free capacity within storage pools.</li> </ul>
Capacity	Usable Capacity by Pool	Displays capacity by storage pool.
Capacity	Usable Capacity by Service Level	<p>Displays capacities for each service level. Service level is based on disk type, disk size, RAID type and FAST cache status (enabled/disabled). For FAST LUNs, Service Level is based on pool name, tiering policy name, and FAST cache status (enabled/disabled). Service levels include:</p> <ul style="list-style-type: none"> <li>• <b>Platinum:</b> Flash Drive</li> <li>• <b>Gold:</b> Fibre Channel, RAID-1</li> <li>• <b>Silver:</b> Fibre Channel, RAID-5</li> <li>• <b>Bronze:</b> SATA Drive</li> </ul>

Parent	Report Name	Description
Capacity	Storage Capacity Presented to NAS	<ul style="list-style-type: none"> <li>• <b>Disks Used:</b> Storage Capacity of production file systems and their overhead, storage capacity of SavVols and Free NAS Pool capacity.</li> <li>• <b>Free Capacity on Used Disks:</b> Storage Capacity of free partitions, free metavolumes and free space on partially used NAS Disks.</li> <li>• <b>System Resource:</b> Storage Capacity of NAS Disks used for internal file systems.</li> <li>• <b>Unused Disks:</b> Storage Capacity of non-partitioned NAS Disks.</li> </ul>
Capacity	NAS disks used breakdown	<ul style="list-style-type: none"> <li>• Usable File System: Storage capacity of production file systems on NAS Disks or NAS Pools.</li> <li>• NAS Pool Free: Free NAS Pool capacity that is available to create production file systems and SavVols.</li> <li>• Usable SavVol: Storage capacity of SavVols on NAS Disks or NAS Pools.</li> <li>• File System Overhead: Reserved overhead capacity to support a production file system.</li> </ul>
Capacity	NAS File systems Usage	<ul style="list-style-type: none"> <li>• File System Used: Used capacity of production file systems.</li> <li>• NAS Pool Free: Free capacity of production file systems.</li> </ul>
Capacity	Storage Processor Utilization	Percentage of time that the SP was busy serving incoming requests.
Performance	NAS Servers	Displays NAS servers and their attributes.
Performance	LUN / Summary	Displays list of LUNs and attributes, LUN Groups, and LUN performance.
Performance	Disks / Summary	Displays list of disks and attributes,
Performance	Storage Pools	Displays all storage pools and their attributes, including: capacity, used disks, FAST VP Capacity, and FAST VP Movements by Tier.
Performance	File Systems / Summary	Displays File Systems and their attributes, including capacity and deduplication.
Performance	Throughput	Displays system read and write throughput.
Performance	Shares	Displays all shares, including type and associated server.
Performance	CIFS/NFS Performance / Summary	Displays CIFS and NFS servers and performance attributes, including Throughput, IOPs, Operations, Connections, and Open files.
Performance	FAST Cache / Summary	Displays FAST Cache attributes including Cache Dirty pages by storage processor, FAST Cache valid elements, Total Cache Dirty Size, Total Cache Throughput/ IOPs
Performance	FAST VP / Summary	Displays FAST VP attributes, including Move Down Capacity, Move within capacity, and Moving up capacity.



# APPENDIX B

## Communication Ports

The following table lists IP ports used by VNX Family Monitoring and Reporting services. TCP port 58080 must be open between browsers and the VNX Family Monitoring and Reporting server for browsers to access the application.

Port	Service
TCP/2000	Backend
TCP/2001	Backend
TCP/48443	Gateway
TCP/53306	Database
TCP/58080	Web Portal

The following table lists IP ports used by VNX Family Monitoring and Reporting to access arrays. These ports need to be opened from Monitoring and Reporting to VNX and VNXe arrays.

Port	Technology
TCP/443	naviseccli (SP IP) and XML/API (CS IP)
TCP/22	SSH (VNX File CLI)



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