# Linux Ubuntu 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 Ubuntu to an SSD or RAID array hosted by HighPoint NVMe AICs.

The following is a list of NVMe AICs and systems.

| | |
|---|---|
| Supported System | Ubuntu 20.04 |
| | Ubuntu 20.04.1 |
| | Ubuntu 20.04.2 |
| | Ubuntu 20.04.3 |
| | Ubuntu 20.04.4 |
| | Ubuntu 20.04.5 |
| | Ubuntu 20.10 |
| | Ubuntu 22.04 |
| | Ubuntu 22.04.1 |
| | Ubuntu 22.10 |
| Supported AIC | SSD7202 |
| | SSD7105 |
| | SSD7505 |
| | SSD7502 |
| | SSD7540 |
| | SSD7580A |
| | SSD7580B |
| | SSD7580C |
| | SSD6780A |
| | RocketAIC 7505HW Series |
| | RocketAIC 7540HW Series |
| | RocketAIC 7749EW Series |

| | RocketAIC 7502HW Series |
| --- | --- |
| | RocketAIC 7105HW Series |
| | RocketAIC 7749MW Series |

# 2 Installing Linux Ubuntu on NVMe AIC

If you would like to install Linux Ubuntu 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 not physically attached to the NVMe AIC from your system.

| Note |
| --- |
| **NVMe AICs only support EFI boot.** If other SCSI adapters are installed, you must ensure 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's EFI SETUP menu, change **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**". 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".
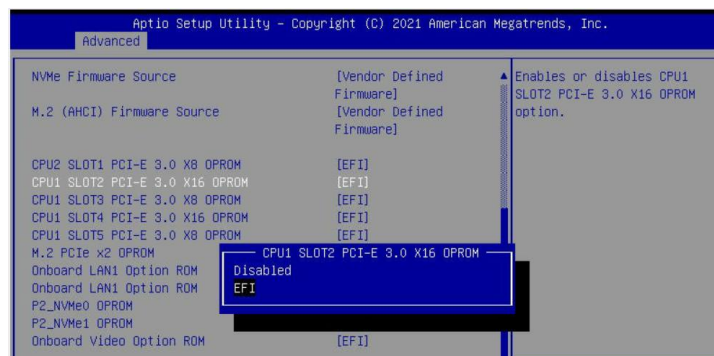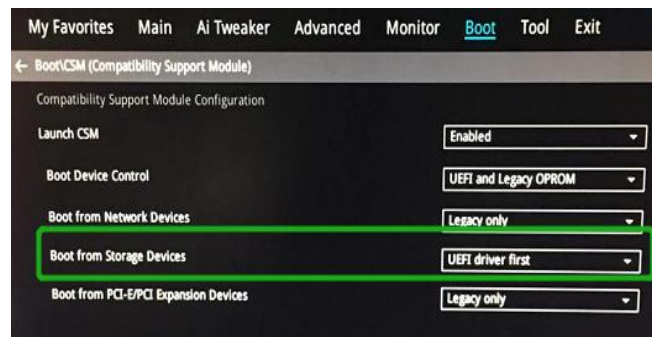
b.    Disable "**Secure Boot**", and set "**Attempt Secure Boot**" to "**Disabled**".
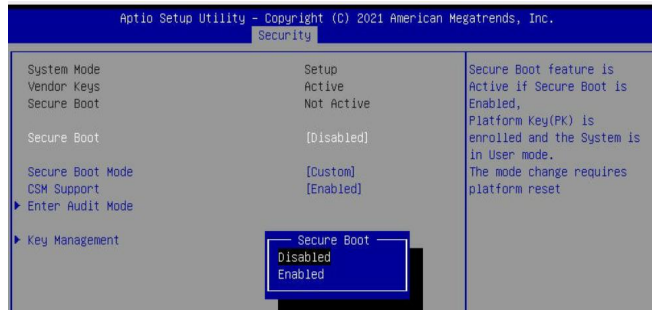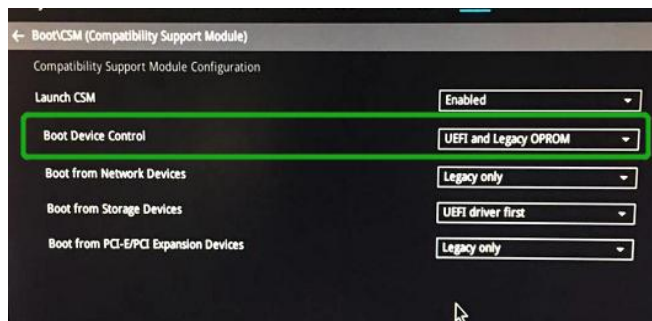


