VIOLIN
Better Business Performance

QV2020 and QV1020 All Flash Array User Guide

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Preface

This user guide is intended to be a comprehensive summary of user-level operations on the QV2020 and QV1020 All Flash Array. The guide is designed for use by administrators and storage managers who are responsible for configuring, monitoring, and maintaining the QV2020 and QV1020 in a production environment.

Conventions

The following conventions are used in this document:

Element	Convention
Button	**Arial, 10 pt, Bold**
Command Line Interface input/output	**`Courier New, 10 pt, Bold`**
Emphasize a word or phrase	Underline
Event notifications or other message	**Times New Roman, 10 pt, Bold**
Key	COURIER NEW, 11 PT, CAPS
Literals	**Times New Roman, 10 pt, Bold**
Titles	Italic
Window option	**Arial, 10 pt, Bold**
Variable, represents text that must be entered	***`<Courier New, 10 pt, Bold, Italic>`***

Document Conventions

Related Documents

The following documents provide additional information about the QV2020 and QV1020 All Flash Array:

- *QV2020 and QV1020 Release Notes*: Provides most recent release updates
- *QV2020 and QV1020 Best Practices Guide*: Provides details on optimal configurations

Contacting VIOLIN

To obtain additional information or technical support for VIOLIN products, or to obtain an RMA number and replacement product, contact us at:

- Phone US Toll Free: +1 800 734 4716
- Global Support Numbers available at: https://www.violinsystems.com/support-services/
- E-mail: support@x-io.com and support@violinsystems.com

Introduction

The QV2020 and QV1020 are high-density, fully redundant, rack-mountable storage device that integrates NVMe drives with advanced array controllers and environmental support components to provide an extremely reliable self-contained storage unit that outperforms more traditional storage sub-systems.

As a fully redundant unit, the QV2020 and QV1020 consist of pairs of active components; each member of the pair can function in the absence of the other member, maintaining operation in the event of failure of an active component. If a component fails, the system supplies information designed to assist in completing corrective actions. The QV2020 and the QV1020 can continue to operate with multiple component failures while making intelligent decisions to provide the highest level of data protection and integrity.

QV2020 and QV1020 Advanced Features

The Array provides the following advanced features:

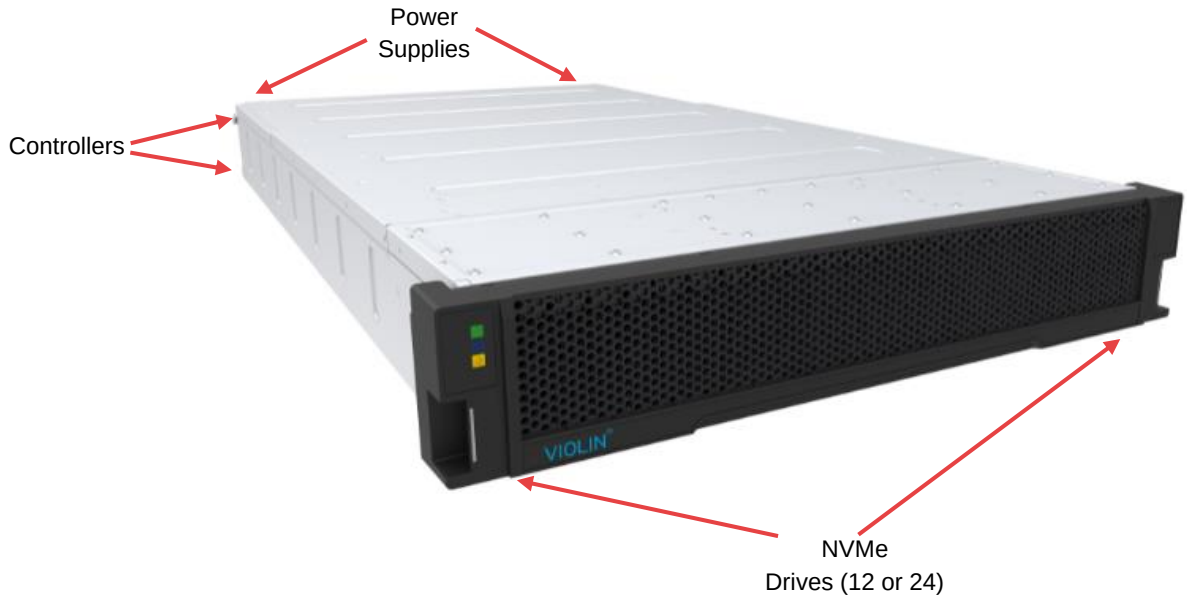
a. **Web-based User Interface** for Storage Management and Provisioning: **MAESTRO** is the Web-based User Interface that provides storage management and provisioning services for all networked QV2020, QV1020, and XIO G4 arrays.
b. **Managed Reliability**: The Array contains processes that improve system reliability through intelligent error management. These processes include:
   - A hierarchy of table-driven recovery actions that repair drive errors ranging from simple errors to those requiring more advanced error handling.
   - In-place drive remanufacture that predicts, diagnoses, and repairs drive degeneration and failures.
   - A closed-loop feedback system between the installation and the manufacturer that collects and analyzes a variety of system operating metrics. This feature greatly reduces failures by remotely predicting and diagnosing potential problems and providing proactive system servicing.
c. **High-performance data I/O**: The system architecture leverages the power of a single processor with multiple cores, Fibre Channel or iSCSI data paths, and SSDs to deliver outstanding data I/O performance.
d. **Quality of Service (QoS)**: Control of performance expectations, useful when running different applications on the same Array. By default, this is actively self-managed by the Array software.
e. **Thin Provisioning**: Allows the user to optimize how the available space is utilized on the Array by allowing the user to over provision the storage. Thinly Provisioned Volumes allocate storage space based on the actual data written.
f. **Deduplication**: A data compression technique that eliminates duplicate copies of data allowing the user to optimize their storage usage. The Array enables in-line deduplication on a per volume basis.
g. **Snapshot:** Space efficient snapshots are supported on dedupe volumes.
h. **Snapshot schedules** can be created per volume, with a total of 2 unique schedules per volumes. Thinning will automatically occur on snapshots created from schedules, with the oldest removed first. The number of snapshots retained is 24, by default, but can be adjusted through the “keep” option on schedules. A user can also mark a snapshot to be “excluded” from the thinning. Manually created snapshots are always marked as “excluded” from thinning. Refer to the QV2020and QV1020 Best Practices for more details.

i. **Dual controllers**: Both controllers actively participate in data I/O, simultaneously accessing all drives in the system. This configuration provides maximum performance as well as reliability.
j. **Automatic failover/failback**: The system performs automatic transfer of volume access from an out of service controller to the partner in conjunction with appropriate multi-path drivers at the host level.
k. **Run-time controller software and drive firmware upgrades**: The system provides the ability to upgrade the internal controller software and drive firmware with new versions without service interruption. Should a controller experience an unrecoverable error during the software upgrade process, the controller software is returned to the previously installed version.
l. **Background parity scan**: Provides enhanced data integrity by employing an embedded function to automatically check all data for RAID parity consistency and flag inconsistent data with a media error.
m. **LUN Expansion**: As volume space needs increase, individual LUNs can be expanded.
n. **Activewatch**: Provides full telemetry.

QV2020 and QV1020 Components

Refer to the *QV2020 and QV1020 Hardware Guide* for a complete description of each component.

The QV2020 and QV1020 All Flash Array has the basic external view:

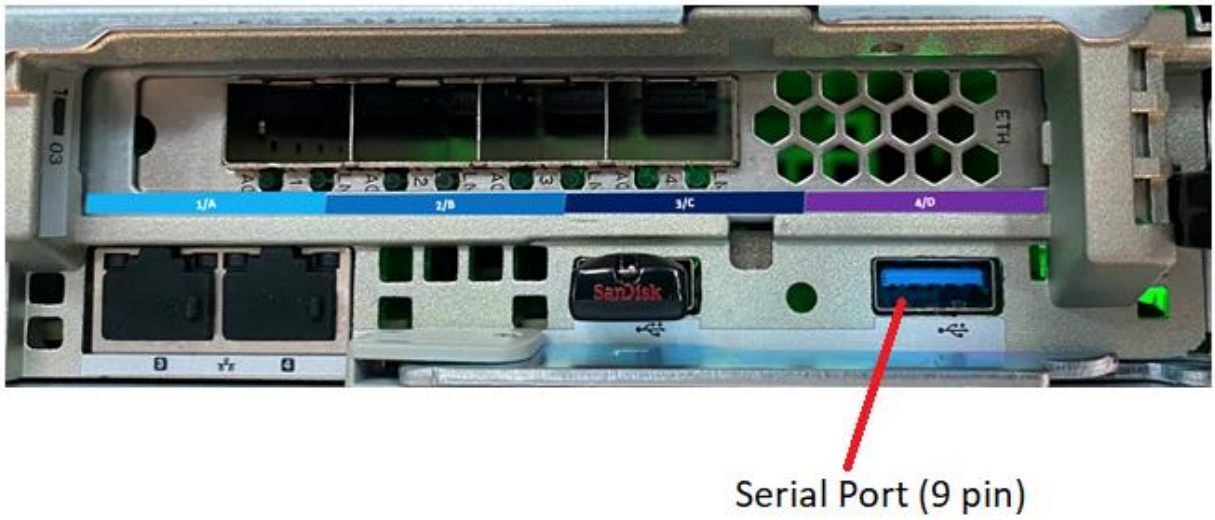


Rear view of QV2020 or 4 port QV1020. QV1020 has option of 2 ports

The QV2020 components are (external and internal):

1. Two Power Supply Units (PSUs), providing a redundant power source
2. Dual Redundant PSUs N+1 (~2000w), Support AC 220V(180Vrms~264Vrms) input
3. Two Managed Reliability Controllers (Fibre Channel or iSCSI), providing control and value-added features
4. Five Fans
5. Supports up 22 Dual-Port NVMe SSDs
    a. 11 or 22 drives, with slots 12 and 24 empty
    b. QV2020 5.0 configurations supports 12 and 24 drives
6. Cable management system
7. One chassis, custom-designed to house the active components of the Array
8. Bezel
9. Serial Console port (see below)

A serial cable can be connected into each controller. The open port is located under the MRC ports.



The serial port cable is a 9 pin on the user end:

Controller

The VIOLIN Controller (two per Array) uses built-in diagnostics and recovery tools to analyze, identify, and recover from a variety of common drive problems. Each Controller has the ability to send telemetry information back to the VIOLIN headquarters and notify the Services organization that something has gone wrong. This is enabled by default and should remain enabled upon installation unless the customer's business does not allow it.

Drives, Open DataPacs, and Pools

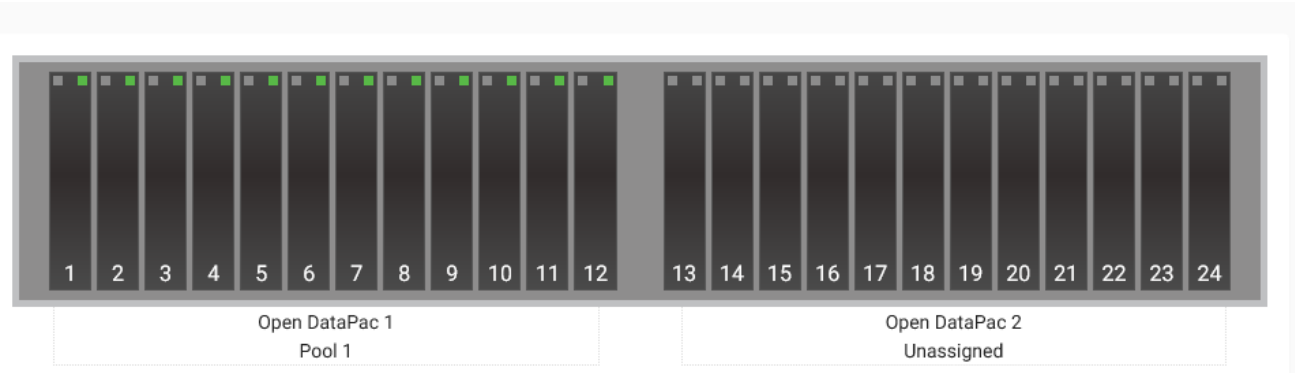
The QV2020 and QV1020 support several different capacities of NVMe SSDs (drives). The QV2020 and QV1020 support 11 or 22 drives, with drive slots 12 and 24 empty. The QV2020 with 5.0 configurations supports 12 or 24 drives.

A collection of 11 same-capacity NVMe drives (installed consecutively) is called an Open DataPac. Open DataPac 1 contains drives 1-11 and Open DataPac 2 contains drives 13-23.

A pool is a collection of one or more Open DataPacs. Future expansion of the Pool is supported by inserting 11 drives into Open DataPac2.

At initialization of the Pool, 10% of each Open DataPac capacity is reserved as a spare. The spare capacity is used in the event of a drive failure. Spare capacity is equivalent to "hot-spare" drives in a more traditional storage solution. Note: QV2020 Arrays configured at 5.1 contain 12 drive Open DataPacs and reserve 20% spare capacity.

The below diagram, from the MAESTRO User Interface, shows 12 installed NVMe SSDs (green LED), from QV2020 installed at software release 5.1. These drives are assigned to Pool 1:



A drive Green LED indicates it is installed and ready for use or in use.

Host Data Traffic

The Array provides high-speed data traffic through eight Fibre Channel or iSCSI ports for the QV2020 and four or eight Fibre Channel ports for the QV1020.

iSCSI Arrays have four 25/10G ports on each Controller and uniquely identified as Data Networks A, B, C, D.

Fibre Channel

The Fibre Channel ports are 16Gb and can connect to a host directly (Direct-Attached) or through a Fibre Channel switch.

Controller 1 is the top controller. FC ports are numbered left to right, as shown below. This is the QV2020 which has 4 FC ports per Controller. The QV1020 has 2 or 4 FC ports per Controller.

Controller 2 is the bottom controller. FC ports are numbered right to left, as shown below..

iSCSI

The iSCSI ports are 25/10Gb and are supported through a switch. The iSCSI controller ports are shown below, labeled A, B, C, D (left to right) on Controller 1 (top). Controller 2 (bottom) ports are right to left.

The iSCSI Controllers each have Data Network A, B.

Reference the QV2020 and QV1020 Best Practices document for configuration details for HBA, switch, and multipath settings.

Array Management

The QV2020 and QV1020 management is provided through the 10/100/1Gb Ethernet ports, via the Array Command Line Interface (CLI) or a web-based User Interface, **MAESTRO**. The preferred method of management is through the web-based User Interface, **MAESTRO**.

Management Tools

Reserved Characters

MAESTRO accepts special characters in text-entry fields except for those characters listed in the table below.

Character	Name
&	ampersand
“	double quotes
/	forward slash
\	back slash
‘	single quote

Table 1: Supported MAESTRO Characters

In addition to the above, the CLI accepts special characters in text-entry fields except for those characters listed in the table below.

Character	Name
%	percent
&	ampersand
<	less than
>	greater than
\	back slash
‘	single quote

Table 2: Supported CLI Characters

Command Line Interface

The Array contains an embedded Command Line Interface (CLI) that responds to commands entered at the CLI prompt on a remote console or invoked through a script. Standard command line protocol (such as terminating a command by pressing ENTER) applies. Although, multiple users may be connected to the Array simultaneously, this is not recommended due to possible conflicts. This section describes the requirements and connection procedure of the CLI.

Remote Console Requirements

The remote console used to control the Array may be any terminal connection application that has Secure Shell connection capability (protocol version 2) through port 22. Secure Shell connection capability is a secure form of telnet. The Array will not respond to a regular telnet connection request.

This section describes the steps to connect to the Array through the remote console.

1. To connect to the target Array use any terminal connection application on the remote console and configure it for SSH service on port 22.
2. Type the IP address or the host name of one of the controllers in the Array into the application's connection field and connect.
3. The application requests SSH access credentials.
4. Enter the access credentials as follows:

   `User name:` administrator
   `Password:` *<password>*

   The user password for the first-time login, built into the Array during its manufacture, is **administrator**. If the password **administrator** is rejected, check with the network administrator to obtain the current valid user password.
5. Connect to the Array by entering its network friendly name or IP address and the prompt appears.
6. CLI commands can now be entered to control the Array as described throughout this document.
7. Enter help at the prompt to display a list of available commands. Appendix B, also shows the list of available commands.
8. To exit from the CLI, type **`exit`** or **`quit`** at the prompt.

Reserved Characters

The CLI permits special characters in text-entry fields except for those characters listed in Tables 1 and 2. An argument in a CLI field may contain spaces if the entire argument entry is enclosed in quotation marks.

MAESTRO

The Array management tool of choice is the Web-based User Interface called MAESTRO. MAESTRO can manage a single Array or multiple. It also manages XIO G4 arrays. MAESTRO includes a dashboard that provides a high level overview of the array status, storage usage, performance monitoring, and component health.

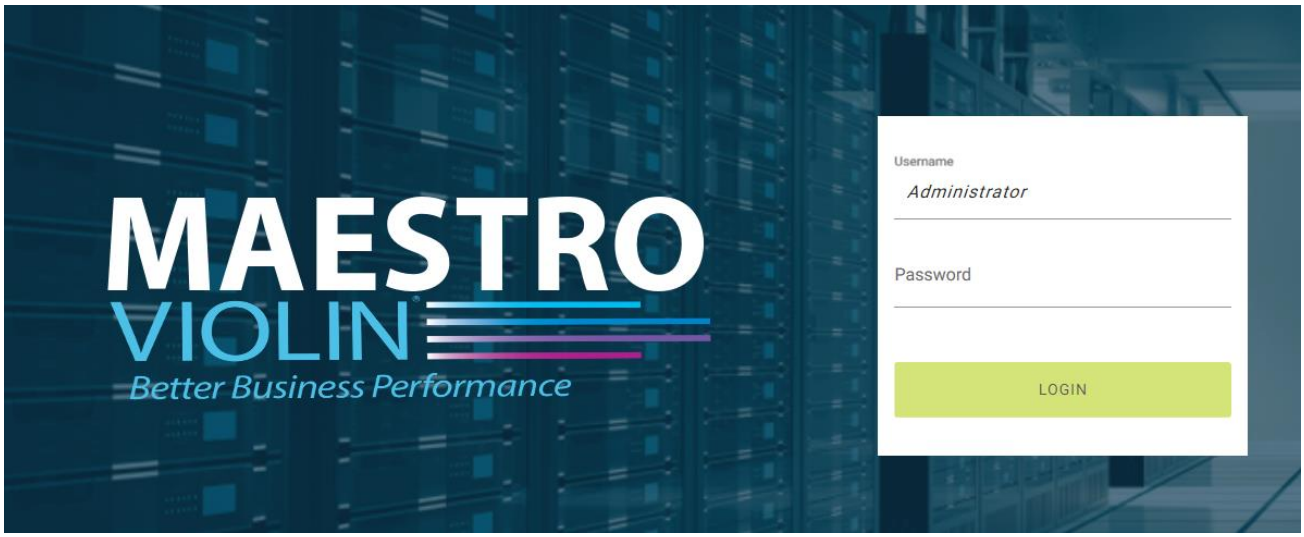
MAESTRO runs within a VM on each of the controllers. One controller's VM is active and the other controller's VM is "stand-by", which will take over if the managing controller is physically removed. The use of a VM within the array eliminates the need for installation of a separate application or dependencies on where the UI can be run.

MAESTRO supported browsers:

- **Google Chrome on Windows 7, Windows 8 and Windows 10**
- **Firefox**
- **IE 11**
- **Edge**

To launch MAESTRO:

1. Using a supported browser: Enter the name or IP address for a QV2020 or QV1020 Controller
2. On the login screen the Username will auto-populate to Administrator
3. Enter the password (**`made4you`**)
4. Click **Login**



Configuring the Array

Configuring the Array can be accomplished by through the command line interface (CLI) or the Web-based User Interface, **MAESTRO**. The installation and initial configuration of the Array is typically provided by a certified VIOLIN partner. Additional user configuration management can be done through either interface, with the preferred method using MAESTRO. The following sections will provide guidance through MAESTRO. The CLI will be documented for areas that are not available through MAESTRO or are more convenient to use through that interface.

Initializing the Array

The Array will be installed by a certified VIOLIN partner, or remote Professional Services. Initial configurations such as network address assignments and Data Security (Data-At-Rest Protection) need to be planned prior to initialization. Once the Array is initialized, it is ready to configure and write data. Re-initializing the Array will delete all data. Contact VIOLIN prior to attempting to re-initialize the system.

Data Security

Must be enabled PRIOR to Array initialization

The QV2020 and QV1020 support two levels of data security: **Data-At-Rest Protection** and **Passkey Protection**. The Data-At-Rest Protection is a feature provided in software versions 5.1.2 and later. These features **must be enabled prior to initialization** of the Array. Passkey Protection is an additional level of security that is enabled by default when Data-At-Rest Protection is enabled.

Data-At-Rest Protection

Data-At-Rest Protection provides a secured handshake on data transfers to the drives, using AES-256 encryption. Data-At-Rest Protection is supported in software 5.1.2 or later and only enabled prior to initialization of the Array. When enabling this feature, a user supplied passkey is required. This passkey is also used to enable **Passkey Protection** of the Array. Data-At-Rest Protection can only be disabled by reformatting the Array.

*The **passkey is not retrievable by Violin Systems. The user must take care to remember the passkey***

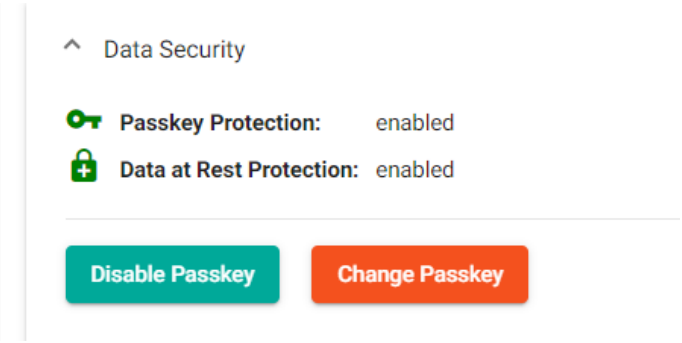
Passkey Protection

Passkey Protection is an additional level of security that is only available when Data-At-Rest Protection is enabled. This feature is optional but enabled by default when Data-At-Rest Protection is enabled. Passkey Protection can be disabled by the user at any time. This additional level of security prevents access to the data after a power loss, or shutdown of the Array, until the Array is unlocked with the passkey. The user will be prompted in MAESTRO or through the command line interface for the passkey. Once the passkey is provided, the Array will complete the power-up process and allow access to the luns.

Passkey Protection changes can be made only if Data-At-Risk Protection is enabled. Array Passkey Protection operations (MAESTRO or command line) are:

- Encryption enable [encryption –enable <passkey>]
- Encryption disable [encryption -disable <passkey>]
- Encryption change passkey [encryption –change <current passkey> <new passkey>

MAESTRO >> Advanced Settings



*The **passkey is not retrievable by Violin Systems. The user must take care to remember the passkey**.*

Data Security Status

The status of Data-At-Rest Protection and Passkey Protection are displayed in MAESTRO and the command line “show ise”.

