SEAGATE

Lyve Mobile Array Command Line Interface (CLI) User Manual

LYVE™

Contents

Installing Lyve Mobile Array CLI

Lyve Mobile Array CLI for Linux and Windows 10 computers lets you manage connected Lyve Mobile devices using the command line.

Go to Lyve Mobile Array Support to download the LMACLI package. For technical issues downloading the package, launch an online chat with Lyve Mobile Support.

Red Hat Enterprise Linux

Two versions of RHEL are supported: RHEL 7 and RHEL 8. The RPM packages for RHEL 7 and RHEL 8 are different files:

- The RPM package file name for RHEL 7 contains the string `el7`.
- The RPM package file name for RHEL 8 contains the string `el8`.

The RPM package depends on packages provided by the Extra Packages for Enterprise Linux (EPEL) project. You must enable this repository by following the instructions for Enterprise Linux 8.

Download the RPM package and install it as root with:

Installation with yum
sudo yum install lmacli-x.y.z-1.el8.noarch.rpm

Ubuntu 20.04 LTS / Ubuntu 22.04 LTS

Download the Debian package (*.deb) and install it as root:

Installation with apt
sudo apt install ./lmacli_x.y.z_all.deb

Windows 10 / Windows 11

1. Download the Zip archive to a folder on your local drive.

2. Open a cmd.exe or PowerShell session and navigate to the destination folder. Enter./lmacli.exe in the command line to run.
3. Install lmacli:

Command prompt—Enter lmacli.exe.
PowerShell—Enter .\lmacli.exe.

Entering Commands

In the CLI, enter lmacli *command*, where *command* is the name of a specific command.

To see a list the commands currently available to Lyve Mobile Array CLI, enterlmacli --help.

For help with a specific command, enterlmacli *command* --help. Example: lmacli discover --help

Commands

Command	Description
configure	Import configuration for the device from the Lyve Management Portal or set it up manually.
discover	Discover Lyve Mobile devices in the neighborhood.
disk-info	Display information about the disks.
fde-decrypt	Disable Full-Disk Encryption.
fde-init	Initialize Full-Disk Encryption.
fde-repurpose	Crypto-erase data to repurpose the device.
fde-unlock	Unlock the device.
fw-info	Display information about the firmware.
fw-update	Update the firmware.
info	Display general info about the device.
log-dump	Copy the device logs to a Zip archive.
rackmount-setup	Set up a Lyve Mobile Array in a Lyve Mobile Rackmount Receiver.
raid-cleanup	Remove all RAID arrays.
raid-dequarantine	Remove RAID arrays from quarantine.
raid-info	Display information about the RAID arrays.

raid-setup	Create a single RAID array (uninitialized).
usb-setup	Set up the management interface if connected over USB or Thunderbolt.
version	Display the CLI version.

Prerequisites

SSH authentication agent

lmacli has to store secrets about the Lyve Mobile Arrays connected to the computer. These secrets are encrypted and, depending on the operating system, you may need to run commands to allow lmacli to access those secrets.

- **Windows**—lmacli secrets are stored in the Credential Manager. No configuration is required.
- **Linux**—lmacli secrets are protected by a SSH private key. You must register a SSH private key to the SSH authentication agent.

To start and configure the SSH authentication agent on Linux:

1. Verify if the SSH agent is already running. In a terminal, enter`echo $SSH_AGENT_PID`. If the command displays a PID number, proceed to step 3.
2. Enter `eval $(ssh-agent -s)` to start the SSH agent.
3. Enter `ssh-add` to add a SSH private key. If you need to generate a SSH private key, ente`ssh-keygen`.

If the SSH authentication agent is not running, lmacli displays the following error`ssh-agent not running.`
If the SSH private key is not registered, lmacli displays the following error`SSH identity is missing.`

Lyve Management Portal

To configure a Lyve Mobile Array obtained through Lyve Management Portal:

- The computer must be connected to internet.
- You must have a valid account on Lyve Management Portal.

Getting Started with lmacli

Searching for Lyve Mobile Arrays

The discover command displays Lyve Mobile Arrays connected to the computer or available over the local network.