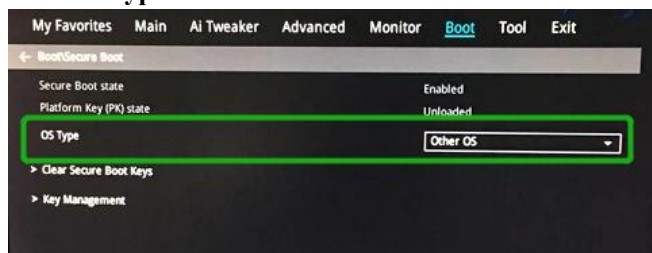2. Configuring the UEFI settings (using an ASUS PRIME X299 -DELUXE motherboard as an example):

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



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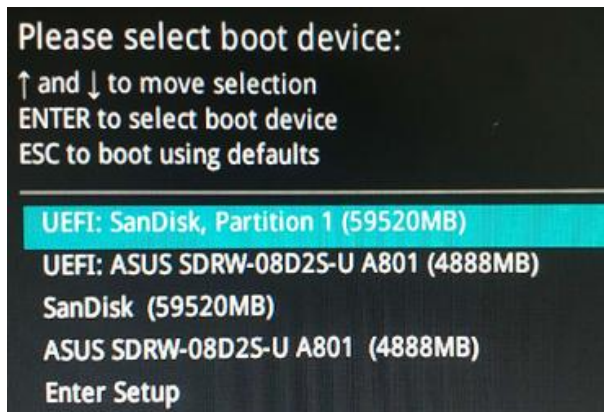


c.    Set "**OS Type**" to "**Other OS**".

## Step 3 Flash UEFI ROM to NVMe AIC

**Example: SSD7505**

For other products, please refer to: <u>Update UEFI ROM</u>

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

1. Unzip the SSD7505 UEFI package to the root dir(/) of a USB flash drive and connect the USB flash drive to the motherboard.

2. Booting from the UEFI USB flash and entering the UEFI environment.



3. Use the command "**go.nsh**" to flash UEFI ROM to the SSD7505 and reboot the system.



4. 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.*

1. Attach NVMe SSDs to the NVMe AIC.

2. Boot, enter the motherboard's Boot list, and select start from UEFI USB flash.



3. Use the command "ArrayCreate.efi" to enter the Utility:



4. Use the command "create RAID0".

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



5. Use the "exit" command to exit the utility.

6. For additional command lines, refer to Appendix A.
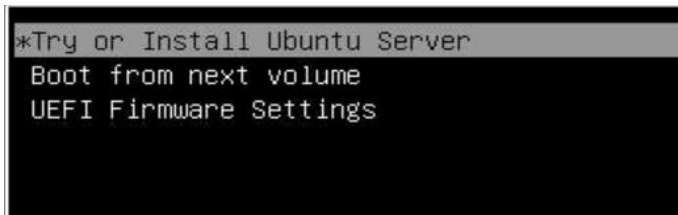
## Step 5 Prepare the Driver Diskette

Extract **HighPoint_NVMe_Ubuntuxx.xx_x86_64_vx.x.x_xx_xx_xx.tar.gz** to a USB flash drive's top(/) directory. It will look like:

```
root@test:/home# tar zxvf HighPoint_NVMe_ubuntu22.10_x86_64_v1.5.1_23_02_27.tar.gz
hptdd/
hptdd/preinst.sh
hptdd/postinst.sh
hptdd/postinst2.sh
hptdd/hptdrv
hptdd/hptblock
hptdd/boot/
hptdd/boot/hptnvme5.19.0-21-genericx86_64.ko.gz
hptdd/60-persistent-storage-hptblock.rules
hptdd/readme.txt
```

## Step 6 Install Linux Ubuntu
### Example: Ubuntu22.10 server

1. Before starting the installation procedure, verify the status of your network environment. To ensure Ubuntu is successfully installed to the RAID array, we recommend disconnecting the system from the internet and any local network.

