



Linux RHEL On HighPoint NVMe RAID AIC Installation Guide

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1 Overview

The purpose of this document is to provide clear instructions on how to install Linux RHEL to an SSD or RAID array hosted by HighPoint NVMe AICs.

The following is a list of NVMe AICs and systems.

Supported System	RHEL7.9 RHEL8.3 RHEL8.5 RHEL8.6 RHEL8.7
Supported AIC	SSD7202 SSD7105 SSD7505 SSD7502 SSD7540 SSD7580A SSD7580B SSD7580C SSD7749M2 RocketAIC 7505HW Series RocketAIC 7540HW Series RocketAIC 7749EW Series RocketAIC 7502HW Series RocketAIC 7105HW Series RocketAIC 7749MW Series

2 Installing Linux RHEL on NVMe AIC

If you would like to install Linux RHEL onto drives attached to the NVMe AIC, please perform the following operations:

Step 1 Prepare Your Hardware for Installation

After you attach your NVMe SSD to the NVMe AIC, you can use **EFI Utility** to configure your NVMe SSDs into RAID arrays, or just use them as single disks.

Before installation, you must remove all the NVMe SSDs, that are not physically attached to the NVMe AIC, from your system.

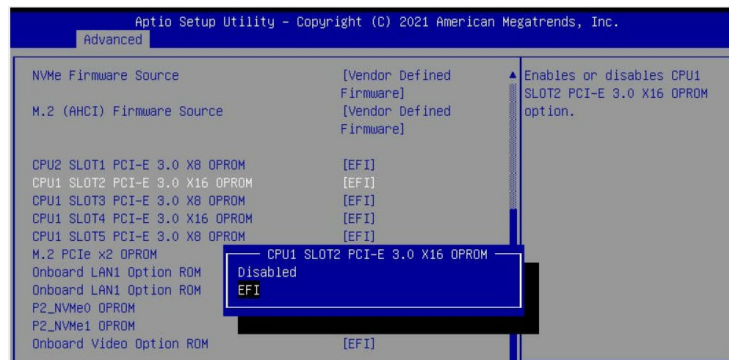
Note

NVMe AIC only supports EFI boot. If you have other SCSI adapters installed, you must make sure the NVMe AIC EFI will be loaded first. If not, try to move it to another PCI slot. Otherwise, you may be unable to boot up your system.

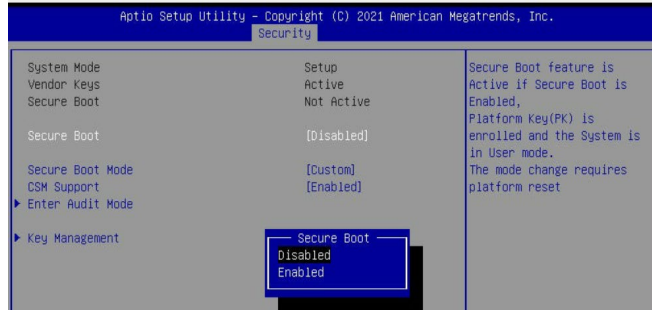
Step 2 Check System EFI Settings

In your system, EFI SETUP menu, change the **Boot Sequence** in such a way that the system will first boot from **EFI CDROM** or **EFI** a Bootable USB drive; after you finish installation, set the NVMe AIC as the first boot device to boot up the system. Refer to your motherboard EFI manual to see how to configure the boot sequence.