To search for Lyve Mobile Arrays:

1. Open a cmd.exe, PowerShell, or Linux terminal session.
2. Enter the following command:

   ```
   lmacli discover
   ```

   For each detected device, the discover command displays its serial number and its IP address.

Example output

```
Serial number  |  IP address
NB20607L       |  10.21.59.18
NB206093       |  169.254.100.123
NB260024       |  10.21.59.3
```

Other lmacli commands need the IP address to determine which Lyve Mobile Array to target.

Discovering Lyve Mobile Arrays in Lyve Mobile Rackmount Receivers

Some Linux distributions like RHEL are protected by a firewall whose default configuration prevents lmacli from detecting the Lyve Mobile Arrays connected to Rackmount Receivers. To enable detection, the firewall must be disabled.

On RHEL:

- `systemctl stop firewalld`
- `sudo systemctl disable firewalld`

Importing the configuration for a Lyve Mobile Array

Retrieving the configuration from the Lyve Management Portal

Allowing lmacli use behind a proxy or firewall

In order to retrieve the device configuration from the Lyve Management Portal, lmacli sends requests to the following URLs:

- https://lmp-prod.us.auth0.com/
- https://rest.lyve.seagate.com/
- https://lyve.seagate.com/

These domains must be allowed if lmacli is used behind a proxy or a firewall.

The Lyve Mobile Array configuration is retrieved from the Lyve Management Portal by executing the `lmacli configure` command.

To retrieve the Lyve Mobile Array configuration:

1. Open a terminal session.
2. Enter the following command:

```
lmacli configure IP address
```

where `IP address` is a Rackmount Receiver port IP address listed in the output of the discover command, for example:

```
lmacli configure 169.254.100.123
```

You're asked to navigate to a Lyve Management Portal to activate your device.

Example output

```
Open the following link to activate your device: https://lyvehub-sandbox.us.auth0.com/activate?
user_code=NSXM-WFSL
```

3. Copy the URL in lmacli and paste it in a browser. Navigate to the site.

4. When prompted, enter your Lyve Management Portal credentials.
5. When prompted, confirm the device by clicking**Confirm**.
6. Check to ensure you received a confirmation message in lmacli. Example:

Example output
Device successfully activated.

Removing the configuration

To remove the configuration:

1. Open a cmd.exe, PowerShell, or Linux terminal session.
2. Enter the following command:

```
lmacli configure --remove IP address
```

where IP address is a Rackmount Receiver port IP address, for example:

```
lmacli configure --remove 169.254.100.123
```

Other useful commands

Info command

Once a Lyve Mobile Array is configured on a machine, use theinfo command to view general info about a device.

> The IP address can be omitted if the Lyve Mobile Array is connected directly to the host via Thunderbolt or USB.

Full-disk encryption commands

Unlocking a Lyve Mobile Array

After a Lyve Mobile Array is powered on, its disks are either:

- **Unsecured**—Full-disk encryption is disabled. The status LED is green.
- **Secured, locked**—Full-disk encryption is enabled and the disks are locked. The status LED is orange.

If a Lyve Mobile Array is**unsecured**, full-disk encryption can be enabled using thefde-init command:

```
lmacli fde-init IP address
```

where IP address is a Rackmount Receiver port IP address, for example:

```
lmacli fde-init 169.254.100.123
```

Once the fde-init command is executed, the Lyve Mobile Array is **secured, unlocked**.

If a Lyve Mobile Array is **secured, locked**, it can unlocked using the `fde-unlock` command:

```
lmacli fde-unlock IP address
```

where IP address is a Rackmount Receiver port IP address, for example:

```
lmacli fde-unlock 169.254.100.123
```

Once the fde-unlock command is executed, the Lyve Mobile Array is **secured, unlocked**. The status LED is green.

Disabling full-disk encryption on a Lyve Mobile Array

> ! **WARNING**—Disabling full-disk encryption may expose your data if your device is lost or stolen.

Full-disk encryption can be disabled using the `fde-decrypt` command:

```
lmacli fde-decrypt IP address
```

where IP address is a Rackmount Receiver port IP address, for example:

```
lmacli fde-decrypt 169.254.100.123
```

Full-disk encryption can be reenabled again using `fde-init`.

