

|  |
| --- |
| AMD-RAID™ Quick Start Guide for Red Hat 8.3 (RHEL) Operating Systems |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Publication # | |  | Revision: | | 1 | | |  |  |  |  |
|  | Issue Date: | November 2020 | | | | |  |  |  |  |  |  |
|  |  |  | | |  | |  | |  |  |  |  |

|  |  |
| --- | --- |
| © 2020 Advanced Micro Devices, Inc. All rights reserved. |  |
| The information contained herein is for informational purposes only and is subject to change without notice. While every precaution has been taken in the preparation of this document, it may contain technical inaccuracies, omissions and typographical errors, and AMD is under no obligation to update or otherwise correct this information. Advanced Micro Devices, Inc. makes no representations or warranties with respect to the accuracy or completeness of the contents of this document, and assumes no liability of any kind, including the implied warranties of noninfringement, merchantability or fitness for particular purposes, with respect to the operation or use of AMD hardware, software or other products described herein. No license, including implied or arising by estoppel, to any intellectual property rights is granted by this document. Terms and limitations applicable to the purchase or use of AMD’s products are as set forth in a signed agreement between the parties or in AMD's Standard Terms and Conditions of Sale. Any unauthorized copying, alteration, distribution, transmission, performance, display or other use of this material is prohibited. | |
| Trademarks | |
| AMD, the AMD Arrow logo, and combinations thereof are trademarks of Advanced Micro Devices, Inc. Other product names used in this publication are for identification purposes only and may be trademarks of their respective companies.  Reverse engineering or disassembly is prohibited.  Microsoft and Windows are registered trademarks of Microsoft Corporation in the US and/or other countries.  Linux is a registered trademark of Linus Torvalds.  PCIe is a registered trademark of PCI-Special Interest Group (PCI-SIG). | |
| Reverse engineering or disassembly is prohibited. | |
| USE OF THIS PRODUCT IN ANY MANNER THAT COMPLIES WITH THE MPEG ACTUAL OR DE FACTO VIDEO AND/OR AUDIO STANDARDS IS EXPRESSLY PROHIBITED WITHOUT ALL NECESSARY LICENSES UNDER APPLICABLE PATENTS. SUCH LICENSES MAY BE ACQUIRED FROM VARIOUS THIRD PARTIES INCLUDING, BUT NOT LIMITED TO, IN THE MPEG PATENT PORTFOLIO, WHICH LICENSE IS AVAILABLE FROM MPEG LA, L.L.C., 6312 S. FIDDLERS GREEN CIRCLE, SUITE 400E, GREENWOOD VILLAGE, COLORADO 80111. | |

Contents

[Contents 3](#_Toc56412400)

[List of Tables 4](#_Toc56412401)

[Revision History 5](#_Toc56412402)

[Chapter 1 General Information 6](#_Toc56412403)

[1.1 Purpose 6](#_Toc56412404)

[1.2 System Requirements 6](#_Toc56412405)

[1.3 Generic System Setup 7](#_Toc56412406)

[Chapter 2 Bootable Arrays 8](#_Toc56412407)

[2.1 Copy AMD-RAID Drivers to a Removable Storage Medium: Red Hat (RHEL) 8](#_Toc56412408)

[Chapter 3 Pre-Installation Steps 9](#_Toc56412409)

[3.1 Enable RAID for the AMD Ryzen™ SP3-Series Processor 9](#_Toc56412410)

[Chapter 4 Create the Bootable Virtual Disk 10](#_Toc56412411)

[4.1 RAIDXpert2 Configuration Utility (HII Mode) For the AMD Ryzen™ SP3-Series Processor 10](#_Toc56412412)

[4.2 UEFI Mode 11](#_Toc56412413)

[Chapter 5 Install the AMD RAID Drivers During a RHEL Linux Installation 12](#_Toc56412414)

[5.1.1 Secure Boot Enablement 12](#_Toc56412415)

[5.1.2 Install the AMD RAIDX driver during the OS Installation 12](#_Toc56412416)

[5.1.3 Install the RAIDXpert2 Management Application 17](#_Toc56412417)