The below display, from MAESTRO Advanced Settings, indicates the Array was enabled with Data-At-Risk Protection, which by default enabled Passkey Protection:

MAESTRO Advanced Settings >> Data Security

When Data-At-Rest Protection is not enabled, Passkey Protection is also not enabled:

Configuration Management

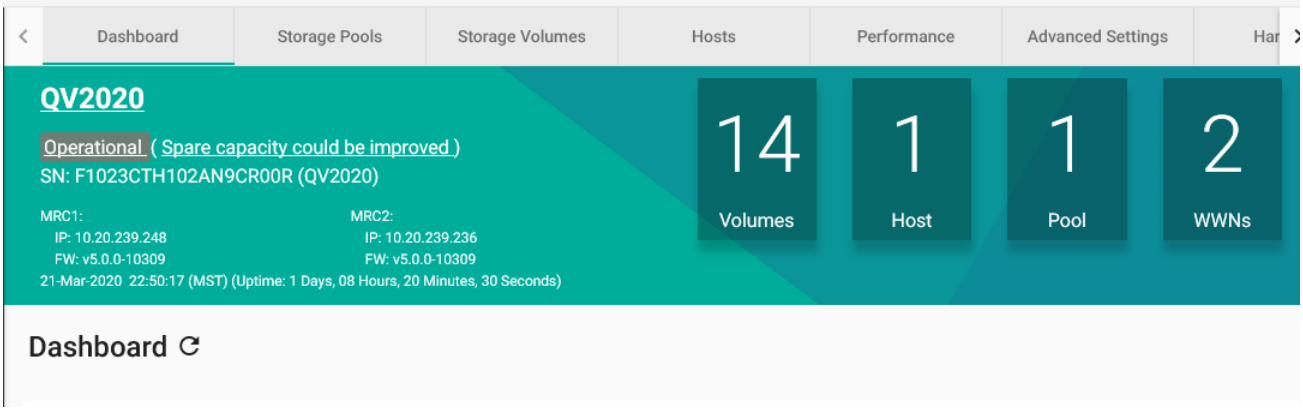
After initialization, MAESTRO can be used to manage additional configuration preferences.

Array system configuration options include:

Desired Action	MAESTRO Suite Action
Create Host	SAN Groups >> *san_group* >> Hosts >> Create Host Client
Server View	Managed Servers
Daylight Savings	SAN Groups >> *san_group* >> Advanced Settings tab
SNMP Configuration	SAN Groups >> *san_group* >> Advanced Settings tab
System Clock	SAN Groups >> *san_group* >> Advanced Settings tab
Telemetry (Subscriptions)	SAN Groups >> *san_group* >> Advanced Settings tab
Create Volume	SAN Groups >> *san_group* >> Storage Volumes tab
Email Notifications	SAN Groups >> *san_group* >> Advanced Settings tab
DHCP/Static	SAN Groups >> *san_group* >> Advanced Settings tab

System Parameters

Once navigated into an array Dashboard, clicking on any of the component tabs (header) will display the details for that component and allow for various system parameters to be configured.



Network Settings

The Array network settings are typically configured during installation of the Array. They can be easily managed later through **MAESTRO**.
The network settings include two Ethernet ports (**1** and **2**), the Media Access Control (MAC) address, link status (connected or unknown), and Dynamic Host Configuration Protocol (DHCP) mode (enabled or disabled). Connections to the CLI are made through the Ethernet ports.

When DHCP mode is enabled, the network DHCP server assigns an IP address, mask, and gateway to each of the Ethernet ports. These addresses are displayed in MAESTRO under Advanced Settings. The Array enables DHCP Mode by default.

When DHCP mode is disabled, the IP address, mask, and gateway for **Port 1** and **Port 2** must be supplied at system setup time and manually changed to reflect any network changes that have an impact.

Once the IPs have been changed, MAESTRO will need the updated IPs entered for management. Click on Managed Arrays >> <array name> >> Update New IP

System Clock Settings

During Array manufacture, the system clock is set to Coordinated Universal Time (UTC). If desired, the system clock can be set as needed to meet site requirements. When the system clock is set on one controller, the system clock of the companion controller is automatically and immediately synchronized.

To approximately synchronize the Array to a local server manually, enter a synchronization time and wait for the server's clock to cycle to that synchronization time before pressing ENTER while in the CLI.

MAESTRO: To display or change the System Clock Settings, select ***Array _Name >> Advanced Settings >> Time Settings,*** then select Edit to update as desired.

The following formats apply to setting time :

a. Date: *dd-mmm-yyyy*, where *mmm* is the 3-letter representation of a month (for example, Nov for November). Enter the month in uppercase or lowercase or a combination of both; it is displayed in lowercase with an initial capital.

b. Time: *hh:mm:ss using* a 24-hour clock.
c. *Time* Zone:
   In the CLI, type **`help timezone`** to see the time zone options.
d. *Daylight*: Enable this option to automatically adjust the time for the change to and from Daylight Savings Time. The Daylight option is enabled by default.

Maestro Time Settings EDIT

NTP Server

When using an NTP Server, "Automatic" will use DHCP to obtain the NTP server address, where as "Static" uses the specified NTP server IP address that is supplied.

System Clock Attribute	CLI Command
Date	configure --date=<*dd-mm-yyyy*>
Time	configure --time=<*hh:mm:ss*>

Timezone	configure --timezone=<zoneoption> Use help timezone to view options
Automatic Daylight Time	configure --timezone=<*zoneoption*> To disable configure --timezone=<*zoneoption*> --dst To enable

Setting System Clock Attributes—CLI Commands

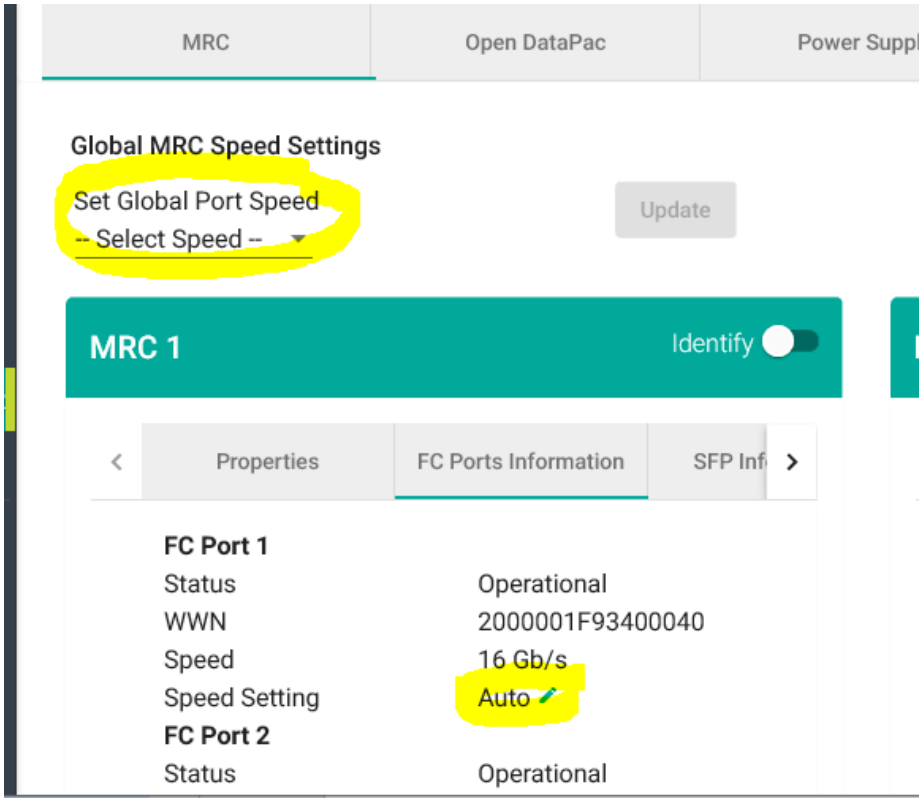
Fibre Channel Port Speed

The Fibre Channel host port speed can be set to one of the following settings:

- Speeds of 4, 8,16Gb on the individual controller ports
- **Auto (default):** Using the protocol defined in the T11 Auto-Negotiation standard, the Array will auto-negotiates with the Fibre Channel switch to determine and set the highest port speed that both devices support.

MAESTRO: ***Array _Name >> Hardware >> Controller >> FC Port Information***

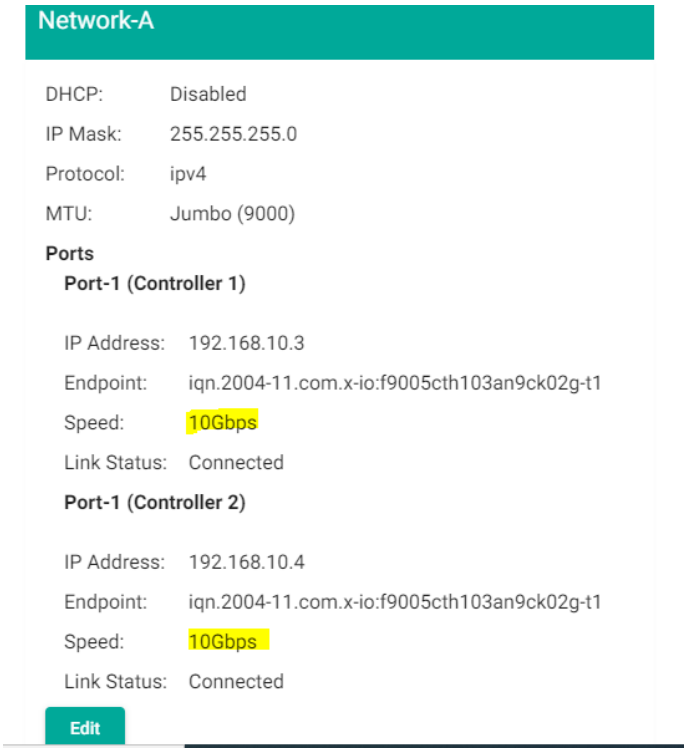
FC speed can be changed per Controller port by selecting the FC Port >> Speed Setting
FC speed can be changed on all Controller ports at one time using the **Set Global Port Speed**



iSCSI Interconnect Speed

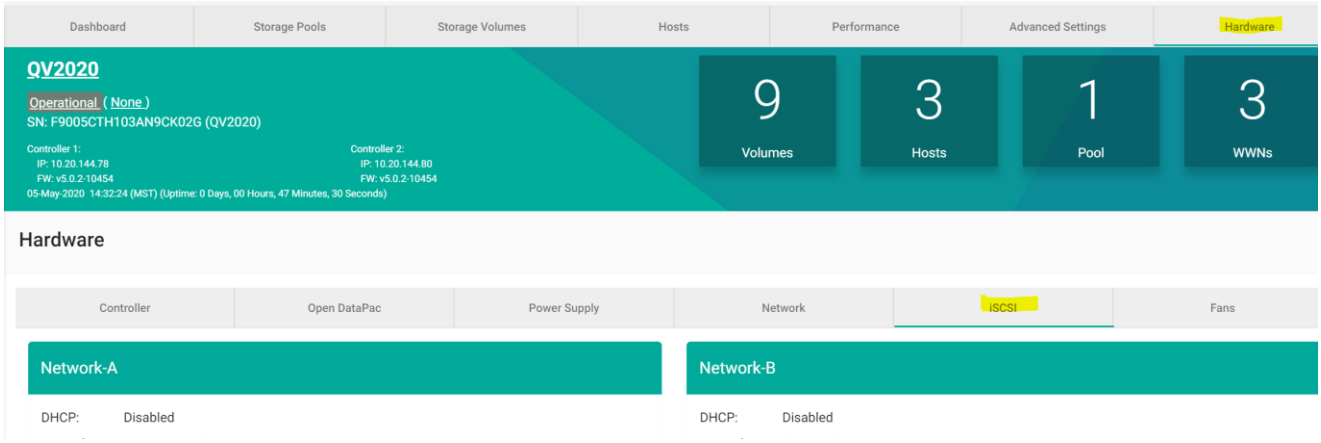
The QV2020 and QV1020 Array iSCSI ports that can operate at 25/10Gb. There are 4 ports per Controller. The negotiated speed is displayed in the iSCSI Hardware Tab. Each Data Network negotiated speed is display per Controller.

Below is an example of Network A for each Controller.



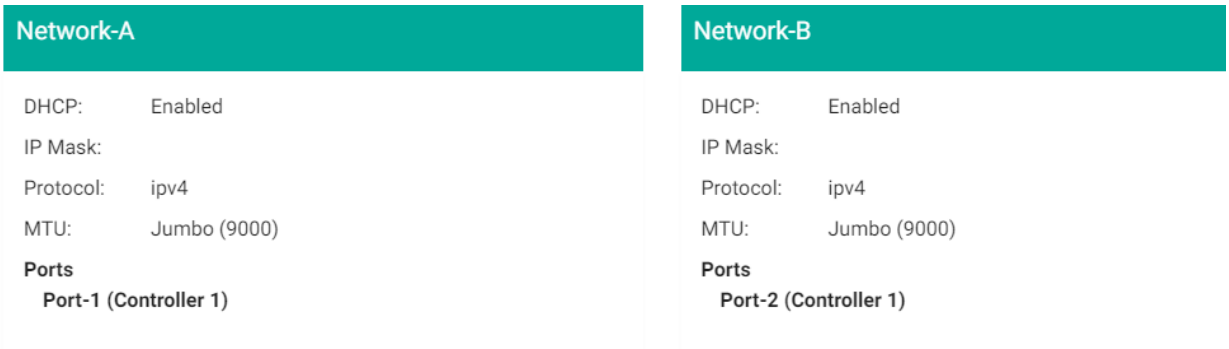
iSCSI Attributes

CHAP and Jumbo Frames iSCSI attributes can be managed through the Hardware iSCSI tab:



Jumbo Frames

The iSCSI Arrays support “normal” Ethernet frames of 1500 bytes or “jumbo” frames of up to 9000 bytes. MTU can be adjusted in the iSCSI tab under the Array Hardware page. Reference the QV2020 and QV1020 Best Practices for additional recommendations for setting Jumbo Frames.

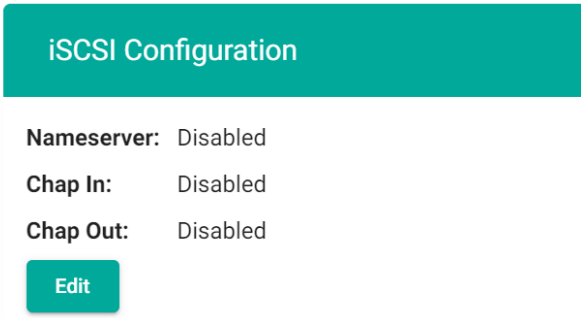


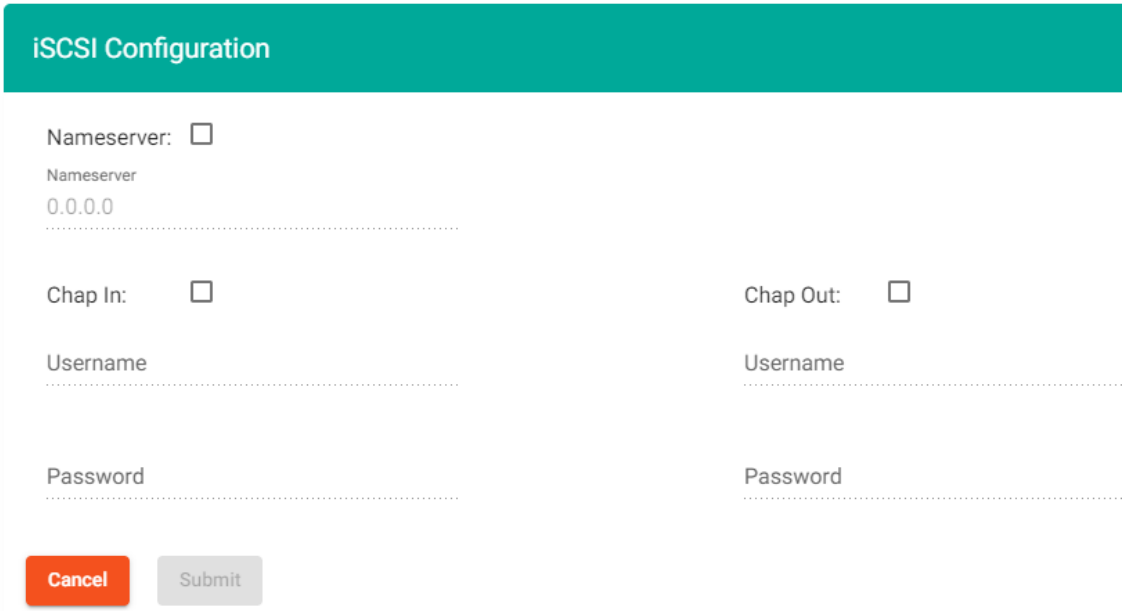
CHAP

The iSCSI Array can be configured to enable CHAP security. The CHAP security model can either perform authentication of the initiator by the target (one-way) or it can authenticate the initiator by the target and then authenticate the target with the initiator (two-way or mutual authentication). The iSCSI Array can use either authentication model as long as the CHAP secret meets the criteria of being 12–16 characters long. If using mutual authentication, the CHAP secrets must be different.

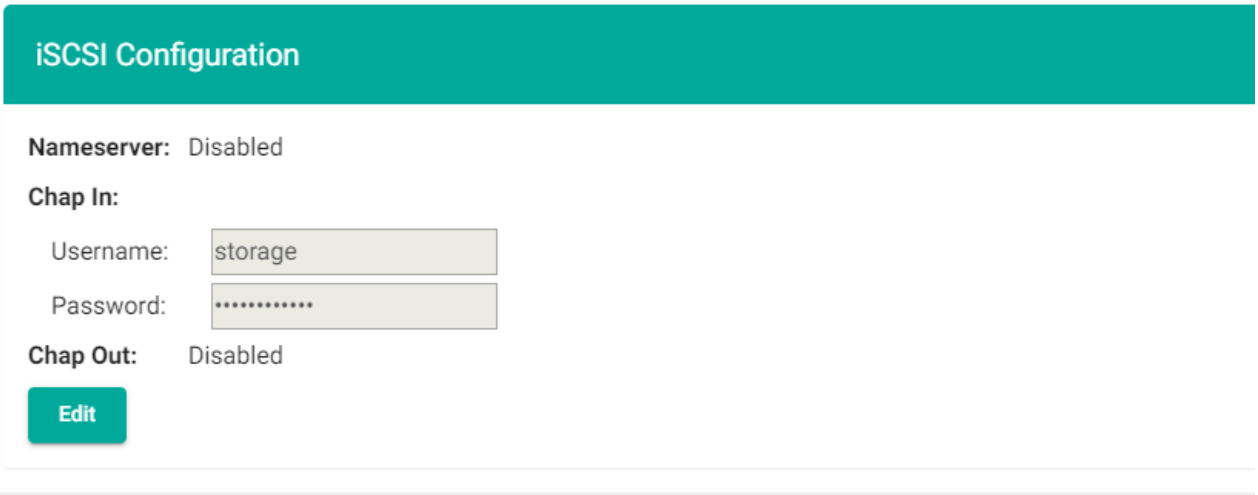
Note: The Array uses a single username and password combination for all hosts. The use of separate username and password combinations for each host is not currently supported.

Chap enable/disable option is located in the iSCSI Configuration section of the page:

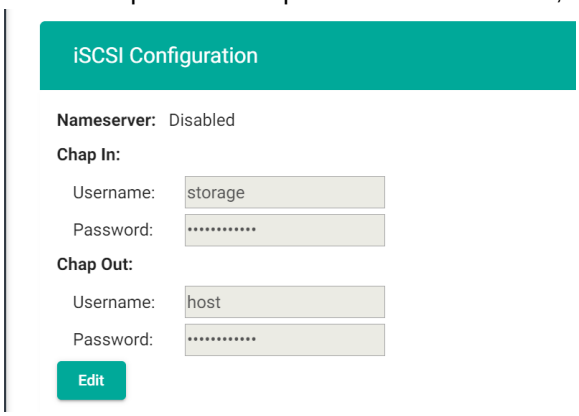




Once enabled, the iSCSI configuration section will display a username and password. The below is what is displayed when Chap In is enabled but Chap Out is still disabled.



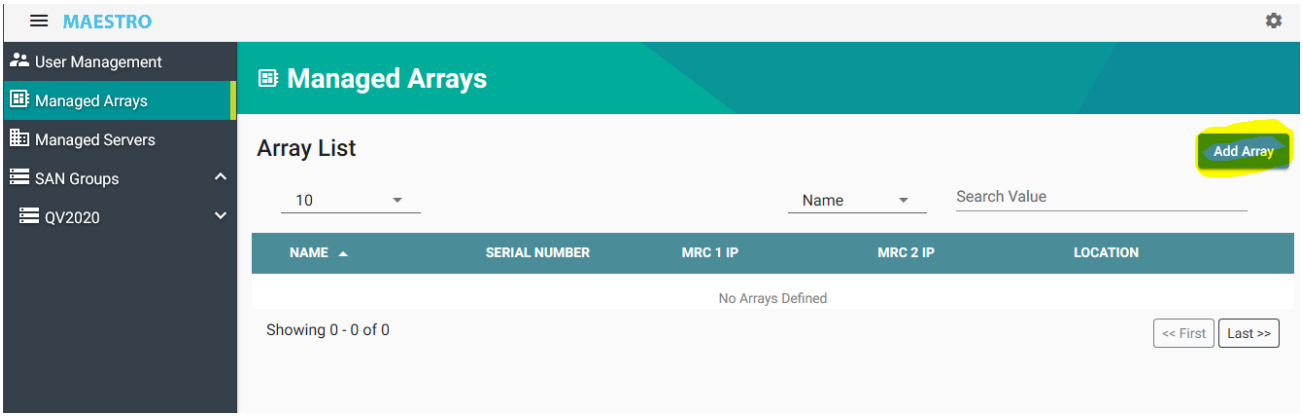
When Chap In and Chap Out are both enabled, the display will appear as following:



Managed Arrays

Once logged into MAESTRO, the array(s) to be managed need to be added to the Managed Arrays list.