Erasing data on a Lyve Mobile Array to repurpose it

Data can be instantly deleted via a cryptographic erase of the encryption key. Use the `fde-repurpose` command:

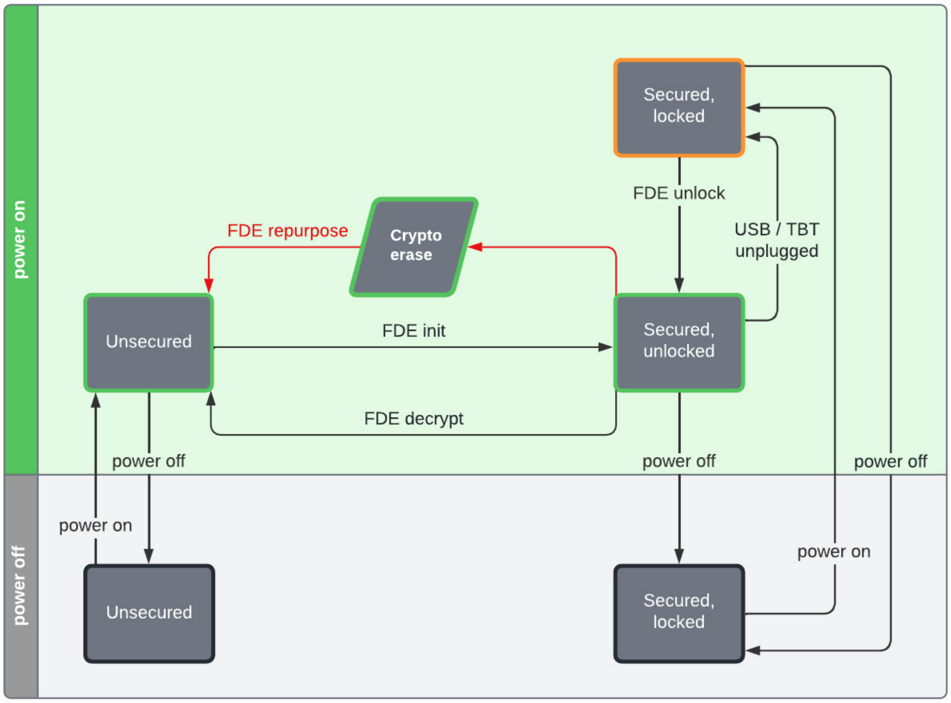
```
lmacli fde-repurpose IP address
```

where IP address is a Rackmount Receiver port IP address, for example:

```
lmacli lmacli fde-repurpose 169.254.100.123
```

The fde-repurpose command will not be executed if the Lyve Mobile Array contains a volume. Use raid-cleanup to remove a volume.

Summary of full-disk encryption states and commands



Linux iSCSI Network Setup for Lyve Mobile Rackmount Receiver

You can use lmacli to configure an iSCSI data path between a Linux host and a Lyve Mobile Rackmount Receiver connected to the same data network.

The following steps are required:

1. Install the required packages on Linux.
2. Configure the network interfaces used for iSCSI with static IP addresses on Linux.
3. Configure Lyve Mobile Rackmount Receiver for iSCSI.
4. Check for network connectivity between the host and the Lyve Mobile Rackmount Receiver.
5. Connect the software iSCSI initiator on the host to the iSCSI target.
6. Configure I/O multipath to improve I/O bandwidth.

Install Open-iSCSI and multipath-tools on Linux

Red Hat Enterprise Linux

To install Open-iSCSI and multipath tools:

1. On the Linux station, open a terminal session.
2. Enter the following command:

```
sudo yum install lsscsi device-mapper-multipath iscsi-initiator-utils
```

Ubuntu/Debian

To install Open-iSCSI and multipath tools:

1. On the Linux station, open a terminal session.
2. Enter the following command:

```
sudo apt install lsscsi multipath-tools open-iscsi
```

Configure host network interfaces

The iSCSI data path between the Linux host and the Lyve Mobile Rackmount Receiver is made of 1-4 network interfaces. On the Linux host, the network interfaces used to transport iSCSI traffic should be configured with static IP addresses.

> Configure the network ports on separate IP subnets unless you are familiar with iSCSI port binding.