Error! Hyperlink reference not valid.Error! Hyperlink reference not valid.Error! Hyperlink reference not valid.Error! Hyperlink reference not valid.**Error! Hyperlink reference not valid.Error! Hyperlink reference not valid.Error! Hyperlink reference not valid.**Error! Hyperlink reference not valid.**Error! Hyperlink reference not valid.**Error! Hyperlink reference not valid.**Error! Hyperlink reference not valid.**Error! Hyperlink reference not valid.**Error! Hyperlink reference not valid.Error! Hyperlink reference not valid.**Error! Hyperlink reference not valid.**Error! Hyperlink reference not valid.Error! Hyperlink reference not valid.Error! Hyperlink reference not valid.**Error! Hyperlink reference not valid.Error! Hyperlink reference not valid.Error! Hyperlink reference not valid.Error! Hyperlink reference not valid.**Error! Hyperlink reference not valid.Error! Hyperlink reference not valid.Error! Hyperlink reference not valid.**Error! Hyperlink reference not valid.**Error! Hyperlink reference not valid.**Error! Hyperlink reference not valid.**Error! Hyperlink reference not valid.**Error! Hyperlink reference not valid.**Error! Hyperlink reference not valid.Error! Hyperlink reference not valid.**Error! Hyperlink reference not valid.**Error! Hyperlink reference not valid.**

List of Tables

[Table 1. System Requirements 7](#_Toc48576811)

[Table 2. Information about Supported Configuration by Installer 8](#_Toc48576812)

Revision History

| Date | Revision | Description |
| --- | --- | --- |
| November 2020 | 1 | Initial preliminary release. |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

# General Information

## Purpose

This Quick Start Guide is designed to assist with system setup in **RAID Mode**, by performing these general procedures:

* Copy AMD RAID device drivers to removable storage media for the following operating system:
* RHEL®
* Load AMD RAID device drivers on a system at the time during RHEL operating system installation.
* Install the AMD-RAIDXpert2 (GUI) for RAID array management.

## System Requirements

Table . System Requirements

|  |  |
| --- | --- |
| Component | Requirements |
| Memory (RAM) | Minimum: 2 at 8 GB, for a total of 16 GB  Recommended: 4 at 8 GB, for a total of 32 GB |
| Hard Disk, SSD | One to Fourteen ATAPI, SATA HDD’s, SATA SSD’s, SATA Optical Drive or NVMe |
| Max number of NVMe devices | 10 |
| Max Controller Count | 11 (Two controllers with Device ID 0x7917and NVMe (one controller per NVMe) |
| Supported AMD Processors | 3rd Gen AMD Ryzen™ Threadripper Processors |
| Supported AMD Chipsets | AMD X570 Chipset |

Table . Information about Supported BIOS Configuration

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| SoC SATA Mode | Promontory SATA Mode | NVMe RAID Mode | SATA RAID Support | NVMe RAID Support |
| AHCI / Auto | AHCI / Auto | Disabled | No | No |
| RAID | RAID | Enabled | Yes | Yes |

Maximum Device Support:

* Max number of devices supported is 14; including ATAPI, SATA and NVMe

Supported RAID Levels:

* Volume
* RAID0
* RAID01
* RAID10

| OS Loaded in Drive | RAID Controller in BIOS | | NVME/ RAID Mode in PBS BIOS Option | Status |
| --- | --- | --- | --- | --- |
| Device ID  0x43BD | Device ID  0x7917 |
| SoC RAID | SATA | SATA | Enabled | CATALYST INSTALL MANAGER prompts user to install RAID driver with Warning Message |
| SoC RAID | RAID | RAID | Enabled | CATALYST INSTALL MANAGER prompts user to install RAID driver with Warning Message. |
| NVMe | RAID | RAID | Disabled | RAID Driver installation shall be blocked for all controllers. |
| RAID/NVMe | SATA | SATA | Enabled | CATALYST INSTALL MANAGER prompts user to install RAID driver with Warning Message. |
| Soc SATA | SATA | SATA | Disabled | RAID Driver installation shall be blocked for all controllers. |
| NVMe | SATA | SATA | Disabled | RAID Driver installation shall be blocked for all controllers |
| SoC RAID | RAID | RAID | Disabled (But no NVMe devices are connected to the system) | RAID Driver installation should happen for AMD and PT controllers. |
| SoC RAID | RAID | RAID | Enabled (But no NVMe devices are connected to the system) | RAID driver installation should happen for AMD and PT controllers. |
| SoC RAID | SATA | RAID | Enabled | Not supported with this release. |
| SoC RAID | RAID | SATA | Enabled | Not supported with this release. |