1. Set UEFI setting with SuperMicro X11DPi-NT motherboard as an example.
 - a. **"Advanced->PCIe/PCI/PnP Configuration->CPUSlot PCI-E OPROM"** to **"EFI"**. Suppose NVMe AIC is connected to motherboard CPU1 Slot 2 PCI-E X16, then you should set "CPU1 Slot 2 PCI-E X16 OPROM" to "EFI";

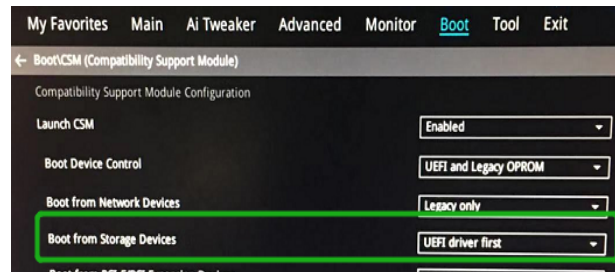


- b. Disable "Secure Boot", and set "Attempt Secure Boot" to "Disabled".

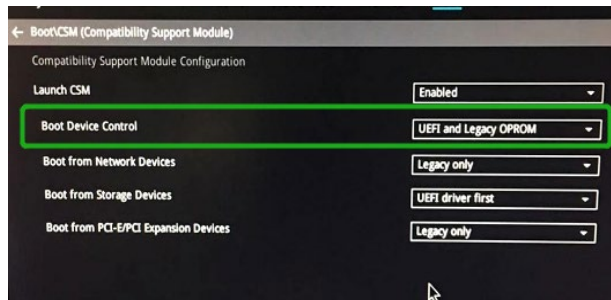


2. Configuring the UEFI settings (using an ASUS PRIME X299 -DELUXE motherboard as an example):

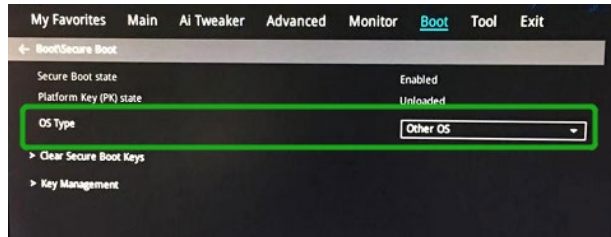
- a. Set "Boot from Storage Devices" to "UEFI driver first";



- b. And "Boot Device Control" to "UEFI Only" or "UEFI and Legacy OPROM";



- c. Set "OS Type" to "Other OS".



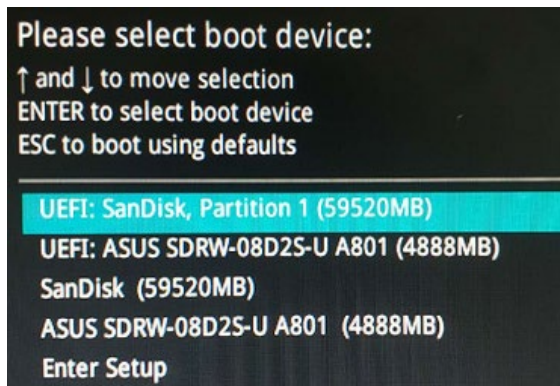
Step 3 Flash UEFI ROM to NVMe AIC

Example SSD7505:

Note: Make sure your USB flash partition format is FAT32.

For other products, please refer to: [Update UEFI ROM](#)

- a. Unzip SSD7505 UEFI package to the root dir(/) of a USB flash drive, and connect the USB flash drive to the motherboard;
- b. Boot from the UEFI USB flash and enter the UEFI environment;



- c. Use the command “go.nsh” to flash UEFI ROM to the SSD7505 and reboot the system.

```
FS1:\> go.nsh
FS1:\> load.efi 7505uefi.rom
Load Utility for Flash EPROM v1.1.0
(built at Jan 5 2021 13:30:42)

Found adapter 0x75051103 at PCI 33:0:0
Flash size 0x10000, File size 0xee00
Offset address 0x20000
EPROM Vendor: WINBOND W25X40BV
Erasing .....Succeeded
Flashing ....

Flashing Success (total retry 0)

Verifying ....

Passed !
FS1:\> _
```

- d. Use the “exit” command to exit the utility.