Identify a network port

You can visually identify a network interface by blinking its LED.

To identify a network port:

1. On the Linux station, open a terminal session.
2. Enter the following command to visually identify a network interface:

```
sudo ethtool --identify interface name
```

where interface name is a network interface on the Linux host, for example:

```
sudo ethtool --identify eno1
```

Configure static IP addresses with netplan

Netplan is the network configuration abstraction renderer used by Ubuntu**Server**.

Below is a sample configuration file for Netplan to set static IP addresses on 4 network ports and enable jumbo frames of 9000 bytes.

Sample configuration file

```
network:
  version: 2
  ethernets:
    ens3f0np0:
      addresses: [192.168.0.1/24]
      mtu: 9000
    ens3f1np1:
      addresses: [192.168.1.1/24]
      mtu: 9000
    ens1f0np0:
      addresses: [192.168.2.1/24]
      mtu: 9000
    ens1f1np1:
      addresses: [192.168.3.1/24]
      mtu: 9000
```

Configure static IP addresses with NetworkManager

NetworkManager is the network management daemon used by Red Hat Enterprise Linux or Ubuntu **Desktop**.

`nmcli` is a command-line interface for the NetworkManager daemon. The following is an example of using `nmcli` to create a network connection with a static IP address and jumbo frames.

1. On the Linux station, open a terminal session.
2. Enter the following command to list network interfaces:

```
nmcli device
```

Example output

```
DEVICE        TYPE      STATE         CONNECTION
eno1          ethernet  connected     eno1
enp108s0f0    ethernet  disconnected  --
enp108s0f1    ethernet  disconnected  --
```

3. Add a network connection by entering the following:

```
nmcli connection add type ethernet ifname interface name ipv4.method manual ipv4.addr "IP address" 802-3-ethernet.mtu 9000
```

where interface name is a Rackmount Receiver iSCSI port andIP address is a Rackmount Receiver port IP address, for example:

```
nmcli connection add type ethernet ifname enp108s0f0 ipv4.method manual
ipv4.addr "192.168.0.1/24" 802-3-ethernet.mtu 9000
```

Example output
Connection 'ethernet-enp108s0f0' (93b21958-1e3e-49e8-9c38-0a63f0e6c77c) successfully added.

4. Confirm that the settings have been applied by entering the following the following:

```
nmcli device show
```

Example output	
GENERAL.DEVICE:	enp108s0f0
GENERAL.TYPE:	ethernet
GENERAL.HWADDR:	F4:E9:D4:73:AE:14
GENERAL.MTU:	9000
GENERAL.STATE:	100 (connected)
GENERAL.CONNECTION:	ethernet-enp108s0f0
GENERAL.CON-PATH:	/org/freedesktop/NetworkManager/ActiveConnection/17
WIRED-PROPTERTIES.CARRIER:	on
IP4.ADDRESS[1]:	192.168.0.1/24
IP4.GATEWAY:	--
IP4.ROUTE[1]:	dst = 192.168.0.0/24, nh = 0.0.0.0, mt = 103
IP6.ADDRESS[1]:	fe80::2b25:ace7:3d38:979a/64
IP6.GATEWAY:	--
IP6.ROUTE[1]:	dst = fe80::/64, nh = ::, mt = 103
IP6.ROUTE[2]:	dst = ff00::/8, nh = ::, mt = 256, table=255

Configure Lyve Mobile Rackmount Receiver for iSCSI

> The following instructions assume you're familiar with using lmacli to discover your Lyve Mobile Array over the network and import its credentials from the Lyve Management Portal. See Entering Commands for details.

lmacli info with iSCSI

The **connection type** for your Lyve Mobile Array is displayed as iSCSI.

To view device details:

1. On the Linux station, open a terminal session.
2. Enter the following:

```
lmacli info IP address
```

where IP address is a Rackmount Receiver port IP address, for example:

```
lmacli info 192.168.0.100
```

Example output	
=== Identification ===	
Product	: STJX46000400
Serial number	: NB261234
Connection type	: iSCSI
Name	:
=== Disk encryption ===	
Status	: Secured, unlocked
=== Pools ===	
Name	: dg
Total size	: 46.0TB
Available size	: 0B
Number of volumes	: 1
=== Volumes ===	
Name	: volume-0
Pool name	: dg
Size	: 46.0TB
RAID level	: RAID0
Status	: OK
Mapped	: No

Create the iSCSI configuration file for lmacli

lmacli reads the iSCSI configuration for a Lyve Mobile rackmount Receiver from a file. You can edit the file to modify the iSCSI configuration of a Lyve Mobile Rackmount Receiver.