## Generic System Setup

A generic system setup process is described below:

1. Copy the **AMD-RAID** drivers to a removable storage medium. *(Refer to Section 2.1)*
2. Power-on the system.
3. Access the platform BIOS window for the system.
4. Configure the BIOS settings as outlined in Section 3.1 to enable RAID Mode on the system.
5. This enables the loading of the **AMD-RAID** UEFI driver.
6. Initialize the disks, using the RAIDXpert2 Configuration Utility (HII) or UEFI shell.
7. Create arrays, using the HII Configuration Utility or UEFI shell. (Refer to Section 4.1)
8. Load the **AMD-RAID** drivers during the operating system installation. *(Refer to Chapter 5)*
9. Complete the rest of the operating system installation.
10. Install the OS RAID Management GUI (AMD RAIDXpert2). *(Refer to Section 5.1.1)*

**IMPORTANT:** To protect your data; always perform a backup prior to installing any new, major hardware or software. If you are adding NVMe as RAID to your existing RAID arrays then update all existing RAID controller drivers to the latest version and reboot the system. Later connect NVMe and install RAID driver on the NVMe devices or download driver software from the vendor support page.

**Note:** A Native AHCI installation does not boot into the OS after you change the BIOS setting to RAID mode.

# Bootable Arrays

**Note:** Before beginning, have the Red Hat® operating system installation media available and ready to install.

**Note**: ~~Windows:~~ Removable storage (Flash Drive) required for Copying AMD -RAID drivers

## Copy AMD-RAID Drivers to a Removable Storage Medium: Red Hat (RHEL)

A removable storage medium is needed to copy **AMD RAID** drivers required for OS installation onto an **AMD-RAID** bootable array.

1. Locate and use a system that is running a Windows/Linux operating system and has a CD DVD drive or an I/O port for removable storage media (such as a USB flash drive formatted as FAT32).
2. Insert the storage medium into the system:
3. Go to a browser and access the web site of your system supplier or motherboard vendor.
4. Download the AMD-RAID drivers from the web site to the appropriate removable storage medium.
5. For RHEL: Copy the .iso image file (that matches the applicable distribution of Linux to the USB flash drive. For example:

dd-rcraid-RHEL8-4-18.0-193.el8.x86\_64.iso

1. Proceed to Red Hat Install and load AMD-RAID drivers during a Red Hat OS installation.

# Pre-Installation Steps

## Enable RAID for the AMD Ryzen™ SP3-Series Processor

Following are the pre-installation steps:

**Note:** The steps to configure a system to RAID mentioned here are specific to **AMD NDA BIOS** based off the **AMI BIOS**. The steps for other BIOS Vendors are different.

1. Power-on the system.
2. Press **ESC** to enter the System BIOS setup page.
3. In the BIOS setup:
4. Select the **Advanced** tab.
5. Select **CSM Configuration**, then press **Enter.**
6. Set **CSM Support** to **Enabled**, then press **Enter.**
7. Set **Boot** **option filter** to **UEFI** only, then press **Enter.**
8. Set **Storage** to **UEFI**, then press **Enter.**
9. In the BIOS setup:
10. Select the **Advanced** tab.
11. Select **AMD CBS**, then press **Enter.**
12. Select **FCH Common Options**, then press **Enter.**
13. Select **SATA Configuration Options**, then press **Enter.**
14. Set **SATA Enable** to **Enabled**, then press **Enter.**
15. Set **SATA Mode** to **RAID**, then press **Enter.**
16. In the BIOS setup:
17. Select the **Advanced** tab.
18. Select **AMD CBS**, then press **Enter.**
19. Select **Chipset Common Options**, then press **Enter.**
20. Select **Chipset SATA Configuration Options**, then press **Enter.**
21. Set **Chipset SATA0 Enable to Enabled**, then press **Enter.**
22. Set **Chipset SATA1 Enable to Enabled**, then press **Enter.**
23. Set **Chipset SATA Mode to RAID**, then press **Enter.**
24. In the **BIOS** setup:
25. Select the **Advanced** tab.
26. Select **AMD PBS** tab, then press **Enter.**
27. Set the **NVMe RAID Mode** to **Enabled,** then press **Enter.**
28. Save (**F4**) the settings and restart the system.

