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Intel® Optane™ Memory M Series

Installation and User Guide

February 2021

Revision History

Revision Number	Description	Revision Date
001	• Initial release as stand-alone Intel® Optane™ Memory M Series Installation & User Guide. Installation information was previously released as Intel® Optane™ Memory M and H Series Installation Guide, document # 571964.	February 2021
002	• Clarification to Minimum Requirements, Section 1.2	February 2021

Intel technologies may require enabled hardware, software or service activation.

No product or component can be absolutely secure.

Your costs and results may vary.

Contents

1   Overview

Intel® Optane™ memory is a system acceleration solution that can be used to increase responsiveness on supported Intel platforms. This solution uses the Intel® Optane™ memory media that is based on Intel® Optane™ technology, along with the Intel® Rapid Storage Technology (Intel® RST) driver. It is a dual-media solution (fast media for caching + slower media for storage capacity) that is presented to the host OS as a single SSD when properly enabled.

When this new memory media is installed between the processor and slower storage media, the computer can store commonly used data and programs closer to the processor. In doing so, Intel® Optane™ memory accelerates your computer's access to frequently used documents, pictures, videos and application files and remembers them even after you power it off.

1.1   About this Document

This document provides the platform requirements and installation process for Intel® Optane™ memory products, including available applications to manage these devices and the following products:

- Intel® Optane™ memory / Intel® Optane™ memory M Series products when paired with a supported "slower media" drive.

Note: The Installation and User guide for the **Intel® Optane™ Memory H Series** can be found here: https://www.intel.com/content/www/us/en/support/articles/000023989/memory-and-storage/intel-optane-memory.html

1.2   Minimum Requirements

Below are the requirements for a system to support system acceleration with Intel® Optane™ Memory. Systems purchased with Intel® Optane™ memory preinstalled and/or branded as *Intel® Optane™ Memory Ready* will meet these requirements.

1. **Motherboard**: Supported motherboards will contain at least 1 M.2 PCIe NVMe storage port and the proper BIOS to support Intel® Optane™ memory.

2. **Processor**: See here for supported Processors for each Intel® RST driver release.

3. **Intel® Optane™ Memory device, or "Fast Media"**

4. **Drive to be accelerated, aka "Slower Media"**: Only a single pass-through disk can be accelerated.

    Please see below for supported options:

    a. SATA HDD – single pass-through

    b. SATA SSD – single pass-through

    c. SSHD – single pass-through

    d. Intel® SSD 660p/665p Series. Support was added with the Intel® RST 17.5.2.x driver version.

5. **Operating System**: Microsoft Windows 10 x64 bit (Version 1703/Build 15063) or greater required.

Note: The Intel® Optane™ Memory and Storage Management application (see Section 5.1) requires Microsoft Windows 10 x64 bit (Version 1803/Build 17134) or greater.

6. **Drivers/Software**

   a. Intel® Rapid Storage Technology (Intel® RST) Windows Driver. See here for supported driver versions per processor.

   b. Intel® Optane™ Memory and Storage Management application, available here.

1.3 Intel® Volume Management Device (Intel® VMD) Support

The 11th Generation Intel® Core™ Processors enabled support for Intel® VMD. This changes the way these platforms are configured for Intel® RST and the related Intel® Optane™ memory technology vs. earlier processor generations.

Following is a summary of these changes, related sections in the document will specify the proper settings for Non-Intel® VMD systems vs Intel® VMD capable systems.

For how to determine if your platform is Intel® VMD capable or not, contact your system/motherboard vendor.
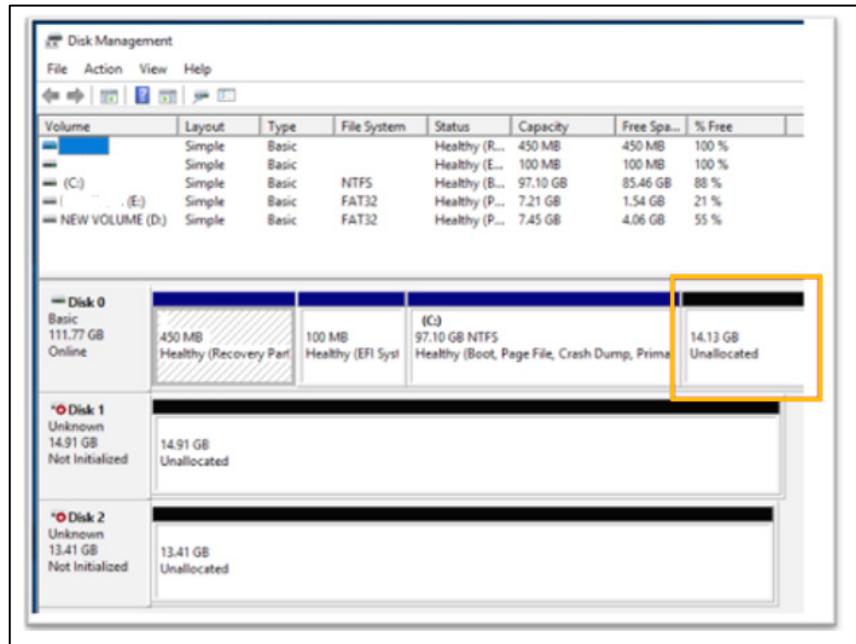
- **BIOS**: The settings in the BIOS are different from earlier, non-Intel® VMD capable platforms.

- **Operating System Installation:**

  o Intel® VMD support starts with driver version 18.0.x, this version is not included in current Windows 10 OS builds.

  o Drives managed by Intel® VMD will not be detected during the OS installation process.

  o The f6flpy Intel® RST driver must be loaded during the installation process to detect these drives.

- **Windows Driver name:**

  o Intel® VMD Capable/Enabled Platform: 'iastorVD'

  o Non-Intel® VMD Capable Platform: 'iastorac'

- **Device Manager:** The listing will be under the 'PCI Express Root Complex' section.

1.4 Limitations/Things to Keep in Mind

The following items are important to keep in mind when configuring a system with Intel® Optane™ memory.

- The acceleration of the following "Slower media" is not supported:

  o RAID volumes or other multiple disk/drive configurations

  o PCIe NVMe drives that are not listed in Section 1.2

  o Drives with more than one system partition, dual boot OS for example.

- Dynamic type drives are not supported, only Basic type.

- MBR Partition structure is not supported, any drives to be accelerated must have a GUID Partition Structure (GPT). see Section 2.2 for options to check the partition structure and make changes if needed.

- Only one Intel® Optane™ memory volume is allowed per system. If more than one volume is detected during boot, the second volume will be placed offline.

  o When a drive is placed "offline" it means that the drive is put in a state where the operating system is unable to detect the drive. The drive can still be detected in the Intel® Optane™ Memory and Storage Management application and the System BIOS (Under the Intel® RST menu).

- When installing the Windows OS, make sure to leave an "Unallocated" space with a minimum of 5 MB at the end of the disk (max LBA).
  - This space is required for any drive that is being accelerated (i.e. the System Disk or Data Drive).
  - If this needs to be modified after installation, see Section 8.

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2 *System Configuration Setup*

Storage acceleration with Intel® Optane™ memory devices is a platform feature and capability. Along with the minimum requirements noted in Section 1.2, specific settings must be made in the system BIOS.

To make setup easy, follow the steps and actions below depending on if this is a new system build or an Intel® Optane™ memory device being added to an existing system, i.e. setup with OS installed.

2.1 New System Build and Setup

New system is defined as a system (Motherboard, Processor, DRAM etc. installed) with no operating system installed.

Follow the steps below to properly configure a system for Intel® Optane™ memory devices.

1. Review the minimum requirements (Section 1.2) and Limitations to Keep in Mind (Section 1.4) before proceeding.

2. Install Hardware:

    a. Intel® Optane™ memory device to a PCIe NVMe M.2 connector on the motherboard (see <u>here</u> for the proper way to do this).

Note: Only 1 device supported as an accelerator per system.

    b. Supported storage drive that will be accelerated, attached to the proper connector on the motherboard.

3. Configure the System BIOS (see Section 3).

4. Install the Latest Windows 10 x64 bit Operating System (see Section 4).

Note: The OS should NOT be installed on the Intel® Optane™ memory device/media.

5. Install the Intel® Optane™ Memory Capable software (see Section 5).

2.2 Upgrade Current System by Adding Intel® Optane™ Memory Device

Current system is defined as a system that contains the Windows 10 x64 bit Operating System and an Intel® Optane™ memory device will be added to the system without reinstalling the OS.

Note: If issues are encountered during the upgrade process, see Section 7 for Troubleshooting options.

Follow the steps below to properly upgrade a system with an Intel® Optane™ memory device:

1. Review the minimum requirements (Section 1.2) and Limitations to Keep in Mind (Section 1.4) before proceeding.

2. Install Hardware:

    a. Intel® Optane™ memory device to a PCIe NVMe M.2 connector on the motherboard (see <u>here</u> for the proper way to do this).

Note: Only 1 device per system can be supported as an accelerator.

3. Check the Disk Partition Structure (MBR vs. GPT, see Section 9).

    a. GPT is supported, MBR is not. The process in Section 9 describes methods to check the current structure and update to GPT if necessary. This will also update the Boot Settings to the required UEFI if needed.

b. If this process cannot be completed, backup all data and start the process as outlined in Section 2.1 as the Operating System will need to be reinstalled.

4. Once the Disk Partition Structure is GPT for the System drive and the drive to be accelerated (if different then the System drive). Next step is to Confirm the BIOS settings are the following:

Important Note: If the settings in the system do not match these, do not change them directly in the BIOS as this could result in the drive no longer booting to the OS, or data loss.

a. **Boot Settings** = *UEFI* (should already be set as a result of step 3).

b. Intel® VMD Capable Platforms (see Section 1.3)

Note: If settings are not set as noted below, backup all data and start the process as outlined in Section 2.1.

    i. **VMD Controller** = *Enable*

    ii. **VMD Storage Ports** = *Enable*

       1. This needs to be enabled for storage/Optane memory devices and SATA controller (if accelerating a SATA device).

c. Non-Intel® VMD Capable Platforms (Intel® Optane™ Memory Capable platforms before 11th Generation Core™ platforms).

    i. **SATA Mode** = *Intel® RST Premium….*

    ii. **Remapping** = *Enable*

       1. This must be enabled for the ports where the Intel® Optane™ memory device and supported PCIe NVMe SSDs for acceleration (if applicable) are installed.

    iii. If settings do not match as noted above, the following options are available:

       1. Option 1: Backup all data and start the process as outlined in Section 2.1 with reinstallation of the OS.

       2. Option 2: Changes can be made safely by using the Intel® RST Software, which software depends on the platform being used.

          Step 1: Check the driver version supported by the platform [here](#).

          Step 2: Follow the instructions below for the supported driver version.

          If 17.9.1.x or greater is supported, **download** software package from [here](#) and follow the installation process. The SATA Mode and Remapping fields will be updated during this process.

          If 17.x is NOT supported, the [Intel® Optane™ Memory](#) application can be used to modify the BIOS during installation. But note that it is recommended to use the Intel® Memory and Storage Management application to manage volumes once the system is setup.

5. Install the Intel® Optane™ Memory and Storage Management application (Section 5).

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3   *System BIOS Settings*
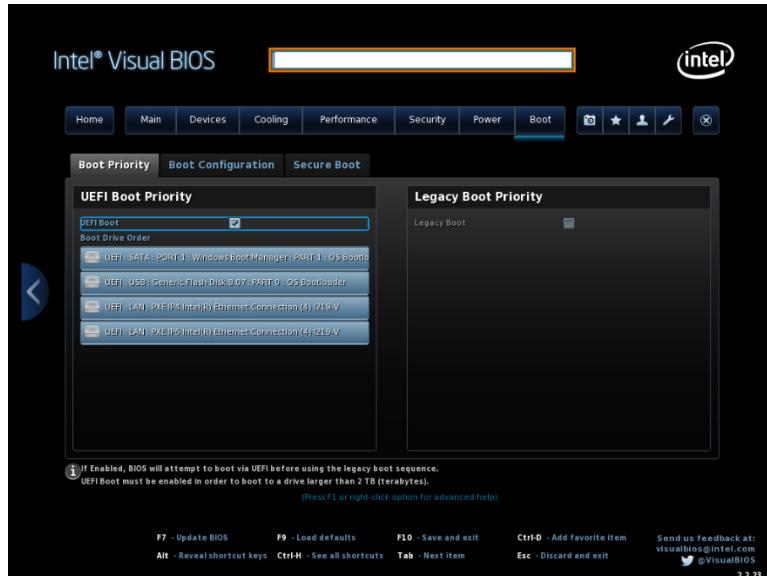
UEFI-compliant system BIOS that includes the Intel® Rapid Storage Technology (Intel® RST) pre-OS UEFI driver version 15.5.0.2875 or greater. Check with the system vendor to confirm this support and current version included in the BIOS on your system.