An example iSCSI configuration file is included in the lmacli package.

- **Linux**—The example iSCSI configuration file is installed in/usr/share/doc/lmacli/examples/lmacli-rackmount-iscsi.conf.
- **Windows**—The example iSCSI configuration file is contained in lmacli's release Zip archive.

Copy the example iSCSI configuration file and modify the copy to match your environment.

Note some important iSCSI parameters:

- **allowed_initiators**—Contains the IQN of the initiators allowed to connect to the Lyve Mobile Array Rackmount Receiver iSCSI target.
  - **Linux**—The IQN of the software initiator is set in the following file/etc/iscsi/initiatorname.iscsi.
  - **Windows**—The IQN of the software initiator can be obtained from the control panel**Control Panel > iSCSI Initiator > Configuration > Initiator name**.
- **jumbo_frame**—Enabling jumbo frames provides a performance boost.

Below is an iSCSI configuration file for LMACLI that enables jumbo frames and configures the network ports reserved for iSCSI traffic so that they all belong to different subnets.

Sample file	
#	
# Sample iSCSI configuration file for `lmacli rackmount-setup`	
#	
# The parameters specified in this file are used to configure the	
# network ports and the iSCSI target service of a Lyve Mobile	
# Rackmount Receiver.	
#	
# The iSCSI configuration can be applied with:	
# $ lmacli rackmount-setup --iscsi-config FILE DESTINATION	
#	
#	
# iSCSI target parameters.	
#	
[iscsi]	
# At least one initiator must be specified.	
# To determine the iSCSI initiator name	
# * Linux : cat /etc/iscsi/initiatorname.iscsi	
# * Windows : Control Panel > iSCSI Initiator > Configuration > Initiator name	
allowed_initiators = ["iqn.2001-04.com.example:initiator",]	
# Be sure to enable jumbo frames in your network adapter before	
# setting the following "jumbo_frame" parameter to true.	
jumbo_frame = true	
#	
# Network ports configuration.	
# Up to 4 network ports, numbered from 0 (leftmost) to 3 (rightmost).	

```
# Please comment-out any port you do not want to use.
#
[[ports]]
index = 0
ip = "192.168.0.100"
netmask = "255.255.255.0"
# gateway =

[[ports]]
index = 1
ip = "192.168.1.100"
netmask = "255.255.255.0"
# gateway =

[[ports]]
index = 2
ip = "192.168.2.100"
netmask = "255.255.255.0"
# gateway =

[[ports]]
index = 3
ip = "192.168.3.100"
netmask = "255.255.255.0"
# gateway =
```

Apply the iSCSI configuration with lmacli

To apply the iSCSI configuration:

1. On the Linux station, open a terminal session.
2. Enter the following:

```
lmacli rackmount-setup --iscsi-config my-server.conf IP address
```

where IP address is a Rackmount Receiver port IP address, for example:

```
lmacli rackmount-setup --iscsi-config my-server.conf 192.168.0.100
```

Example output

```
Checking device configuration (iSCSI)
Checking iSCSI configuration file
Clearing existing rackmount configuration
Creating new rackmount configuration
```

Check for network connectivity between the host and Rackmount Receiver

Checking for network connectivity between the host and the Lyve Mobile Rackmount Receiver may eliminate future issues. Each rackmount receiver port declared in the iSCSI configuration file should be tested with the`ping` command.

> If ethernet jumbo frames are enabled, the packet size must be set to 8972 bytes. The IP header (20 bytes) and ICMP header (8 bytes) combined are 28 bytes. Thus, the resulting payload size equals the jumbo frame MTU: 9000 bytes.