# Create the Bootable Virtual Disk

## RAIDXpert2 Configuration Utility (HII Mode) For the AMD Ryzen™ SP3-Series Processor

**Note:** The steps to configure arrays in RAID mode mentioned here are specific to **AMD NDA BIOS** and are based off **AMI BIOS**.

1. Power-on the system.
2. Press **ESC** or **DEL** to get into the **Platform BIOS.**
3. Select the **Advanced** tab.
4. Select **RAIDXpert2 Configuration Utility**, then press **Enter.**
5. At the RAIDXpert2 Configuration Utility’s Main Menu, use the arrow keys to select **Array Management**, then press **Enter**.
6. Use the **arrow keys** to select **Create Array**, then press **Enter.**
7. Select **RAID Level**, then press **Enter**.
8. From the **Select RAID Level** drop-down menu, use the **arrow keys** to select the desired RAID level, then press **Enter.**
9. Select the disks with which to create the array:
10. Use the **arrow keys** to select **Select Physical Disks**, then press **Enter.**
11. To select individual disks, highlight a disk with the **arrow keys** and press the **Space Bar** or **Enter**. Any number of disks may be selected using this method.
12. To select all disks, use the **arrow keys** to select **Check All**, then press **Enter.**
13. Use the **arrow keys** to select **Apply Changes**, then press **Enter.**
14. Select an array size by doing the following:
15. Use the **arrow keys** to select **Array Size**, then press **Enter.**
16. The Array size defaults to the Maximum size allowed by the number of physical disks and RAID level selected. If you want a smaller size Array size, enter the desired value.
17. Press **Enter** when the desired size is reached.
18. Use the arrow keys to select **Cache Tag Size.**
19. Any Array with only HDD/SSD has the default CTS of 64 k.
20. Any Array with only NVMe has the default CTS of 256 k.
21. Use the arrow keys to select Read Cache Policy, then press Enter.
22. Select the desired Read Cache Policy, then press **Enter.**
23. Use the arrow keys to select Write Cache Policy, then press Enter.
24. Select the desired **Write Cache Policy**, then press **Enter.**
25. Use the **arrow keys** to select **Create Array**, then press **Enter.**
26. After completion of array creation save and reboot the BIOS.

## UEFI Mode

1. At the system **Power-On Self-Test (POST)** screen, press **F7 / F12 / ESC** (or similar) to access the **UEFI Configuration Utility** (aka UEFI Boot Manager).
2. Boot to the **EFI Internal** shell.

**Note:** Obtain the rcadm.efi file from your system supplier or motherboard vendor and copy it onto a UEFI flash drive, in the root directory.

1. Enter **fsx:** where x is the number of the UEFI Flash Drive.
2. Use **rcadm** to create the desired Boot Virtual Disk.

**Examples:**

**Note**: the user may have to press the page up key to see more of the information.

1. Query the devices connected in the system: (Output displays the UEFI AMD RAID Driver Versions, physical devices and arrays):

**rcadm.efi –M -qa**

1. Create a RAID1 on disks 2, 3 with a max size available and enables Read/Write Cache – default cache setting:

**rcadm.efi –C –r1 –d 2 3**

1. Create a RAID0 on disks 1, 2 with a size of 10 0 Gbs and enables Read Cache:

**rcadm.efi –C –r0 –d 1 2 –s 100000 –ca r**

1. Create a RAID10 on disks 1, 2, 3, 4 with a size of 125 Gbs and enables Write Cache:

**rcadm.efi –C –r10 –d 1 2 3 4 –s 125000 –ca w**

# Install the AMD RAID Drivers During a RHEL Linux Installation

### Secure Boot Enablement

**Note:** If you do not want to enable Secure Boot, proceed to section 5.1.2

**Note:** Prior to starting this procedure, obtain the AMD-RAID AMD\_Signing\_key from your **system supplier or motherboard vendor. Copy the AMD-RAID AMD\_Signing\_key to the root directory of a USB flash drive.**

**Note:** The steps to enable Secure boot mentioned here are specific to **AMD NDA BIOS** and are based off **AMI BIOS**.