Step 4 Create Array

Note: RocketAIC series NVMe drives are already pre-configured with RAID0. You can skip this step. If you want to use another type of RAID array for a Boot-RAID configuration, you can refer to the following steps.

- a. Attach NVMe SSDs to the NVMe AIC.
- b. Boot, enter the motherboard's Boot List, and select start from UEFI USB flash.

```
Boot Override
UEFI: USB, Partition 1
(B97/D0/F0) UEFI PXE: IPv4 Intel(R) I350 Gigabit Network
Connection(MAC:3cecef40a1dc)
```

- c. Use the command “ArrayCreate.efi” to enter the Utility:

```
F:\> ArrayCreate.efi
Highpoint RAID utility for UEFI (version: 20200306)
==== Controller information:
      Vendor: HighPoint Technologies, Inc.
      Product: SSD7505 (7505)

==== Physical device list(count 2):
1/1 Samsung SSD 980 PRO 1TB-S5GXNG0N905363B, 1000123MB(MaxFree 1000123MB), Normal
1/2 Samsung SSD 980 PRO 1TB-S5GXNG0N905305N, 1000123MB(MaxFree 1000123MB), Normal

==== Logical device list(count 0):
-----
>>> Please specify command to execute:
<<< _
```

- d. Use the command “create RAID0”.

This will create a RAID0 array using all of the NVMe SSDs, and the maximum available capacity.

```
<<< create RAID0
      Creating array: RAID0_000041A7.
      Array created successfully.
=====

==== Physical device list(count 2):
1/1 Samsung SSD 980 PRO 1TB-S5GXNG0N905363B, 1000123MB(MaxFree 0MB), Normal
1/2 Samsung SSD 980 PRO 1TB-S5GXNG0N905305N, 1000123MB(MaxFree 0MB), Normal

==== Logical device list(count 1):
1 [VD1] RAID0_000041A7 (RAID0), 2000246MB (Stripe 512KB), Normal
      1/1 Samsung SSD 980 PRO 1TB
      1/2 Samsung SSD 980 PRO 1TB
-----
>>> Please specify command to execute:
<<< _
```

- e. Use the “exit” command to exit the utility.
- f. For additional command lines, refer to [Appendix A](#).

Step 5 Prepare the Driver Diskette

Extract **HighPoint_NVMe_RHELxx.xx.x_x86_64_vx.xx.xx_xx_xx_xx.tar.gz** to the top(/) directory of a USB flash drive. It will look like:

```
[root@localhost home]# tar zxvf HighPoint_NVMe_rhel8.7_x86_64_v1.5.1_23_04_18.tar.gz
hptdd/
hptdd/rhdd
hptdd/pcitable
hptdd/pci.ids
hptdd/modules.pcimap
hptdd/module-setup.sh
hptdd/modules.dep
hptdd/modules.cgz
hptdd/modules.alias
hptdd/modinfo
hptdd/install.sh
hptdd/dracut-hptdrv.sh
hptdd/60-persistent-storage-hptblock.rules
hptdd/rhel-install-step1.sh
hptdd/rhel-install-step2.sh
hptdd/readme.txt
```

Step 6 Install RHEL

Example: RHEL8.7

- Before starting the installation procedure, verify the status of your network environment. To ensure Ubuntu is successfully installed to the RAID array, we recommend that the system is disconnected from the internet and any local network.
- Insert the USB flash drive into the target system.
- Boot the system using a bootable USB drive.
- When the Installation screen appears, press 'e' to edit the boot command line option.