Note: For best compatibility, Intel recommends having the same baseline (i.e. 15.x) pre-OS driver in the system BIOS as the Intel® RST Windows runtime driver version.

The 11th Generation Intel® Core™ Processors enabled support for Intel® VMD. This changes the way the BIOS is configured for Intel® Optane™ memory devices vs. earlier platforms. This section will separate these into Intel® VMD capable and Non-Intel® VMD capable. Check with the system vendor to determine if your platform/processor is Intel® VMD capable or not. The differences between these two platform setups for Intel® Optane™ memory are summarized in Section 1.3.

In both cases, Intel® Optane™ memory only supports UEFI, make sure the Boot Settings are set properly before installation of the OS.
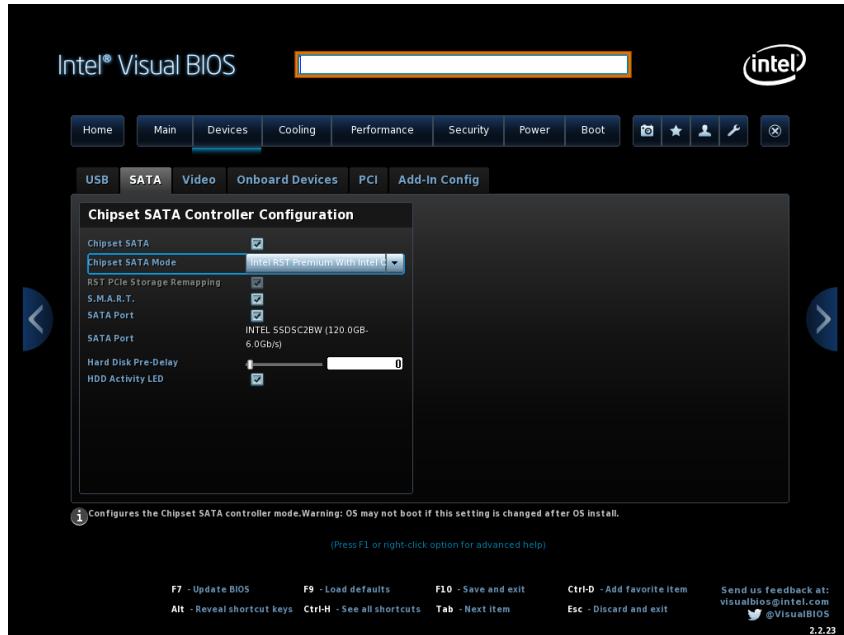

3.1   Non-Intel® VMD Capable Platforms

This section describes the specific BIOS settings that must be set on systems that do not support Intel® VMD. This would include all Intel® Optane™ memory capable platforms before the 11th Generation Core™ Processor Platforms. See the following for more details: Software and Platform Support for Intel® Optane™ Memory.

Note: The field names and menu locations in the BIOS may vary depending on the vendor, confirm the location in the manufacturer's user guide/support site.
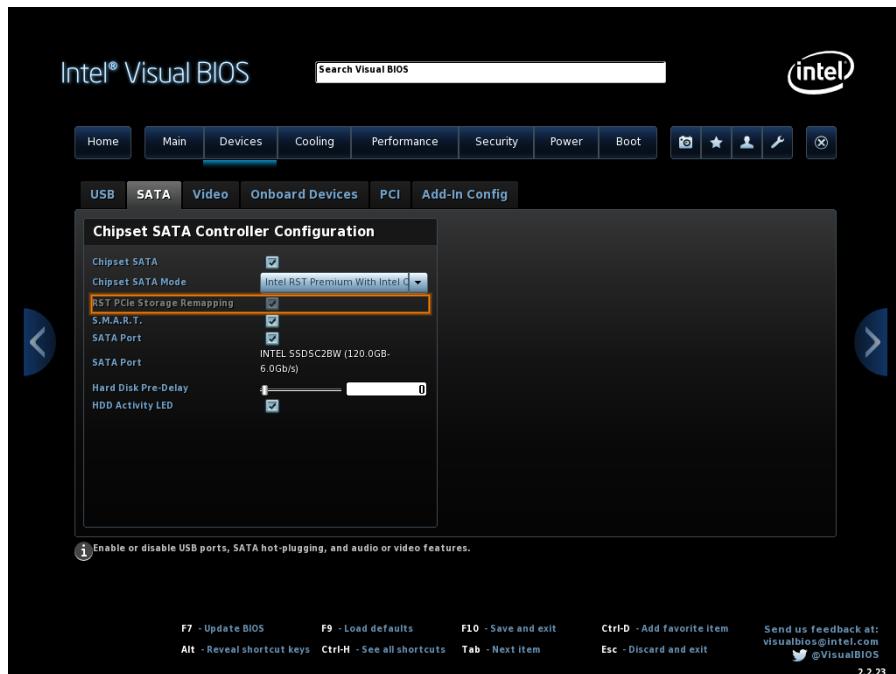
Step 1: After enabling *UEFI* in the Boot Settings, set the SATA Mode to *Intel® RST Premium…*

Step 2: Make sure that remapping for the port (PCIe connector) that contains the Intel® Optane™ memory device is *Enabled.*

Notes:

- If the 'slower media' being accelerated is a supported PCIe NVMe drive, remapping must be enabled for this port/device as well

- This setting may not be available in the BIOS until the storage hardware is connected to the motherboard/system
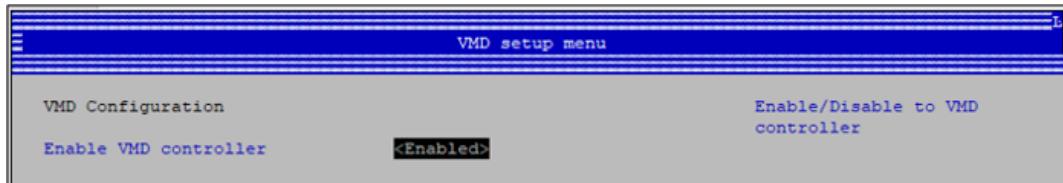
3.2 Intel® VMD Capable Platforms

This section describes the specific BIOS settings that must be set on systems that support Intel® VMD. The 11th Generation Core™ Processors enabled this support with Intel® RST driver version 18.0.1.x and greater. See the following for specific support: Software and Platform Support for Intel® Optane™ Memory.

Note: The field names and menu locations in the BIOS may vary depending on the vendor, confirm the location in the manufacturer's user guide/support site.

Step 1: After enabling *UEFI* in the Boot Settings, *Enable* the VMD Controller

Step 2: Set the Intel® Optane™ memory device and the 'slower media' to be accelerated to be Intel® VMD controlled. Keep in mind that if the 'slower media' is SATA, the SATA Controller must be *Enabled,* if the 'slower media' is PCIe NVMe it should also be *Enabled*

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4 Operating System Installation

This section describes the Operating System installation process and how this is different between Intel® VMD capable platforms and Non-Intel® VMD capable platforms (see Section 1.3).

4.1 Requirements:

Microsoft Windows 10 x64 bit (Version 1703/Build 15063) or greater required

Note: The Intel® Optane™ Memory and Storage Management application (see Section 5.1) requires Microsoft Windows 10 x64 bit (Version 1803/Build 17134) or greater.

Non-Intel® VMD capable platforms

No additional steps required; the OS installation software should detect all drives in the system during the installation process. Follow the instructions and guidance to complete installation.

Intel® VMD Enabled platforms

An additional step during the OS installation process is required for the operating system to detect drives under Intel® VMD control.

The Intel® RST driver version 18.0.1.x and greater is required for Intel® VMD capable platforms. This driver version is not yet part of the Microsoft Windows installation package.

During the OS installation, any drives that have been enabled in the BIOS for Intel® VMD management will not be detected until a supported driver is *loaded*, following are Instructions on how to do this.

1. Go to https://downloadcenter.intel.com/download/29978?v=t and **select/download** the *f6flpy-x64 (Intel® VMD).zip* package.

2. **Unzip** the package to a USB drive.

3. Start the Windows OS Installation process with the USB drive connected to the system.

4. Follow the prompts until it asks for the 'drive to install to' page.

5. If the drive for installation is not shown, do the following to load the Intel® RST driver that was downloaded in Step 1 above.

    a. **Click** *Load Driver*

    b. **Browse** to the driver on the USB drive

    c. **Select** the driver, *iastorVD*, and **Click** *Next* (The drive should now be available for OS installation.)

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5 Intel® Optane™ Memory Capable Applications

There are three different applications that provide management functionality for the various capabilities of the Intel® Rapid Storage Technology (Intel® RST) management storage subsystem.

This section explores the capabilities specific to the Intel® Optane™ memory functionality and features of the recommended Intel® Optane™ Memory and Storage Management application.

Important Note: The Intel® Optane Memory (Section 11.1) and Intel® Rapid Storage Technology (Section 11.2) applications have reached End of Life and are no longer supported, see here for more information.

5.1 Intel® Optane™ Memory and Storage Management Application

This section provides an overview of the steps to configure the Intel® Optane™ memory capable device with the Intel® Optane™ Memory and Storage Management application on a computer with the operating system already installed on a platform that meets the requirements outlined in Section 1.2.

This application is only available through the Microsoft Store and requires the Intel® RST Windows driver to be installed on the system before downloading.

Note: The Intel® RST version 17.9.1.x and greater installs the driver and starts the installation process of the Intel® Optane™ Memory and Storage application from the Microsoft Store. For supported platforms this is the only step to install the proper software and you can skip to section 5.1.1. See if your platform is supported here and how to download the proper package

If your platform is not supported with version 17.9.1.x and greater, follow the steps below to complete the installation.

Driver installation:

1. Go to https://downloadcenter.intel.com/download/28993?v=t and **select/download** the *f6flpy-x64.zip* package.

2. **Unzip** the package to a location you will remember. Browse to the location if necessary.

3. Install the driver using the 'right click' method.

    a. **Right click** on the *iaStorAC.inf* file and **select** *Install* from the drop-down menu.

4. **Restart** the computer to complete the installation.

Download/install the application:

1. Navigate to and open the Microsoft Store application.

    a. **Press** the *Windows key* and **type** *Microsoft Store.*

2. In the *Search* field at the top of the screen **type** *Intel Optane Memory and Storage Management* and select the application.
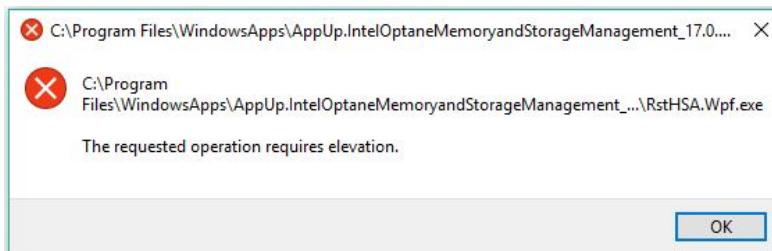
3. If your system contains the proper requirements you will be able to download and install.