To check network connectivity for jumbo frames:

1. On the Linux station, open a terminal session.
2. Enter the following command:

```
ping -s 8972 IP address
```

where `IP address` is a Rackmount Receiver port IP address declared in the iSCSI configuration file, for example:

```
ping -s 8972 192.168.0.100
```

Example output

```
PING 192.168.0.100 (192.168.0.100) 8972(9000) bytes of data.
8980 bytes from 192.168.0.100: icmp_seq=1 ttl=64 time=0.150
ms
8980 bytes from 192.168.0.100: icmp_seq=2 ttl=64 time=0.150
ms
```

Connect the iSCSI initiator on the host to the iSCSI target

Discover the iSCSI target

The iSCSI target on the Lyve Mobile Rackmount Receiver can be discovered with the `iscsiadm` command. The `--portal` parameter should be set to one of the IP addresses declared in lmacli's iSCSI configuration file.

To discover the iSCSI target:

1. On the Linux station, open a terminal session.
2. Enter the following command:

```
sudo iscsiadm --mode discovery --type sendtargets --portal IP address
```

> where IP address is a Rackmount Receiver port IP address declared in the iSCSI configuration file, for example:
>
> ```
> sudo iscsiadm --mode discovery --type sendtargets --portal 192.168.0.100
> ```

Example output

```
192.168.0.100:3260,1 iqn.1995-03.com.dothill:01.array.00c0fff39296-624ebda2.a
192.168.1.100:3260,2 iqn.1995-03.com.dothill:01.array.00c0fff39296-624ebda2.a
192.168.2.100:3260,3 iqn.1995-03.com.dothill:01.array.00c0fff39296-624ebda2.a
192.168.3.100:3260,4 iqn.1995-03.com.dothill:01.array.00c0fff39296-624ebda2.a
```

Log in to the iSCSI target

The `iscsiadm` command can also be used to connect the iSCSI initiator to the iSCSI target through all its portals.

To log in to the iSCSI target:

1. On the Linux station, open a terminal session.
2. Enter the following command:

```
sudo iscsiadm --mode node --target IQN --login
```

> where IQN is an iSCSI Qualified Name obtained from the `discover` command, for example:
>
> ```
> sudo iscsiadm --mode node --target iqn.1995-03.com.dothill:01.array.00c0fff39296-624ebda2.a --login
> ```

Example output

```
Logging in to [iface: default, target: iqn.1995-03.com.dothill:01.array.00c0fff39296-624ebda2.a, portal: 192.168.2.100,3260] (multiple)
Logging in to [iface: default, target: iqn.1995-03.com.dothill:01.array.00c0fff39296-624ebda2.a, portal: 192.168.1.100,3260] (multiple)
Logging in to [iface: default, target: iqn.1995-03.com.dothill:01.array.00c0fff39296-624ebda2.a, portal: 192.168.3.100,3260] (multiple) Logging in to [iface: default, target: iqn.1995-03.com.dothill:01.array.00c0fff39296-624ebda2.a, portal: 192.168.0.100,3260] (multiple)
Login to [iface: default, target: iqn.1995-03.com.dothill:01.array.00c0fff39296-624ebda2.a, portal: 192.168.2.100,3260] successful.
Login to [iface: default, target: iqn.1995-03.com.dothill:01.array.00c0fff39296-624ebda2.a, portal: 192.168.1.100,3260] successful.
Login to [iface: default, target: iqn.1995-03.com.dothill:01.array.00c0fff39296-624ebda2.a, portal: 192.168.3.100,3260] successful.
Login to [iface: default, target: iqn.1995-03.com.dothill:01.array.00c0fff39296-624ebda2.a, portal: 192.168.0.100,3260] successful.
```

The lsscsi command can be used to display the block devices. Each block device listed represents a path to the same LUN.

Example output					
[5:0:0:0]	enclosu	SEAGATE	STJX46000400	M100	-
[5:0:0:1]	disk	SEAGATE	STJX46000400	M100	/dev/sdc
[6:0:0:0]	enclosu	SEAGATE	STJX46000400	M100	-
[6:0:0:1]	disk	SEAGATE	STJX46000400	M100	/dev/sde
[7:0:0:0]	enclosu	SEAGATE	STJX46000400	M100	-
[7:0:0:1]	disk	SEAGATE	STJX46000400	M100	/dev/sdd
[8:0:0:0]	enclosu	SEAGATE	STJX46000400	M100	-
[8:0:0:1]	disk	SEAGATE	STJX46000400	M100	/dev/sdf

The multiple paths to the device are coalesced by the device mapper multipath daemon.

