Linux Host Configuration: iSCSI with Pavilion Hyperparallel Flash Array

Version 1.0.0

Last Updated: August 2020
Document Version: Version 1.0.0 Rev 0

Legal Notice:

Technical Support:

Technical Support maintains support centre's globally. If you have questions regarding an existing support agreement, please email/phone the support agreement administration team as follows:

Phone:

USA & Canada: 1-888-342-0461

United Kingdom: 0800–69-8055

Netherlands: 0800-022-2832

International: 1-408-684-4958

Email:

support@pavilion.io

Documentation:
Make sure that you have the current version of the documentation. Each document displays the date of the last update on page 2.

Documentation Feedback:
Your feedback is important for us.
For documentation feedback send your comments to your Pavilion field support contact.

Contents

1 Summary

The purpose of this document is to guide the user through the installation and configuration of RHEL/Centos 7/8 host with **Pavilion** Hyperparallel Flash Array (HFA) to enable storage provided by **Pavilion** HFA to be accessed by **iSCSI initiators** over iSCSI protocol. This document describes the general set of configurations that have been validated.

It is assumed that the audience is familiar with Linux and iSCSI, as this document is not intended to serve as a comprehensive Linux and iSCSI Guide.

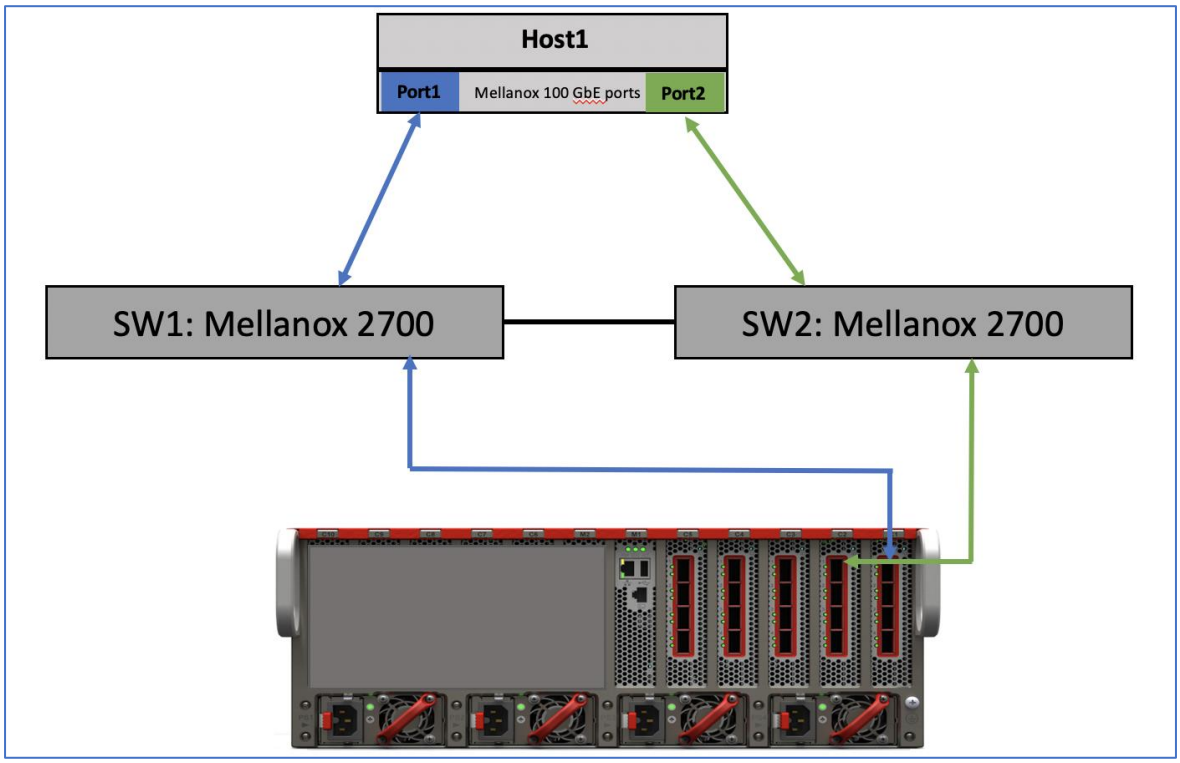
2 iSCSI Overview

iSCSI is a protocol that uses TCP to transport SCSI commands, enabling the use of the existing TCP/IP networking infrastructure as a SAN. As with SCSI over Fibre Channel (FC), iSCSI presents SCSI targets and devices to iSCSI initiators (requesters). Unlike NAS, which presents devices at the file level, iSCSI makes block devices available via the network. Block devices are presented across an IP network to your local system. These can be consumed in the same way as any other block-storage device.

3 Solutions Overview

The solution for this guide consists of the following components:

- 1x Supermicro E5-2690 V4 Server with 1x Mellanox CX-4 Card (dual port)
- **Pavilion** HFA with version 2.3.1.2 or higher
- 2x Mellanox 2700 switches
- Centos 7/8 OS installed on the host



4 Configuring Pavilion Controllers for iSCSI

This section lists the steps required to configure two controllers to serve iSCSI connections. Once they are configured for iSCSI protocol, set the dataports, and configure Active/Standby paths.