In order to download the software, Windows 10 x64 bit (version 1803) or greater must be installed. You can check this by doing the following. (The store should also tell you if these requirements are met.)

    a. **Press** the *Windows key + x* on the keyboard

    b. **Select** *Run*

    c. **Type** *winver*

4. Read and Accept the license, and the installation should be complete.

After the installation is complete, when launching the application, you may encounter the following error message. These extra steps are not required in version Windows 10 (Version 1809) and later.
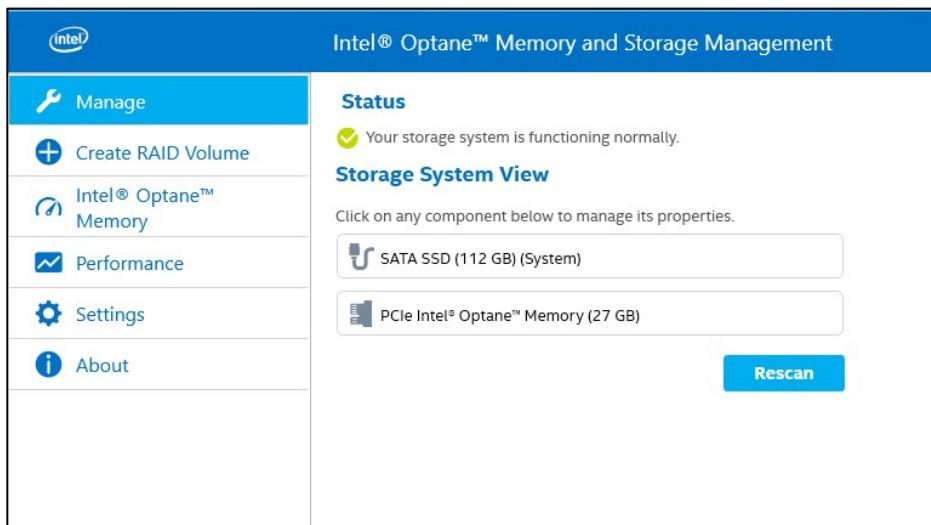
In some operating system versions this error may occur when the application is not 'Run as Administrator'. To run the application as administrator:

1. **Press** the *Windows key* and locate the application (this may be under the *Intel* folder)
2. **Right-click** on the application
3. **Click** *More* in the drop over menu
4. **Click** *Run as Administrator* in the resulting menu
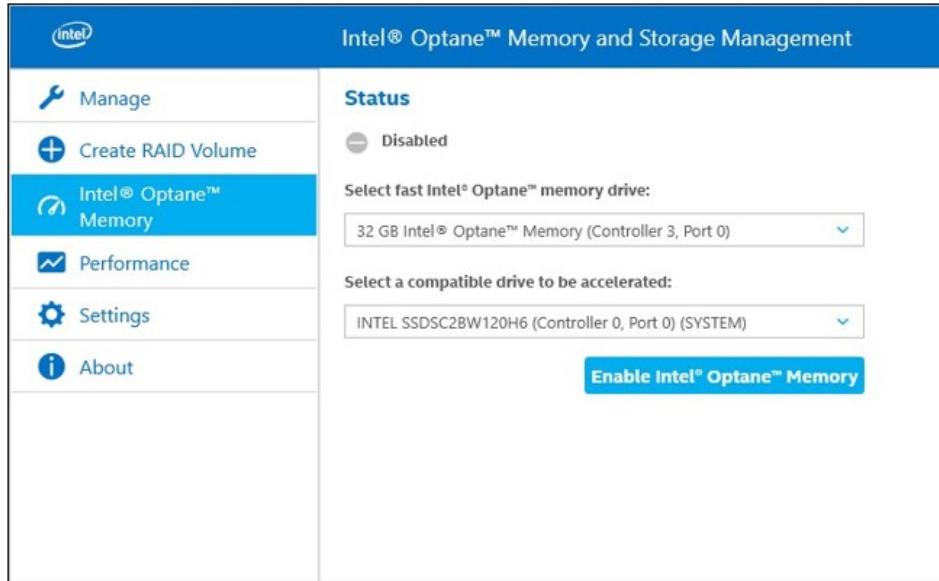
5.1.1 Enabling Acceleration

1. **Open** the application and you will see the storage devices and volumes currently contained in the system in the 'Manage' tab.
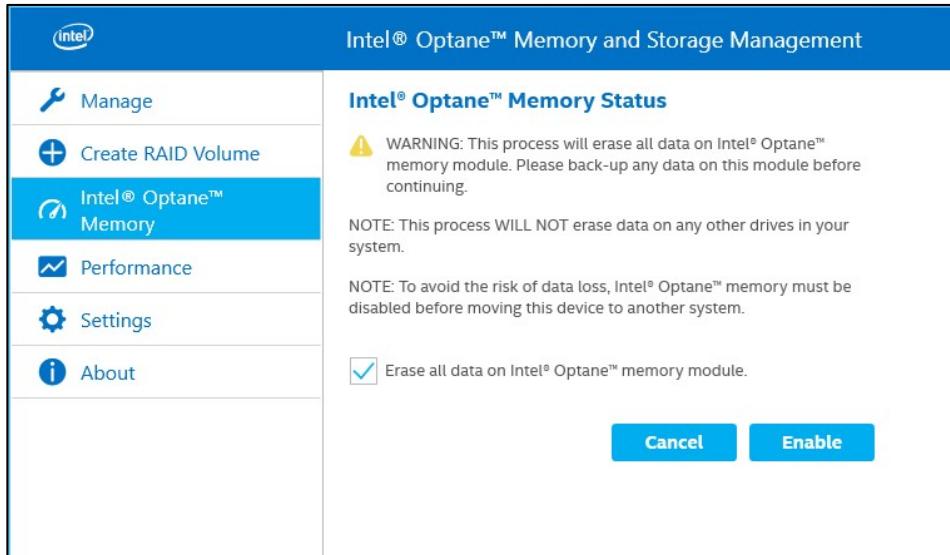
2. **Navigate** to the *Intel® Optane™ Memory* tab, where you will see the current state of the volume. The drop-down menu will display the available Intel® Optane™ memory combinations that can be selected.

    a. If the word (SYSTEM) appears beside the compatible drive to be accelerated, this indicates that the operating system is installed on that device.
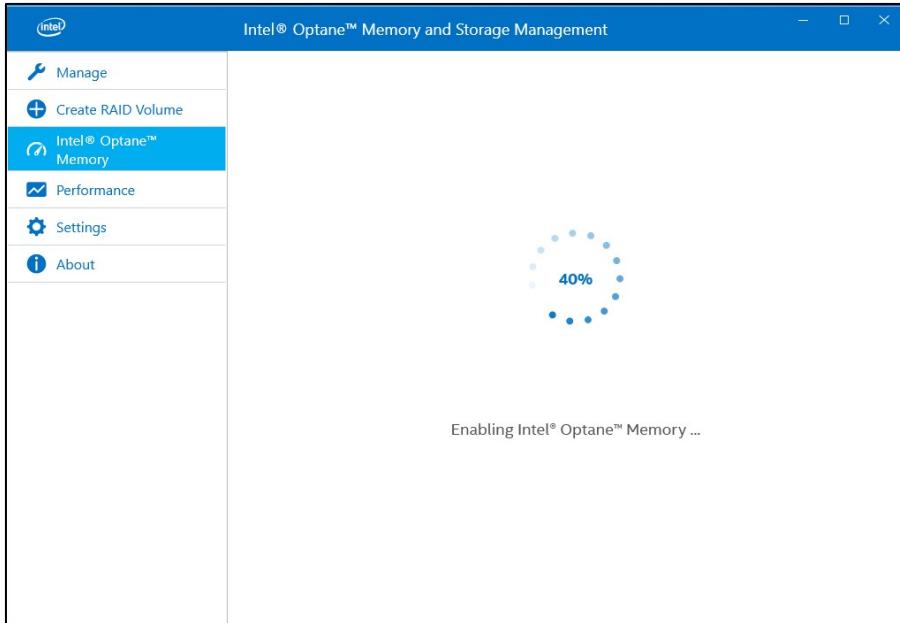
3. **Click** the *Enable Intel® Optane™ Memory* button:
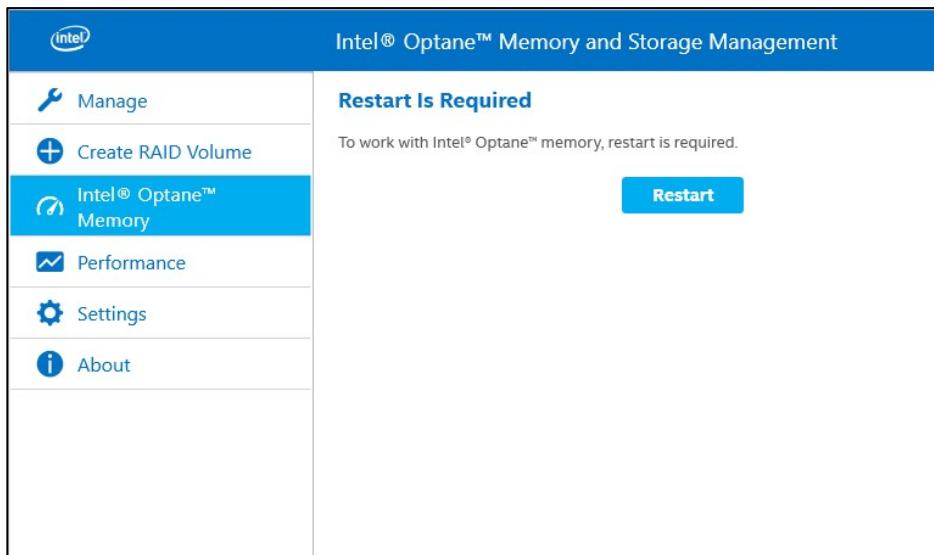
4. Confirm understanding that all data will be removed from the Intel® Optane™ memory, **click** *Enable*:

5. Acceleration is being enabled. The Intel® Optane™ memory 'fast media' and the 'slower media' are being 'paired' into a single volume.
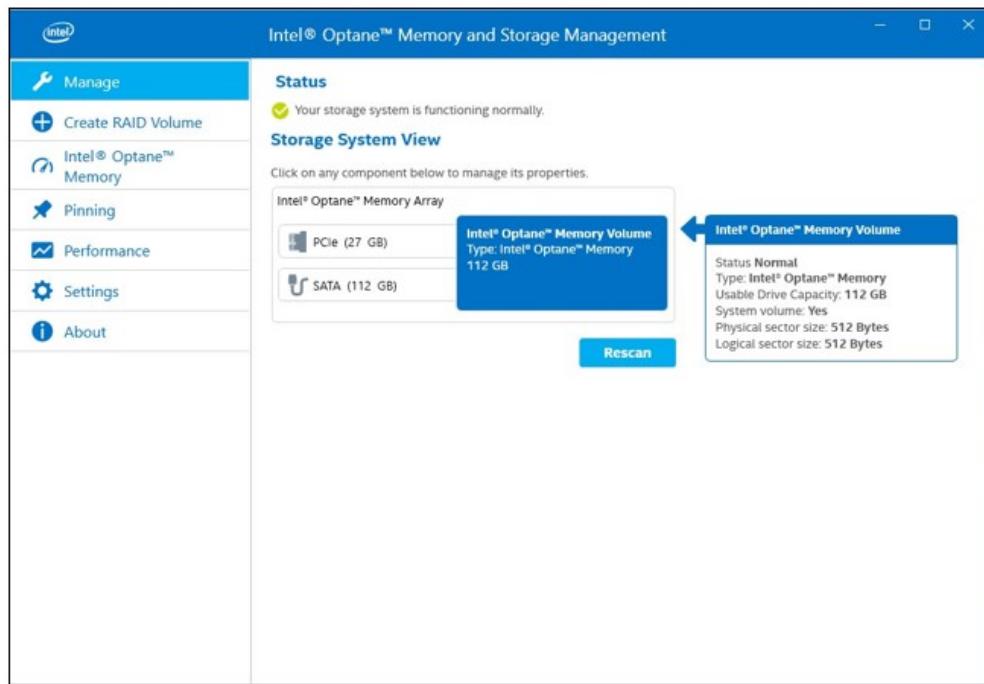

6. A restart is required once volume creation is complete; to do so **click** *Restart*.

    a. If the module contains at least 32 GB of Intel® Optane™ memory capacity, just before entering the OS you may see a screen that shows some finishing details of the enabling process. This is related to the scheduling of data cache and is not supported on 16 GB devices.
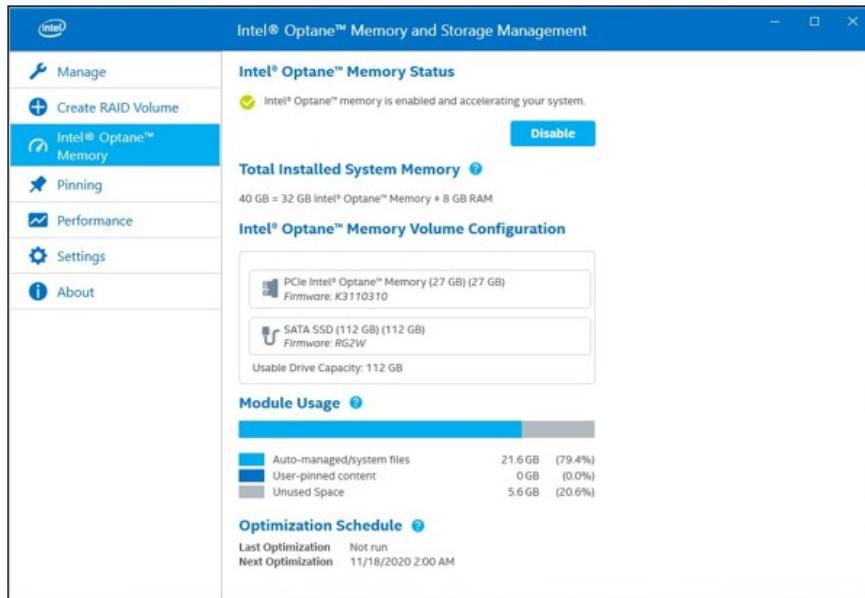
7. After rebooting the system, enter the application and the volume will be shown in the Manage and Intel® Optane™ Memory tabs.