See below for details on configuring I/O multipath for a Lyve Mobile Rackmount Receiver.

Configure I/O multipath to improve I/O bandwidth

The role of the device mapper multipath daemon is to detect and coalesce multiple paths to devices, for fail-over or performance reasons.

To display the list of multipath devices:

1. On the Linux station, open a terminal session.

2. Enter the following:

```
sudo multipath -ll
```

Example output

```
mpatha (3600c0ff000f390bace61ac6201000000) dm-1
SEAGATE,STJX46000400
size=40T features='0' hwhandler='1 alua' wp=rw
|-+- policy='service-time 0' prio=50 status=active
| `- 5:0:0:1 sdc 8:32 active ready running
|-+- policy='service-time 0' prio=50 status=enabled
| `- 6:0:0:1 sde 8:64 active ready running
|-+- policy='service-time 0' prio=50 status=enabled
| `- 8:0:0:1 sdf 8:80 active ready running
`-+- policy='service-time 0' prio=50 status=enabled
`- 7:0:0:1 sdd 8:48 active ready running
```

To improve I/O bandwidth, it is recommended to change thepath_grouping_policy parameter from the default failover to group_by_prio. To set thepath_grouping_policy to group_by_prio for all Lyve Mobile Arrays, add the following snippet to **/etc/multipath.conf**:

Example output

```
devices {
        device {
                vendor "SEAGATE"
                product "STJX.*"
                path_grouping_policy "group_by_prio"
        }
}
```

After restarting the device mapper multipath daemon, the output ofmultipath -ll appears as follows:

Example output

```
mpatha (3600c0ff000f390bac420bb6201000000) dm-1 SEAGATE,STJX46000400
size=40T features='0' hwhandler='1 alua' wp=rw
`-+- policy='service-time 0' prio=50 status=active
  |- 5:0:0:1 sdc 8:32 active ready running
  |- 6:0:0:1 sdd 8:48 active ready running
  |- 7:0:0:1 sde 8:64 active ready running
  `- 8:0:0:1 sdf 8:80 active ready running
```

The first line starts with the multipath device name (mpatha in the example above). The full path to the device is /dev/mapper/mpatha.

Linux SAS/FC Network Setup for Lyve Mobile Rackmount Receiver

You can use lmacli to configure a SAS or FC data path between a Linux host and a Lyve Mobile Rackmount Receiver connected to the same data network.

The following steps are required:

1. Install the required packages on Linux.
2. Configure the Rackmount Receiver for SAS or FC.
3. Scan for new disks on Linux.
4. Configure I/O multipath to improve I/O bandwidth.

Install multipath tools on Linux

Red Hat Enterprise Linux

To install multipath tools:

1. On the Linux station, open a terminal session.
2. Enter the following command:

```
sudo yum install lsscsi device-mapper-multipath
```

Ubuntu/Debian

To install multipath tools:

1. On the Linux station, open a terminal session.
2. Enter the following command:

```
sudo apt install lsscsi multipath-tools
```

Configure Lyve Mobile Rackmount Receiver for SAS/FC

> The following instructions assume you're familiar with using lmacli to discover your Lyve Mobile Array over the network and import its credentials from the Lyve Management Portal. See Entering Commands for details.

lmacli info with SAS/FC

The **connection type** for your Lyve Mobile Array is displayed as SAS or FC.