4.1 Login to the Pavilion HFA

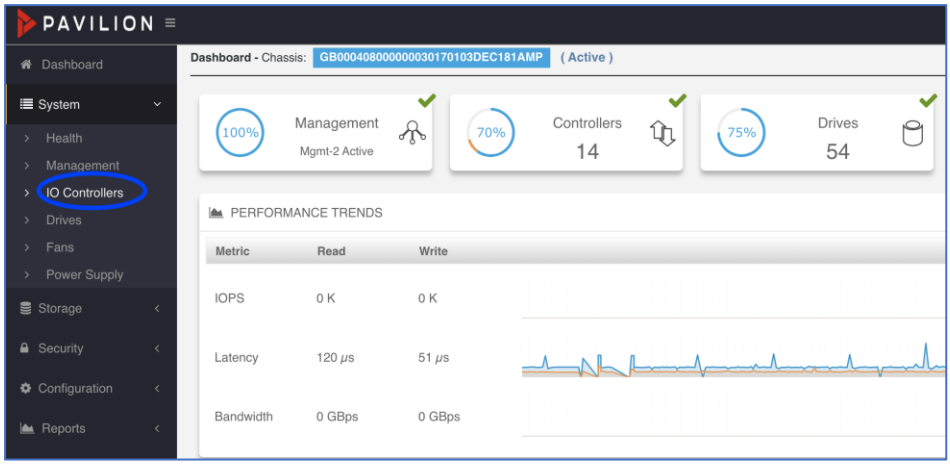
This section lists how you can login to **Pavilion** HFA.

Step 1: Using the GUI interface, log in with the administrator login and password. See below image for reference:

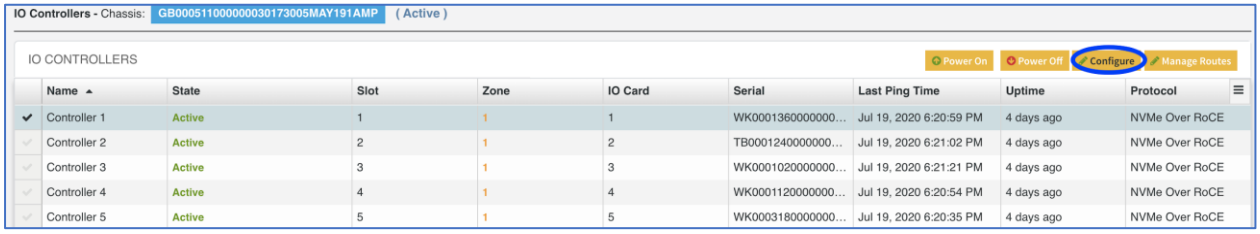
4.2 Configure Individual Controllers to serve iSCSI Volumes

This section lists the steps required to configure controllers to serve iSCSI volumes.

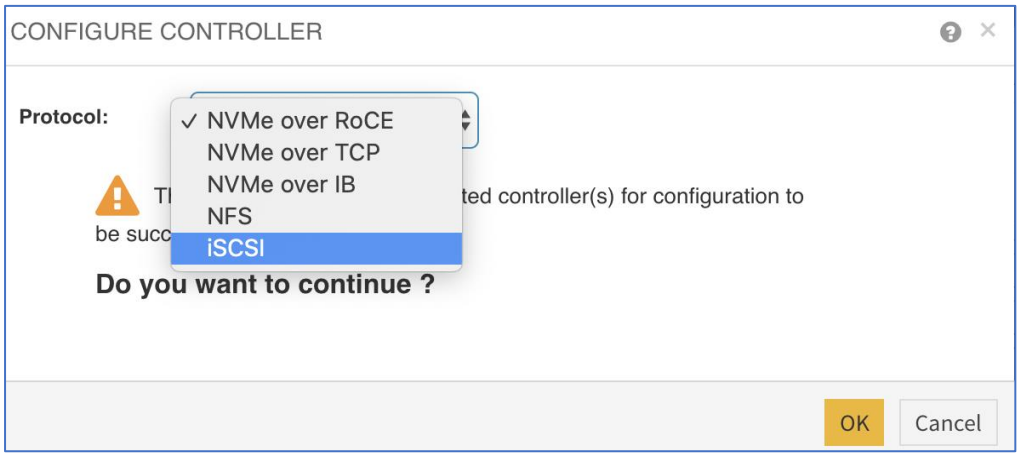
Step 1: Click on the **System>IO Controllers** tab on the side menu to bring up the list of installed controllers. See image below for reference:



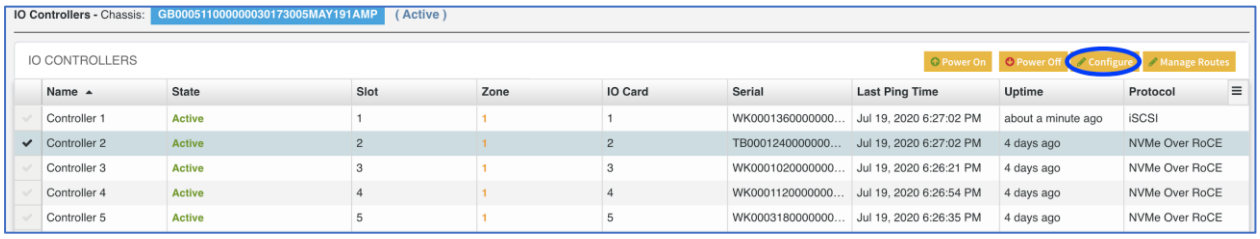
Step 2: For this instance, IO **Controller 1** and IO **Controller 2** are used. Select IO Controller 1 and click **Configure** as seen in the below image:



Step 3: Under the **Protocol** dropdown select **iSCSI.**



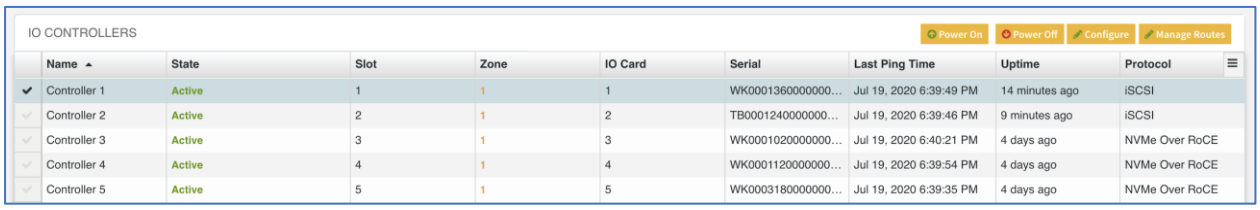
Step 4: Repeat the above steps for **Controller 2** also, as seen in the below image:



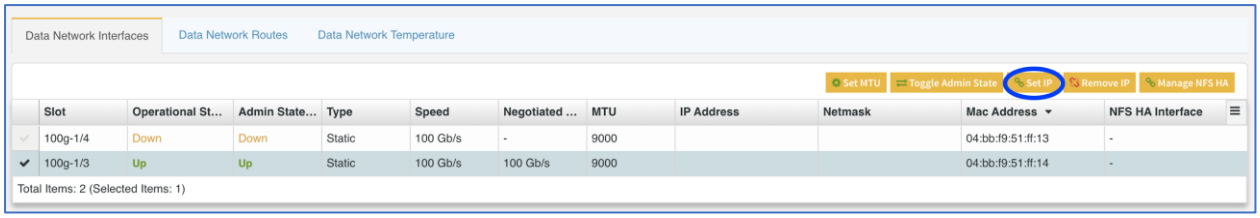
4.3 Configure Data Network (IP) interfaces for the controller's

This section lists how to configure Data Network (IP) interfaces for controllers:

Step 1: Re-select the controller you changed to iSCSI in the prior step to begin configuring its IP configuration. See image below:

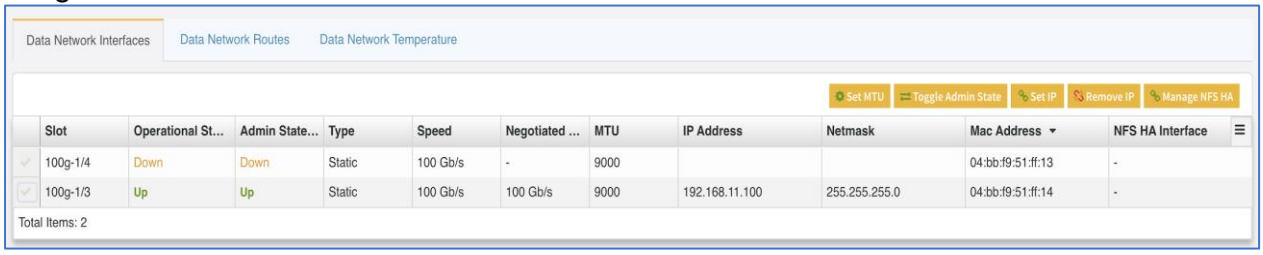


Step 2: Once the controller is selected, the **Data Network Interfaces** tab will appear at the bottom of the screen. Select the interface (each controller has two) and use the **Set IP** button to bring up the **Set Dataport IP** window and enter the IP and netmask desired.

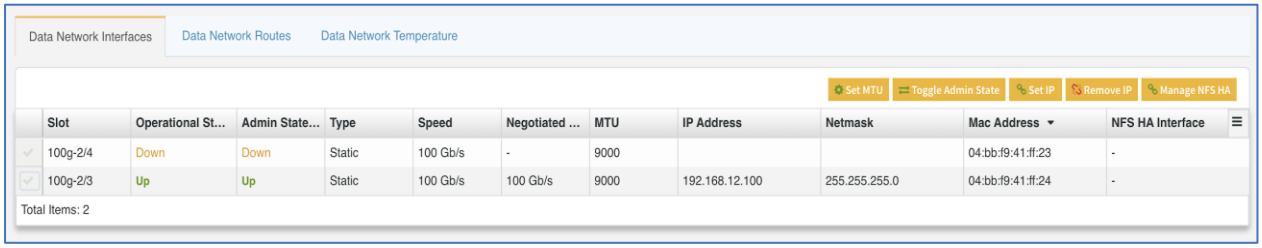


Step 3: Assign **IP address** and **Netmask** as seen in the below image:

Step 4: Subsequently **Controller 1** is configured for iSCSI as seen in the below image:



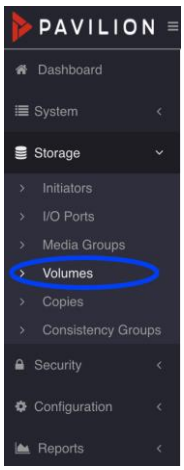
Step 5: Similarly configure IP Address for **Controller 2**, see below image for reference:



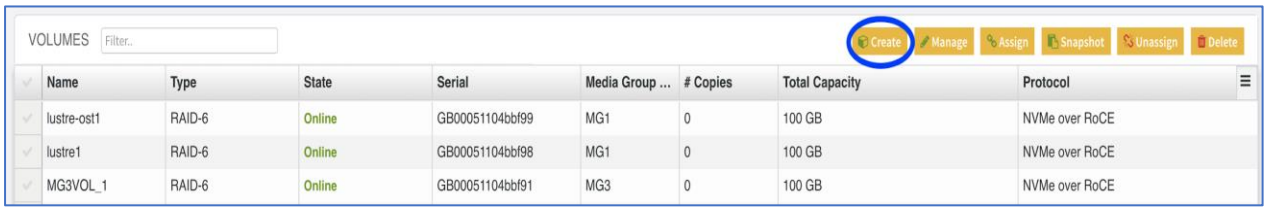
4.4 Creating a Volume

This section lists how to create a volume

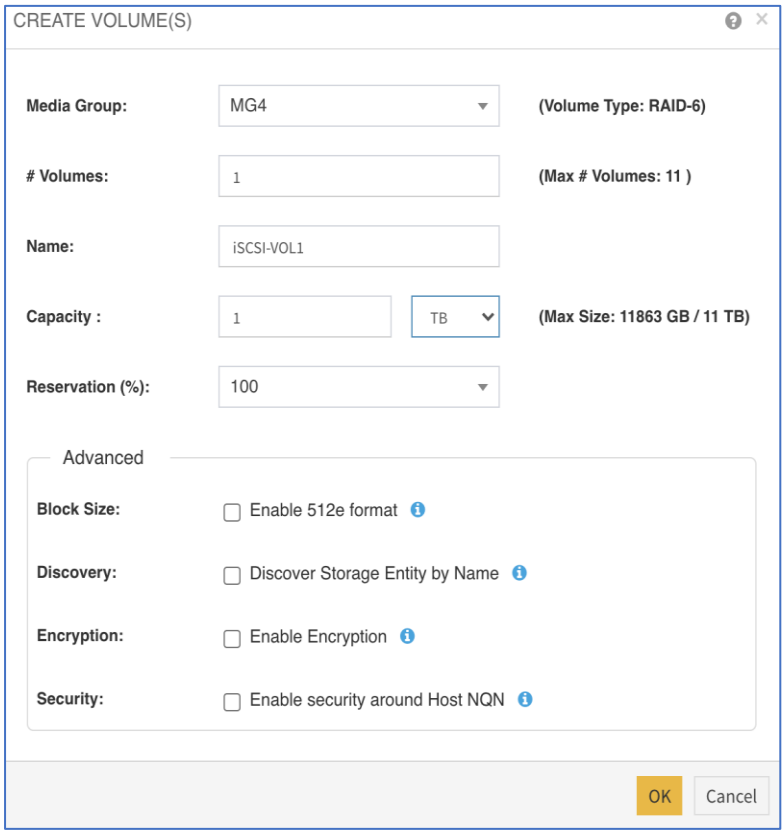
Step 1: Log in to the administration GUI, as usual. Go to the **Storage** Pane menu and select **Volumes.** You will be presented with a list of pre-existing volumes, and a set of buttons to manage them. See image for reference:



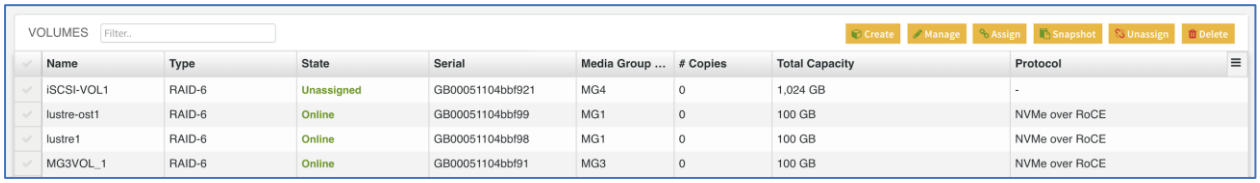
Step 2: Click **Create** to begin Volume creation



Step 3: Use the options (media group, name, total capacity, etc.) and configure the volume as described.



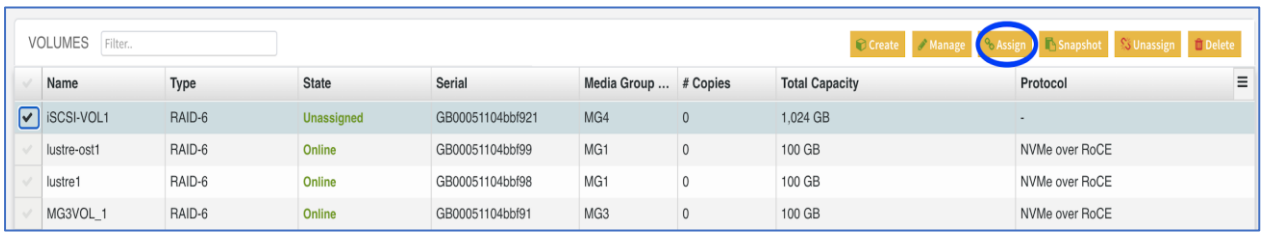
Step 4: Volume has been created and ready to be assigned to the Controller pair.



4.5 Assigning the volume

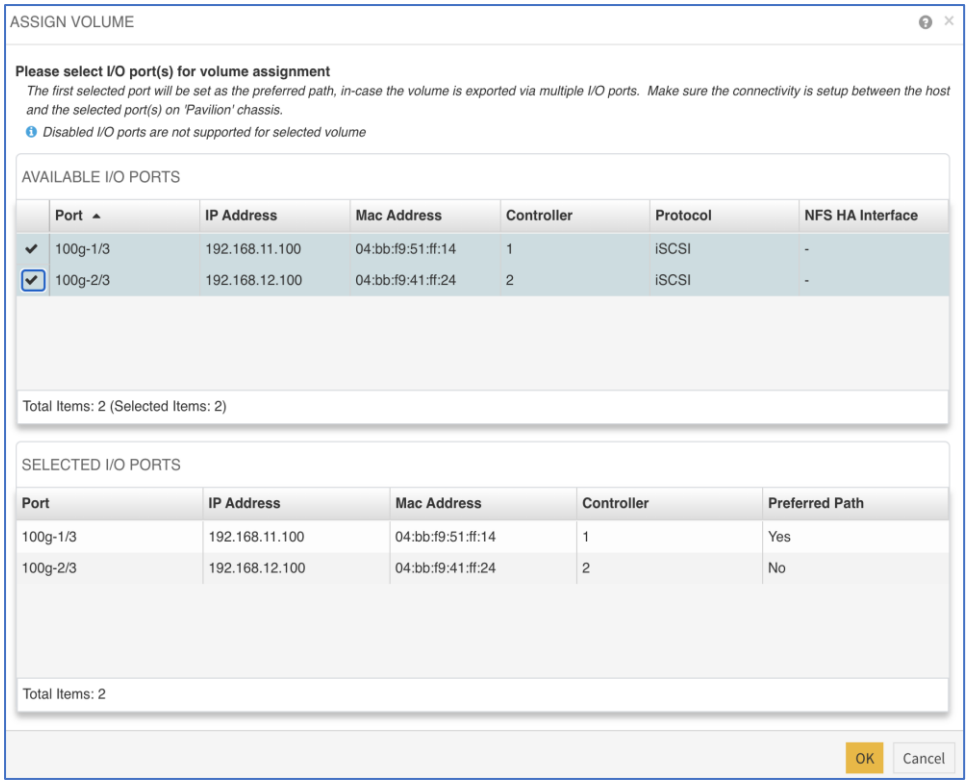
This section lists the steps required to assign the volume**.**

Step 1: Select the newly created volume in the list and click on the **Assign** button, as seen in the below image:



Name	Type	State	Serial	Media Group ...	# Copies	Total Capacity	Protocol
iSCSI-VOL1	RAID-6	Unassigned	GB00051104bbf921	MG4	0	1,024 GB	-
lustre-ost1	RAID-6	Online	GB00051104bbf99	MG1	0	100 GB	NVMe over RoCE
lustre1	RAID-6	Online	GB00051104bbf98	MG1	0	100 GB	NVMe over RoCE
MG3VOL_1	RAID-6	Online	GB00051104bbf91	MG3	0	100 GB	NVMe over RoCE

Step 2: At this point, select the Active and Standby data ports and click OK, see image for reference:



Step 3: The above step assigns volume to the Controller pair and the volume is ready to be mounted on a host.