    a. The volume will also be shown in the OS-related applications such as Device Manager and Disk Management. The individual drives will no longer be visible in these windows.
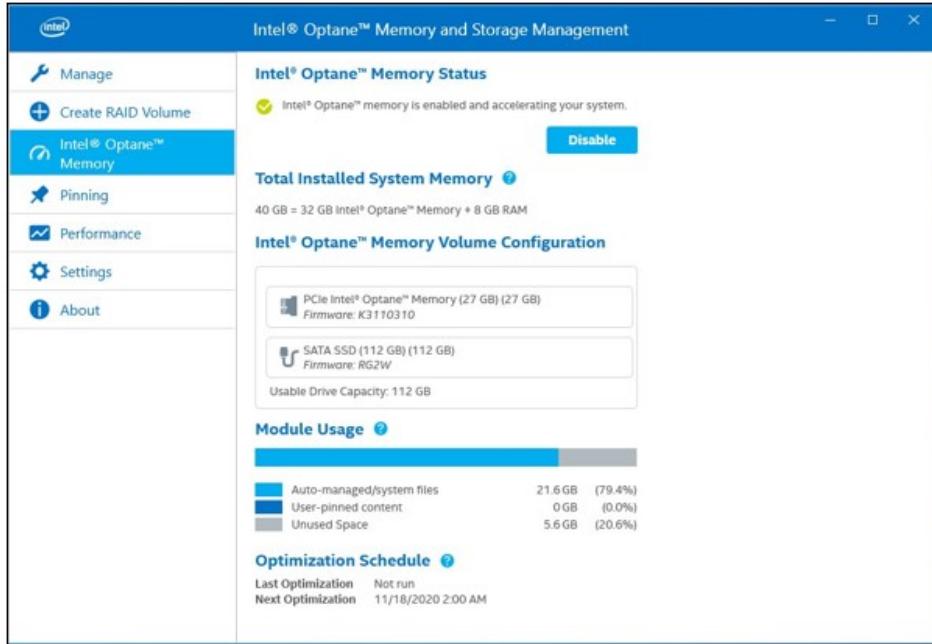
Devices with 32 GB or more Intel® Optane™ memory capacity, will have additional features such as Pinning and Optimization (cache) scheduling available. For these devices the 'Intel® Optane™ Memory' page will look like the following image:
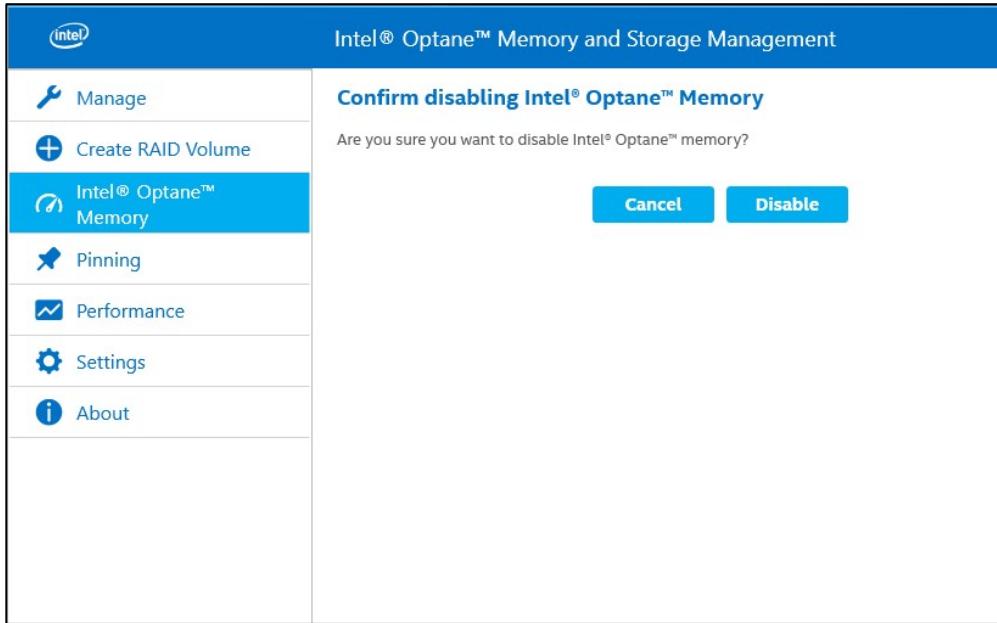
5.1.2   Disabling Acceleration
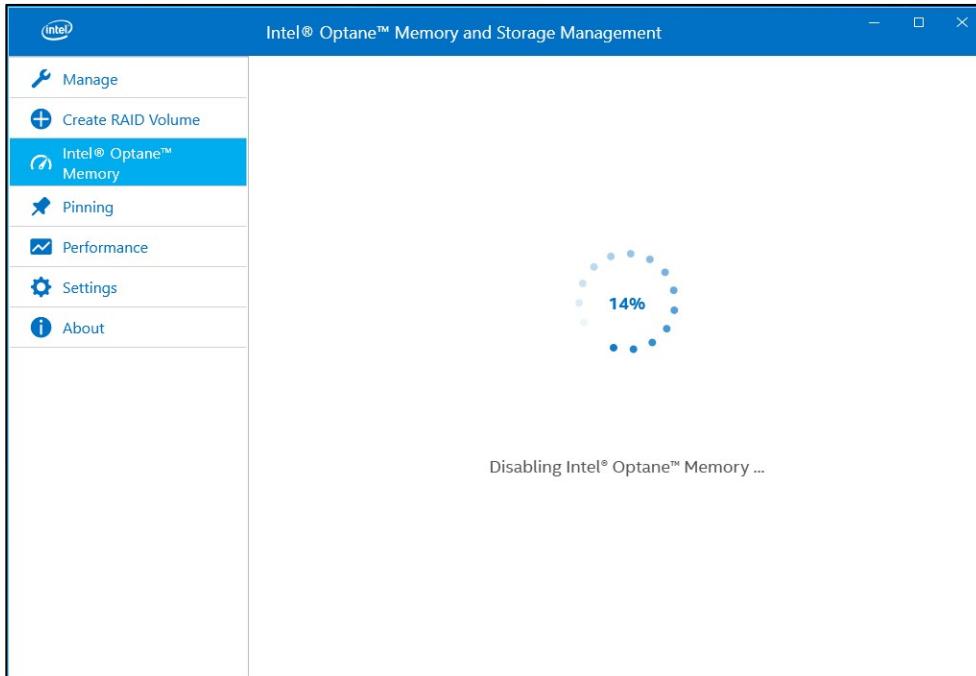
1. **Open** the application and **navigate** to the *Intel® Optane™ Memory* tab and **click** *Disable*:
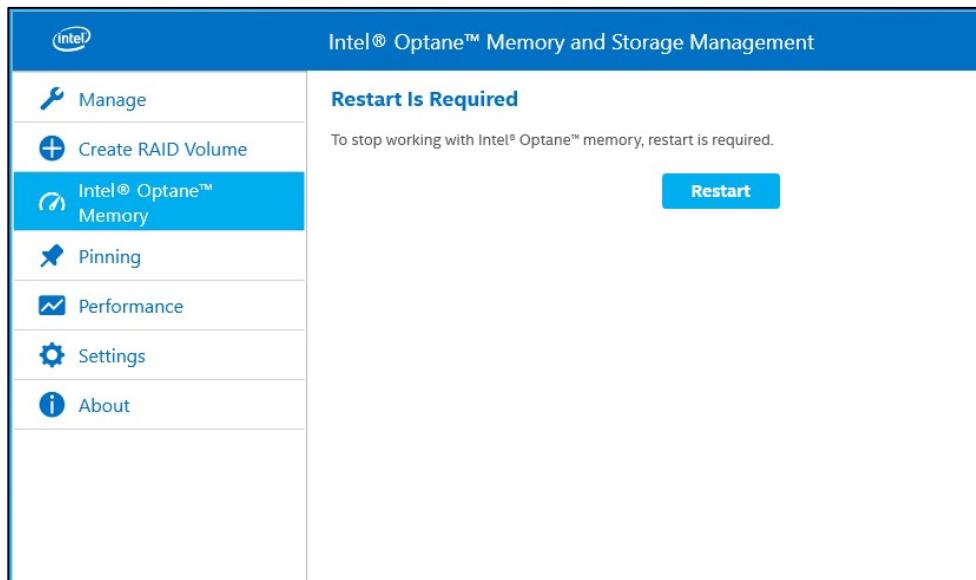
2. Confirm that you wish to disable acceleration; **click** *Disable*.

3. Acceleration is being disabled. The Intel® Optane™ memory 'fast media' and the 'slower media' are being separated (un-paired).
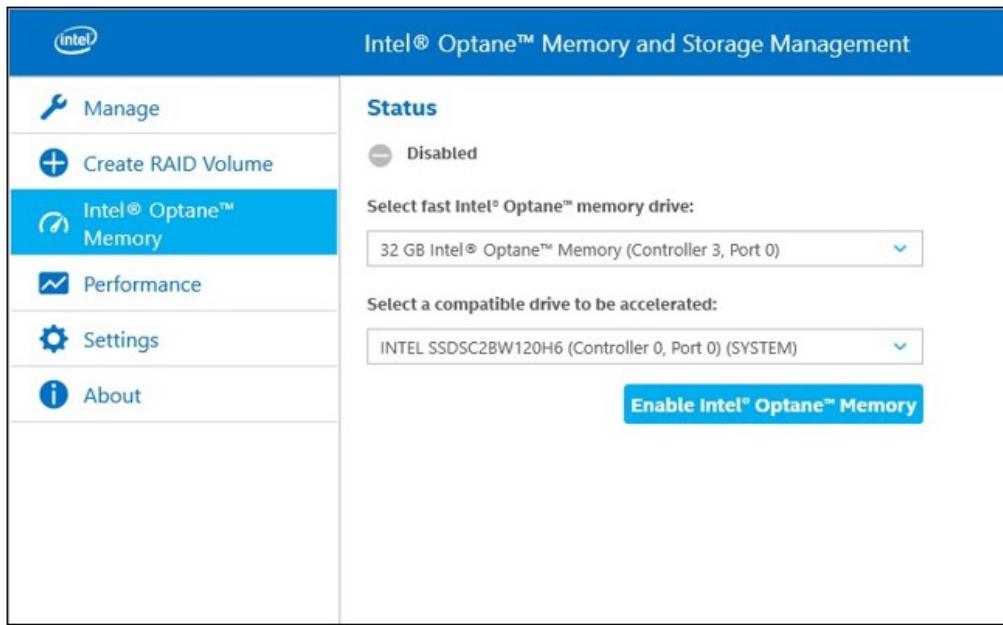
4. Once complete, **click** *Restart*.
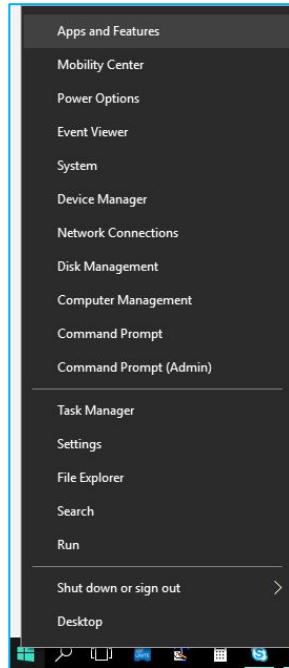
5.1.3 Uninstalling the Application
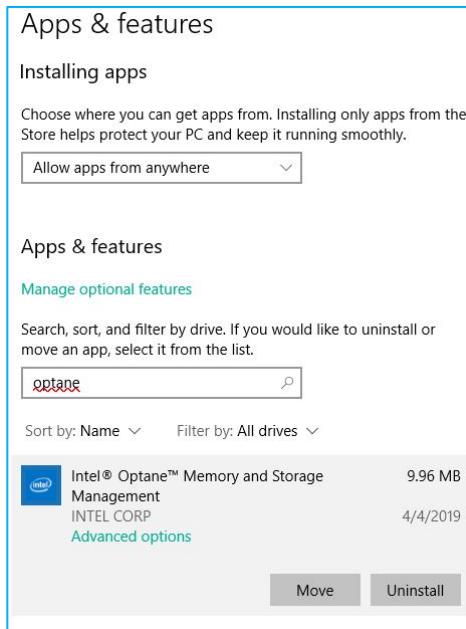
1. Verify that acceleration has been disabled before uninstalling the user interface (UI).