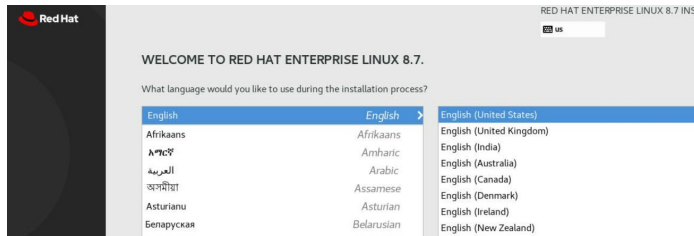
```
Install Red Hat Enterprise Linux 8.7
Test this media & install Red Hat Enterprise Linux 8.7
Troubleshooting -->
```

On the edit command window, move the cursor to the end of the line "linuxefi /images /pxeboot... ", and append "**modprobe.blacklist=nvme**" (do not include the quotation marks).

```
setparams 'Install Red Hat Enterprise Linux 8.7'
    linuxefi /images/pxeboot/vmlinuz inst.stage2=hd:LABEL=RHEL-8-7-0-BaseOS-x86_64 quiet modprobe\
    blacklist=nvme_
    initrddefi /images/pxeboot/initrd.img
```

Press **CTRL+X** or **F10** to start the system.

- e. When the following window appears during the installation process,



Press **Ctrl+ALT+F2** to switch to the shell on the console and press **Enter** to activate this console.

```
Red Hat Enterprise Linux 8.7 (Ootpa)
Kernel 4.18.0-425.3.1.el8.x86_64 on an x86_64

[anaconda root@localhost /]# _
```

Next, execute the following commands:

- # **mkdir /hptdd** ← Create a mount point for the USB flash drive
- # **mount /dev/sda1 /hptdd/** ← Mount the USB flash drive to /hptdd
- # **cp -a /hptdd/hptdd /tmp/** ← Copy the driver installation file to the system's temporary directory
- # **umount /dev/sda1** ← Unmount the USB flash drive

```
[anaconda root@localhost /]# mkdir /hptdd
[anaconda root@localhost /]# mount /dev/sda1 /hptdd/
[anaconda root@localhost /]# cp -a /hptdd/hptdd/ /tmp/
[anaconda root@localhost /]# umount /dev/sda1
```

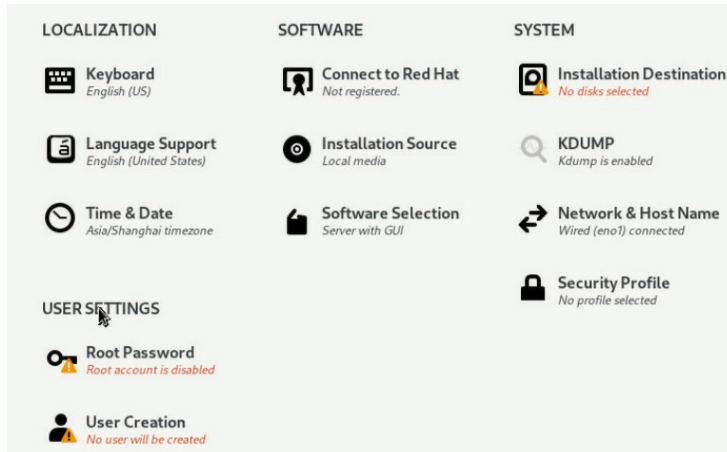
When the USB flash drive is unmounted, please unplug the USB flash drive from the system. Next, execute the following commands to install the driver for Linux RHEL.

- # **sh /tmp/hptdd/RHEL-install-step1.sh** ← Load NVMe AIC driver.

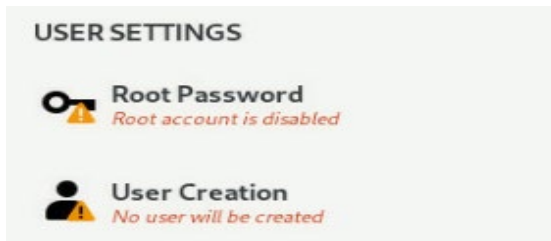
```
[anaconda root@localhost /]# sh /tmp/hptdd/rhel-install-step1.sh
Driver Installation
Driver installation step 1 completed.
[anaconda root@localhost /]# restart-anaconda _
```

- f. Then press “**ALT+F6**” to switch back to the installation screen and Choose language.