5 Linux Host Configuration

This section describes how to install and configure **RHEL 7 and 8 hosts** for iSCSI and multipath.

Note: Verify the ethernet cards (Mellanox ConnectX-4 or newer recommended) are recognized and operating with an MTU of 9000 (for best performance on 100 G networks).

Execute the following commands to verify:

```
# lspci | grep Mellanox
03:00.0 Ethernet controller: Mellanox Technologies MT27700 Family
[ConnectX-4]
03:00.1 Ethernet controller: Mellanox Technologies MT27700 Family
[ConnectX-4]

# ethtool eth2 | grep -e detected -e Speed
Speed: 100000Mb/s
Link detected: yes
```

Step 1: This step calls out the **iSCSI initiator installation requirements**. The iSCSI initiator is a kernel module that is already available with the appropriate Red Hat Enterprise Linux installation.

Note: To set up iSCSI at the host level following two packages are required:

1) iSCSI-initiator-utils
2) device-mapper-multipath

RHEL 7

For **RHEL 7** execute the following commands:

This installs the **`iscsiadm`** utility which will be used to discover and connect the iSCSI storage. Listed below are the commands:

```
# yum install iscsi-initiator-utils
# yum install device-mapper-multipath
```

RHEL8

For **RHEL 8** execute the following commands:

```
# dnf install iscsi-initiator-utils
# dnf install device-mapper-multipath
```

Step 2: This step calls out how to configure IP address for iSCSI traffic.
Configure iSCSI traffic using device **eth2** and **eth3** using the following commands:

```
[root@localhost ~]# vi /etc/sysconfig/network-scripts/ifcfg-eth2
DEVICE=eth2
UUID=e9c7f292-7000-436a-818f-03ca7fdb6303
# Static IP Address #
BOOTPROTO=none
IPADDR=192.168.11.101
NETMASK=255.255.255.0
ONBOOT=yes
# Jumbo Frames
MTU=9000

[root@localhost ~]# vi /etc/sysconfig/network-scripts/ifcfg-eth3
DEVICE=eth3
UUID=bb2a4ff2-2600-4dd1-abb9-0acd98bf83df
# Static IP Address #
BOOTPROTO=none
IPADDR=192.168.12.101
NETMASK=255.255.255.0
ONBOOT=yes
# Jumbo Frames
MTU=9000
```

Step 3: After configuring the IP addresses restart the network service using the following commands:

Using RHEL 7:

```
# systemctl restart network
```

Using RHEL8:

```
# systemctl restart NetworkManager.service
```

Step 4: As a next step test connectivity with **Pavilion** controllers:

Ping the **Pavilion** controller data port IP address (the one that volumes were connected to in prior stages, not the management interface). Add "-s 9000" to verify jumbo frames are enabled. See below sample for reference:

```
# ping 192.168.11.100
PING 192.168.11.100 (192.168.11.100) 56(84) bytes of data.
64 bytes from 192.168.11.100: icmp_seq=1 ttl=64 time=0.092 ms
64 bytes from 192.168.11.100: icmp_seq=2 ttl=64 time=0.029 ms

# ping 192.168.11.100 -s 8972 -M do
PING 192.168.11.100 (192.168.11.100) 8972(9000) bytes of data.
8980 bytes from 192.168.11.100: icmp_seq=1 ttl=64 time=0.104 ms
8980 bytes from 192.168.11.100: icmp_seq=2 ttl=64 time=0.037 ms

# ping 192.168.12.100
PING 192.168.12.100 (192.168.12.100) 56(84) bytes of data.
64 bytes from 192.168.12.100: icmp_seq=1 ttl=64 time=0.121 ms
64 bytes from 192.168.12.100: icmp_seq=2 ttl=64 time=0.085 ms

# ping 192.168.12.100 -s 8972 -M do
PING 192.168.12.100 (192.168.12.100) 8972(9000) bytes of data.
8980 bytes from 192.168.12.100: icmp_seq=1 ttl=64 time=0.112 ms
8980 bytes from 192.168.12.100: icmp_seq=2 ttl=64 time=0.100 ms
```

Note: If the "ping -s 8972" command fails, but the plain "ping" command without the 8972 option succeeds, this is often the fault of a switch that is not configured to support MTU 9000 (jumbo frames). Please consult your switch's operating guide to check the MTU on connected ports, and correct if necessary.