2. **Right-click** on the *Windows start menu* and **click** *Apps and Features*.

3. **Search** for *Optane* and **click** *Uninstall.*

4. Once complete, a system restart is required.

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6 *Additional Features/Capabilities*

This section covers additional features/capabilities provided by Intel® Optane™ memory capable applications.

6.1 Data Drive Acceleration (DDA)

Data drive acceleration, or DDA, is the capability to accelerate – with Intel® Optane™ memory -- a 'slower media' which does not contain an operating system, only data.

- Statistics, as shown in the Intel® Optane™ memory application, are not available with DDA.
- Systems with more than one bootable drive are not supported and results cannot be guaranteed.

6.1.1 Hardware/Software Requirements

All the Minimum Requirements (Section 1.2) continue to apply to DDA and the specific data drive being accelerated.

System must contain the following:
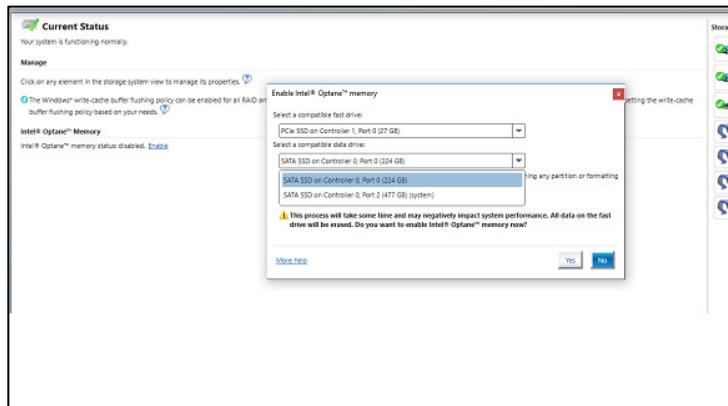
1. System drive (e.g. C:) with the Windows 10 operating system installed (can be SATA or NVMe)
2. Data drive (e.g. D:) to be accelerated
3. Intel® Optane™ memory module

Note: Data drives must still be formatted with a GPT partition and Type Basic.

6.1.2 Enable/Disable Acceleration

The process to Enable/Disable acceleration (Section 5) continue to apply to DDA and the specific data drive being accelerated.
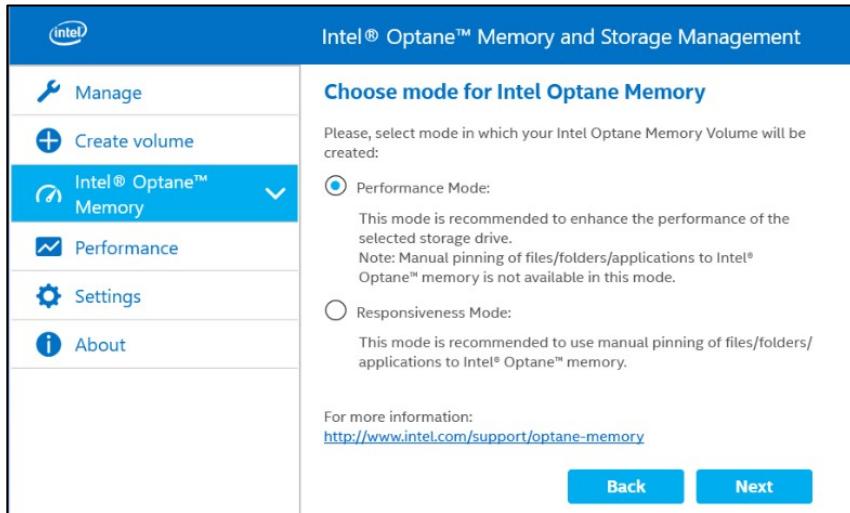
Note: When selecting a drive for acceleration, the supported System drive that contains the operating system will have "(System)" at the end of the selection. Additional drives available for DDA in the system will not have this in the name.

6.2 Pinning

Pinning enables customized responsiveness by allowing the selection of specific files, folders, and applications to be accelerated.

- Pinning is supported on 32 GB or greater capacity Intel® Optane™ memory devices only.

See additional information about the Pinning feature here:
https://www.intel.com/content/www/us/en/support/articles/000028779.html

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7   Troubleshooting

This section includes examples of errors that could occur during installation of the Intel® Optane™ memory SW/driver packages. For more information and help on these errors, please also refer to the error code and message article for more details: https://www.intel.com/content/www/us/en/support/memory-and-storage/intel-optane-memory/000024113.html or contact Intel Customer Support

Additional Troubleshooting options can be found here: https://www.intel.com/content/www/us/en/support/articles/000055140.html

- Images current from the time of publication. Some text may change as updates are made to the applications.

- Contained below are only samples and not a comprehensive list of errors for all applications.

7.1   Device Detection Issues

If the module is not detected in the Windows environment, or system BIOS, see the following for some troubleshooting to try and determine what the issue may be.

For Intel® Optane™ memory / Intel® Optane™ memory M Series devices: https://www.intel.com/content/www/us/en/support/articles/000025194.html

7.2   Cache Rebuild Occurs on Reboot

If a hard reboot (user presses the power button) or unexpected power loss occurs on a system with acceleration enabled, upon boot a message will display stating a cache rebuild is in process. This state is expected, as a result of the power loss.

7.3   Hardware Failure

7.3.1   Fast Media Missing At Boot

If the system boots and the Intel® Optane™ memory media is not detected by the Intel® RST UEFI driver, the driver will protect the current data on the drive by disabling it and not exposing it to the boot manager. This gives the user an opportunity to take additional steps to determine what the issue may be.

In this state, the system is not bootable and the drive will be set to a 'Disabled' state in the UEFI/BIOS. It is recommended that the end user power down the platform and try the following to resolve this issue.

1) If the module has become unattached from its port, reattach the missing Intel® Optane™ memory module and ensure that it is correctly installed into the system.
2) If the Intel® Optane™ memory module is not missing or disconnected, attempt the following:
   a) Check that the M.2 connector is not damaged on the board or on the Intel® Optane™ memory module.
   b) Disconnect the 'slower media' drive and boot into the system BIOS menu. Enter the Intel® RST menu and confirm if the Intel® Optane™ memory module can be seen. If the module cannot be seen, exit the Intel® RST menu and confirm that the SATA controller remapping function is **enabled** on the port that the Intel® Optane™ memory module is connected to.
   c) Confirm that the Intel® Optane™ memory module is not damaged. Damage on the module may cause it to not be detected correctly.

7.3.2 Slower Media Missing at Boot

If the system boots and the 'slower media' device is not detected by the Intel® RST UEFI driver, the driver will protect the current data on the Optane™ memory module by disabling it and not exposing it to the boot manager. This allows the user the opportunity to take additional steps to determine what the issue may be.

In this state, the system is not bootable and the Intel® Optane™ memory module will be set to a 'Disabled' state in the UEFI/BIOS. It is recommended that the end user power down the platform and try one or all the following to resolve this issue.

1) Check the cabling for the drive. If the 'slower media' has become unattached from its port, reattach the missing device and ensure that it is correctly installed into the system.

2) Confirm that the 'slower media' is not damaged. Damage to the drive may cause it to not be detected correctly.

3) If available, connect a different 'slower media' device into the same port/cabling to confirm that the cables are not damaged.

7.3.3 Media Failure and Data Recovery

No Intel® RST data recovery tools are available for a drive that has experienced mechanical or electrical failure and is considered 'inoperable'. If the system encounters an unrecoverable failure of the media, there is no recovery/repair available.

7.3.4 Media Replacement Procedure

This section documents support for Intel® Optane™ memory capable module upgrades or replacements for systems that already have acceleration enabled. Whether upgrading/replacing the module or the 'slow' device, the following steps will apply.

Note: To mitigate potential data loss, it is critical to backup all data before proceeding with the steps below.

1. Disable Acceleration

   a) Option 1: Within the Operating System

      i) Depending on the application being used to manage the volume, follow the steps in one of the sections below:

         (1) Section 5.1.2: Intel® Optane™ Memory and Storage Management application
         (2) Section 11.1.4: Intel® Optane™ Memory application
         (3) Section 11.2.2: Intel® Rapid Storage Technology application

   b) Option 2: Within the system BIOS:

      i) **Enter** the *system BIOS*
      ii) **Navigate** to the *Intel® RST menu*
      iii) **Double Click** on each of the volume members and 'Disassociate' or 'Reset to non-optane'

2. Swap out the media to be replaced

   a) Power down the computer.

   b) Open the computer and locate the media to be replaced.

Note: Consult the computer manufacturer for the location of the slot for the media and instructions to remove/insert the M.2 module.

   c) Close the computer and power it on.
   d) Boot into the Windows OS

Note: If the OS was installed on the 'slower media' being accelerated, follow the steps in Section 4 to install the OS and Section 5 to install the application

3. Re-enable Acceleration

   a) Depending on the application being used to manage the volume, follow the steps in one of the sections listed below:
      i) Section 5.1.1: Intel® Optane™ Memory and Storage Management Application
      ii) Section 11.1.3: Intel® Optane™ Memory Application
      iii) Section 11.2.1: Intel® Rapid Storage Technology Application

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8 *Error Related to Last Partition Resizing*

At least 5 MB of continuous unallocated space must be left free for the Intel® RST package to use for metadata when building and for management of the Intel® Optane™ memory volume.

For options on utilities that can be used to free this space after installation, see the following article:

Unsupported System Drive: Last Partition Unable to Resize Error

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9   *Verify/Make Changes to Drive Partition Structure (MBR vs GPT)*

System acceleration with Intel® Optane™ memory devices is only supported with drives that are formatted with the GPT (GUID Partition Table) partition structure.
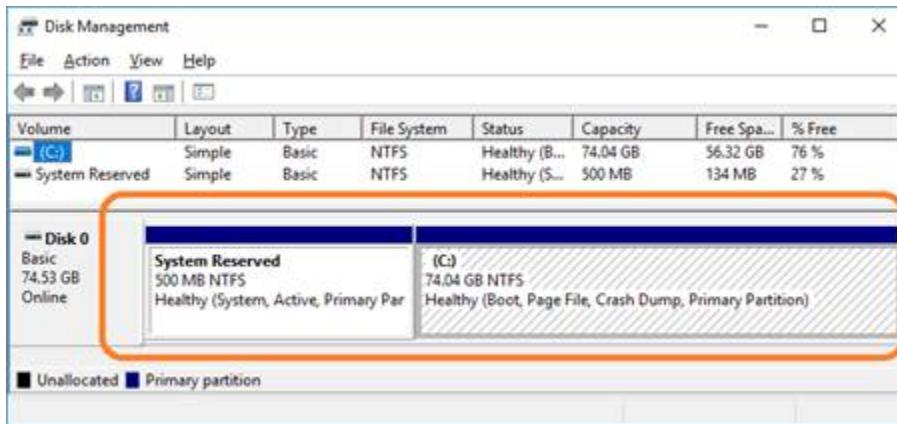
Depending on how your system's operating system was originally installed, this structure may be the Legacy MBR (Master Boot Record) supported on previous Windows versions.