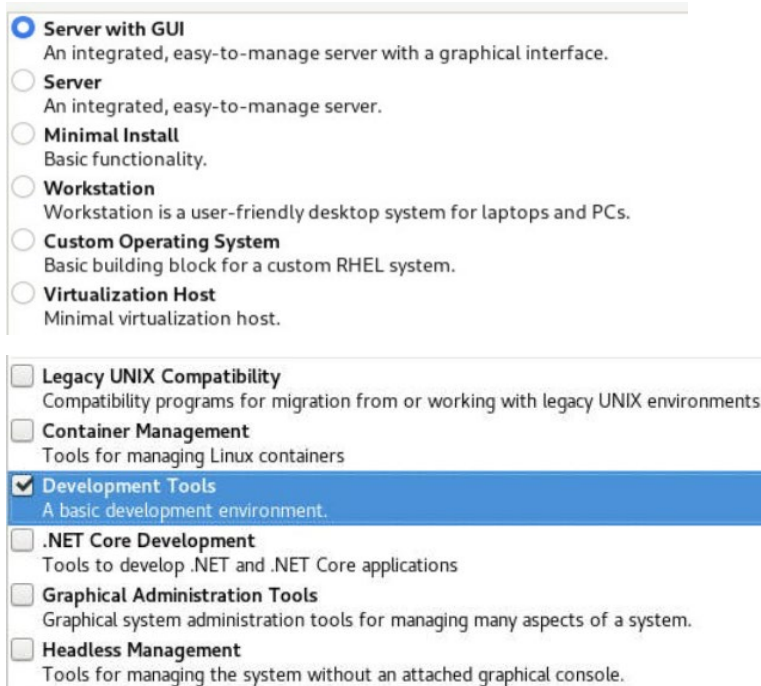
g. When the following window appears during the installation process,



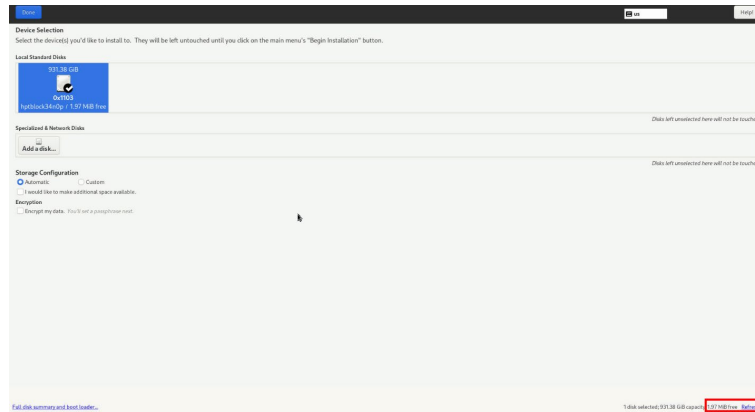
1) Set Root Password



2) Set Software Selection and choose Server with GUI→Development Tools

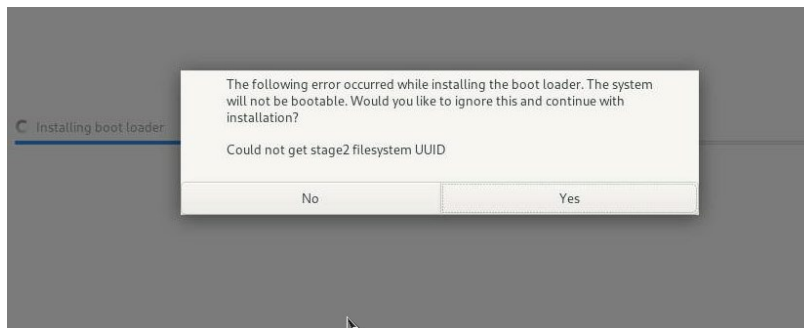


- 3) Select Installation Destination and click “refresh”, but if you didn't find this option, you can press **Ctrl+ALT+F2** to the shell and type **# restart-anaconda**