Launch MAESTRO, click on Manage Arrays > Add Array



Add QV2020

When adding the array, some options are useful to configure:

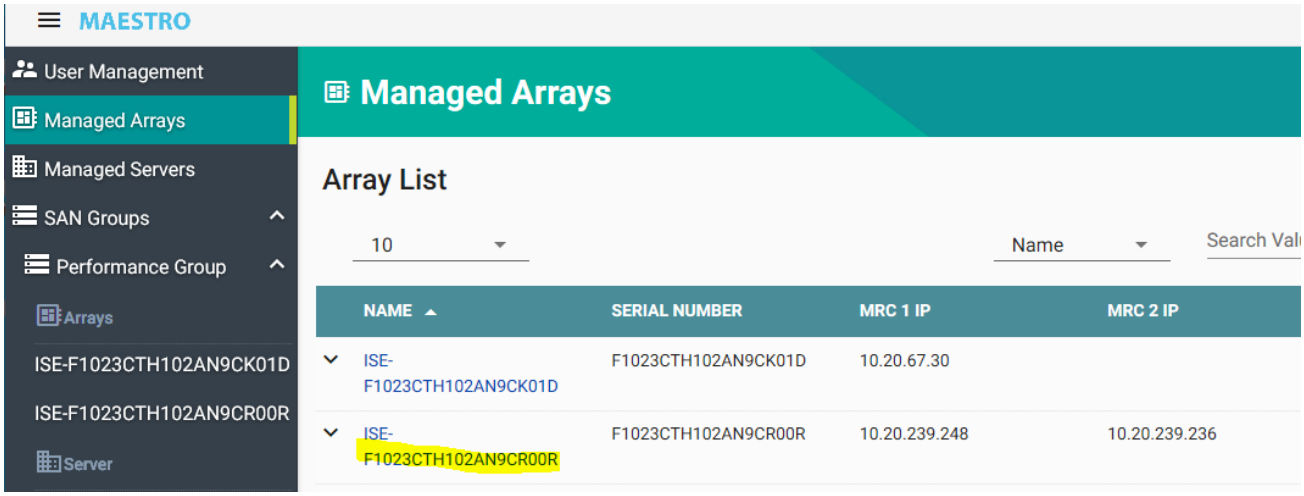
System Name
The system name is an optional user-defined name for the Array. A name is any alphanumeric string of up to thirty-two characters. Embedded blanks and special characters, except “Reserved Characters” shown in tables 1 and 2, are permitted.
Address
The Address is an optional user-defined address for the Array, such as a physical address, building, or any address string. The address is any alphanumeric string of up to sixty characters. Embedded blanks and special characters, except “Reserved Characters” shown in tables 1 and 2, are permitted.
Location
The Location is an optional user-defined location for the array, such as a data center, room number, rack number, rack position, or any other type of locator. The location is any alphanumeric string of up to sixty characters. Embedded blanks and special characters, except Reserved Characters shown in tables 2 and 2, are permitted.
Contact Name
The Contact Name is an optional user-defined name for a person associated with this Array, such as a storage manager, network administrator, or other associated person. The contact name is any alphanumeric string of up to sixty alphanumeric characters. Embedded blanks and special characters, except Reserved Characters shown in tables 1 and 2, are permitted.
Contact Phone
The Contact Phone is an optional user-supplied phone number for the contact person See “Contact Name”. The contact phone is any alphanumeric string of up to sixteen characters. Embedded blanks and special characters, except Reserved Characters shown in tables 1 and 2, are permitted.
Contact Email
The Contact Email is an optional user-defined e-mail address for the contact person. See “Contact Name”. The Contact Email field accepts any valid e-mail address of up to sixty alphanumeric characters.

The above information is reported back to VIOLIN through the Activewatch services. It can provide useful information for shipment of parts and who to contact.

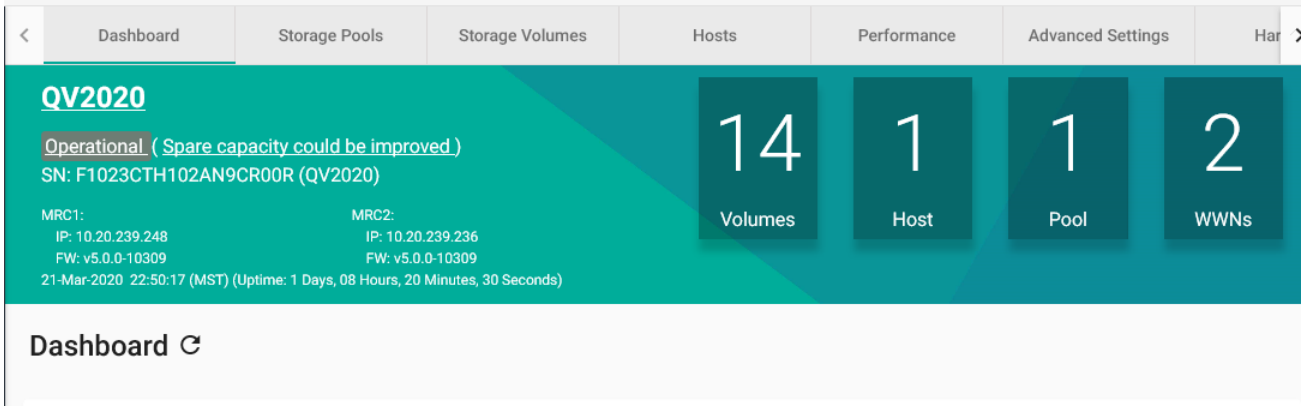
Once the arrays are added to the Managed Arrays list, MAESTRO will maintain persistent information for all the arrays regarding performance, San Group assignments, and Managed Servers. This data is stored on a mirrored VM on the “managing” array. The managing array is the IP used to launch MAESTRO.

Note: If MAESTRO is launched to a non-managing array, the same data will not be available until it is also added to the Managed Arrays in that instance of MAESTRO.

Management and configuring of an array is just one click-away. Click on the array name in the Managed Arrays list:

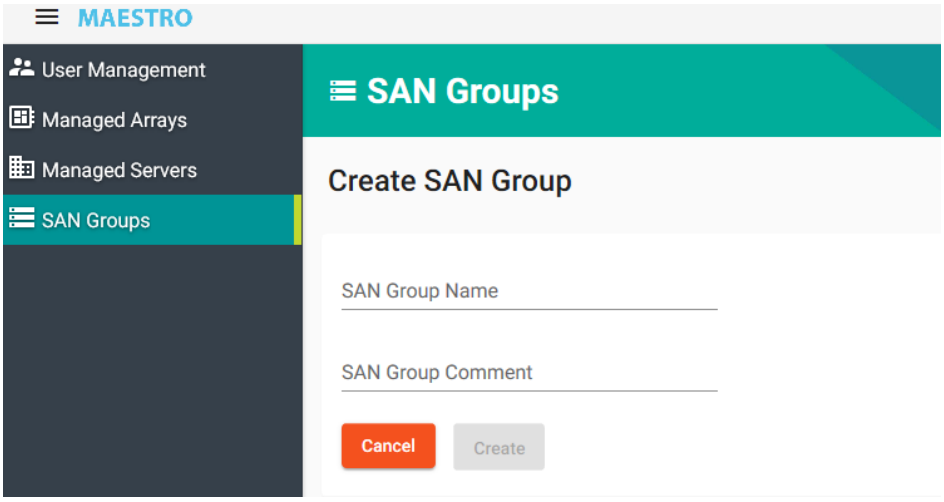


This launches into the Dashboard for the array:



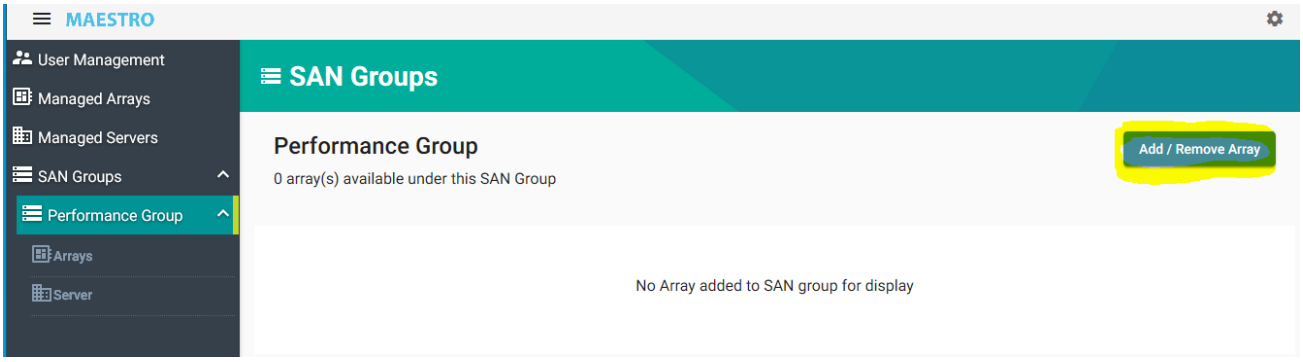
SAN Groups (optional)

QV2020, QV1020, and XIO G4 arrays can be logically grouped into SAN Groups. A SAN Group is a collection of arrays that that allows quick access to a group of arrays. This is useful when there are large number arrays in the Managed Arrays. A SAN Group can be created when an array is added to Managed Arrays or independently by clicking in the left Navigation pane on SAN Groups. When fewer arrays are in the Managed Arrays list, access to the array can easily occur by clicking on the array name in the Managed Arrays list, instead of adding to a SAN Group.

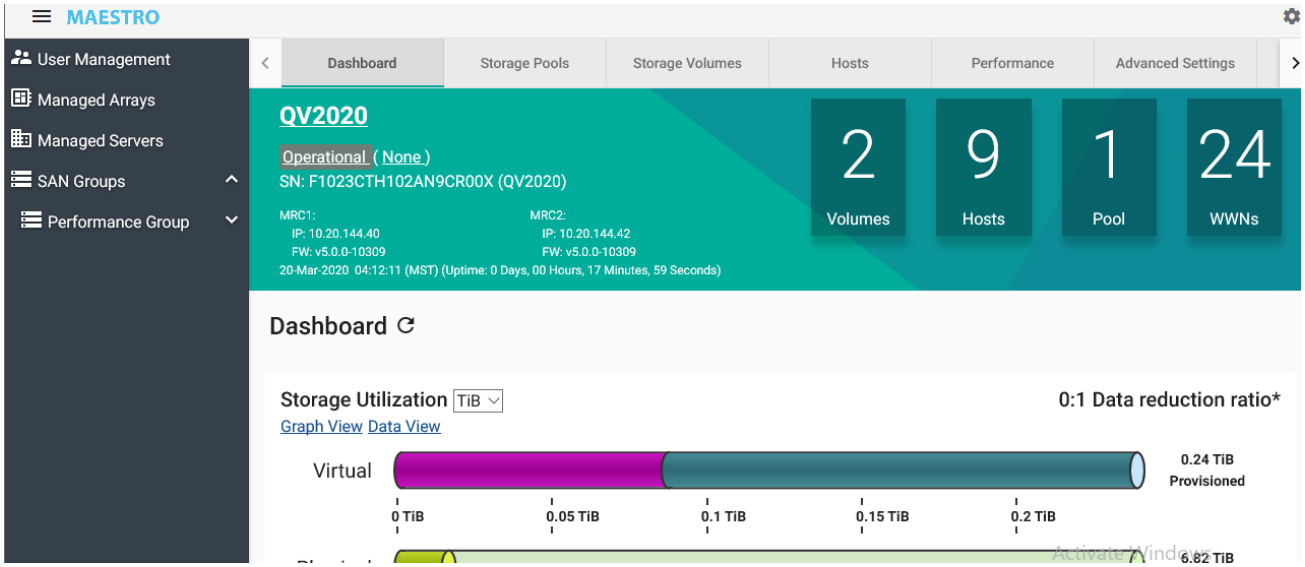


Arrays are added to a SAN Group either when they are added into Managed Arrays or after a SAN Group is created.

Click on SAN Group name in navigation pane and ADD the array



The QV2020, QV1020, and XIO G4 arrays that are being monitored by MAESTRO are shown in the left navigation pane. Click on an array and the status summary is displayed in the Dashboard.



Dashboard —Status Summary

Storage Pools

In the QV2020 and QV1020 All Flash Array, storage capacity is organized into entities called storage pools or pools.

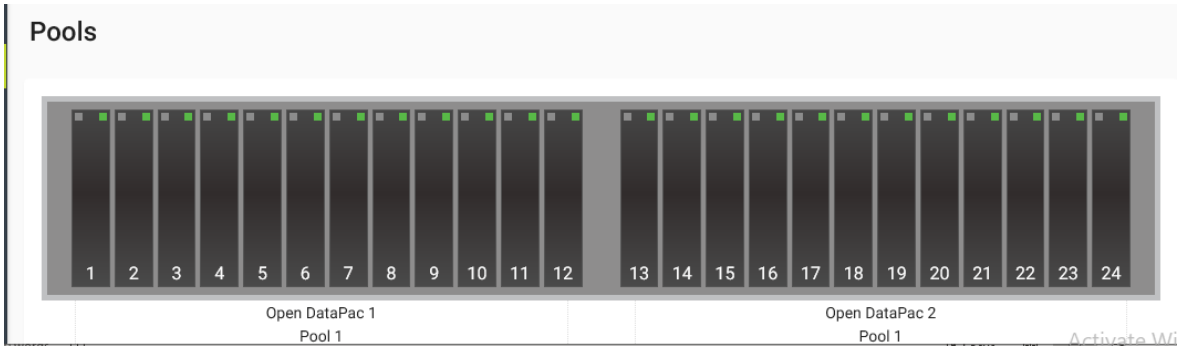
An Open DataPac is a collection of NVMe drives. 11 drives are in Open DataPac. One or two Open DataPacs are supported, for a total of 22 drives. The QV2020 5.0 configuration supports 12 drive Open Datapacs. for a total of two Open DataPacs and 24 drives.

Open DataPacs are allocated by default to Pool1. Pool expansion is supported by installing Open DataPac 2, after the array is initialized.

A pool consists of all available capacity provided by one or two Open DataPacs. The overall capacity of each pool is determined by the number and size of the drives in the Open DataPac(s) allocated to the pool, minus the 10% that is reserved for spare capacity. QV2020 5.0 configurations are initialized by default at 20% spare capacity.

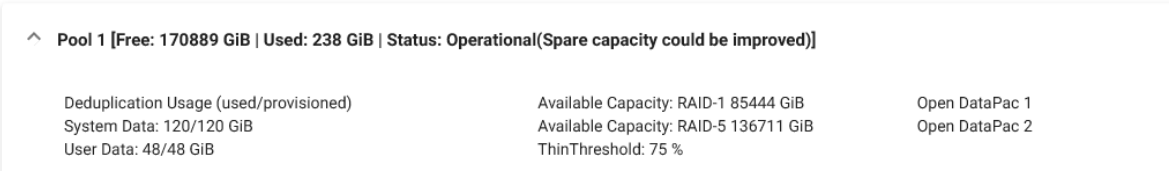
Volumes are created within a pool. Volumes can be RAID-1 or RAID-5, and thin or thick provisioned or type deduplication. Deduplication is enabled by default through MAESTRO. Dedupe volumes are restricted to Pool1. QoS can be enabled on thick and thin volumes. QoS is not supported on dedupe volumes.

Open DataPac and Storage Pools page: (QV2020 5.0 software configuration with 24 drives)



Pool Information

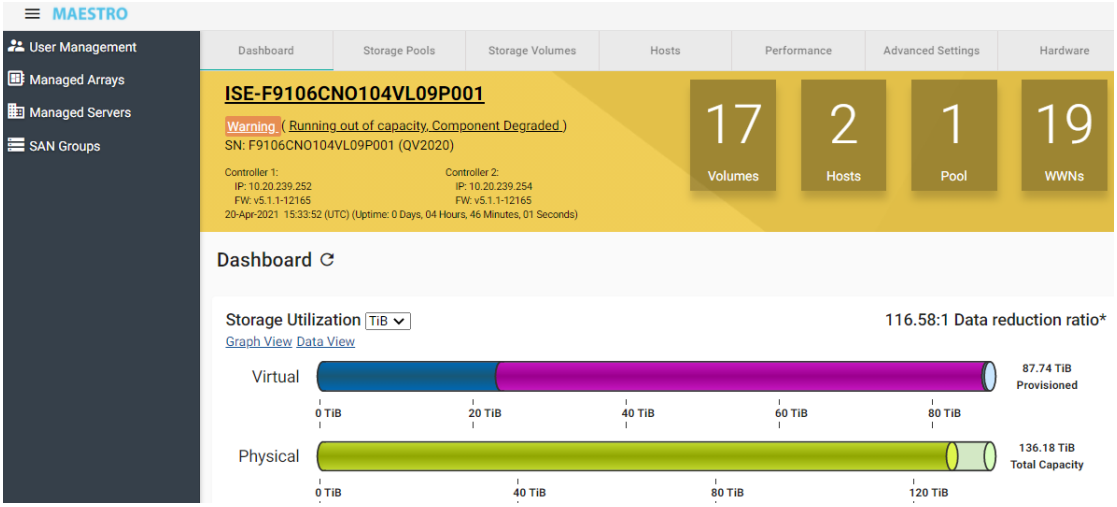
Pool capacity and usage details are displayed on the Storage Pools page.



Thin Threshold (Running Out of Capacity)

Thin Threshold provides an alert when the array total used capacity has reached the threshold, or beyond. By default it is set to alert when 75% of the array capacity has been written/used. The Thin Threshold setting is displayed in Pool information. Thin Threshold can be adjusted, via command line, to alert at lower or higher thresholds.

Several alerts are generated when the threshold is reached: email alert (if enabled), Maestro will display a yellow banner (Running out of capacity), and command line “show ise” command will indicate warning status. Below are examples of these alerts.

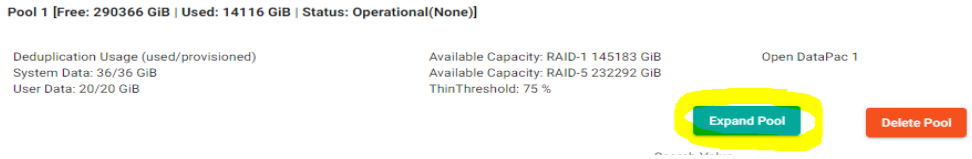



```
bem:> show ise

System Information
================================================================================

  ISE-F9106CNO104VL09P001 (IP Address: 10.20.239.254)
  ----------------------------------------------------------------------------
   Status           : Warning (Running out of capacity, Component Degraded)
      Details       : 0x00000002
   Date/Time        : 20-Apr-2021 15:35:16
   Time Zone        : UTC
   Up Time          : 0 Days, 4 Hours, 54 Minutes, 39 Seconds
   Identifier       : 2000001F93400930
   Serial Number    : F9106CNO104VL09P001
```

Although this feature is mainly intended to alert for configurations with thin volumes, it actually provides an alert for any configuration running out of capacity.

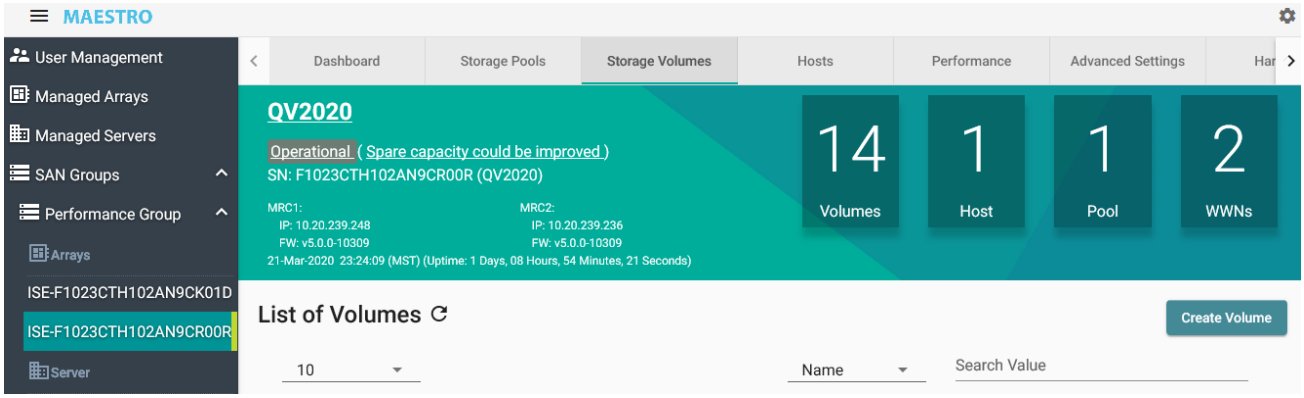
Pool Expansion

Additional capacity can be added to the Array if the drive slots are not fully populated. After inserting additional drives, Pool 1 can be expanded by clicking on the Expand Pool button, as shown below.

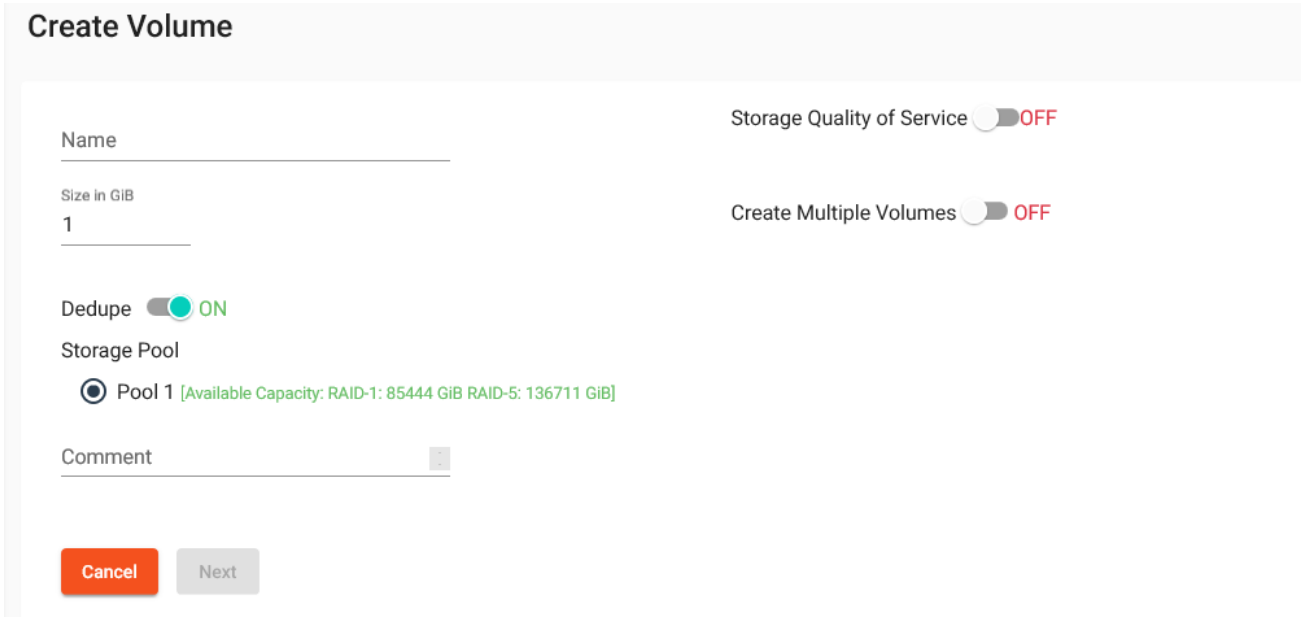


Volumes

Volumes can be created through the array Storage Volumes tab.