2. Insert the USB flash drive into the target system.

3. Boot the system using a bootable USB drive.

4. press 'e' to edit the boot command line option when the Installation screen appears.

```
*Try or Install Ubuntu Server
 Boot from next volume
 UEFI Firmware Settings
```

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

```
setparams 'Try or Install Ubuntu Server'

        set gfxpayload=keep
        linux       /casper/vmlinuz  ---  modprobe.blacklist=nvme_
        initrd      /casper/initrd
```

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

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



Press **"ALT+F2"** to switch to the shell on console 2, and press **ENTER** to activate this console.

If you use Ubuntu Desktop, please press **CTRL+ALT+F3** to switch to the shell on console 2 and press **ENTER** to activate this console.

**Ubuntu login: ubuntu**



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 /hptdd**                    ← Unmount the USB flash drive

```
root@ubuntu-server:/home/ubuntu-server# mkdir /hptdd
root@ubuntu-server:/home/ubuntu-server# mount /dev/sda1 /hptdd/
root@ubuntu-server:/home/ubuntu-server# cp -a /hptdd/hptdd/ /tmp/
root@ubuntu-server:/home/ubuntu-server# 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 Ubuntu.

**# sh /tmp/hptdd/preinst.sh**        ← Load NVMe AIC driver.

```
root@ubuntu-server:/home/ubuntu-server# sh /tmp/hptdd/preinst.sh
This step succeeded!
root@ubuntu-server:/home/ubuntu-server#
```

6. Press **"ALT+F1"** to switch back to the installation screen and continue the installation as usual**.**

7. When the screen shows that "**install complete**".

```
           acquiring and extracting image from cp:///tmp/tmproaz71fu/mount
  executing curtin install curthooks step
    curtin command install
      configuring installed system
        running 'mount --bind /cdrom /target/cdrom'
        running 'curtin in-target -- setupcon --save-only'
          curtin command in-target
        running 'curtin curthooks'
          curtin command curthooks
            configuring apt configuring apt
            installing missing packages
            Installing packages on target system: ['efibootmgr', 'grub-efi-amd64', 'grub-efi-amd64-signed', 'shim-signed']
            configuring iscsi service
            configuring raid (mdadm) service
            installing kernel
            setting up swap
            apply networking config
            writing etc/fstab
            configuring multipath
            updating packages on target system
            configuring pollinate user-agent on target
            updating initramfs configuration
            configuring target system bootloader
            installing grub to target devices
  final system configuration
    configuring cloud-init
    calculating extra packages to install
    restoring apt configuration
subiquity/Late/run

                                          [ View full log ]
                                          [ Reboot Now   ]
```

Press "**ALT+F2**" to the shell and type the following commands:

**# sh /tmp/hptdd/postinst.sh** ← Install NVMe AIC driver.

A message will be displayed that the driver has been installed successfully.

```
root@ubuntu-server:/home/ubuntu-server# sh /tmp/hptdd/postinst.sh
W: Possible missing firmware /lib/firmware/ast_dp501_fw.bin for module ast
Sourcing file `/etc/default/grub'
Sourcing file `/etc/default/grub.d/90_iommuoff.cfg'
Sourcing file `/etc/default/grub.d/init-select.cfg'
Generating grub configuration file ...
Found linux image: /boot/vmlinuz-5.19.0-21-generic
Found initrd image: /boot/initrd.img-5.19.0-21-generic
Warning: os-prober will be executed to detect other bootable partitions.
Its output will be used to detect bootable binaries on them and create new boot entries.
Found FreeDOS on /dev/sda1
done
Setdefaultkernel:No change.
We have completed the driver installation.
root@ubuntu-server:/home/ubuntu-server#
```

8. Press **"ALT+F1"** to switch back to the installation screen and finish the installation.

9. If you want to boot from another kernel, please install the NVMe AIC driver after entering the system.

   a. use "apt-get update" to retrieve new lists of Ubuntu packages (**please connect to the internet**)