Use the information below to:

- Verify the current Structure drive to be accelerated
- Process to convert Structure to GPT (if needed)

9.1   Verify Current Drive Partition Structure

1. **Boot** into *Windows*
2. Open Disk Manager (**Windows +x key**, then **click** *Disk Manager*)
3. Locate the disk that you want to accelerate (Image below is an example of a primary system boot disk)

4. **Right-click** the *disk* shown as (Disk x, Basic, Capacity, Online) on the left (for example, where it says Disk 0 in this image).
5. **Select** *Properties*
6. **Click** the *Volumes tab*
7. Here you can confirm the Partition style
8. If MBR, continue on to Section 9.2
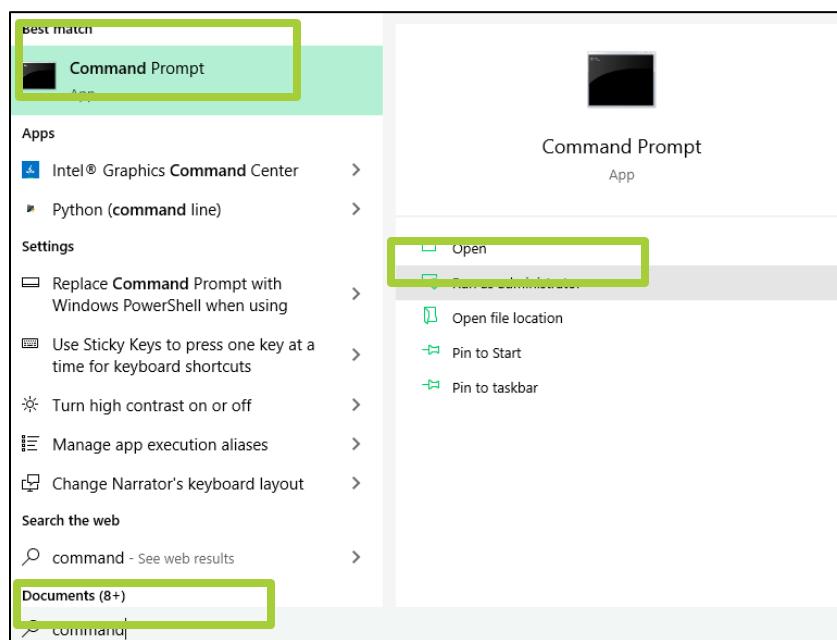
9.2   Convert from MBR to GPT with MBR2GPT.exe

Requirements:

- Windows 10 Creators Update x64 (Version 1703, Build 10.0.15063) or later.

- A computer able to boot UEFI. In the BIOS setup, you should see options for UEFI boot. Confirm with your computer manufacturer for support.

Instructions:

1. Open Command Prompt with administrator privileges

    a.   **Press** *Windows Key +x*

    b.   **Type** `command` and **select** *Run as administrator* from right side panel

2. **Type** the following: `mbr2gpt.exe /convert /allowfullOS`

3. Shut down and boot into the BIOS

4. Change your settings to UEFI mode

Note: This will be a change in your Boot settings from 'Legacy' to 'UEFI'. Confirm with your system manual on the location of this setting

For more information see: https://www.intel.com/content/www/us/en/support/articles/000024558.html

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10 Windows Recovery Environment

10.1 Preparing the Windows 10 OS Recovery (Advanced)

This section steps through the process of preparing a Windows 10 OS image for Windows* Recovery. 'Injecting' the Intel® RST driver into the OS Recovery Image/tools before installing the OS allows for the possible recovery of a system in the event of damage to the OS image.

Requirements:
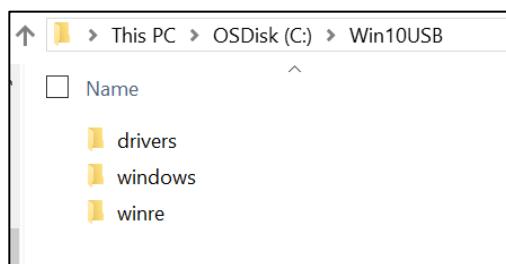
- [Windows Assessment and Deployment Kit (ADK)](#) installed

- Windows 10 64b ISO

- Latest F6 Intel® Rapid Storage Technology SW/driver package available from
  https://downloadcenter.intel.com/download/28993?v=t

- USB Key for installation

Steps:
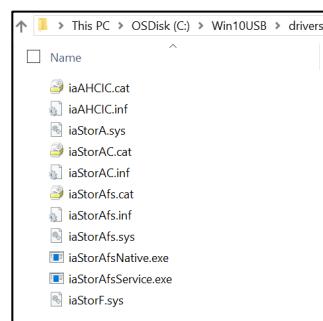
1. Create a USB Bootable Key from the Windows 10 OS ISO Image.

Note: Consult the computer manufacturer for the location of the slot for the media and instructions to remove/insert the M.2 module.
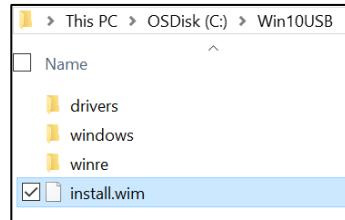
2. Create a temporary working directory on the local PC (e.g. C:\Win10USB).

3. In the working directory, **create** 3 sub directories named *windows, winre and drivers.*

4. **Extract** the *Intel® Rapid Storage Technology driver* to the "drivers" subdirectory.

5. From the Windows 10 USB Install key, **copy** the *install.wim* file from the "sources" directory to the working directory C:\Win10USB.

> This PC > OSDisk (C:) > Win10USB
>
> Name
>
> - drivers
> - windows
> - winre
> - ☑ install.wim

6. **Open** a *Command Prompt as Administrator* and change to the working directory (e.g. cd C:\Win10USB). Make sure that all folders and Windows Explorer are closed before starting this process.

```
Administrator: Command Prompt
Microsoft Windows [Version 10.0.10586]
(c) 2015 Microsoft Corporation. All rights reserved.

C:\windows\system32>cd Win10USB
The system cannot find the path specified.

C:\windows\system32>cd c:\Win10USB

c:\Win10USB>
```

7. Based on the Windows 10 version, determine which index number to modify. Choose the index that matches the Windows 10 version being used.

To determine the index, run the command: `dism /get-wiminfo /wimfile:install.wim`

Example below modifies Index 2. Steps can be repeated to modify additional versions.

```
c:\Win10USB>dism /get-wiminfo /wimfile:install.wim

Deployment Image Servicing and Management tool
Version: 10.0.10586.0

Details for image : install.wim

Index : 1
Name : Windows 10 Pro
Description : Windows 10 Pro
Size : 14,747,431,455 bytes

Index : 2
Name : Windows 10 Home
Description : Windows 10 Home
Size : 14,586,404,734 bytes

The operation completed successfully.

c:\Win10USB>
```

8. Modify the "install.wim" file by running the following commands:
   Mount the Windows Image:
   `dism /mount-image /imagefile:install.wim /index:2 /mountdir:windows`

```
c:\Win10USB>dism /mount-image /imagefile:install.wim /index:2 /mountdir:windows

Deployment Image Servicing and Management tool
Version: 10.0.10586.0

Mounting image
[===========================100.0%==========================]
The operation completed successfully.
```

9. Add the Intel® Rapid Storage Technology drivers to the Windows Image:
   `dism /image:windows /add-driver /driver:drivers /forceunsigned /recurse`

```
c:\Win10USB>dism /image:windows /add-driver /driver:drivers /forceunsigned /recurse

Deployment Image Servicing and Management tool
Version: 10.0.10586.0

Image Version: 10.0.14393.0

Searching for driver packages to install...
Found 3 driver package(s) to install.
Installing 1 of 3 - c:\Win10USB\drivers\iaAHCIC.inf: The driver package was successfully installed.
Installing 2 of 3 - c:\Win10USB\drivers\iaStorAC.inf: The driver package was successfully installed.
Installing 3 of 3 - c:\Win10USB\drivers\iaStorAfs.inf: The driver package was successfully installed.
The operation completed successfully.
```

10. Mount the Windows Recovery Image:
    `dism /mount-image /imagefile:c:\Win10USB\windows\windows\system32\recovery\winre.wim /Index:1 /mountdir:winre`

```
c:\Win10USB>dism /mount-image /imagefile:c:\Win10USB\windows\windows\system32\recovery\winre.wim /Index
:1 /mountdir:winre

Deployment Image Servicing and Management tool
Version: 10.0.10586.0

Mounting image
[===========================100.0%==========================]
The operation completed successfully.
```

11. Add the Intel® Rapid Storage Technology driver to the Windows Recovery Image:
    `dism /image:winre /add-driver /driver:drivers /forceunsigned /recurse`

```
c:\Win10USB>dism /image:winre /add-driver /driver:drivers /forceunsigned /recurse

Deployment Image Servicing and Management tool
Version: 10.0.10586.0

Image Version: 10.0.14393.0

Searching for driver packages to install...
Found 3 driver package(s) to install.
Installing 1 of 3 - c:\Win10USB\drivers\iaAHCIC.inf: The driver package was successfully installed.
Installing 2 of 3 - c:\Win10USB\drivers\iaStorAC.inf: The driver package was successfully installed.
Installing 3 of 3 - c:\Win10USB\drivers\iaStorAfs.inf: The driver package was successfully installed.
The operation completed successfully.
```

12. Un-mount the Windows Recovery Image:
    `dism /unmount-wim /mountdir:winre /commit`

```
c:\Win10USB>dism /unmount-wim /mountdir:winre /commit

Deployment Image Servicing and Management tool
Version: 10.0.10586.0

Image File : c:\Win10USB\windows\windows\system32\recovery\winre.wim
Image Index : 1
Saving image
[=========================100.0%=========================]
Unmounting image
[=========================100.0%=========================]
The operation completed successfully.
```

13. Un-Mount the Windows Image:
    `dism /unmount-wim /mountdir:windows /commit`

```
c:\Win10USB>dism /unmount-wim /mountdir:windows /commit

Deployment Image Servicing and Management tool
Version: 10.0.10586.0

Image File : c:\Win10USB\install.wim
Image Index : 2
Saving image
[=========================100.0%=========================]
Unmounting image
[=========================100.0%=========================]
The operation completed successfully.
```

14. **Copy** the updated *install.wim* in the working directory back to the "sources" directory on the USB install key.

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11 Legacy Intel® RST/Optane™ Memory Applications

The following applications have reached End of Life and are no longer supported, validated or being updated.
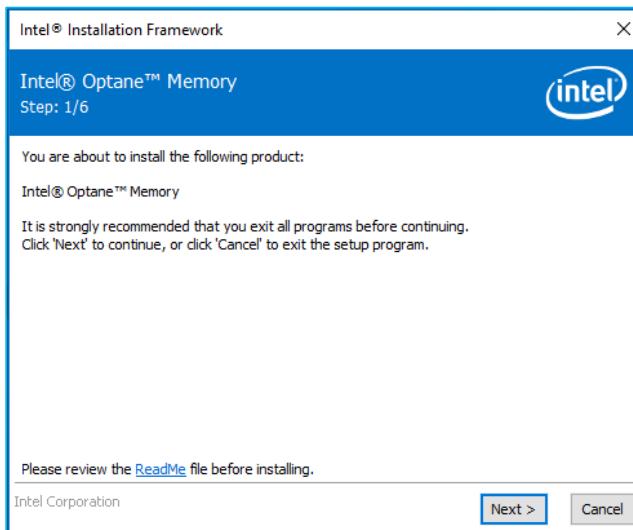
The information below is provided for reference for users that continue to utilize these products before updating to the supported Intel® Optane™ Memory and Storage Management application as detailed in Section 5.

11.1 Intel® Optane™ Memory Application
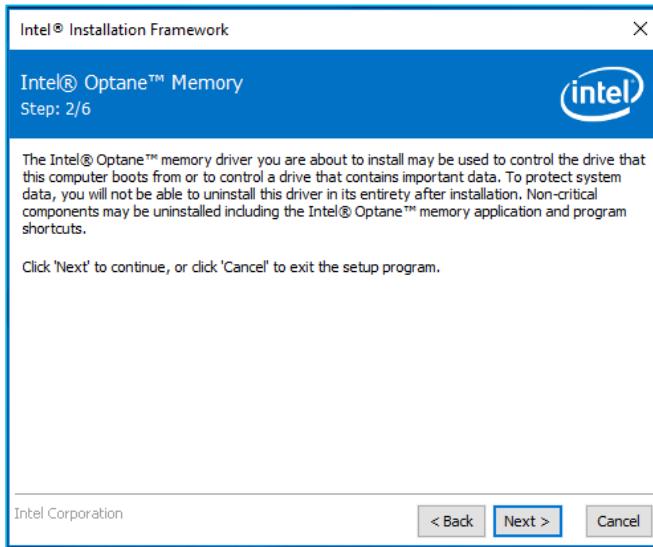
This section provides an overview of steps to configure Intel® Optane™ memory with the Intel® Optane™ Memory application on a computer that already contains the Windows 10 Operating System. Some motherboards may require a system BIOS update before the Intel® Optane™ memory SW/driver package can be installed. Consult the Motherboard vendor's support website for the latest Intel® Optane™ memory supported system BIOS.