Click on Create Volume and volume types and available capacity will display:



Thin Provisioning

Thin Provisioning is a method of over-subscribing or over-provisioning the amount of space on a storage array. One of the advantages of thin provisioning is on-demand allocation. This allows the storage administrator to present volume to an Operating System without having to fully allocate the space on the

storage array. By using Thin Provisioned volumes, the array can be used in a more space efficient manner. Only when new writes are requested are the new blocks actually allocated to the Thin Provisioned volume. Blocks that are re-written do not require new blocks to be allocated. Thin Provisioning thresholds are implemented on a per pool basis.

NOTE: The default Thin threshold is 75% of the pool storage. Use the CLI **`modify –pool=<pool_ID>`** command to change the threshold value.

Deduplication

Dedupe volumes are the default volume type. It is assumed the user will want to optimally use the storage capacity by allowing the array to detect duplicate data and store only one copy. The array detects duplicates across all dedupe volumes and optimizes into one copy of the data.

The dedupe volume size is not reserved within the system and full capacity is not guaranteed like a thick volume. As unique writes come in for a volume, the requested capacity growth will be measured against the original volume size. Data will not be allowed to be written if the volume size has been reached or the array no longer has available capacity.

Deduplication requires execution of complex algorithms withing the array. As such, dedupe volumes are traditionally not as high performing as non-dedupe volumes.

Quality of Service (QoS)

QoS settings are available per volume. This optional feature is available on thick and thin volumes. It is not supported on dedupe volumes. Setting the IOPS limits effectively sets a priority for volumes. If these goals or limits are not met, the array automatically adjusts the service levels in order to make sure that necessary QoS levels for your highest priority applications are nearly always maintained.

Min Goal IOPS can be considered a means of “reserving” performance for given LUNs and will throttle back other LUN performance to achieve this goal. Throttling delays the I/O request, which adds latency to the I/O to slow down the host. The Min can be guaranteed only if the host is generating the I/O to reach that minimum, so care should be taken to set a realistic Min value.

Max Limit IOPS is used in conjunction with Min Goal and is only applied when other volumes are unable to achieve their minimum goals and the system is under. Max Limit per volume can be considered a soft threshold for IOPS. As long as volumes are achieving their Min Goal, then IOPS can go higher and reach the Burst Limit (hard threshold) for an indefinite period of time.

Burst Limit IOPS “caps” the IOPS as a hard threshold or ceiling. IOPS can never exceed the Burst Limit. If a user is using QoS for the use case of provisioning IOPS, this generally will set Burst Limit the same as Max Limit.

Converting Volumes from Thick to Thin

The array supports converting thick volumes to thin volumes.

NOTE: Some operating systems and applications may not automatically adjust to the volume attribute change. Please refer to you vendor-specific documentation for specific guidelines on how to rediscover a volume that has been converted to a thin volume.

MAESTRO: In *Edit Volume dialog*, select Thin Provisioning option.

Re-size LUNs

The array supports LUN re-sizing, expansion, and shrink in place without first copying data to another volume. LUN re-sizing in the array is done in multiples of 1GB by adding to or subtracting from the currently highest numbered logical block address. During LUN re-sizing, independent of the LUN re-size amount, host I/O to the volume is momentarily paused (no more than ten seconds).

A re-sizing process cannot be aborted once initiated, cannot be undone, and the original presentation persists. Presentation changes must be done manually after the LUN is re-sized. The re-size process is unaffected by controller failovers and reboots.

LUN Expansion

When the expansion process begins, the array reserves enough space to complete the expansion.

LUN Shrink

The operating system volume shrink must be completed before a LUN shrink is attempted. Not all operating systems, file systems, and databases support volume shrink. Refer to the operating system documentation for recommended procedures prior to volume shrink.

NOTE: Improper use of LUN shrink results in data loss.

Configuring Hosts

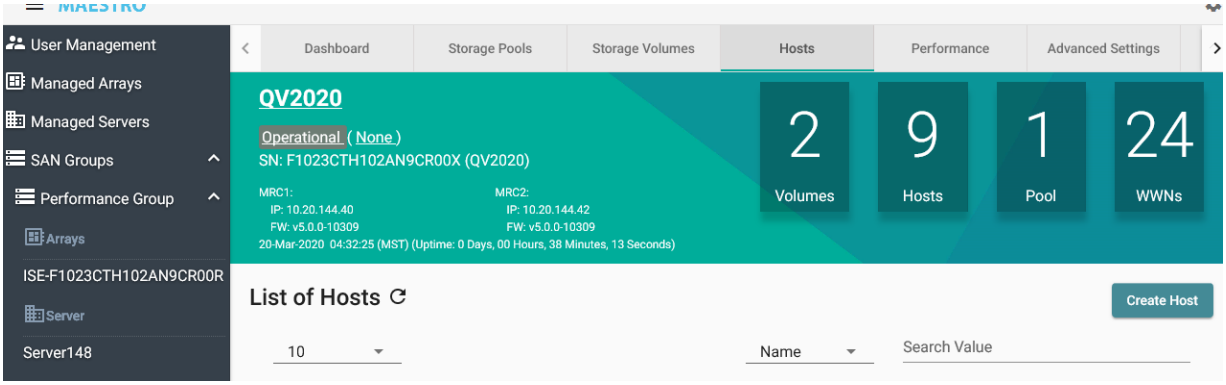
In the Array, the Host Bus Adapter (HBA) port World Wide IDs (WWIDs) are organized into entities called hosts. A host consists of one or more HBAs under a single name, by which all the HBAs in the host are referenced. Volumes must be presented to a Host for a server to have access to the LUN.

Mapping Volumes and Hosts

When presenting a volume to a host, a mapping between that host and that volume is created. Each time a mapping is made, the array assigns an incrementing LUN number (starting with 1) to the volume so that it can be seen by that host.

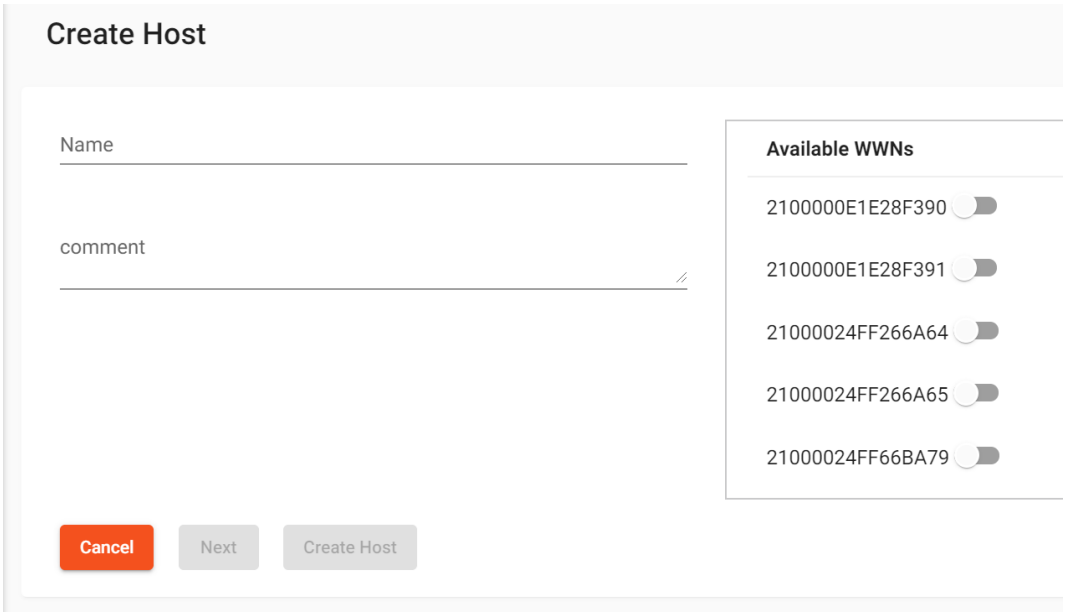
NOTE: Some operating systems or Boot from SAN environments require **`LUN0`** or a valid response from **`LUN0`** to discover presented LUNs. Verify the requirements by referring to the best practices for your operating system.

. Hosts can be created and volumes assigned through the array Hosts page;

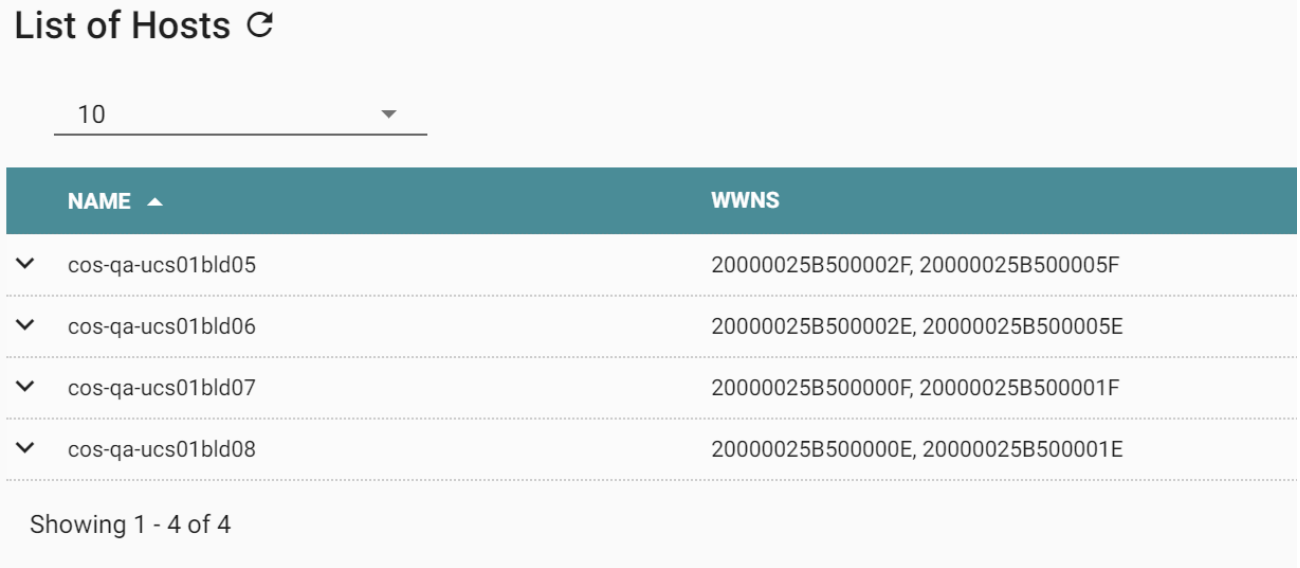


Click on Create Host, select volumes (already created) by clicking the slider.

Creating a **Fibre Channel host** to present volumes will look like the below, with a list of available WWNs. If nothing is listed as available, then the host Fibre connections have not yet logged into the Array or all WWNs have already been assigned to an Array “host”.

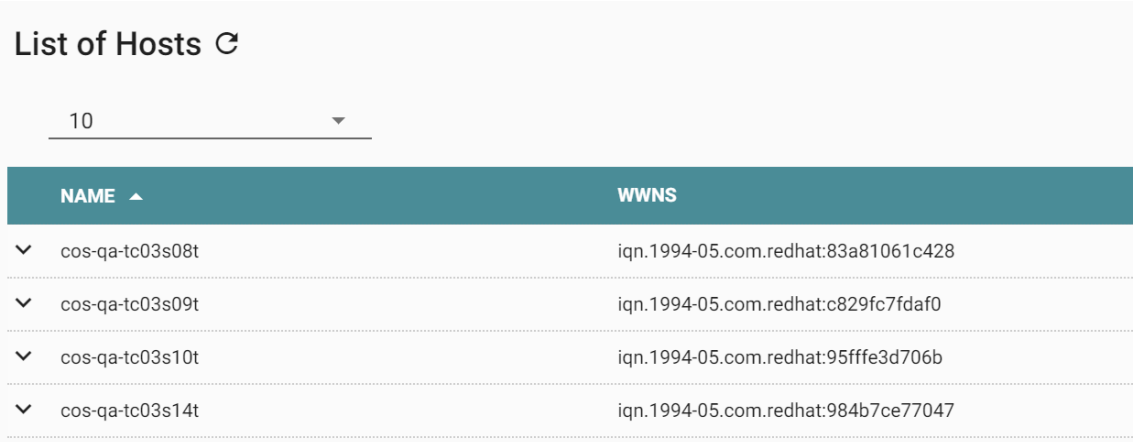


After assigning WWNs for a Fibre Channel Host, the display will appear as follows, where WWNs will be listed under the WWNS column:



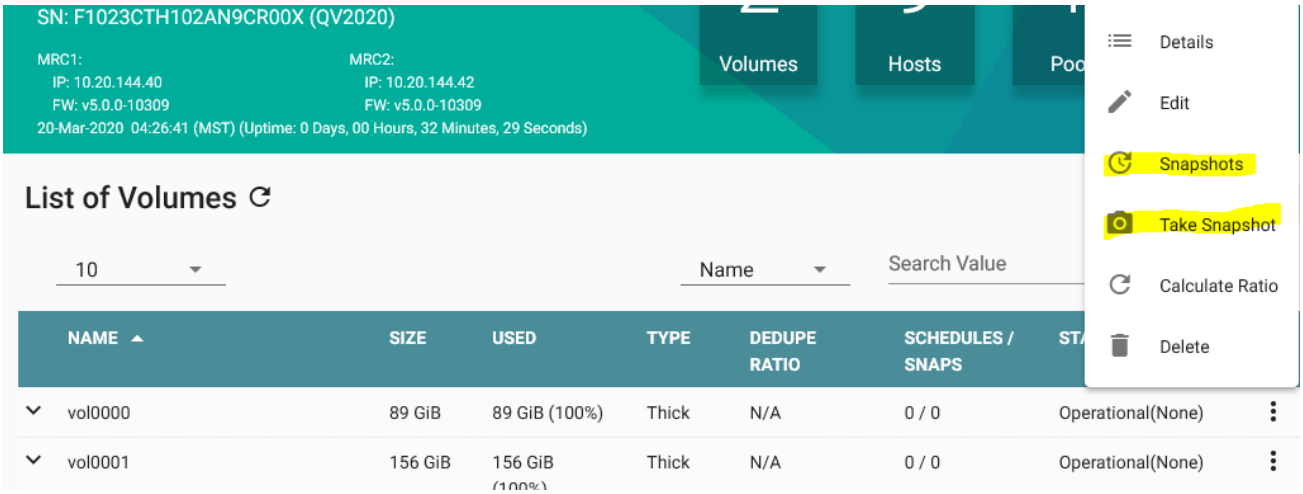
Creating a **iSCSI host** to present volumes will look like the below, with a list of available IQNs. If nothing is listed as available, then the host iSCSI connections on the host have not yet been enabled. The list will only display IQNs that have logged into the Array and have not been assigned to an Array “host”.

After assigning IQNs for an iSCSI Host, the display will appear as follows, where IQNs will be listed under the WWNS column:



Snapshots

Space efficient snapshots are supported on dedupe volumes. This feature can be managed in MAESTRO through the Volumes tab. Snapshots can be manually created or automatically generated based on schedules.



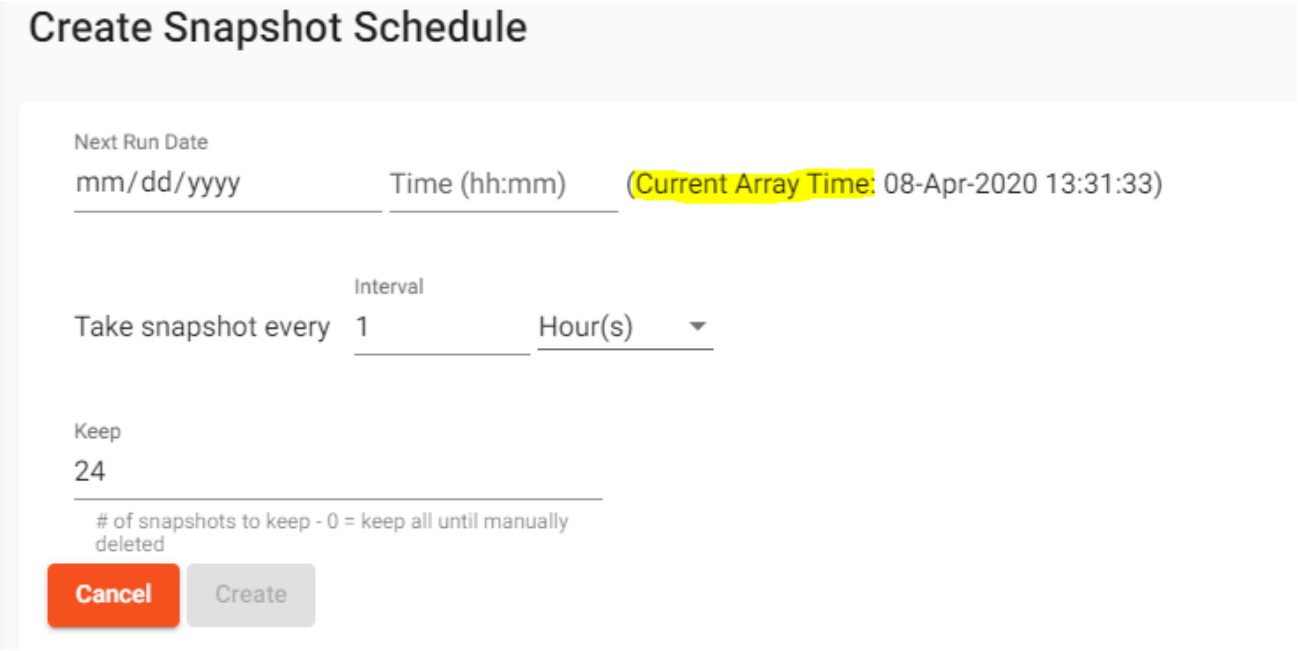
Snapshots

Snapshot Schedules

Schedules allow for snapshots to be automatically generated at a fixed interval with an initial start date/time.

Snapshot schedules “Next Run Date” is based on the **array timezone**, noted in the Banner time.

When creating a schedule, the array time zone and date/time are used. All future snapshots will be dated with the array time.



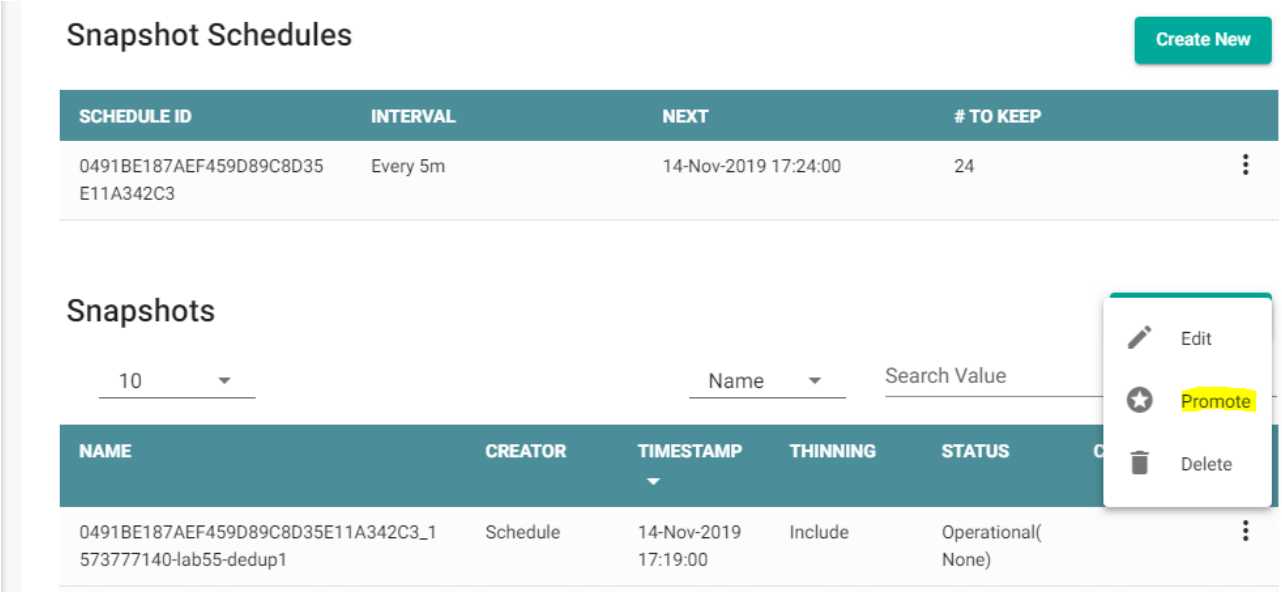
A "**keep**" option on the schedule allows for a default of 24 snapshots to accumulate, per schedule, before thinning occurs. The keep value can be adjusted per schedule. Snapshots created by schedules can be changed to "exclude from thinning".

Special Considerations:

1) A maximum of two non-identical schedules can be assigned per volume.
2) Schedules that coincide at the same time on multiple volumes will have slight overhead in performance due to background thinning. It is recommended to stagger these intervals to avoid concurrent operations.
3) Time changes on the array will not update the original time for the snapshot schedules. Each schedule will need to be updated or recreated with the new timestamp baseline.

Promoted Snapshot

Snapshots are not accessible by the client/server to preserve the original data. If data needs to be read or written from a snapshot, the snapshot must be "promoted". Promote will clone the data from the snapshot and create a new array volume. The new volume is independent from the original parent volume of the snapshot. Data written on the promoted volume will not be written to the original snapshot nor the parent volume of the snapshot. A snapshot can be promoted through the Volume Snapshot page, by selecting the details on the snapshot.

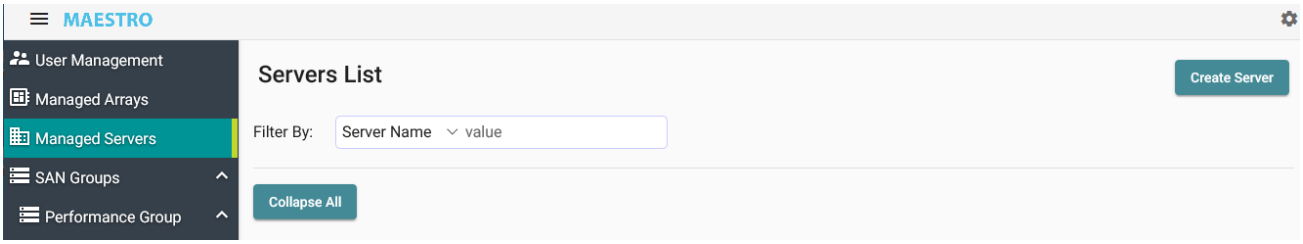


Refer to the QV2020 and QV1020 Best Practices Guide for how to configure and manage snapshots and schedules through MAESTRO.

Managed Servers (optional)

Once hosts are created and volumes are presented, MAESTRO provides an optional feature called **Managed Servers**. This feature generates a top-down logical view of servers, as defined by their HBAs, and associations to managed arrays and volumes.