To view device details:

1. On the Linux station, open a terminal session.
2. Enter the following:

```
lmacli info IP address
```

where IP address is a Rackmount Receiver port IP address, for example:

```
lmacli info 192.168.0.100
```

Example output	
=== Identification ===	
Product	: STJX46000400
Serial number	: NB261234
Connection type	: SAS
Name	:
=== Disk encryption ===	
Status	: Secured, unlocked
=== Pools ===	
Name	: dg
Total size	: 59.9TB
Available size	: 0B
Number of volumes	: 1
=== Volumes ===	
Name	: volume-0
Pool name	: dg
Size	: 59.9TB
RAID level	: RAID0
Status	: OK
Mapped	: No

Apply the SAS/FC configuration with lmacli

To apply the configuration:

1. On the Linux station, open a terminal session.
2. Enter the following:

```
lmacli rackmount-setup IP address
```

where IP address is a Rackmount Receiver port IP address, for example:

```
lmacli rackmount-setup 192.168.0.100
```

Example output

```
Checking device configuration (SAS)
Clearing existing rackmount configuration
Creating new rackmount configuration
```

Scan for new disks on Linux

Display storage devices

To view connected storage devices:

1. On the Linux station, open a terminal session.
2. Enter the following:

```
lsscsi
```

Example output

```
[0:0:13:0]  enclosu  SEAGATE  STJX46000400  M100  -
[0:0:14:0]  enclosu  SEAGATE  STJX46000400  M100  -
```

If the host is equipped with a dual-port SAS or FC host bus adapter, Linux should display tw**enclosures**. Each enclosure may contain a**disk** if the cable connects the host to the corresponding ports on Rackmount Receiver. The enclosures and disks associated with the Lyve Mobile Array volume have their vendor attribute set to SEAGATE and their model starts with STJX.

If enclosures are displayed but no disk is associated with them, the host storage configuration must be rescanned in order to refresh the configuration.

Rescan SAS/FC bus

To refresh the configuration:

1. On the Linux station, open a terminal session.
2. Enter the following:

```
rescan-scsi-bus.sh
```

Example output

```
[SNIP]
2 new or changed device(s) found.
     [0:0:13:1]
     [0:0:14:1]
0 remapped or resized device(s) found.
0 device(s) removed.
```

Following the rescan, a summary of the storage configuration changes is displayed. In the example above, two new disks are detected (one for each enclosure).

Enter lsscsi again to display the block device associated with each disk:

Example output

[0:0:13:0]	enclosu	SEAGATE	STJX46000400	M100	-
[0:0:13:1]	disk	SEAGATE	STJX46000400	M100	/dev/sda
[0:0:14:0]	enclosu	SEAGATE	STJX46000400	M100	-
[0:0:14:1]	disk	SEAGATE	STJX46000400	M100	/dev/sdb

Each disk listed in the example above represents a distinct**path** to the same LUN exported by the Lyve Mobile Array.

The multiple paths to the device are coalesced by the device mapper multipath daemon. See Configure I/O multipath to improve I/O bandwidth below.

Configure I/O multipath to improve I/O bandwidth

The device mapper multipath daemon detects and coalesces multiple paths to devices for failover or performance purposes.

Display multipath devices

To display multipath devices:

1. On the Linux station, open a terminal session.
2. Enter the following:

```
sudo multipath -11
```

Example output

```
mpatha (3600c0ff000f392966aae456201000000) dm-1 SEAGATE,STJX60000400
size=55T features='0' hwhandler='1 alua' wp=rw
|-+- policy='service-time 0' prio=50 status=active
| `- 0:0:13:1 sda 8:0 active ready running
`-+- policy='service-time 0' prio=50 status=enabled
`- 0:0:14:1 sdb 8:16 active ready running
```

To improve I/O bandwidth, it is recommended to change the `path_grouping_policy` parameter from the default failover to `group_by_prio`. To set the policy to `group_by_prio` for all Lyve Mobile Arrays, add the following snippet to `/etc/multipath.conf`:

Example output

```
devices {
        device {
                vendor "SEAGATE"
                product "STJX.*"
                path_grouping_policy "group_by_prio"
        }
}
```

After restarting the device mapper multipath daemon, the result of the `multipath -11` command should look like this:

Example output

```
mpatha (3600c0ff000f392966aae456201000000) dm-1 SEAGATE,STJX60000400
size=55T features='0' hwhandler='1 alua' wp=rw
`-+- policy='service-time 0' prio=50 status=active
|- 0:0:13:1 sda 8:0 active ready running
`- 0:0:14:1 sdb 8:16 active ready running
```

The first line starts with the multipath device name (`mpatha` in the example above). The full path to the device is `/dev/mapper/mpatha`.