Step 5: Verify host **iqn** by executing the following command:

```
#  cat /etc/iscsi/initiatorname.iscsi
InitiatorName=iqn.1994-05.com.redhat:2bbd4785b80
```

Step 6: Configure multipathing on the host by executing the following commands:

```
[root@localhost ~]# mpathconf --enable --with_multipathd y
[root@localhost ~]# mpathconf --enable --user_friendly_names y
```

Step 7: Update `multipath.conf` file with **Pavilion** recommended multipath configuration, as seen below:

[root@localhost ~]# vi /etc/multipath.conf

```
Defaults
{
        user_friendly_names yes
        find_multipaths yes
        no_path_retry "queue"
        path_grouping_policy "failover"
 }
blacklist
{

}
blacklist_exceptions
{

}
Devices
{
        Device
     {
                vendor "PVL-*"
                product ".*"
                path_grouping_policy "failover"
                path_selector "queue-length 0"
                path_checker "directio"
                hardware_handler "1 alua"
                prio "alua"
                prio_args "exclusive_pref_bit"
                no_path_retry "queue"
                failback manual
                rr_weight "priorities"
                fast_io_fail_tmo 25
      }
        device
      {
                vendor                  "Pavilion"
                product                 "HPFA 2"
                hardware_handler        "1 alua"
                path_grouping_policy    "failover"
                path_selector           "queue-length 0"
                failback                "manual"
                path_checker            "tur"
                rr_weight               "priorities"
```

```
                prio                    "alua"
                prio_args               "exclusive_pref_bit"
                fast_io_fail_tmo        25
                no_path_retry           "queue"

        }
}
Multipaths
 {
 }
```

Step 8: Restart **iSCSI** and **multipathd** service using the following commands:

```
root@localhost ~]# systemctl start iscsid
root@localhost ~]# systemctl enable iscsi
root@localhost ~]# systemctl restart multipathd
```

5.1 iSCSI Volume Access

This section shows how to connect to **Pavilion** volumes from the host using iSCSI protocol.

Step 1: Discover targets:
Once the iSCSI service is running and volume access is set up correctly use the **`iscsiadm`** command utility to discover, login or logout your targets.

To get a list of available targets type:

```
#iscsiadm -m discovery -t sendtargets -p <Target IP address>:3260
```

Active Controller

```
[root@localhost ~]# iscsiadm --mode discoverydb --type sendtargets
--portal 192.168.11.100 --discover
192.168.11.100:3260,1 iqn.2014-01.org.pvl-
iscsi.x8664:sn.gb00051104bbf921n18
```

Standby Controller

```
[root@localhost ~]# iscsiadm --mode discoverydb --type sendtargets
--portal 192.168.12.100 --discover
192.168.12.100:3260,1 iqn.2014-01.org.pvl-
iscsi.x8664:sn.gb00051104bbf921n20
```

In this example, the volume with serial number **GB00051104bbf921** has been found.

Note: However, volume is not yet logged in so you cannot access it.

The following command shows we do not have an active connection yet:

```
[root@localhost ~]# iscsiadm -m session –i
iscsiadm: No active sessions.
```

Step 2: Target Login:
After the discovery process is complete the host can connect to the volume using the following command. Target information can be added from the discovery process performed in **Step 1.**

```
#iscsiadm --m node --targetname <iscsi iqn for the volume> --
portal Controller_IP:3260 --login
```

Connect to both Active and Standby controllers.

```
[root@localhost ~]# iscsiadm --mode node --targetname iqn.2014-
01.org.pvl-iscsi.x8664:sn.gb00051104bbf921n18  --portal
192.168.11.100:3260 --login
Logging in to [iface: default, target: iqn.2014-01.org.pvl-
iscsi.x8664:sn.gb00051104bbf921n18, portal: 192.168.11.100,3260]
Login to [iface: default, target: iqn.2014-01.org.pvl-
iscsi.x8664:sn.gb00051104bbf921n18, portal: 192.168.11.100,3260]
successful.

[root@localhost ~]# iscsiadm --mode node --targetname iqn.2014-
01.org.pvl-iscsi.x8664:sn.gb00051104bbf921n20  --portal
192.168.12.100:3260 --login
Logging in to [iface: default, target: iqn.2014-01.org.pvl-
iscsi.x8664:sn.gb00051104bbf921n20, portal:192.168.12.100,3260]
Login to [iface: default, target: iqn.2014-01.org.pvl-
iscsi.x8664:sn.gb00051104bbf921n20, portal:192.168.12.100,3260]
successful.
```

Note: After a successful connect process, active sessions can be seen by running following command.

```
[root@localhost ~]# iscsiadm -m session
tcp: [4] 192.168.11.100:3260,1 iqn.2014-01.org.pvl-
iscsi.x8664:sn.gb00051104bbf921n18 (non-flash)
tcp: [5] 192.168.12.100:3260,1 iqn.2014-01.org.pvl-
iscsi.x8664:sn.gb00051104bbf921n20 (non-flash)
```

To **log in** to **all** your established sessions, enter the following command:

```
[root@localhost ~]# iscsiadm -m node --login
Logging in to [iface: default, target: iqn.2014-01.org.pvl-
iscsi.x8664:sn.gb00051104bbf921n20, portal: 192.168.12.100,3260]
Logging in to [iface: default, target: iqn.2014-01.org.pvl-
iscsi.x8664:sn.gb00051104bbf921n18, portal: 192.168.11.100,3260]
```

```
Login to [iface: default, target: iqn.2014-01.org.pvl-
iscsi.x8664:sn.gb00051104bbf921n20, portal: 192.168.12.100,3260]
successful.
Login to [iface: default, target: iqn.2014-01.org.pvl-
iscsi.x8664:sn.gb00051104bbf921n18, portal: 192.168.11.100,3260]
successful.
```

Step 3: Mount Volume and create file system.

Run "**`lsblk`**" to check for device names as seen below:

```
[root@localhost ~]# lsblk
NAME     MAJ:MIN RM   SIZE RO TYPE  MOUNTPOINT
sda        8:0    0 223.6G  0 disk
├─sda1     8:1    0   512M  0 part  /boot
├─sda2     8:2    0  22.4G  0 part  [SWAP]
└─sda3     8:3    0 200.7G  0 part  /
sdb        8:16   0     1T  0 disk
└─mpathe 253:0    0     1T  0 mpath
sdc        8:32   0     1T  0 disk
└─mpathe 253:0    0     1T  0 mpath
```

Step 4: Run following command to check for multipath path status:

```
[root@localhost ~]# multipath -ll
mpathe (36001405b00051104bbf921f000000000) dm-0 Pavilion,HPFA 2
size=1.0T features='0' hwhandler='1 alua' wp=rw
|-+- policy='service-time 0' prio=50 status=active
| `- 11:0:0:21 sdc 8:32 active ready running
`-+- policy='service-time 0' prio=50 status=enabled
  `- 10:0:0:21 sdb 8:16 active ghost running
```