Click on Managed Servers and then Create Server to create a Server.



Once a server is created, MAESTRO will poll all the Managed Arrays and generate a collective list of all the volumes presented to that server, via Hosts:

Server148

Vol Name (GUID)	Capacity (%Alloc)	LUN	Array Name
dedup1 (6001F9340004000035DA000200000000)	1200GiB (5.39%)	1	ISE-F9005CTH103AN016008
dedup1-001 (6001F9340004000035DB000200000000)	1200GiB (4.51%)	2	ISE-F9005CTH103AN016008
dedup1-002 (6001F9340004000035DC000200000000)	1200GiB (99.95%)	3	ISE-F9005CTH103AN016008
dedup1-003 (6001F9340004000035DD000200000000)	1200GiB (99.95%)	4	ISE-F9005CTH103AN016008
dedup1-004 (6001F9340004000035DE000200000000)	1200GiB (99.95%)	5	ISE-F9005CTH103AN016008
dedup1-005 (6001F9340004000035DF000200000000)	1200GiB (99.91%)	6	ISE-F9005CTH103AN016008
dedup1-006 (6001F9340004000035E0000200000000)	1200GiB (99.91%)	7	ISE-F9005CTH103AN016008
dedup1-007 (6001F9340004000035E1000200000000)	1200GiB (99.91%)	8	ISE-F9005CTH103AN016008
dedup1-008 (6001F9340004000035E2000200000000)	1200GiB (99.91%)	9	ISE-F9005CTH103AN016008
thick1 (6001F9340004000035E3000200000000)	100GiB (100%)	10	ISE-F9005CTH103AN016008
thick1-001 (6001F9340004000035E4000200000000)	100GiB (100%)	11	ISE-F9005CTH103AN016008
thick1-002 (6001F9340004000035E5000200000000)	100GiB (100%)	12	ISE-F9005CTH103AN016008
thick1-003 (6001F9340004000035E6000200000000)	100GiB (100%)	13	ISE-F9005CTH103AN016008
Dedup1-v1 (6001F934000300002D02000200000000)	2000GiB (1.09%)	1	ISE-F9005CTH103AN9CK02J
Dedupe-v1-001 (6001F934000300002D03000200000000)	2000GiB (1.12%)	2	ISE-F9005CTH103AN9CK02J

This view is helpful when scheduling server maintenance to verify which Arrays/LUNs are associated. In the above display, two Arrays (highlighted) have volumes that are presented to Server148.

Edits and management to an array or volume from the Server list is as simple as clicking on the Array or volume link:

Servers List

Create Server

Filter By: Server Name value

Collapse All

Server148 (Performance Group)

Vol Name (GUID)	Capacity (%Alloc)	LUN	Array Name
dedup1 (6001F934000400003A38000200000000)	3000GiB (27.36%)	1	ISE-F1023CTH102AN9CR00R
dedup1-001 (6001F934000400003A39000200000000)	3000GiB (25.70%)	2	ISE-F1023CTH102AN9CR00R
dedup1-002 (6001F934000400003A3A000200000000)	3000GiB (63.21%)	3	ISE-F1023CTH102AN9CR00R
dedup1-003 (6001F934000400003A3B000200000000)	3000GiB (63.73%)	4	ISE-F1023CTH102AN9CR00R
dedup1-004 (6001F934000400003A3C000200000000)	3000GiB (63.26%)	5	ISE-F1023CTH102AN9CR00R
dedup1-005 (6001F934000400003A3D000200000000)	3000GiB (62.40%)	6	ISE-F1023CTH102AN9CR00R
dedup1-006 (6001F934000400003A3E000200000000)	3000GiB (64.42%)	7	ISE-F1023CTH102AN9CR00R
dedup1-007 (6001F934000400003A3F000200000000)	3000GiB (61.71%)	8	ISE-F1023CTH102AN9CR00R
thick (6001F934000400003A40000200000000)	10GiB (100.00%)	9	ISE-F1023CTH102AN9CR00R
thick-001 (6001F934000400003A41000200000000)	10GiB (100.00%)	10	ISE-F1023CTH102AN9CR00R

VIOLIN vCenter Plugin

A vCenter storage plug-in is available in the QV2020 software release 5.0.11, and QV1020 5.1 software version and later The VIOLIN array plugin allows the ability to create and manage datastores on the array from within vCenter. The VIOLIN plugin includes array volume create, delete, and modify, as well as presentation to an ESX host as a datastore. MAESTRO provides easy-of-use to install, uninstall, or verify install of the array plug-in.

The VIOLIN plugin is supported on vCenter versions:

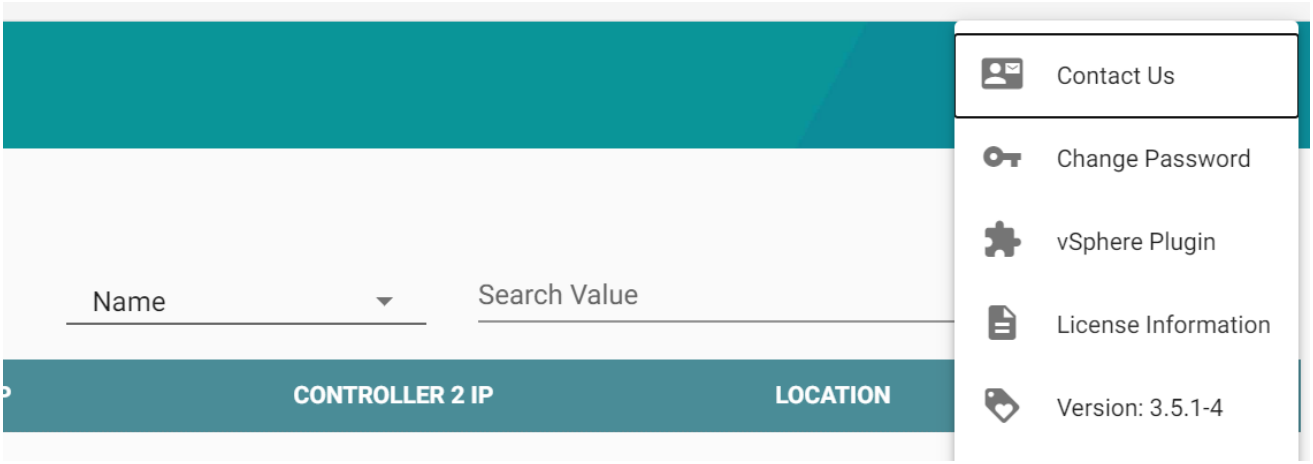
- 6.5 U3
- 6.7 U3
- 7.0

Note: vCenter versions prior to 7.0 may require a ESX server reboot to update the installation status of the VIOLIN plugin.

Registering VIOLIN QV2020 vCenter Plugin

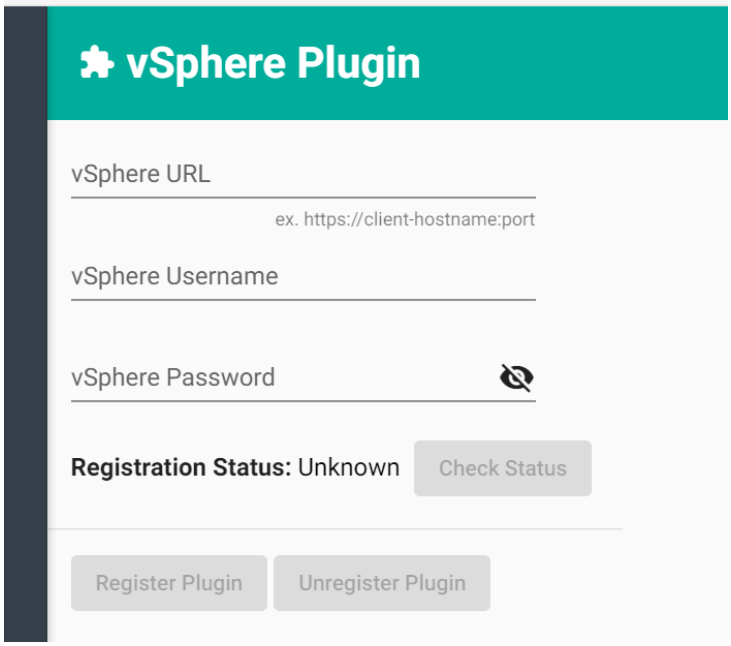
The VIOLIN array plugin is registered (installed) within vCenter by using MAESTRO.

To register (install), unregister (uninstall) or check the status of the VIOLIN vCenter plugin, log into MAESTRO and select vSphere Plugin from the gear options.



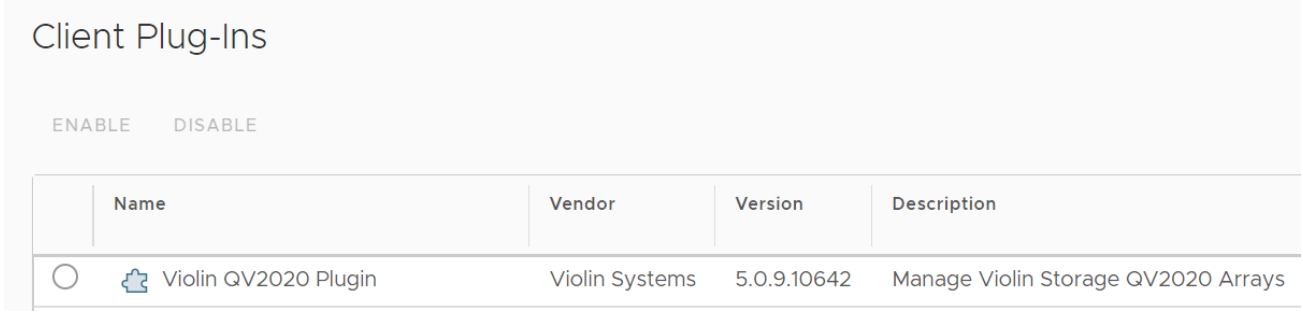
The vCenter https address and credentials are required. Once these fields are populated, MAESTRO can verify the registration status of the plugin and register or unregister the VIOLIN plugin.

Select Register Plugin to install the VIOLIN array plugin.

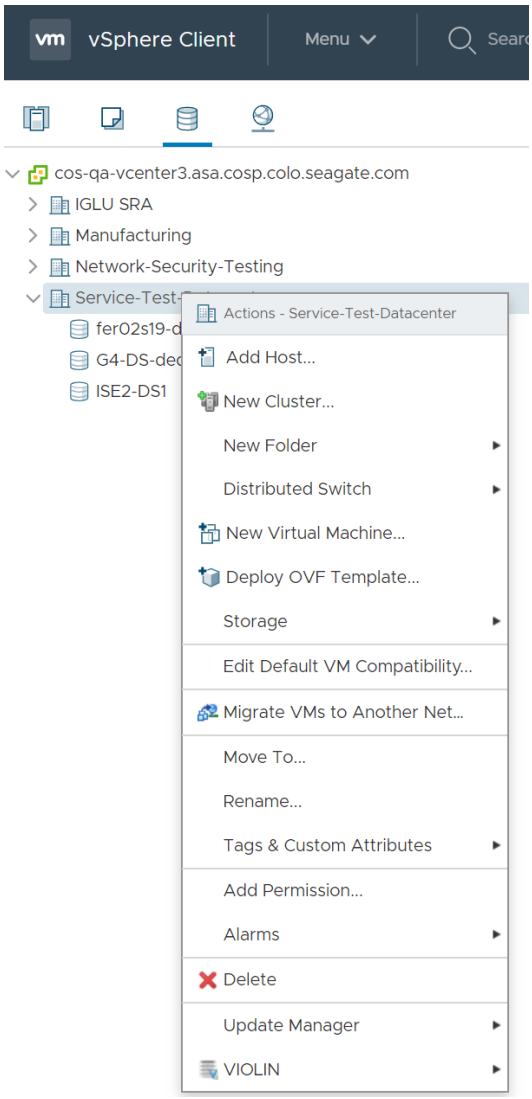


Using the VIOLIN Array Plugin

Once the VIOLIN Array plugin is registered in the vCenter, the plugin will display in the list of vCenter plug-ins in the Administration page:



The VIOLIN QV2020 Plugin can be accessed like any other vCenter storage plug-in by right-clicking on Hosts and Clusters or Storage view:

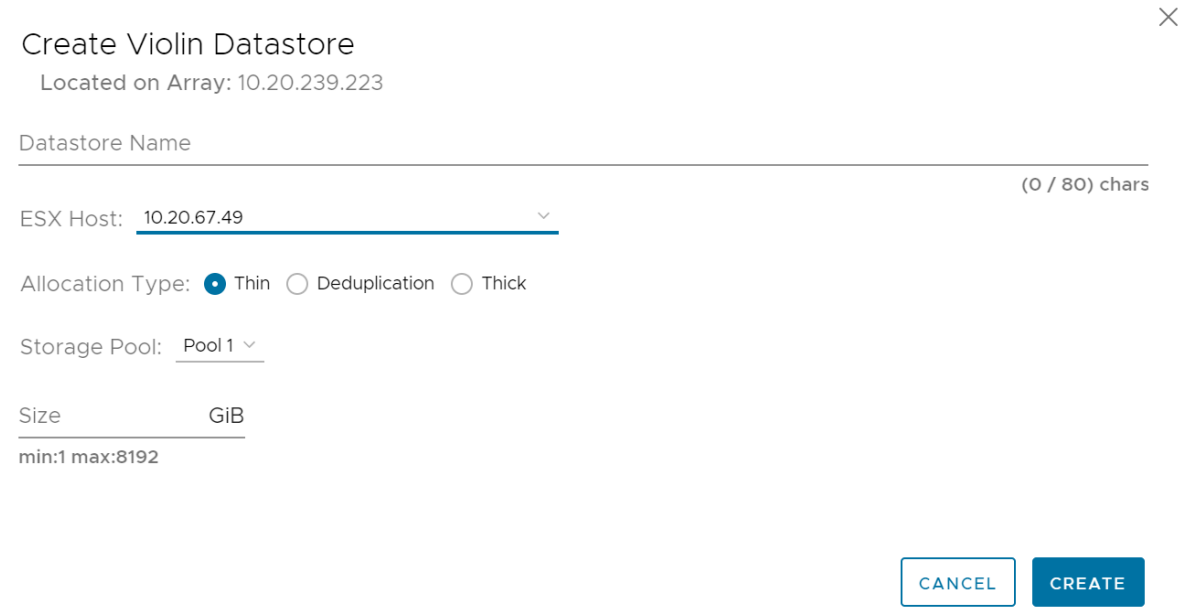


Click on the VIOLIN pull-down for datastore management options.

When using the plugin, the address and login credentials for MAESTRO are required to access to the QV2020 Managed Arrays.

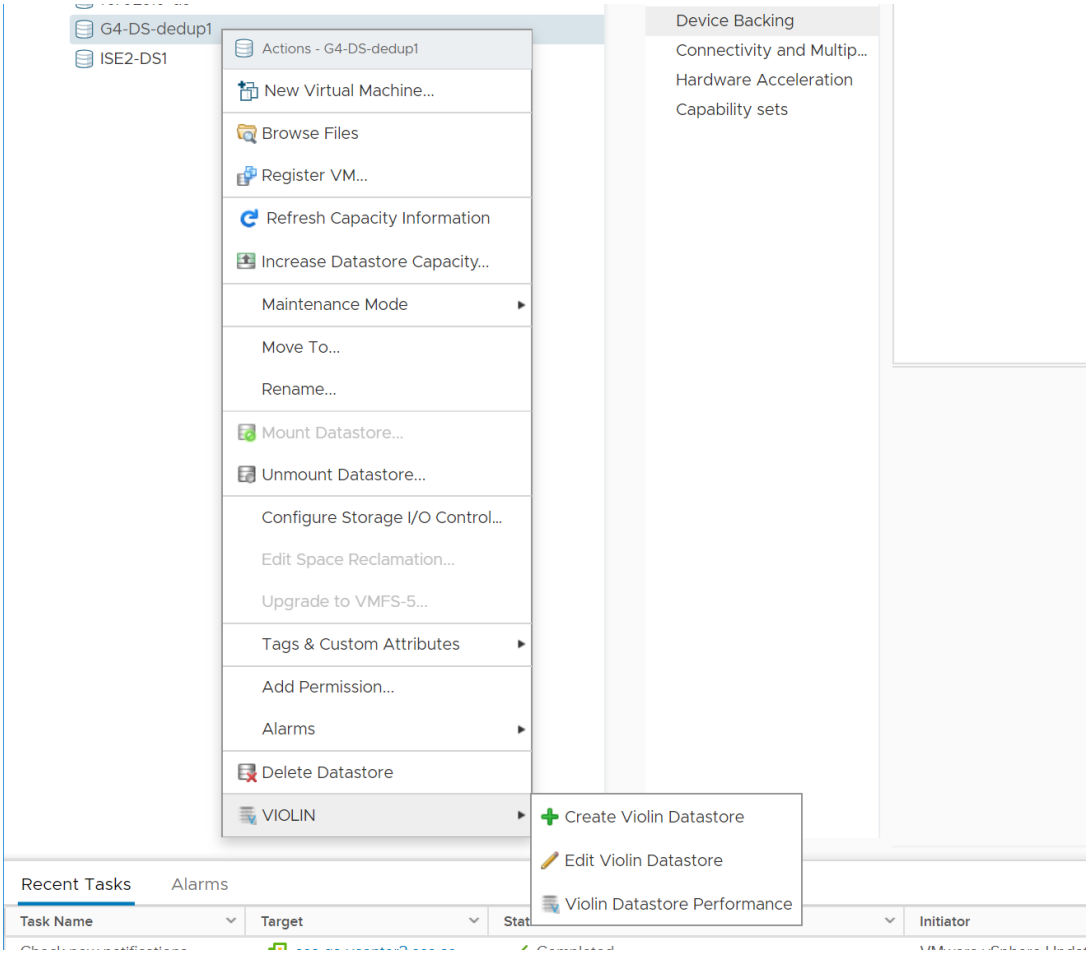
Creating a Datastore

Through the VIOLIN QV2020 plugin, click on Create Datastore. The name supplied for the Datastore will be viewable in vCenter, as well as in the array volumes list through MAESTRO.



Managing a Datastore

Once a datastore is created on the array, it can be deleted or modified through the VIOLIN plugin.



Array Monitoring

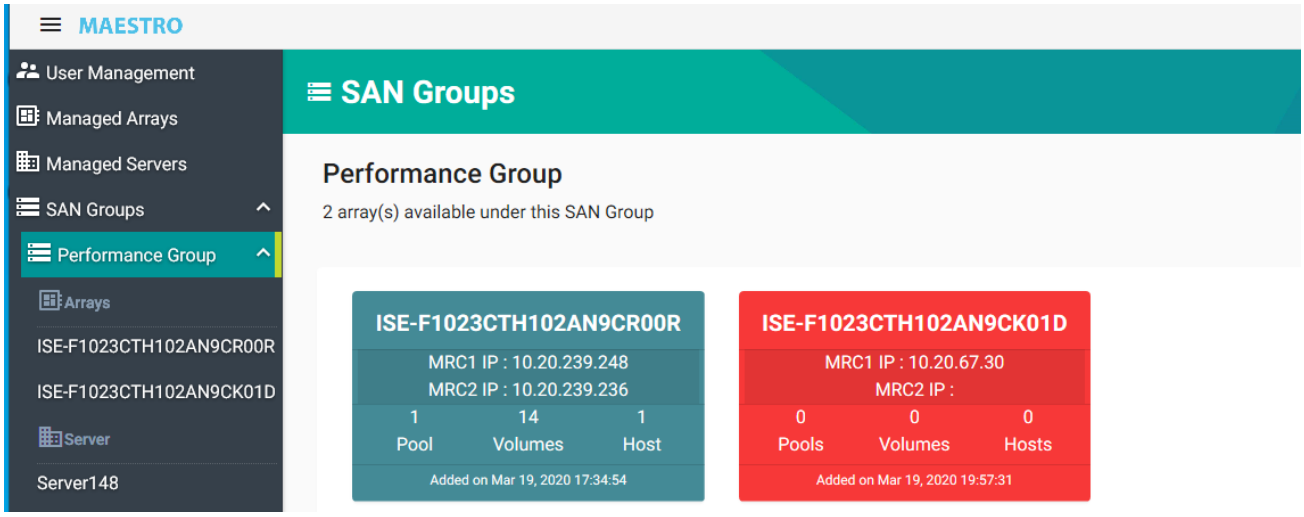
The QV2020 and QV1020 offer multiple methods to monitor the health and capacity usage of the array. Automated health is sent to the VIOLIN Activewatch System (phone home). This automated service runs every 24 hours. It will alert the Violin Services team to events that may need attention.

Note, this service should never be the sole method of managing a customer's array. A customer should also monitor their systems. This will provide coverage when there may be outages in sending the information to VIOLIN (network outages, for example) or receipt of the information within VIOLIN.

In additional to automated Activewatch Service, MAESTRO provides status-at-a-glance of the array health, through array Dashboard and San Group overview pages.

San Group Status-at-a-Glance (optional)

If managed arrays have been added into a SAN Group, click on the SAN Group name to display a high level health status of the arrays in that group, as well as IPs, volume and host count.

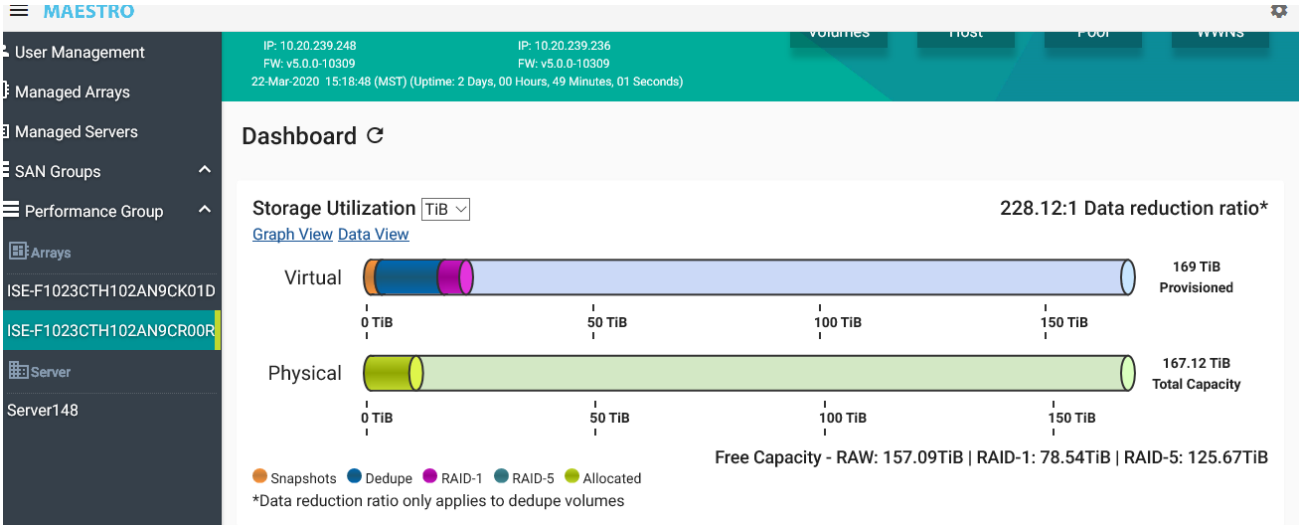


San Group status-at-a-glance

Array Dashboard

The Dashboard provides a summary of an array, including component health and storage capacity usage.