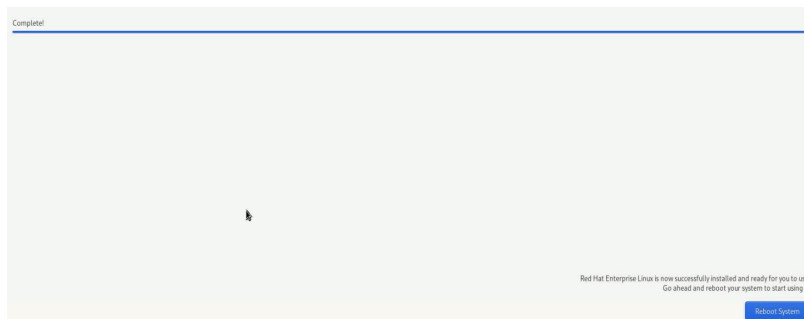


- 4) Then choose your own disk and begin installation.

- h. If the following information is displayed during the installation, select “Yes”.



- i. When the screen shows that “Complete!”.



press **Ctrl+ALT+F2** to the shell and type the following commands:

- | | |
|---|--|
| # cp -r /tmp/hptdd /mnt/sysimage/tmp/hptdd | ← Copy the driver installation file to system |
| # chroot /mnt/sysimage | ← Switch to the top(/) directory in the system |
| # sh /tmp/hptdd/RHEL-install-step2.sh | ← Install NVMe AIC driver |
| # rm -rf /tmp/hptdd | ← Delete the driver file in the system |

exit ← Exit the top(/) directory of the system

```
[anaconda root@localhost /]# cp -r /tmp/hptdd /mnt/sysimage/tmp/hptdd
[anaconda root@localhost /]# chroot /mnt/sysimage/
[anaconda root@localhost /]# sh /tmp/hptdd/rhel-install-step2.sh
Driver Installation
Updating 4.18.0-425.3.1.el8.x86_64...
Driver installation step 2 completed.
[anaconda root@localhost /]# rm -rf /tmp/hptdd/
[anaconda root@localhost /]# exit
exit
[anaconda root@localhost /]# _
```

- j. Press **ALT+F6** to switch back to the installation screen and finish the installation.
- k. If you want to boot from another kernel, please install the SSD7000 driver after entering the system.
- l. Restart to enter the system, **please connect to the internet:**
- m. Download the appropriate driver from the Software Downloads web page.

Please execute the following command before installing the driver, **please connect to the internet:**

- 1) Log in to your Redhat account password.

```
# subscription-manager register --username xxx --password=xxx --auto-attach
```

- 2) Extract the driver package:

```
tar zxvf HighPoint_NVMe_G5_Linux_Src_Src_vx.xx.xx_xx_xx_xx.tar.gz
```

Run the **.bin** file to install the driver package.

```
sh hptnvme_g5_linux_src_vxx.x.x_xx_xx_xx.bin or
```

```
./hptnvme_g5_linux_src_vxx.x.x_xx_xx_xx.bin
```

```
root@test:/home# ./hptnvme_g5_linux_src_v1.5.1_2023_02_21.bin
Verifying archive integrity... All good.
Uncompressing HighPoint NVMe RAID Controller Linux Open Source package installer.....
Checking and installing required toolchain and utility ...
Installing program make ... done
Installing program gcc ... done
Found program perl (/usr/bin/perl)
Found program wget (/usr/bin/wget)
```

- n. Follow the prompts to complete the driver installation.

```
SUCCESS: Driver hptnvme is installed successfully for kernel 4.18.0-425.3.1.el8.x86_64.
Please restart the system for the driver to take effect.
If you want to uninstall the driver from the computer, please run hptuninhptnvme to un
install the driver files.
[root@localhost home]#
```

- o. After RHEL has been installed, you can reconnect the system to the network/internet and update the system as needed.