For successful installation all the requirements noted in Section 1.2 must be met.
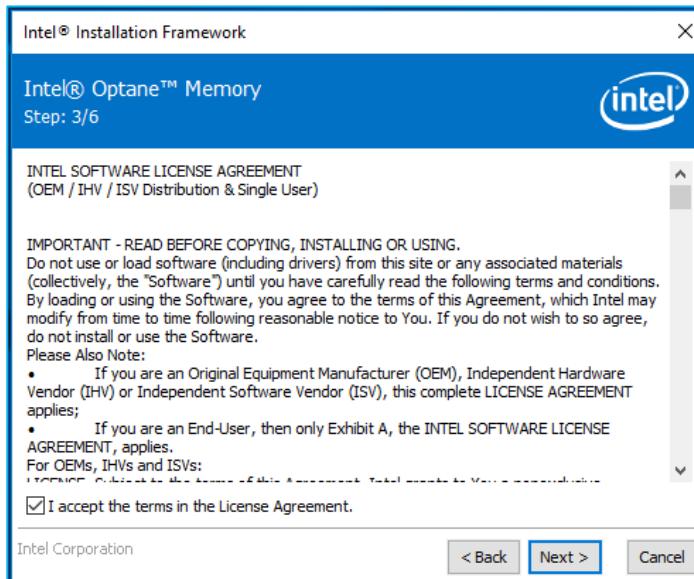
1. Go to https://downloadcenter.intel.com/download/28993?v=t and select the most recent 'SetupOptaneMemory.exe' package (this includes the driver and application).

2. Run the executable. **Click** *Next* to continue.
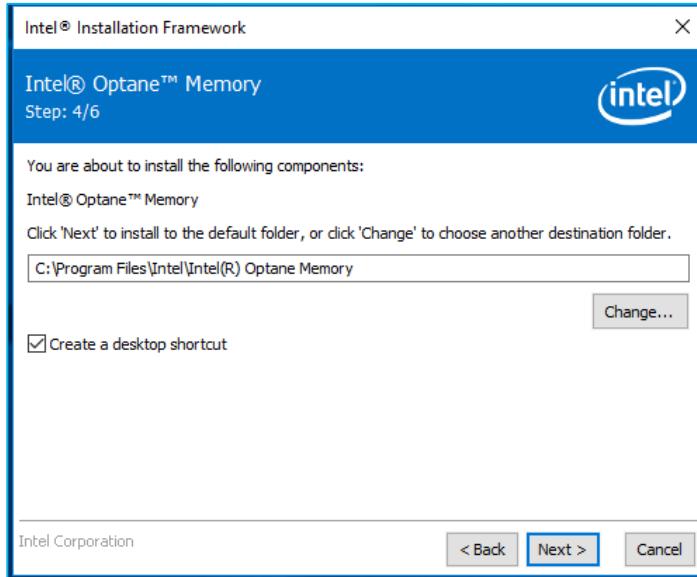
3. The following screen informs the user that the driver may be used to control which drive the computer boots from. **Click** *Next* to continue.
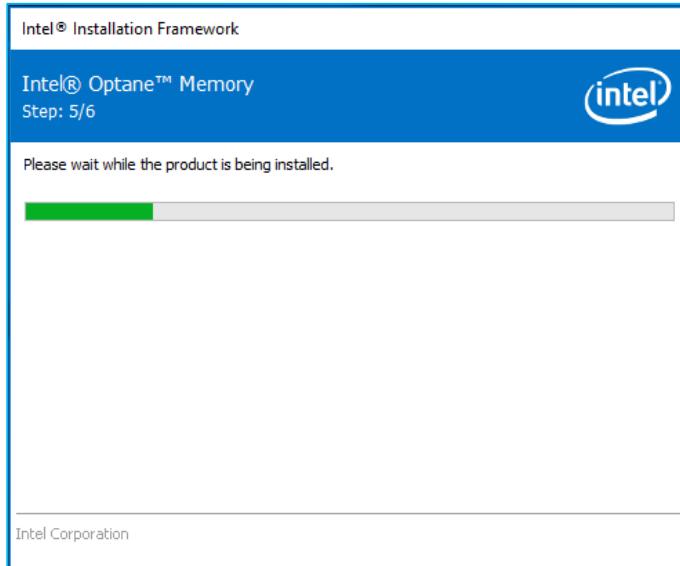
4. The following screen requires the user to read and accept the License Agreement. The user must **check** the *I accept...* box in order to **clic**k *Next* and continue.
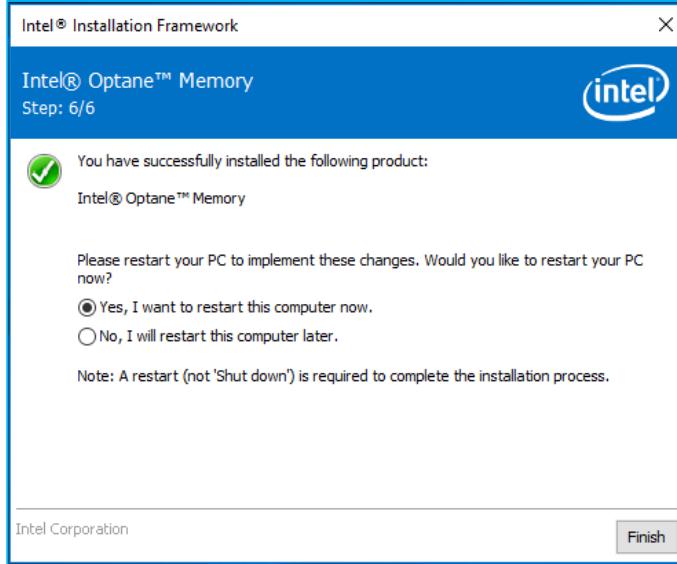
5. The following dialog box allows the user to select where on the system the software files will be loaded. The user can either **navigate** to a location using the *Change...* button, or use the default provided. The user must **click** *Next* to continue the installation.
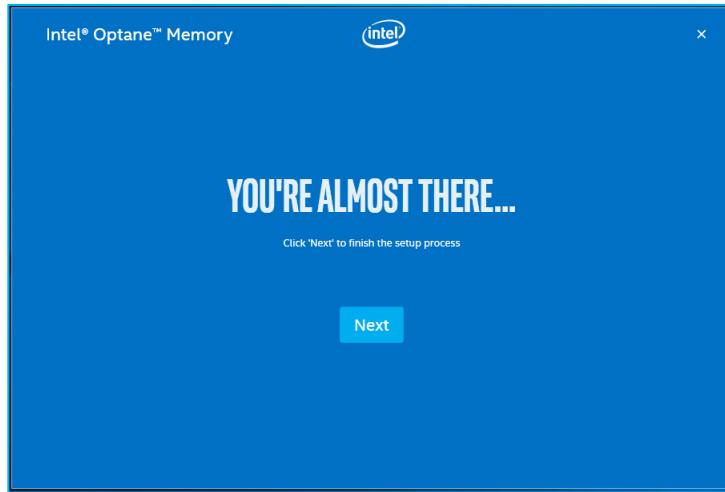
6. The following screen appears, showing the progress of the installation.

7. At this point in the installation process, the system will need to restart.
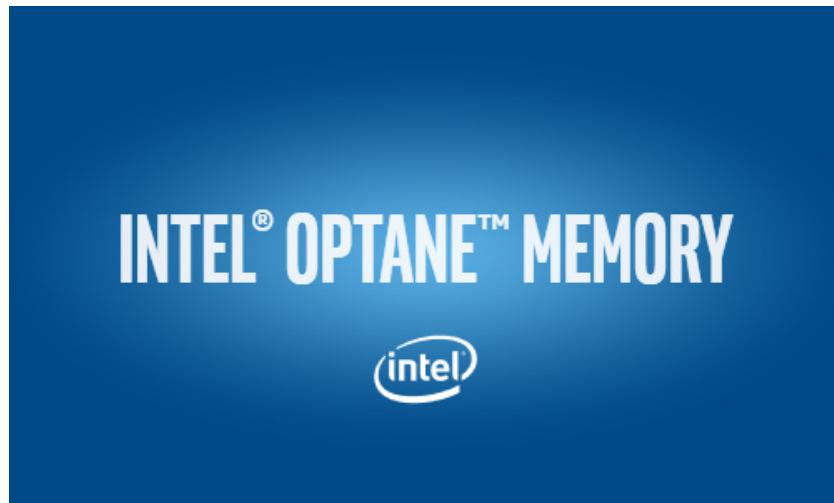
8. Once the system has completed the reboot and has entered the OS, the user will be prompted to complete the installation process. This may take several minutes to launch. **Click** *Next* to continue.
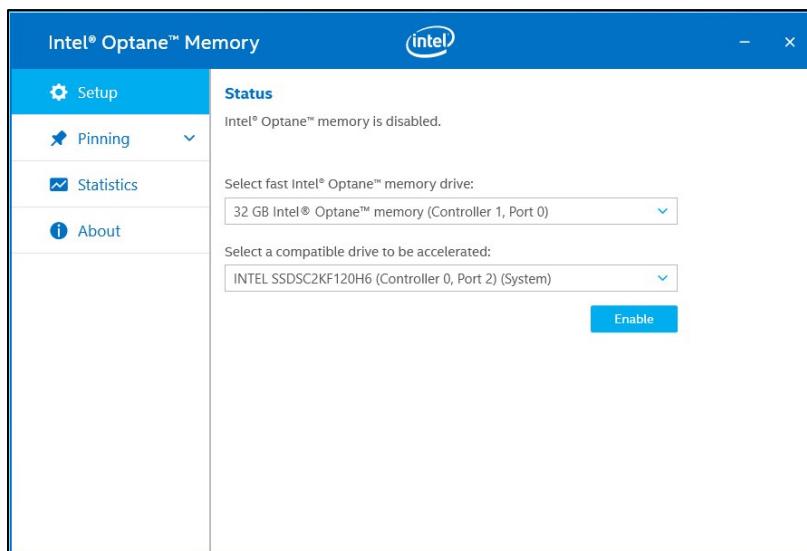
11.1.1 Enabling Acceleration
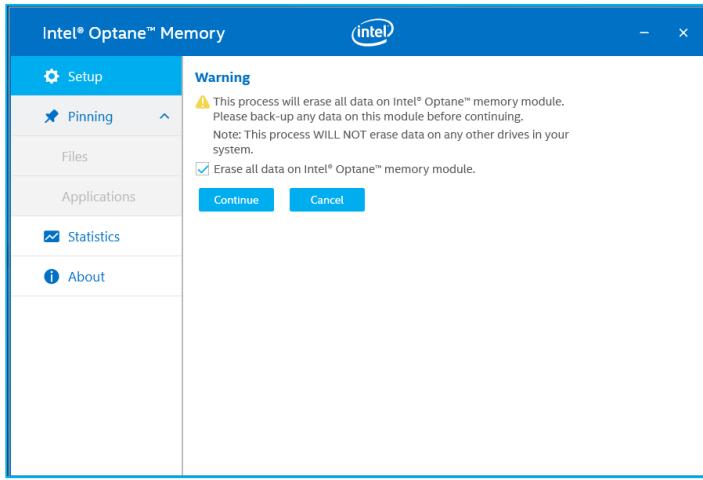
1. When the user chooses to continue the setup process, the window below will appear at the startup of the Intel® Optane™ Memory application. This may take several seconds to appear.
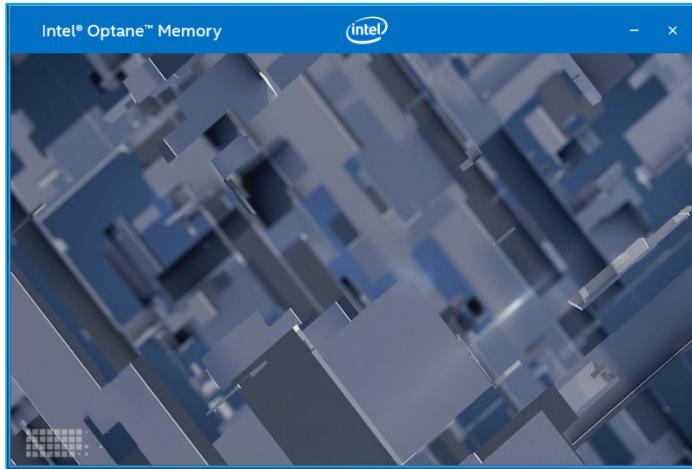
2. **Navigate** to the *Setup* tab, where the current status of the volume is displayed. The drop-down menus contain the available Intel® Optane™ memory combinations that can be selected. Select the appropriate combination and **click** *Enable*.