Click on an array to display the Dashboard:



Storage Utilization

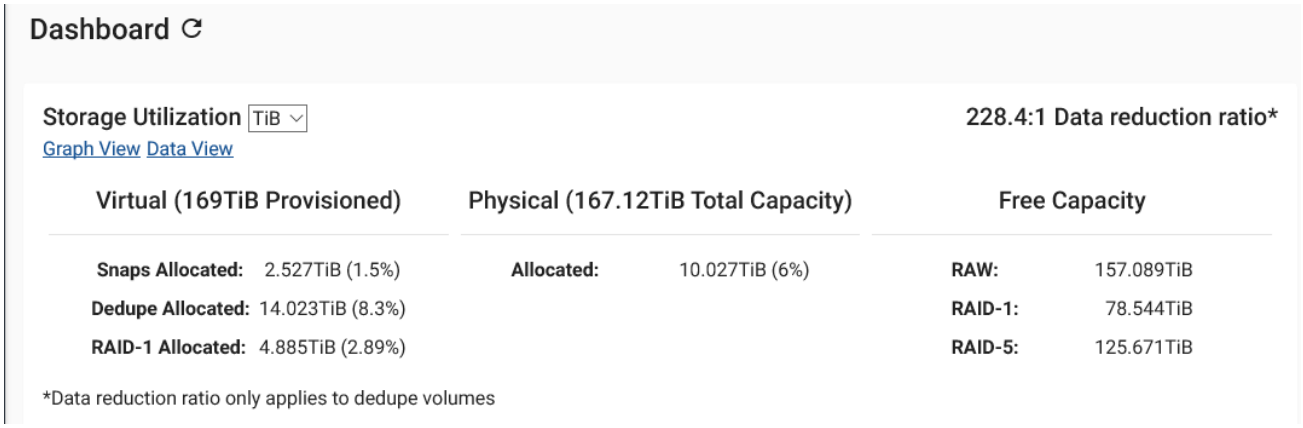
Overall capacity of the array and usage are displayed in the Virtual and Physical bars in the dashboard.

Physical capacity is the total user capacity available, minus metadata and deduplication metadata, measured against actual written capacity.

Virtual capacity is the total requested volume capacity (create volume size) measured against actual allocated capacity.

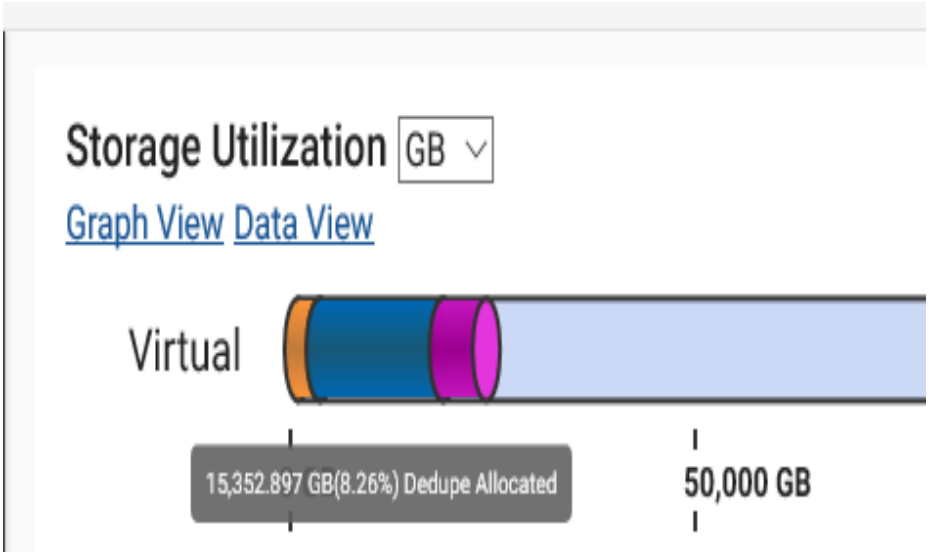
The colored bars within Virtual and Physical indicate allocated capacity and the type: Thick Raid-1, Thick Raid-5, Dedupe, Thin, and snapshots.

To get a data view instead of graph view, click on Data View under Storage Utilization



Storage utilization defaults to TiB. To change the unit of measurement, click on the Storage Utilization pulldown. Options are TB, TiB, GB and GiB.

Hover over the various colored bars to get detailed information on type of allocated storage and usage.



Volume Monitoring

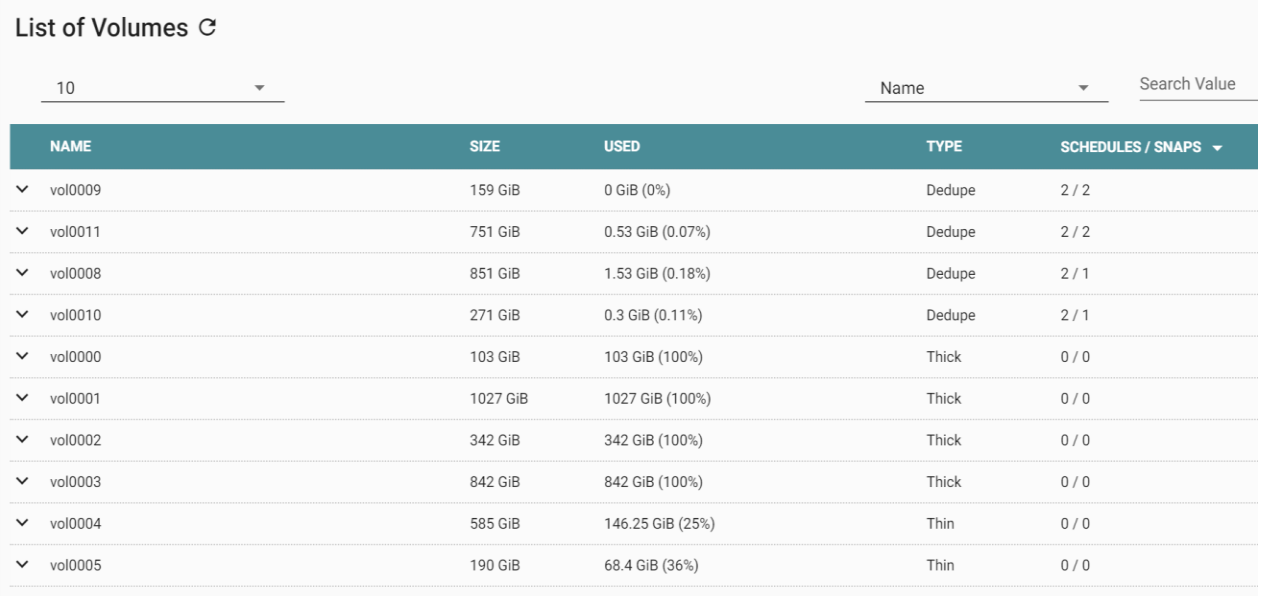
Details on volumes are display in the array Volumes page.

SIZE is the initial requested size of the volume during the create volume. This does not include the additional capacity that is allocated for the volume redundancy type, such as RAID-1 which allocates double the capacity to mirror the data. RAID-5, Dedupe or Thin provisioned volumes also have allocated overhead for redundancy.

USED is actual allocated capacity for the volume against the SIZE. It does not include redundancy allocated capacity.

For **Thick** volumes, this will always be the same as the size requested in the create volume, since data space is fully allocated at creation time.

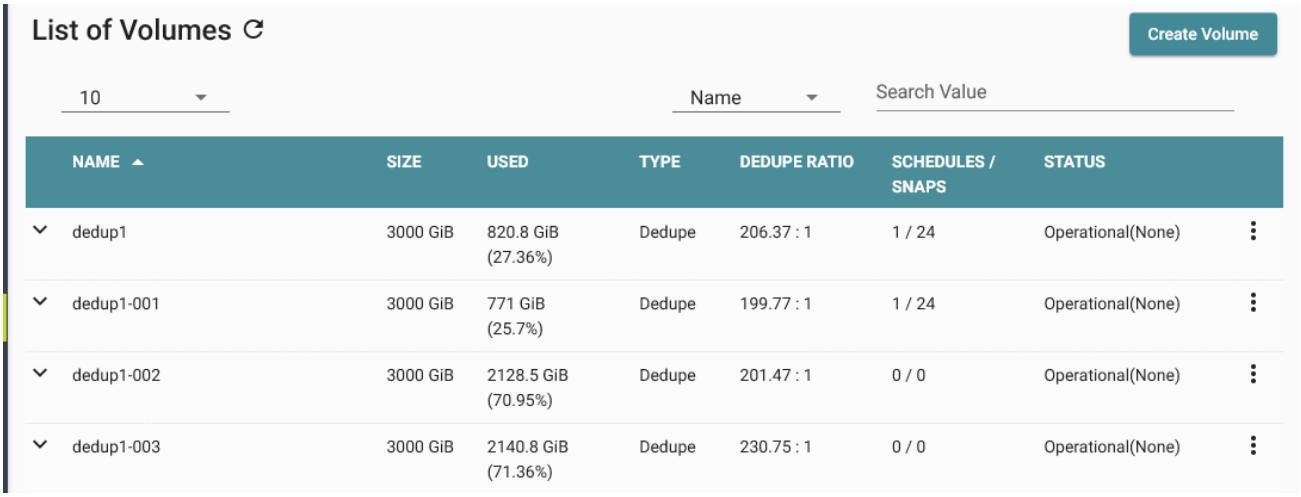
For **Thin** and **Dedupe** volumes this is the allocated (written) capacity, which can grow as data is written or shrink as data is deleted and space is reclaimed. Note that that reclamation of capacity upon a delete is a background task and could take time to complete. Therefore, the USED value could decrease over time.



NAME	SIZE	USED	TYPE	SCHEDULES / SNAPS
vol0009	159 GiB	0 GiB (0%)	Dedupe	2 / 2
vol0011	751 GiB	0.53 GiB (0.07%)	Dedupe	2 / 2
vol0008	851 GiB	1.53 GiB (0.18%)	Dedupe	2 / 1
vol0010	271 GiB	0.3 GiB (0.11%)	Dedupe	2 / 1
vol0000	103 GiB	103 GiB (100%)	Thick	0 / 0
vol0001	1027 GiB	1027 GiB (100%)	Thick	0 / 0
vol0002	342 GiB	342 GiB (100%)	Thick	0 / 0
vol0003	842 GiB	842 GiB (100%)	Thick	0 / 0
vol0004	585 GiB	146.25 GiB (25%)	Thin	0 / 0
vol0005	190 GiB	68.4 GiB (36%)	Thin	0 / 0

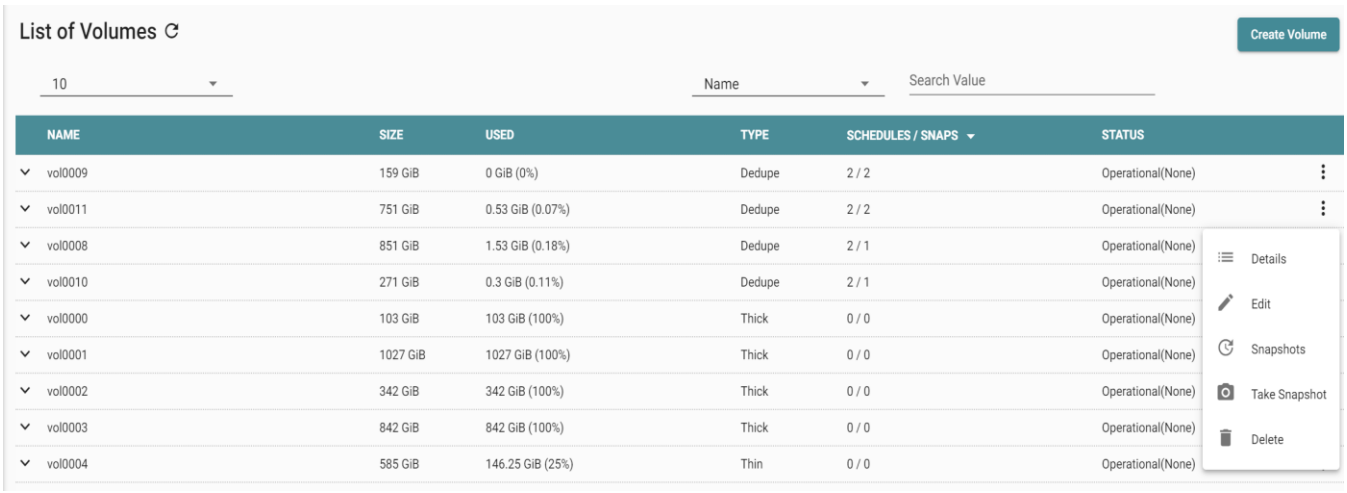
Snapshot Monitoring

Snapshots and snapshot schedules are supported on Dedupe type volumes. The number of snapshots and automated schedules is displayed on a volume under Schedules/Snaps.

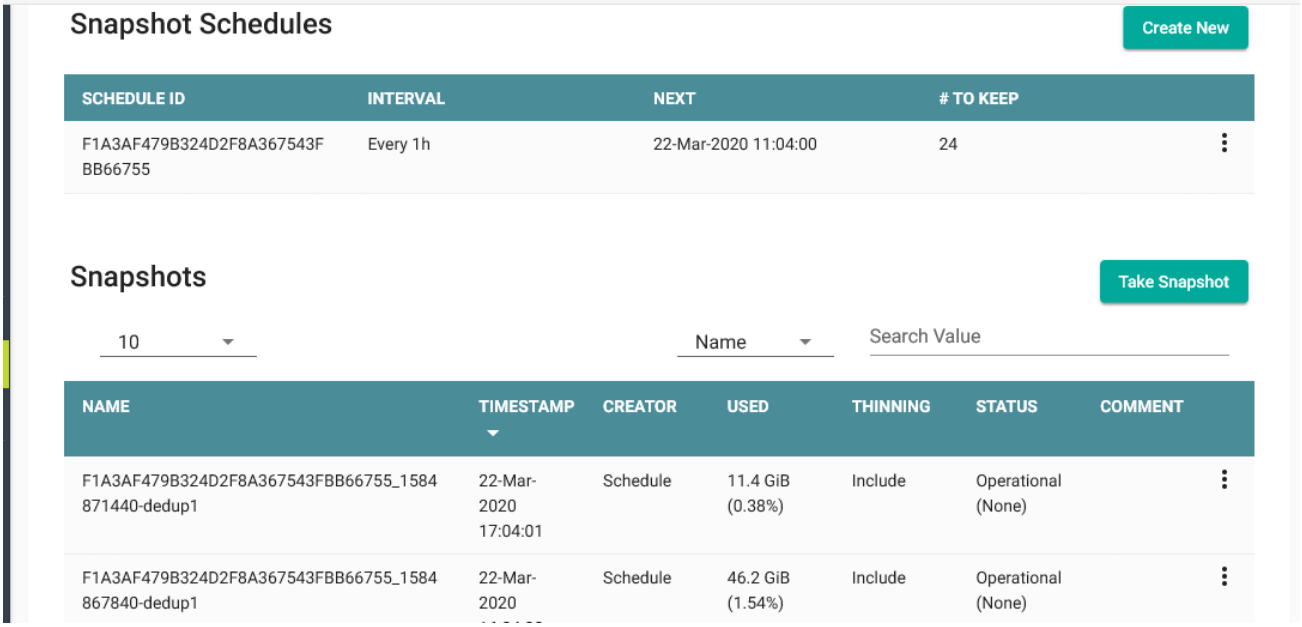


NAME	SIZE	USED	TYPE	DEDUPE RATIO	SCHEDULES / SNAPS	STATUS
dedup1	3000 GiB	820.8 GiB (27.36%)	Dedupe	206.37 : 1	1 / 24	Operational(None)
dedup1-001	3000 GiB	771 GiB (25.7%)	Dedupe	199.77 : 1	1 / 24	Operational(None)
dedup1-002	3000 GiB	2128.5 GiB (70.95%)	Dedupe	201.47 : 1	0 / 0	Operational(None)
dedup1-003	3000 GiB	2140.8 GiB (71.36%)	Dedupe	230.75 : 1	0 / 0	Operational(None)

To take a single snapshot, click on the “three dots” on the right side of a volume and click on **Take Snapshot**. To create a schedule, view details of a schedule or snapshot, click on **Snapshots**.

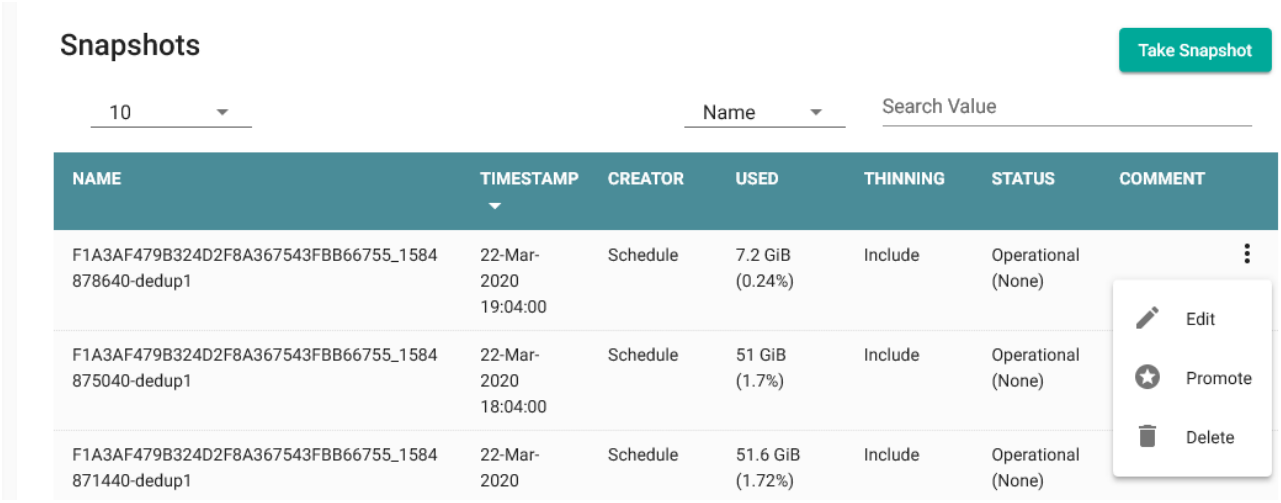


The Snapshot Schedules section indicates when the next snapshot is scheduled to automatically occur, as well as how many copies to keep. This can be edited by clicking on the “three dots” on the far right of the schedule name. Name of the snapshot can also be changed from the default generated name.



Snapshots created from schedules or manually by clicking the Snapshot or Take Snapshot are listed in the Snapshots section. Default names are generated. These can be changed by clicking the “three dots”.

Thinning indicates if a snapshot will be kept until manually deleted by the user or automatically removed based on the **KEEP** value of a schedule. Manually created snapshots will only get deleted manually by the user. Scheduled snapshots get deleted one at a time as they “age out” according to the KEEP value. When the KEEP value is reached, the next snapshot (new) will cause the oldest snapshot for that schedule to get deleted. Each schedule maintains its own set of snapshots and the KEEP value is independent of other schedules.

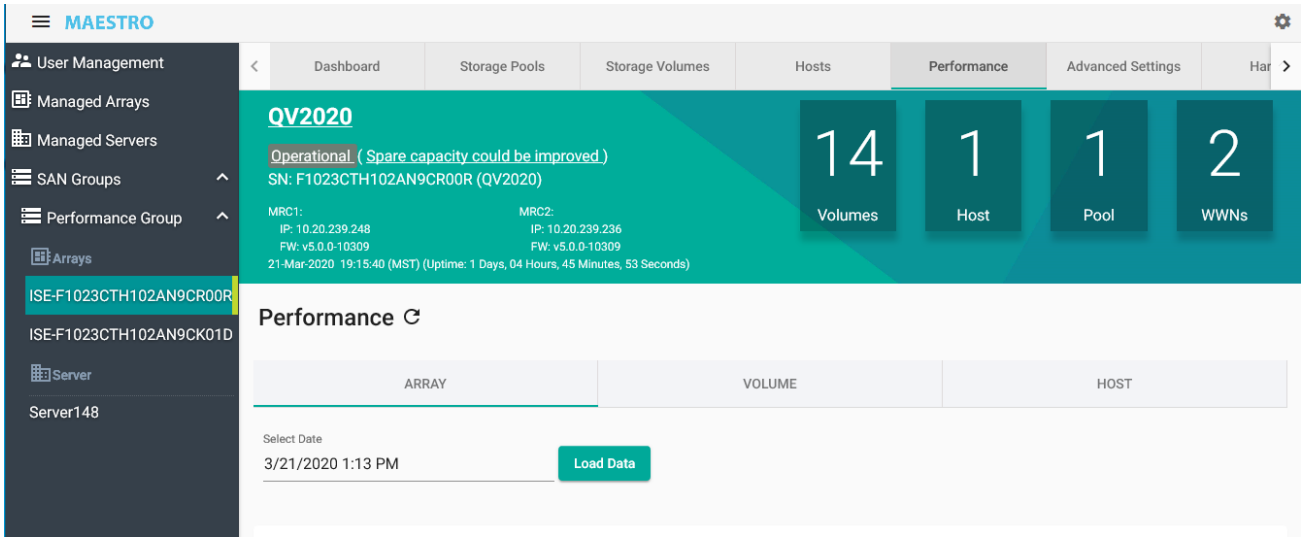


Additional information on Snapshots and Schedules can be found in the *Snapshots* section of this document.

Performance

MAESTRO provides performance monitoring on an array. The graphs are real-time, as well as the option to review historical data.