Step 5: Create filesytem on the device. For this documentation we will be creating an **xfs** filesystem on device **`/dev/mapper/mpathe`** see below command:

```
[root@localhost ~]# mkfs.xfs /dev/mapper/mpathe
meta-data=/dev/mapper/mpathe     isize=512    agcount=4,
agsize=67108864 blks
         =                       sectsz=4096  attr=2,
projid32bit=1
         =                       crc=1        finobt=1, sparse=1,
rmapbt=0
         =                       reflink=1
```

```
data     =                       bsize=4096   blocks=268435456,
imaxpct=5
         =                       sunit=0      swidth=0 blks
naming   =version 2              bsize=4096   ascii-ci=0, ftype=1
log      =internal log           bsize=4096   blocks=131072,
version=2
         =                       sectsz=4096  sunit=1 blks, lazy-
count=1
realtime =none                   extsz=4096   blocks=0,
rtextents=0
```

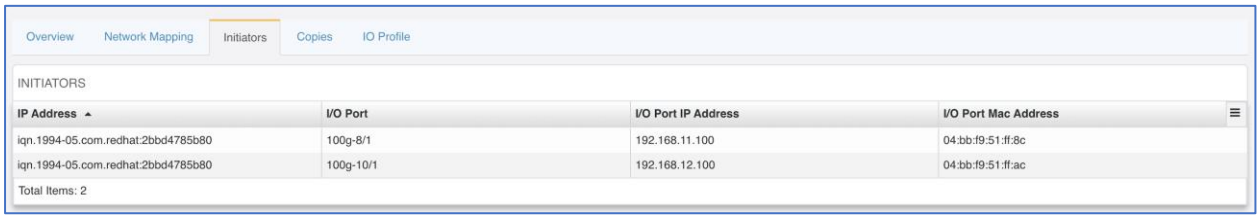
Step 6: Next step is to create a mount point and mount the filesystem using the following commands:

```
[root@localhost ~]# mkdir /iscsi1

[root@localhost ~]# mount /dev/mapper/mpathe /iscsi1

[root@localhost ~]# df -h
Filesystem           Size  Used Avail Use% Mounted on
devtmpfs              32G     0   32G   0% /dev
tmpfs                 32G     0   32G   0% /dev/shm
tmpfs                 32G  9.6M   32G   1% /run
tmpfs                 32G     0   32G   0% /sys/fs/cgroup
/dev/sda3            197G   52G  136G  28% /
/dev/sda1            488M  117M  336M  26% /boot
tmpfs                6.3G     0  6.3G   0% /run/user/0
/dev/mapper/mpathe   1.0T  7.2G 1017G   1% /iscsi1
```

Step 7: Verify initiator on **Pavilion** GUI.
Navigate to Storage>Volumes, verify the updates under I**nitiator** tab for the selected volume, you can see host **iqn**, see image for reference:



5.2 Disconnecting from Pavilion Volume

This section covers how to unmount a **Pavilion** Volume.

Step1: Firstly, unmount the volume on the host using the following command:

```
[root@localhost ~]# umount /iscsi1/
```

Step 2: Log off a target.
Disconnect from the **Pavilion** Controllers using the below commands.

```
iscsiadm -m node -T <iscsi iqn for the volume> --logout
```

From the output of the below command, we can get the volume **iqn.**

```
[root@localhost ~]# iscsiadm -m session
tcp: [3] 192.168.12.100:3260,1 iqn.2014-01.org.pvl-
iscsi.x8664:sn.gb00051104bbf917n20 (non-flash)
tcp: [4] 192.168.11.100:3260,1 iqn.2014-01.org.pvl-
iscsi.x8664:sn.gb00051104bbf917n18 (non-flash)
```

Step 3: Logout from all the sessions:

```
[root@localhost ~]# iscsiadm -m node -T iqn.2014-01.org.pvl-
iscsi.x8664:sn.gb00051104bbf917n20  --logout
Logging out of session [sid: 3, target: iqn.2014-01.org.pvl-
iscsi.x8664:sn.gb00051104bbf917n20, portal: 192.168.12.100,3260]
Logout of [sid: 3, target: iqn.2014-01.org.pvl-
iscsi.x8664:sn.gb00051104bbf917n20, portal: 192.168.12.100,3260]
successful.
```

```
[root@localhost ~]# iscsiadm -m node -T iqn.2014-01.org.pvl-
iscsi.x8664:sn.gb00051104bbf917n18  --logout
Logging out of session [sid: 4, target: iqn.2014-01.org.pvl-
iscsi.x8664:sn.gb00051104bbf917n18, portal: 192.168.11.100,3260]
Logout of [sid: 4, target: iqn.2014-01.org.pvl-
iscsi.x8664:sn.gb00051104bbf917n18, portal: 192.168.11.100,3260]
successful.
```

Step 4: Perform a rescan operation:

```
[root@localhost ~]# iscsiadm -m node -R
 iscsiadm: No session found.
```

Step 5: Check for Active sessions:

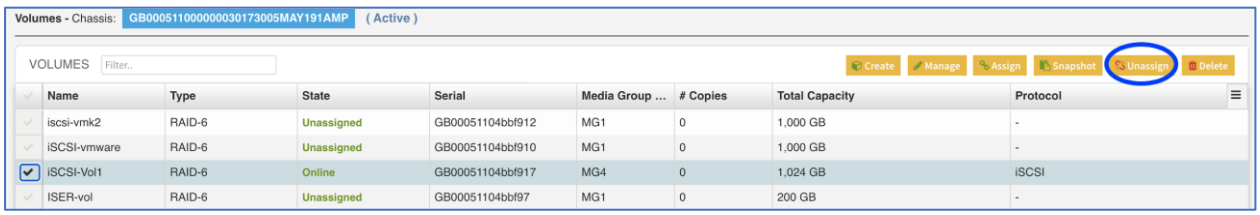
```
[root@localhost ~]# iscsiadm -m session
iscsiadm: No active sessions.
```