1. Insert the USB flash drive with the **AMD\_Signing\_key** into the system.
2. Power-on the system.
3. Press **ESC**, to enter the platform BIOS.
4. Select the **Security** Tab
5. Select **Secure Boot**, then press **Enter**.
6. Select **Restore Factory Keys**, then press **Enter**.
7. At the **Install factory defaults**, select **Yes**, then press **Enter.**
8. Select **Key Management**, then press **Enter**.
9. Select **Authorized** **Signatures**, then press **Enter**.
10. Select **Append**, then press **Enter**.
11. Select **No**, then press **Enter**.
12. At the **Select a File System** window, select the USB inserted above, then press **Enter**.
13. At the **Select File** window, select **AMD\_Signing\_key.cer**, then press **Enter**.
14. At the **Input File Format** window, select **Public Key Certificate**, then press **Enter**.
15. At the **Append** window, select **Yes**, then press **Enter**.
16. At the **Append** window, select **Ok**, then press **Enter**.
17. Press **ESC**
18. Select **Secure Boot**, then press **Enter**.
19. Select **Enable**, then press **Enter**.
20. Press **F4**, to Save and exit the BIOS.

### Install the AMD RAIDX driver during the OS Installation

**Note:** Prior to starting this procedure, obtain the AMD-RAID drivers from your system supplier or motherboard vendor.

* Copy the AMD-RAID drivers to a Removeable Storage Medium: Red Hat (RHEL)
* See section 2.1

**Note:** When installing Red Hat Linux, use the Linux dd installation mode instead of the Linux expert mode.

**Note:** Not all the windows indicated in this procedure will display during installation.

**Note:** It is AMD’s recommendation that a reset/reboot of the system is performed whenever the user is adding or moving a SATA M.2 SSD or NVMe device(s).

* In the OS, issue a reset/reboot.
* Wait for the AMD BIOS screen to display, press **ESC** to enter the BIOS.
* Power off the system.
* Install or remove the necessary device(s).Power on the system and allow the OS to boot properly.

1. Power-on the system
2. Insert the Red Hat installation CD-ROM, DVD or USB.
3. Create a bootable array, see Chapter 4
4. At the Red Hat Enterprise Linux Welcome window:
5. Press the **Up Arrow**
6. Select **Install Red Hat Enterprise Linux 8.x** (the text should be high-lighted in white).
7. Press **E**
8. Press the down arrow twice and select the **linuxefi /images** string.
9. Press the **END** key.
10. Add “inst.dd modprobe.blacklist=ahci modprobe.blacklist=nvme” to the end of the string.

**Example:** linuxefi /images……quiet inst.dd modprobe.blacklist=ahci modprobe.blacklist=nvme

1. Press **CTRL X**

**Note:** If the shell doesn’t display (the screen is black) reset the system and try with the following settings:

1. Add inst.dd modprobe.blacklist=ahci modprobe.blacklist=nvme nomodeset to the end of the string:

**Example:** linuxefi /images……quiet inst.dd modprobe.blacklist=ahci modprobe.blacklist=nvme nomodeset

1. Press **CTRL X**
2. At the Driver Disk Device Selection:
3. Insert the USB drive (which contains the AMD-RAID dd-rcraid….x86\_64.iso) into the USB port.
4. Press **r**
5. Press **Enter** to refresh.
6. Press **X** (x representing the number ofUSB flash drives inserted previously.
7. Press **Enter**
8. At the Choose Driver Disk ISO file:
9. Press **1** – number of the dd-rcraid-RHEL….el8.x86\_64.iso entry.
10. Press **Enter**
11. At the Select Drivers to Install:
12. Press **1** – number of the /media/DD/….x86\_64.rpm entry.
13. Press **Enter**

The /media/DD/…is now selected and should look like [X] /media/DD/…..x86\_64.rpm.

1. Press **c**
2. Press **Enter**
3. At the Driver Disk Device Selection:
4. Press **c**
5. Press **Enter**
6. Remove the USB flash drive.
7. At the **Welcome to Red Hat Enterprise Linux** screen:
8. Choose the desired **Language**
9. Choose the desired **Country**
10. In the bottom-right corner, click **Continue**
11. At the Installation Summary screen, configure the following:
12. Under **Localization**:

* **Keyboard**
* **Language Support**
* **Time and Date**

1. Under **System**:

* **Installation Destination**
* Under **Local Standard Disks**
* Select **AMD-RAID Array 01**
* Under **Storage Configuration**
* Select **Custom**
* In the upper-left corner, click **Done**
* Click the **Click here to create them automatically** link.