Overall array performance summary is provided in the array Dashboard. Additional details for volume and host performance are displayed in the array Performance page:

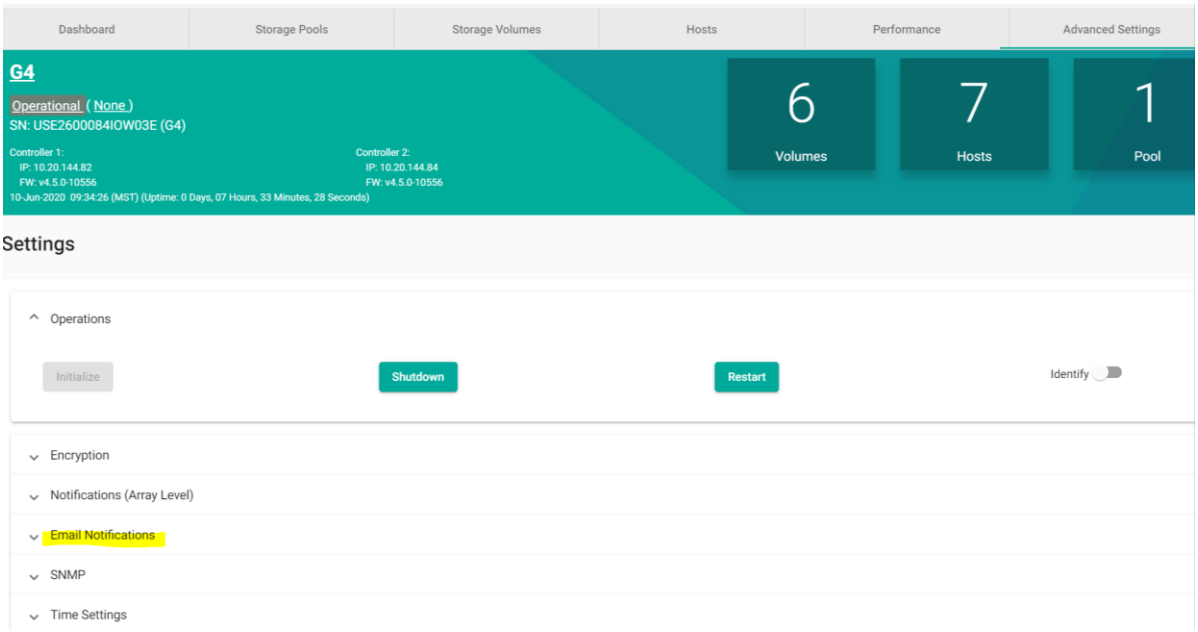


Array Performance

The **Performance Information** view shows a one-second snapshot of the performance statistics. This information will update automatically on the screen. The **Load Data** button will allow data to be displayed from a time period of interest.

Email Notification

Email notification can be enabled on the Array to send email to multiple users for various Array conditions. Each email user has the option to send email for various events: Critical, Severe, Error, Warning, Informational, Normal and all. Email notifications can be configured under the Array Advanced Settings:



SNMP

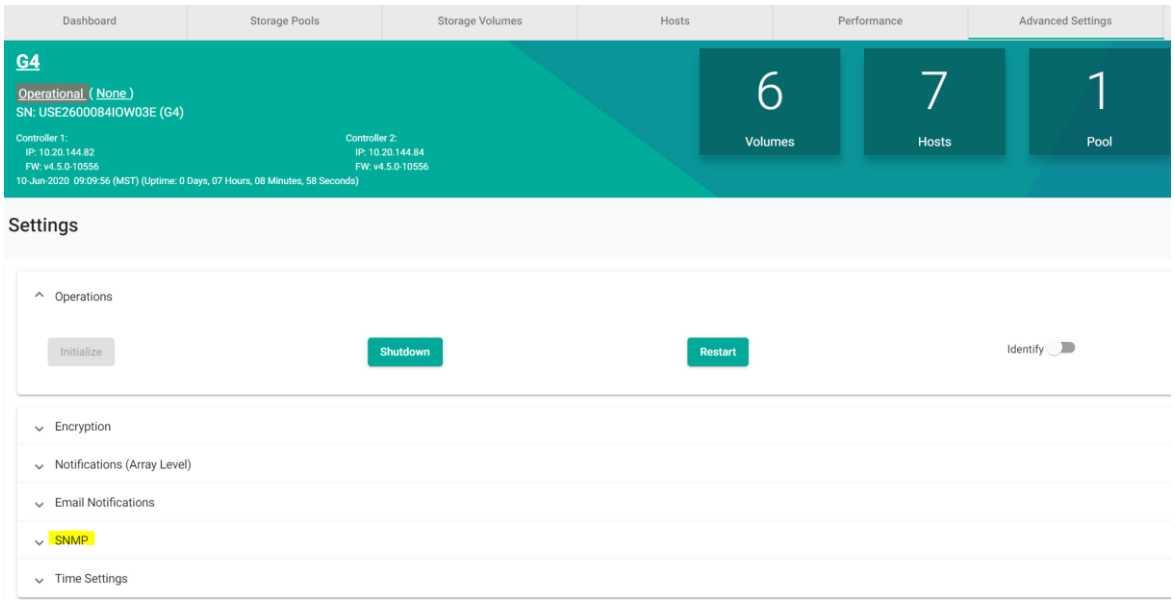
The array has a number of configurable SNMP settings as well as fixed factory settings. SNMP V1 and V2 are supported, and the SNMP protocol data units (PDUs) are implemented. In addition, the Array includes an algorithm to prevent denial of service attacks.

SNMP PDU	Support Status	Notes
GetRequest	Yes	Array monitors port 161
GetNextRequest	Yes	Array monitors port 161
Response	No	—
SetRequest	No	Array is set through the CLI
GetBulkRequest	Yes	Array monitors port 161
InformRequest	No	—
TrapV2	Yes	Array sends on port 162
Report	No	—

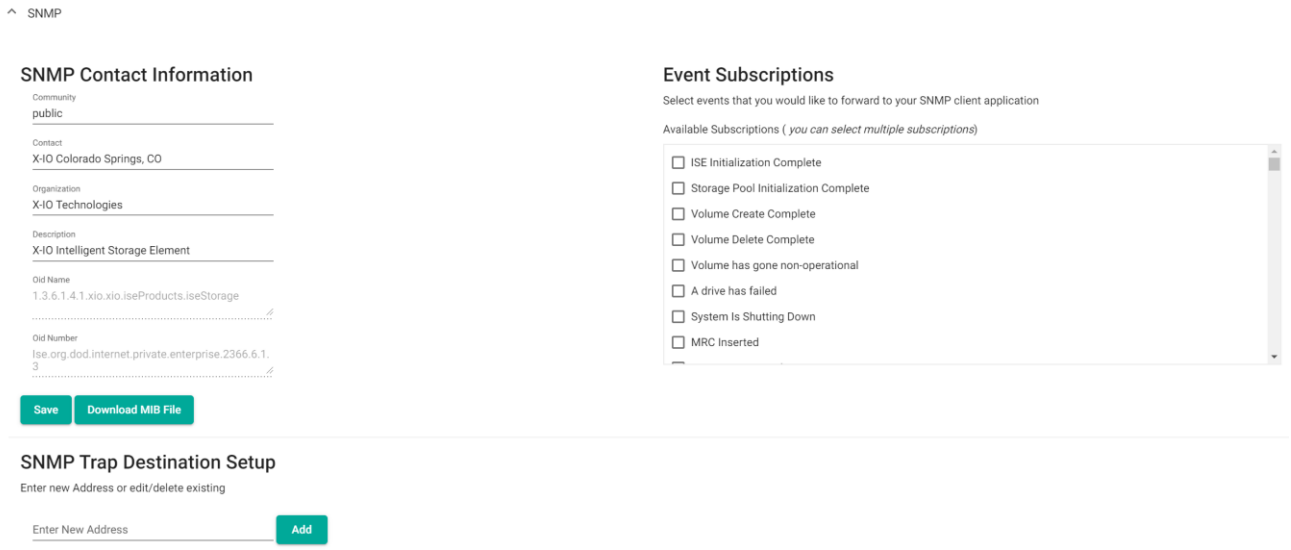
SNMP PDUs Implementation

Configuring SNMP

SNMP contact information, MIB root OID, Event subscriptions, and SNMP trap destination IP address are the configurable SNMP settings. This feature is in MAESTRO under the Array Advanced Settings:



Clicking on the SNMP header will open the menu for SNMP settings:



SNMP Contact Settings

The information entered in the four SNMP Contact settings is included in the Management Information Base (MIB) file for the Array and in SNMP GetRequest and Trap notification packets. The SNMP Contact information settings are:

- Community string
- Contact information
- Organization
- Description

MIB Root OID Setting

The Array Root OID Name and Number are also displayed.
When any change to the four Contact Information parameters is saved by clicking **SUBMIT** or **SAVE CHANGES**, the system automatically regenerates the MIB file to include the new information.

MIB File

The Management Information Base (MIB) file for the Array can be viewed or downloaded to be compiled into an SNMP device-monitoring tool using the on-screen instructions. The Array automatically regenerates the MIB file when changes to any logical object in the system are made, ensuring that the MIB file is always current.

Event Subscriptions

Event subscriptions provide the means to designate which events are to be forwarded to the SNMP Client Application. Upon an event, the system checks this list to determine whether to send the event as an SNMP trap to the SNMP Trap Destination list see the “SNMP Trap Destination Setup” section. SNMP traps are datagrams and do not have guaranteed delivery. Traps are sent only once and are not saved locally.
Trap service is provided by one of the two Controllers; if the trap-serving Controller experiences an exception causing a reboot, the surviving Controller resumes trap service using only the traps and destinations defined for itself. Traps defined only for an out-of-service Controller are not sent by the surviving Controller. Should trap service need to be restarted on the surviving Controller, some traps may be lost during the transition.

SNMP Trap Destination Setup

The SNMP trap destination setup allows specification of site-specific IP addresses to which the selected SNMP events (see “Event Subscriptions”) are sent. Events can be sent to different IP addresses from each port if desired. Duplicate IP addresses are not permitted in the address lists and cannot be added.

System Monitoring with SNMP

The Array provides an SNMP MIB containing the Object Identifiers (OIDs) of Array variables. These variables can be monitored using SNMP Get Request PDUs see “SNMP Setup” . The following example shows the MIB entry for Array (ISE) temperature, where **N** is a company’s assigned private enterprise OID.

```
iseTemperature    OBJECT-TYPE         SYNTAX Integer32
       MAX-ACCESS read-only
      STATUS current
       DESCRIPTION
      "ISE Temperature"
      ::= { ise 32 }    -- 1.3.6.1.4.1.N.6.1.1.1.2.32
```

Figure 1: Sample MIB Entry

An SNMP Get Request with the OID in this example returns an integer representing the current temperature of the Array.

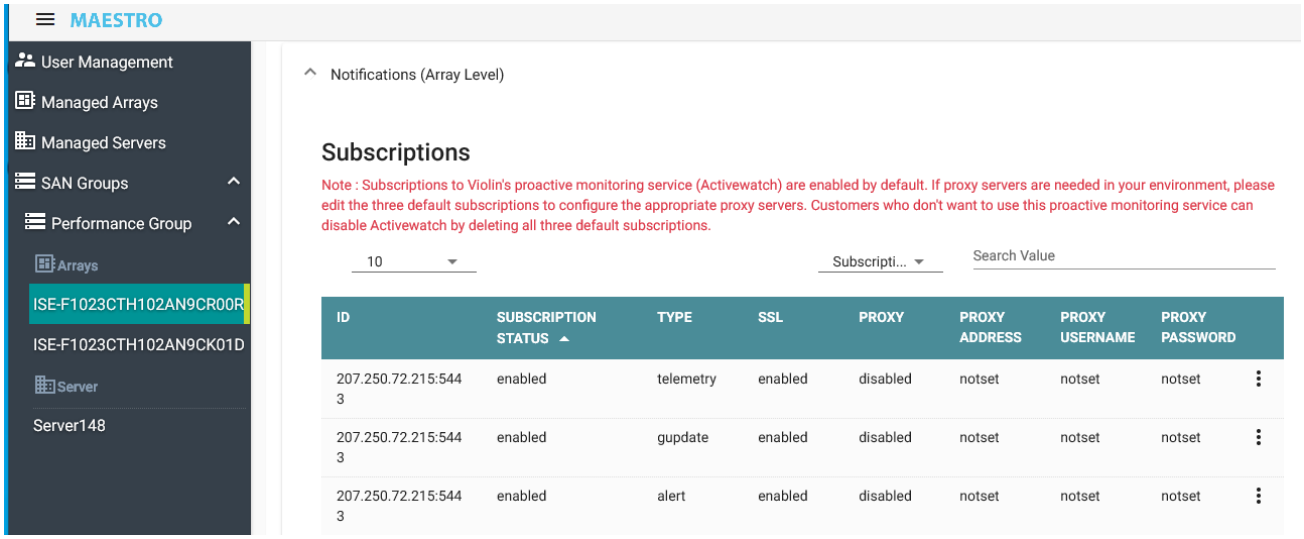
Array Notifications/Subscriptions

The array **Activewatch Service** (phone home) ships with a default destination address and the subscription function enabled. This destination uses a secure SSL connection.

To use the **Activewatch Service**, it may be necessary to configure the site firewall to allow outbound HTTPS communication (port 443 using TCP). To specify the destination, define the target address as **`207.250.72.215`**—this restricts other HTTPS traffic.

	[1] **NOTE:** The interval for Telemetry and General Update subscriptions can be specified, but Alert subscriptions cannot be specified. [2] When creating or changing Telemetry update subscriptions, it is recommended that the interval be left at **`1440`**. If a smaller interval is specified, the QV2020 can run out of resources and log the following event in the SMGT event log:

Subscriptions are viewable in MAESTRO under Advanced Settings >> Notifications for an array:



When subscriptions need to be modified or removed, this can be done by clicking on the far-right “3 dots” and EDIT. Note that if one subscription type is disabled or enable, all subscription types to the same ID will be enabled or disabled. This maintains consistency on what data is proactively sent.

Send Telemetry Data File

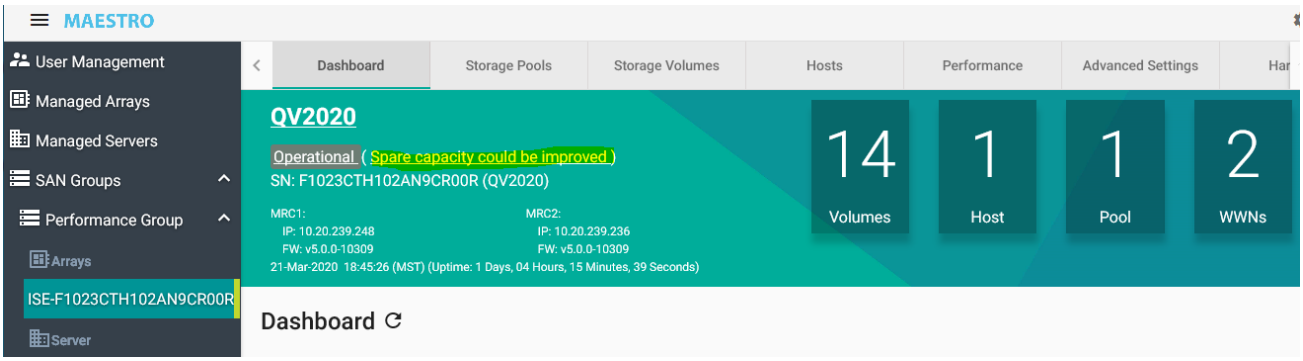
An immediate transmission of a Telemetry data, outside the normal schedule, can be sent using the Array command line. The transmission uses a secure SSL operation.

To initiate immediate transmission of the Telemetry data file, enter the following command at the CLI prompt.

```
telemetry send
```

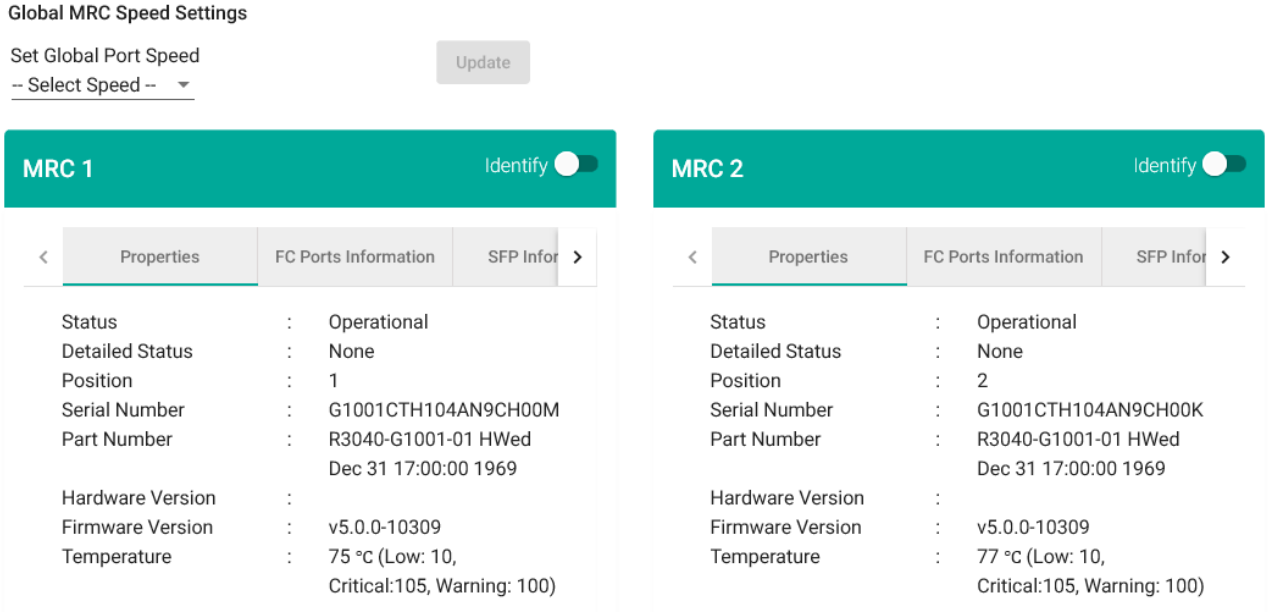
Environment Status

The array Dashboard banner provides an overall health status. If an error or informational event occurs, it will be display in the status section of the banner. Click on the link and it will launch to the appropriate area of concern. Below is an example where sparing capacity could be improved due to a failed drive. Clicking on the highlighted “Sparing capacity could be improved” will launch to the Storage Pools page where additional details can be reviewed.



Controller

Status on each controller is provided in the array Hardware page. Clicking on Controller will provide real-time information. Within the Controller page, click on Properties for overall status



The following information is displayed for each Controller

Field	Comment
Status	Overall state of the Controller, normally **Operational**; other possible states include **Warning**, **Critical**, and **Non-Operational**.
Detailed Status	Shown in parentheses after Status, normal is **None**; abnormal states are detailed here.

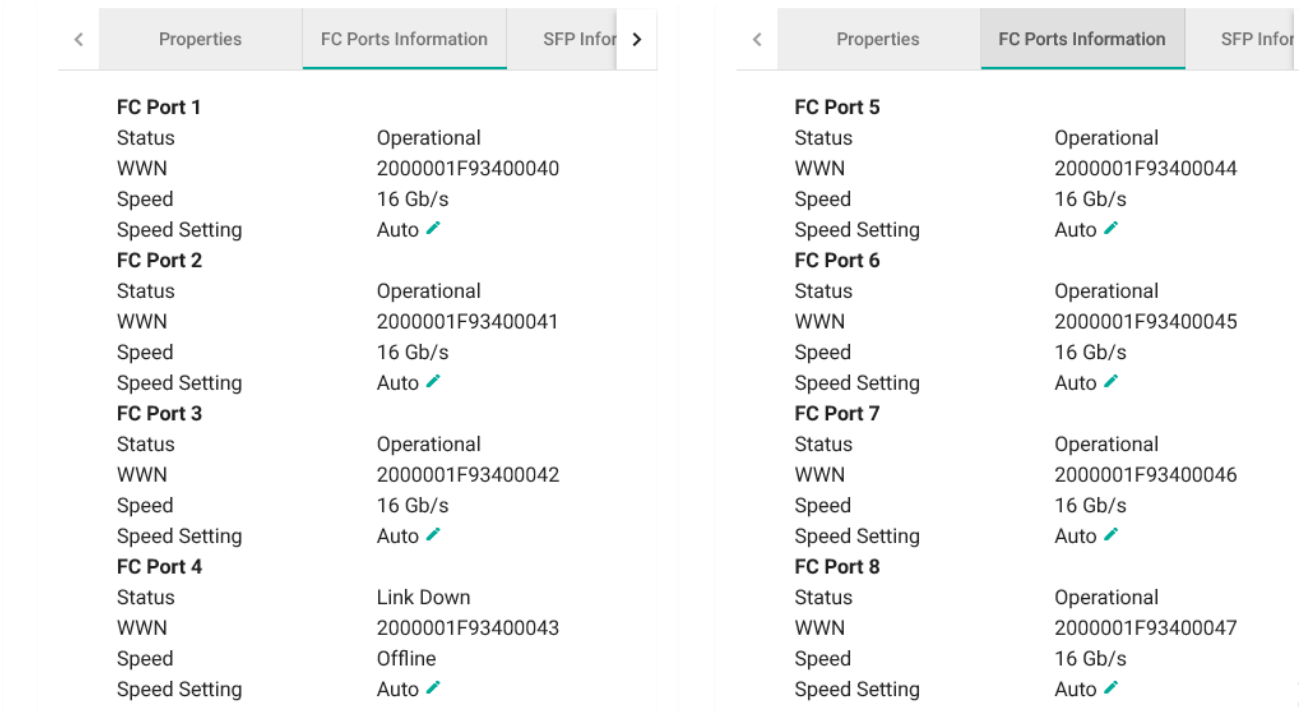
Hardware, Firmware Version	N/A
Position	Physical bay location in the chassis (1=Left, 2=Right)
Serial Number, Part Number	Unique serial number of each Controller
Controller Ambient Temperature	Controller temperature plus warning and critical temperature thresholds.

FC Ports Information

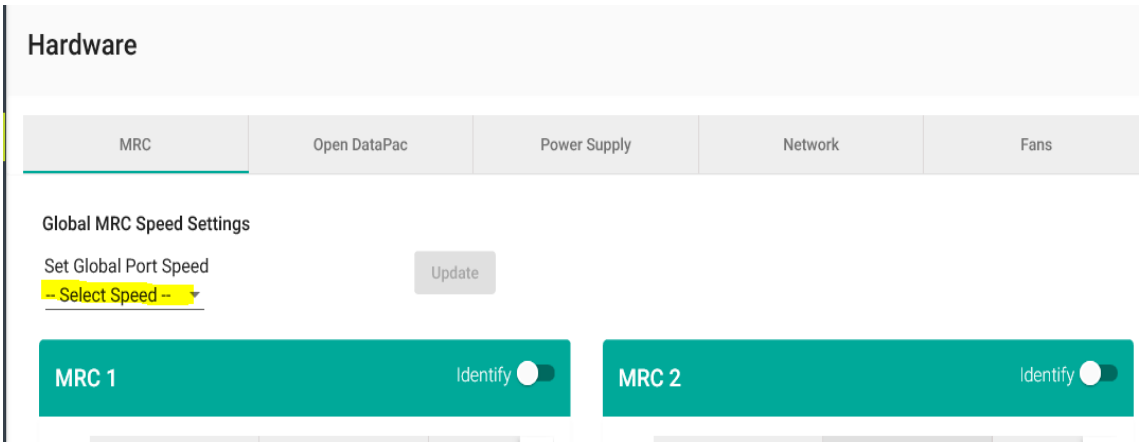
Click on FC Ports Information to display the status of each Controller FC port.