```
root@test:/home# apt-get update
Get:1 http://cn.archive.ubuntu.com/ubuntu kinetic InRelease [267 kB]
Get:2 http://cn.archive.ubuntu.com/ubuntu kinetic-updates InRelease [118 kB]
Get:3 http://cn.archive.ubuntu.com/ubuntu kinetic-backports InRelease [99.9 kB]
Get:4 http://cn.archive.ubuntu.com/ubuntu kinetic-security InRelease [109 kB]
Get:5 http://cn.archive.ubuntu.com/ubuntu kinetic/main amd64 Packages [1,384 kB]
Get:6 http://cn.archive.ubuntu.com/ubuntu kinetic/main amd64 c-n-f Metadata [30.2 kB]
Get:7 http://cn.archive.ubuntu.com/ubuntu kinetic/restricted amd64 Packages [120 kB]
Get:8 http://cn.archive.ubuntu.com/ubuntu kinetic/restricted amd64 c-n-f Metadata [488 B]
Get:9 http://cn.archive.ubuntu.com/ubuntu kinetic/universe amd64 Packages [14.5 MB]
Get:10 http://cn.archive.ubuntu.com/ubuntu kinetic/universe Translation-en [5,791 kB]
Get:11 http://cn.archive.ubuntu.com/ubuntu kinetic/universe amd64 c-n-f Metadata [291 kB]
Get:12 http://cn.archive.ubuntu.com/ubuntu kinetic/multiverse amd64 c-n-f Metadata [8,408 B]
Get:13 http://cn.archive.ubuntu.com/ubuntu kinetic-updates/main amd64 Packages [365 kB]
Get:14 http://cn.archive.ubuntu.com/ubuntu kinetic-updates/main Translation-en [98.0 kB]
```

   b. Download the appropriate driver from the Software Downloads web page.

   c. Extract the driver package:

   **tar zxvf HighPoint_NVMe_G5_Linux_Src_Src_vx.xx.xx_xx_xx_xx.tar.gz**

   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)
```

10. Follow the prompts to complete the driver installation.

```
Sourcing file `/etc/default/grub'
Sourcing file `/etc/default/grub.d/90_iommuoff.cfg'
Sourcing file `/etc/default/grub.d/init-select.cfg'
Generating grub configuration file ...
Found linux image: /boot/vmlinuz-5.19.0-21-generic
Found initrd image: /boot/initrd.img-5.19.0-21-generic
Warning: os-prober will be executed to detect other bootable partitions.
Its output will be used to detect bootable binaries on them and create new boot entries.
Found FreeDOS on /dev/sda1
Adding boot menu entry for UEFI Firmware Settings ...
done
Synchronizing state of hptdrv-monitor.service with SysV service script with /lib/systemd/systemd-sysv-install.
Executing: /lib/systemd/systemd-sysv-install enable hptdrv-monitor
update-rc.d: warning: enable action will have no effect on runlevel 1
Created symlink /etc/systemd/system/default.target.wants/hptdrv-monitor.service → /lib/systemd/system/hptdrv-monitor.service.

SUCCESS: Driver hptnvme is installed successfully for kernel 5.19.0-21-generic.
Please restart the system for the driver to take effect.
If you want to uninstall the driver from the computer♦ please run hptuninhptnvme to uninstall the driver files.
```

11. After installing Ubuntu, 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 /. You can view the driver status through this file 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 Trouble Shooting

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.

1.  Select the default (kernel: 5.19.0-21-amd64) and enter the system.



2.  Install Linux Opensource driver.

3.  Download the appropriate driver from the Software Downloads web page.

    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**



4.  Follow the prompts to complete the driver installation.



5.  After the installation, 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.