**Note:** AMD-RAID only supports a file system type of ext4, using the XFS file system will cause an unrecoverable installation error.

1. Under **Installation**:

* Select **DATA/home**.
* Change **File System** from **xfs** to **ext4**
* Select **SYSTEM/rhel-root**
* Change **File System** from **xfs** to **ext4**
* Select **SYSTEM/boot**
* Change **File System** from **xfs** to **ext4**
* In the upper-left corner, click **Done**
* In the **Summary of Changes** window, click **Accept Changes**

1. Under **Network and Hostname**

* In the bottom-left corner, enter a valid **Hostname**, the press the **Apply** button
* Select an **Ethernet Port**
* In the bottom-right corner, click **Configure**
* Enter valid entries
* Click **Save**
* Under Ethernet, click the **ON** button
* In the upper-left corner, Click **Done**

1. Under **Software**:

* **Connect to Red Hat**
  1. Enter a valid **User name**
  2. Enter a valid **Password**
  3. Click **Register**
  4. In the upper-left corner, click **Done**
* **Software Selection**
  1. Select **Server with GUI**
  2. In the upper-left corner, click **Done**

1. Under **User Settings**:

* In the upper-right corner, click **Done**

1. In the bottom-right corner, click **Beginning Installation**

**Note:** Wait for the “**Red Hat Enterprise Linux is now successfully installed and ready for you to use! Go ahead and reboot to start using it!**” to appear

* In the bottom-right corner, click **Reboot**
* Remove the installation media

1. At the **Initial Setup** window
2. Under **Licensing**

* Click **License Information**
* Review the EULA and select (check mark) **I accept the License Agreement**
* In the upper-left corner, click **Done**

1. Under **System**

* Configure **Subscription Manager**
* In the bottom-right corner, click **Finish Configuration**

1. Login to the system
2. Select a user
3. Enter a password
4. At the **Welcome** window
5. Select the desired **Language**
6. Click **Next**
7. At the **Typing** window
8. Select the desired **Language**
9. Click **Next**
10. If desired, configure **Privacy**
11. Click **Next**
12. At the Connect your Online Accounts
13. Configure or click **Skip**
14. Click **Start** **using the Red Hat Enterprise Linux Server**

### Install the RAIDXpert2 Management Application

1. Contact your system supplier or motherboard vendor to obtain the new AMD-RAID Linux Management Application.
2. Copy the AMD-RAID 9.3.0-00xxx\_linux\_raidxpert2.tgz to a USB flash drive.
3. Insert a USB flash drive, formatted as FAT32.
4. Log into the system as **root** or **su root.**
5. Click **Activities**->**Files** and select the USB flash drive inserted previously.
6. Locate and select the AMD-RAID 9.3.0-00xxx\_linux\_raidxpert2.tgz package and drag it to **/home** on your desktop.
7. Click **Activities**->**Terminal** to open a terminal / console window.
8. Enter: **tar xzvf 9.3.0-00xxx\_linux\_raidxpert2.tgz -C /opt**
9. To open the AMD-RAID RAIDXpert2 Management Application:
10. Click **Activities**->**Terminal** **to open a terminal / console window**
11. Enter: **cd /opt/raidxpert2/bin**
12. Enter: **./RAIDXpert2 &**

**Note:** “Cannot Open Display”Error While Launching RAIDXpert2 on RHEL 8.x. When the latest RAIDXpert2 Management Utility is executed, you may receive an error that looks like: **qt.qpa.xcb: could not connect to display :0**

RHEL requires elevated permissions to run the program, use the following commands to create temporary elevated session permission:

1. Open a terminal window to allow clients to connect from any host using xhost+
2. The following commands must be entered as a non-root user:

* Enter the following command: xhost+
* access control disabled, clients can connect from any host

**Note:** This will grant the user **temporary** elevated permissions to run the program. Please note, once you reboot or update the program, you will have to re-enter these commands to regrant yourself these permissions.