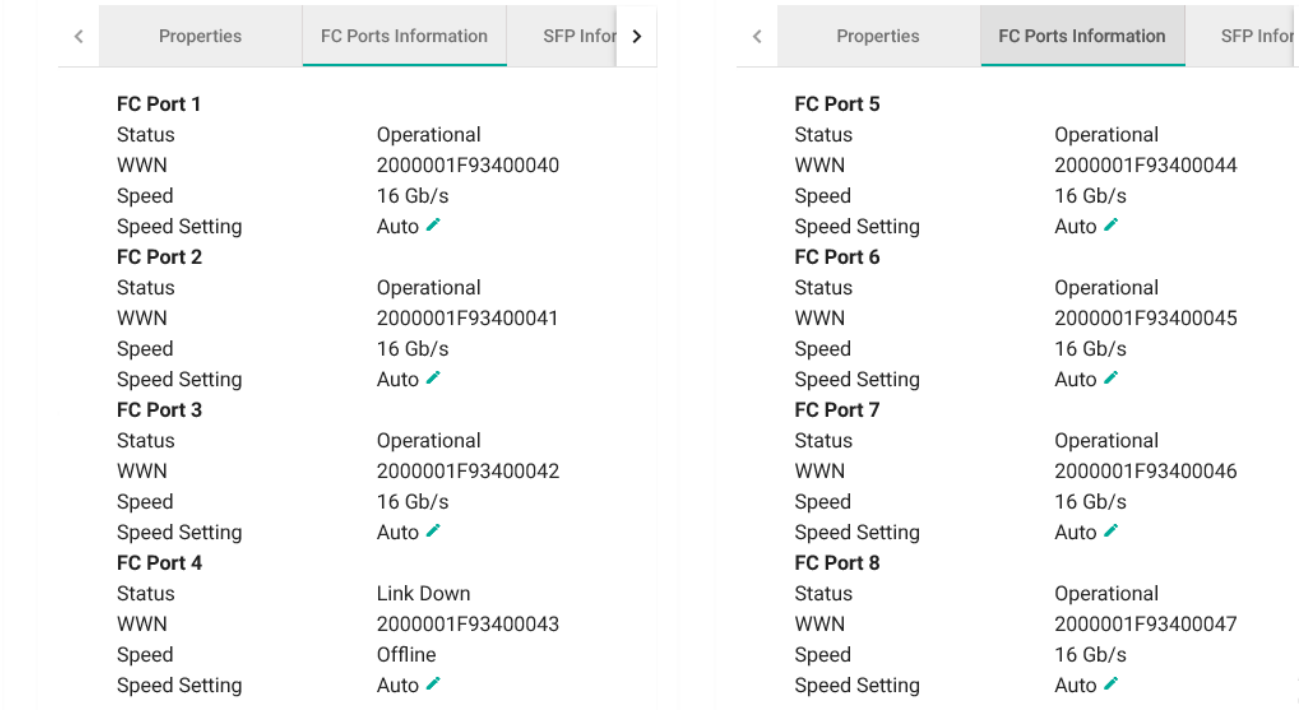
Speed indicates active FC port speed.
Speed Setting indicates if the Controller port is set to Auto negotiate or Fixed speed.

Each FC port functions independently of each other and can be set to differing supported speeds.



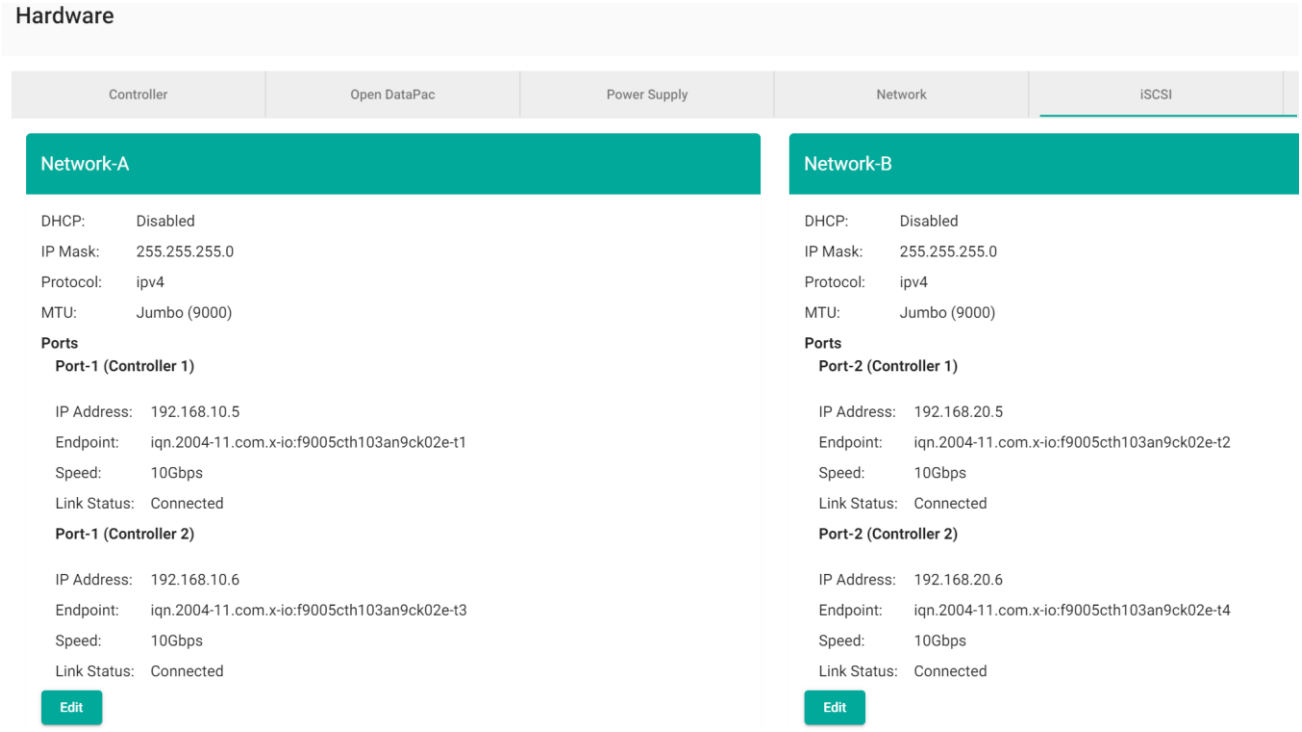
To globally set all FC ports to the same speed, select the “Set Global Port Speed” pulldown and select a setting.


Hardware
MRC
Open DataPac
Power Supply
Network
Fans
Global MRC Speed Settings
Set Global Port Speed
-- Select Speed --
Update
MRC 1
Identify
MRC 2
Identify



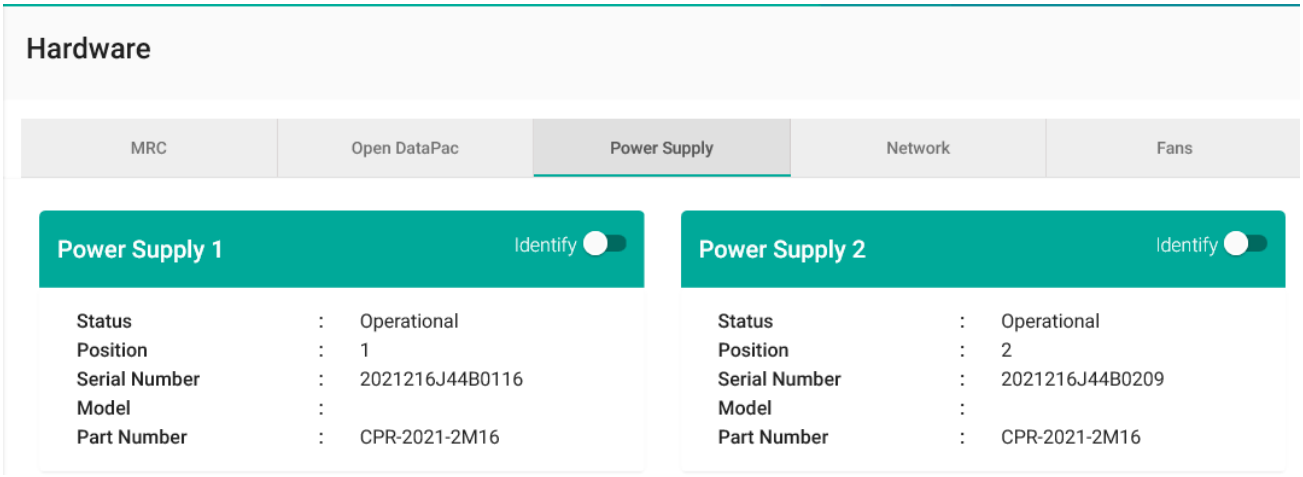
iSCSI Attributes

Information on the iSCSI configuration such as speed, jumbo frames and CHAP can be found in the iSCSI tab under the Array Hardware page.



Power Supply

Power supply status is available under the array Hardware >> Power Supply page.



The following information is displayed for each Power Supply:

Field	Comment
Status	Overall power supply state, normally **Operational**, other possible states are: **Warning**, **Critical**, and **Non-Operational**
Detailed Status	Shown in parentheses after Status; normal is **None**, abnormal states are detailed here
Serial Number	Serial number of the power supply
Model	Model of the power supply
Part Number	Part number of the power supply
Position	Physical bay location in the chassis. 1=left, 2=right

Power Supply

Array Maintenance

The QV2020 and QV1020 provide a number of maintenance features, including:

- Restart and Shutdown of the array
- Changing password
- Identifying components
- Upgrading array software and drive firmware
- Battery Calibration

Restart and Shutdown

Restarting the array involves the following actions:

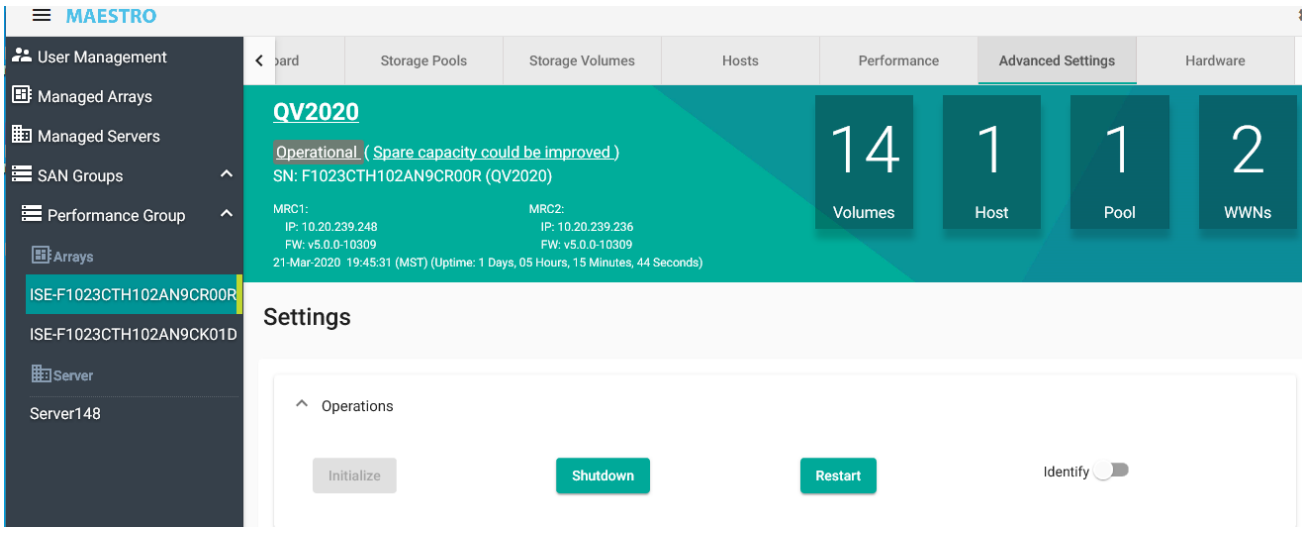
- Completion of all in-progress I/O commands from all hosts
- Flushing of all data from cache
- Preparation of internal processes for a graceful shutdown
- Shutting down the array
- Restart the Array

During a restart or shutdown of the array, all configuration settings are retained. A restart or shutdown will terminate any CLI sessions and make the array inaccessible in MAESTRO.

When the restart completes, the array again accepts a connection from a remote console or MAESTRO.

Shutdown will require the user to pull power to the array and then restore power before it will restart.

The restart and shutdown operations are found in the array Advanced Settings page:



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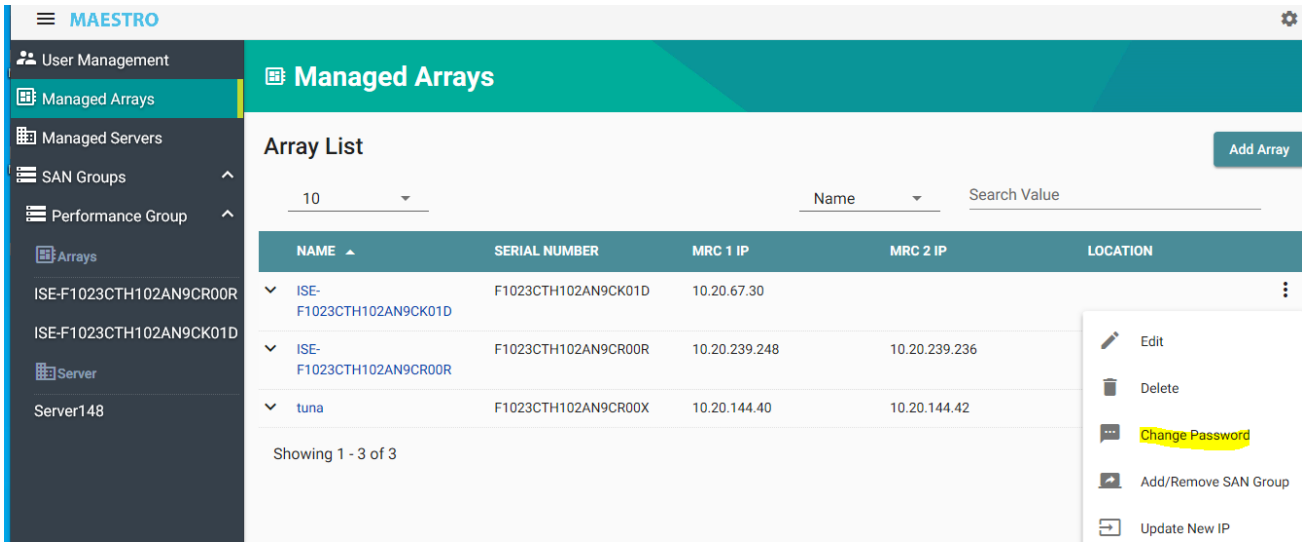
Changing the Password

The **administrator** password can be changed through the Managed Arrays page

Click on the “three dots” on the right of the array to get a pulldown list of options. Select Change Password

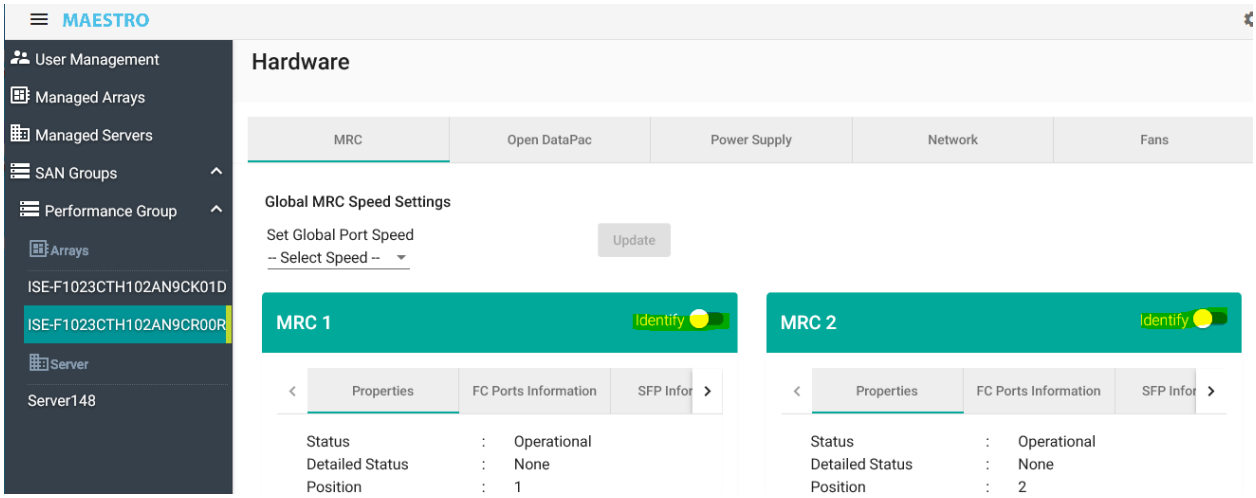


After the password is changed, click again on the “three dots” and select Edit to store the new password in MAESTRO.

Identifying Components

To physically locate the array or components, use the Identify slider available on each component page for the array in MAESTRO.

For example, to identify a Controller, click in the array Hardware >> Controller page



Array Software Upgrades

Upgrading the array software is an uptime event. The array must be in an operational state before performing a firmware upgrade. The array state can be confirmed in the array Dashboard. If the array or any component is in a state other than **Operational**, the problem must be corrected before performing the firmware upgrade.

When the array software upgrade is performed, the new firmware is automatically propagated to both controllers. After a firmware upgrade, the array automatically begins using the newly installed firmware. All configuration settings, volume configurations, and other system information are preserved through the upgrade process.

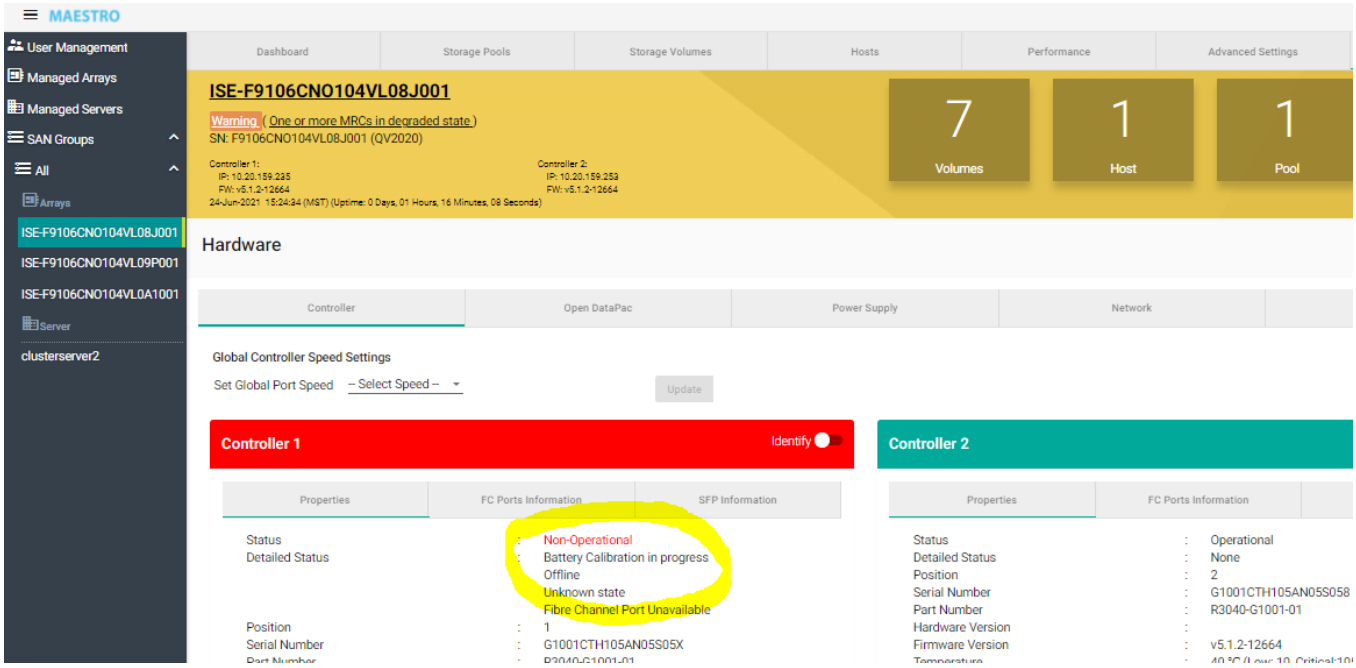
Event notifications are sent during the upgrade process. If Event Subscription is on, upgrade events refer to the processes on both controllers; that is, a single event covers upgrade activity on both controllers. Several event notifications, identifying various stages of the upgrade, are available for subscription.

Contact VIOLIN service to schedule an upgrade for the QV2020 or QV1020.

Battery Calibration

Battery Calibration will occur every 180 days (6 months), starting with software 5.1.2. When battery calibration starts, one controller at a time will be taken offline for approximately 12 hours. IO will continue to be serviced from the remaining online controller. During battery calibration, the controller status will report offline due to battery calibration. Email alerts are generated at the start and completion of battery calibration for each controller. Battery calibration requires both controllers to be online and operational to start. If a controller replacement occurs, or battery calibration has never been run on the array, the process will start within 2 hours of being online.

Below shows MRC1 during battery calibration in Maestro:



Command line show mrc output will indicate Battery Calibration and ports offline:

```
administrator:> show mrc

 MRC Information ============================================================

  MRC-1 (NXO) ------------------------------------------------------------
    Status          : Non-Operational (Battery Calibration in progress, Offline,
                      Unknown state, Fibre Channel Port Unavailable)
    Part Number     : R3040-G1001-01      Serial Number    : G1001CTH105AN05S05X
    Firmware Ver.   : v5.1.2-12664        Hardware Ver. :
    Temperature     : 40 C (Warning: 100 C, Critical: 105 C)

    FCPort  Type    WWN               Speed    Setting  Status
    0       Unknown 2000001F93400890  Offline Unknown  Link Down
    0       Unknown 2000001F93400891  Offline Unknown  Link Down
    0       Unknown 2000001F93400892  Offline Unknown  Link Down
    0       Unknown 2000001F93400893  Offline Unknown  Link Down

    SFP ID  Present  Serial No.      Status
    1       yes                     Warning (No Access)
    2       yes                     Warning (No Access)
    3       yes                     Warning (No Access)
    4       yes                     Warning (No Access)
```

Feedback

VIOLIN welcomes feedback, positive and negative, and VIOLIN Global Services at 1.800.734.4716 stands ready to assist as needed.

Contacting VIOLIN

To obtain additional information or technical support for VIOLIN products, or to obtain an RMA number and replacement product, contact us at:

- Phone US Toll Free: +1 800 734 4716
- Global Support Numbers available at: https://www.violinsystems.com/support-services/
- E-mail: support@x-io.com and support@violinsystems.com

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