3 Monitoring the Driver

Once the driver is running, you can monitor it through the Linux proc file system support. There is a special file under `/proc/scsi/hptnvme/`. Through this file, you can view the driver status and send control commands to the driver.

Note

The file name is the SCSI host number allocated by OS. If you have no other SCSI cards installed, it will be 0. In the following sections, we will use `x` to represent this number.

Use the following command to show the driver status:

```
# cat /proc/scsi/hptnvme/x
```

This command will show the driver version number, physical device list, and logical device list.

4 Installing RAID Management Software

HighPoint's RAID Management Software can be used to check the status of the SSDs and RAID arrays hosted by the NVMe AIC. Installation of the management software is optional but recommended.

Please refer to HighPoint RAID Management Software documentation for more information.

5 Troubleshooting

If you do not install the system or update the kernel according to the installation manual, the system will crash and you will not be able to enter. Please follow the steps below.

- a. Choose “**Red Hat Enterprise Linux (4.18.0-425.3.1.el8.x86_64)8.7.**” and enter the system.

```
Red Hat Enterprise Linux (4.18.0-425.3.1.el8.x86_64) 8.7 (Ootpa)
Red Hat Enterprise Linux (0-rescue-d876da976b4a496794c5e34297c432ed) 8.7
System setup
```

- b. Install Linux Opensource driver.
- c. Download the appropriate driver from the Software Downloads web page.
- d. Run the `.bin` file to install the driver package.

```
sh hptnvme_g5_linux_src_vxx.x.x_xx_xx_xx.bin or
```

./hptnvme_g5_linux_src_vxx.x.x_xx_xx_xx.bin

```
root@test:/home# ./hptnvme_g5_linux_src_v1.5.1_2023_02_21.bin
Verifying archive integrity... All good.
Uncompressing HighPoint NVMe RAID Controller Linux Open Source package installer.....
Checking and installing required toolchain and utility ...
Installing program make ... done
Installing program gcc ... done
Found program perl (/usr/bin/perl)
Found program wget (/usr/bin/wget)
```

- e. Follow the prompts to complete the driver installation.

```
SUCCESS: Driver hptnvme is installed successfully for kernel 4.18.0-425.3.1.el8.x86_64.
Please restart the system for the driver to take effect.
If you want to uninstall the driver from the computer, please run hptuninhptnvme to un
install the driver files.
[root@localhost home]#
```

- f. After the installation is complete, you can perform system update operations.

6 Rebuilding Driver Module for System Update

When the system updates the kernel packages, the driver module `hptnvme.ko` should be built and installed manually before rebooting.

Please refer to the README file distributed with the NVMe AIC open-source package on how to build and install the driver module.

7 Appendix A

Support command: **help/info/quit/exit/create/delete.**

- **Create Command**

Syntax

Create Array Type (RAID0/RAID1/RAID10) Member Disk list (1/1,1/2|*)
Capacity (100|*)

Examples

```
<<< create RAID0
```

```
<<< create RAID0 *
```

```
<<< create RAID0 * *
```

Create a RAID0 array with all disks and with maximum capacity.

```
<<< create RAID1 1/1, 1/3 10
```

Create a RAID1 array with disk 1/1 and 1/3 and with 10GB capacity.

```
<<< create RAID10
```

```
<<< create RAID10 *
```

```
<<< create RAID10 * *
```

Create a RAID10 array with all disks and with maximum capacity.

- **Delete Command**

Syntax

```
delete {array ID}
```

Examples

```
<<< delete 1
```

Delete the first array from the Logical device list.

```
<<< delete 2
```

Delete the second array from the Logical device list.

- **Info Command**

Syntax

```
info
```

Display physical device list and logical list

- **Exit Command**

Syntax

```
Q/q/quit/exit
```

Quit the application

- **Help Command**

Syntax

```
H/h/help
```

This is a help message.