Step 6: To **log out** of **all** your established sessions, enter the following command:

iscsiadm --mode node --logoutall=**all**

```
[root@localhost ~]# iscsiadm --mode node --logoutall=all
Logging out of session [sid: 6, target: iqn.2014-01.org.pvl-
iscsi.x8664:sn.gb00051104bbf921n20, portal: 192.168.12.100,3260]
Logging out of session [sid: 7, target: iqn.2014-01.org.pvl-
iscsi.x8664:sn.gb00051104bbf921n18, portal: 192.168.11.100,3260]
Logout of [sid: 6, target: iqn.2014-01.org.pvl-
iscsi.x8664:sn.gb00051104bbf921n20, portal: 192.168.12.100,3260]
successful.
Logout of [sid: 7, target: iqn.2014-01.org.pvl-
iscsi.x8664:sn.gb00051104bbf921n18, portal: 192.168.11.100,3260]
successful.
```

Step 7: Last step will be to re-login to the **Pavilion** GUI, navigate to Storage>Volumes select the volume and click Unassign button as seen below:

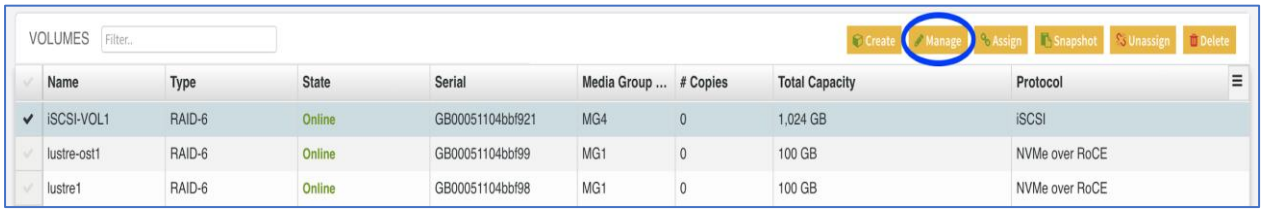


5.3 Volume Expansion

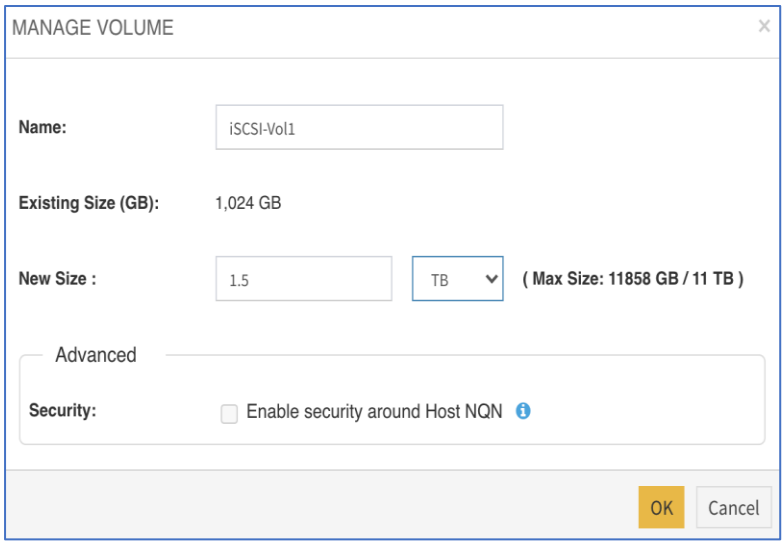
This section covers how to expand a volume when using iSCSI protocol.

Step 1: Expand the **Pavilion** volume

Login to **Pavilion** GUI, navigate to Storage>Volumes, select the volume that needs to be expanded and click **Manage** button:



Step 2: Provide the New Size and click OK:



Step 3: Perform rescan operation on the host:

```
[root@localhost ~]# iscsiadm -m node -R
Rescanning session [sid: 8, target: iqn.2014-01.org.pvl-
iscsi.x8664:sn.gb00051104bbf921n20, portal: 192.168.12.100,3260]
Rescanning session [sid: 9, target: iqn.2014-01.org.pvl-
iscsi.x8664:sn.gb00051104bbf921n18, portal: 192.168.11.100,3260]
```

Step 4: Run xfs_growfs on the mount point:

```
[root@localhost ~]# xfs_growfs /iscsi1
meta-data=/dev/mapper/mpathe     isize=512    agcount=4,
agsize=67108864 blks
         =                       sectsz=4096  attr=2,
projid32bit=1
         =                       crc=1        finobt=1, sparse=1,
rmapbt=0
         =                       reflink=1
data     =                       bsize=4096   blocks=268435456,
imaxpct=5
         =                       sunit=0      swidth=0 blks
naming   =version 2              bsize=4096   ascii-ci=0, ftype=1
log      =internal log           bsize=4096   blocks=131072,
version=2
         =                       sectsz=4096  sunit=1 blks, lazy-
count=1
realtime =none                   extsz=4096   blocks=0,
rtextents=0
data blocks changed from 268435456 to 402653184
```

Step 5: Verify volume has been expanded:

Run **df -h** command to verify the new size for the volume.

```
[root@localhost ~]# df -h
Filesystem          Size  Used Avail Use% Mounted on
devtmpfs             32G     0   32G   0% /dev
tmpfs                32G     0   32G   0% /dev/shm
tmpfs                32G  9.6M   32G   1% /run
tmpfs                32G     0   32G   0% /sys/fs/cgroup
/dev/sda3           197G   52G  136G  28% /
/dev/sda1           488M  117M  336M  26% /boot
tmpfs               6.3G     0  6.3G   0% /run/user/0
/dev/mapper/mpathe  1.5T   11G  1.5T   1% /iscsi1
```

Volume has been expanded to 1.5 T as seen in the above output.