3. In the Warning dialog box that appears, confirm understanding that all data will be removed from the Intel® Optane™ memory and **click** *Continue*.

4. Acceleration is being enabled. The Intel® Optane™ memory 'fast' media and the 'slower' media are being 'paired' into a single volume.
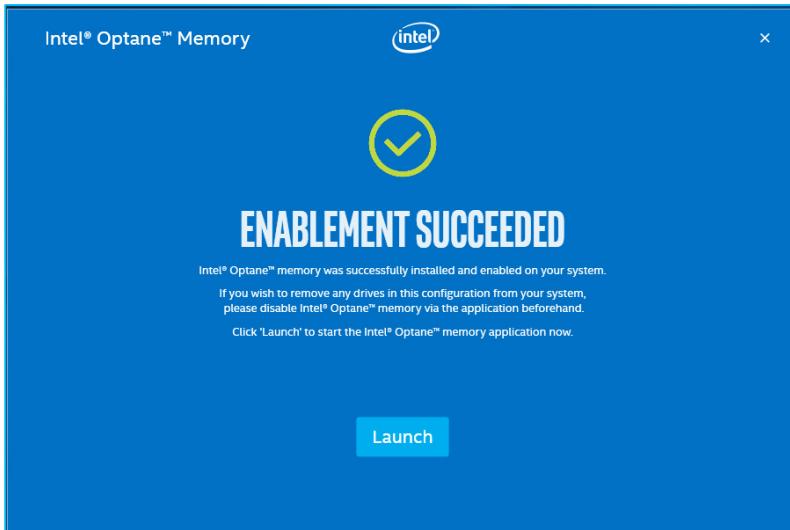
5. Once volume creation is complete, a restart is required. **Click** *Restart*.
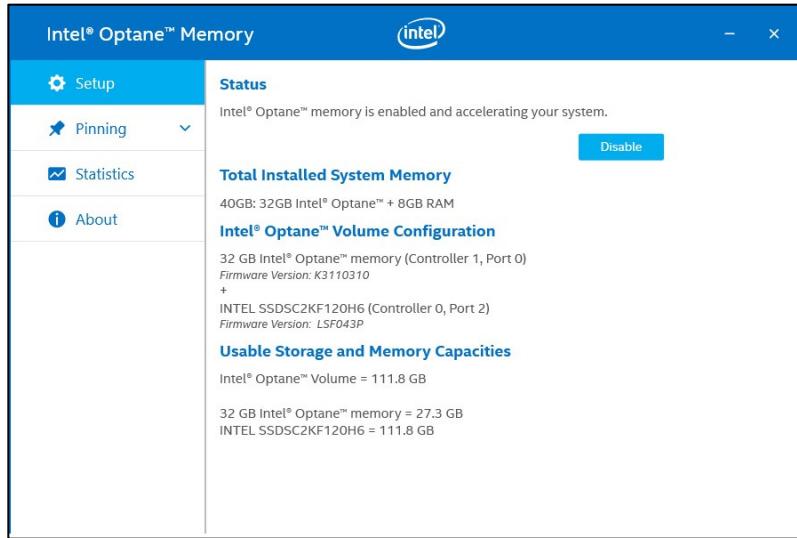
   a. If the module contains at least 32GB of Intel® Optane™ memory capacity, you may see a screen that shows some finishing details of the enabling process, just before entering the OS. This is related to the scheduling of data cache and is not supported on 16GB devices.

6. The application can be launched once the system has restarted.
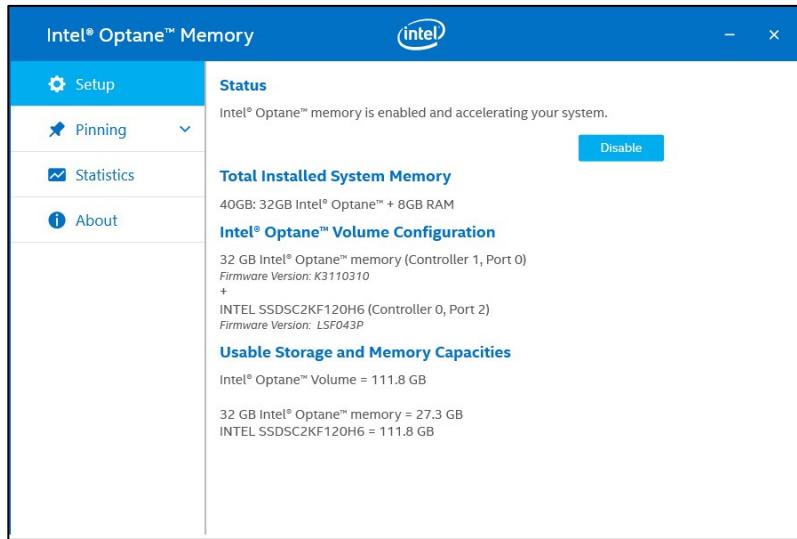
7. Once the system has rebooted, enter the application and the volume will be displayed in the 'Setup' tab.

    a. The volume will also appear in OS system related applications such as 'Device Manager' and 'Disk Management'. The individual drives will no longer be visible in these windows.
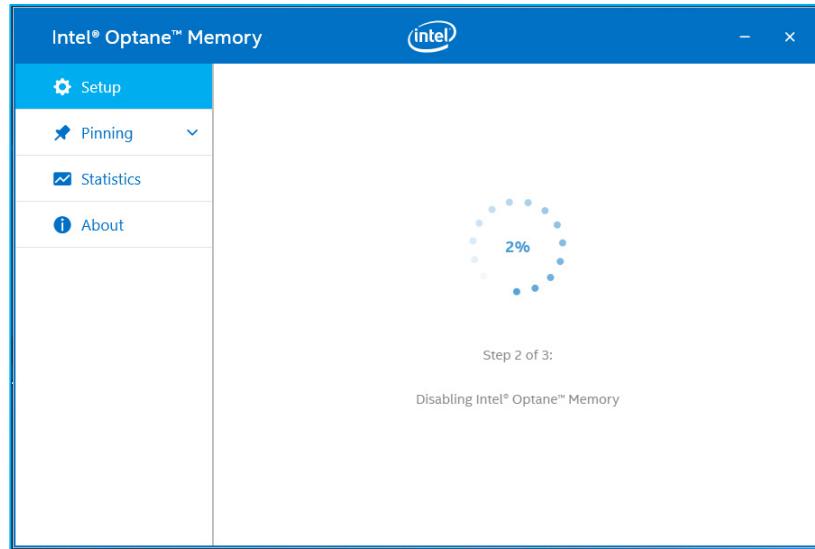
11.1.2 Disabling Acceleration
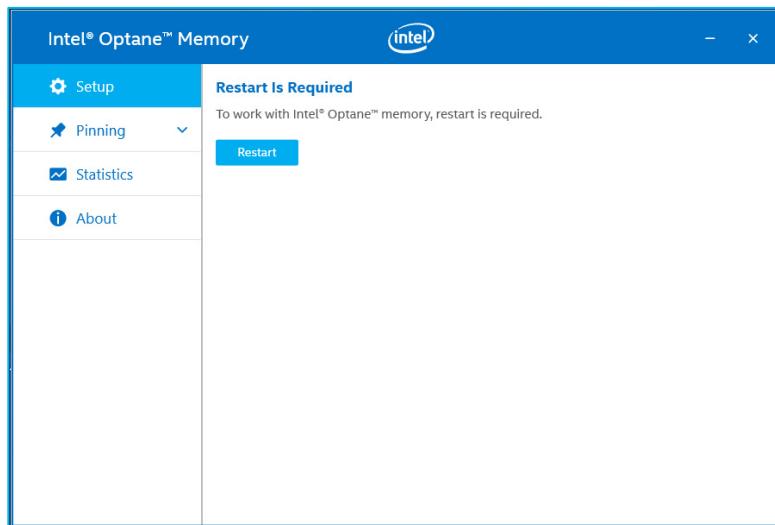
1. **Navigate** to the *Setup* tab. **Select** *Disable*.
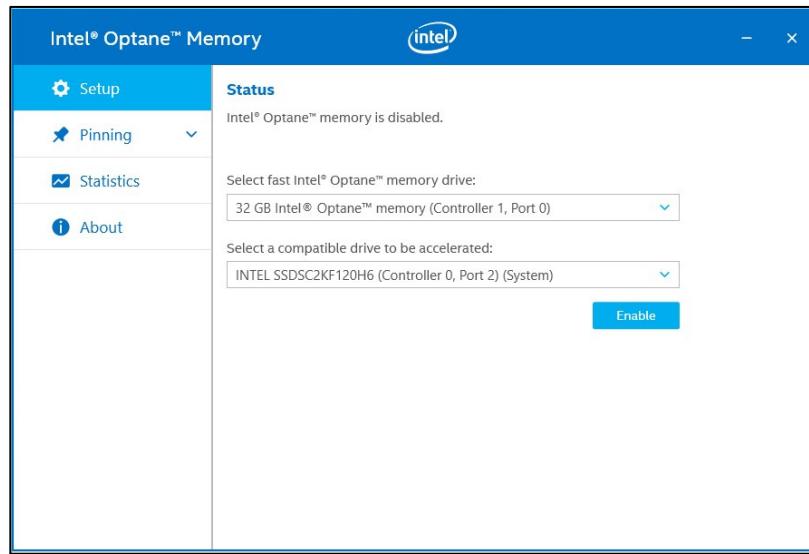
2. Acceleration is being disabled. The Intel® Optane™ memory 'fast' media and the 'slower' media are being separated (un-paired).

3. When complete, **Click** *Restart*.
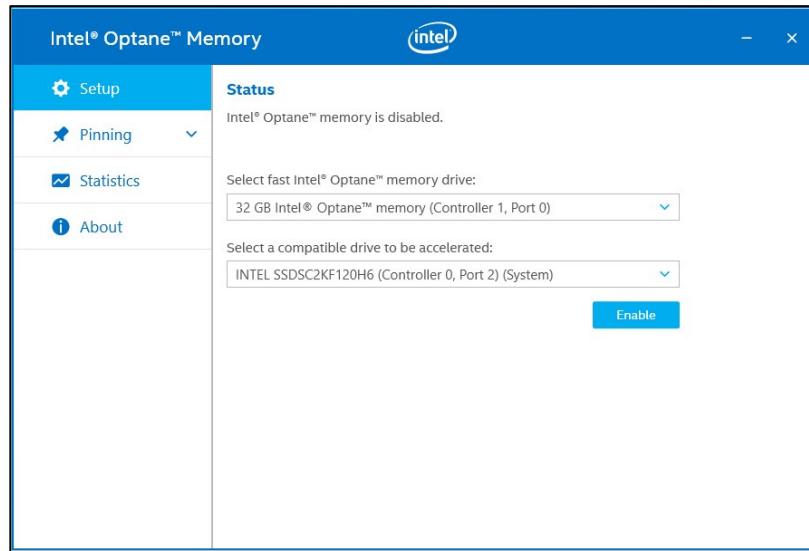
4. Once the system has rebooted to the OS, open the Intel® Optane™ Memory application and **select** the *Setup* tab and verify that the volume is no longer enabled.
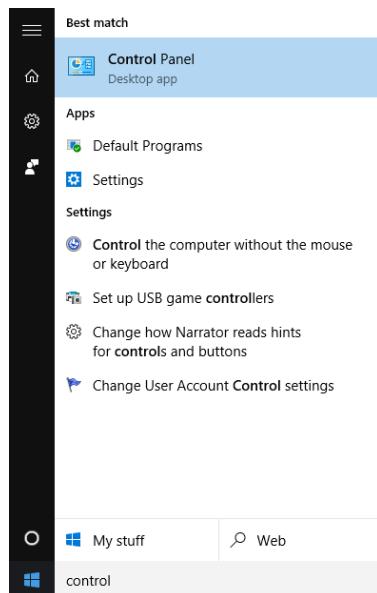
11.1.3 Uninstalling the Application
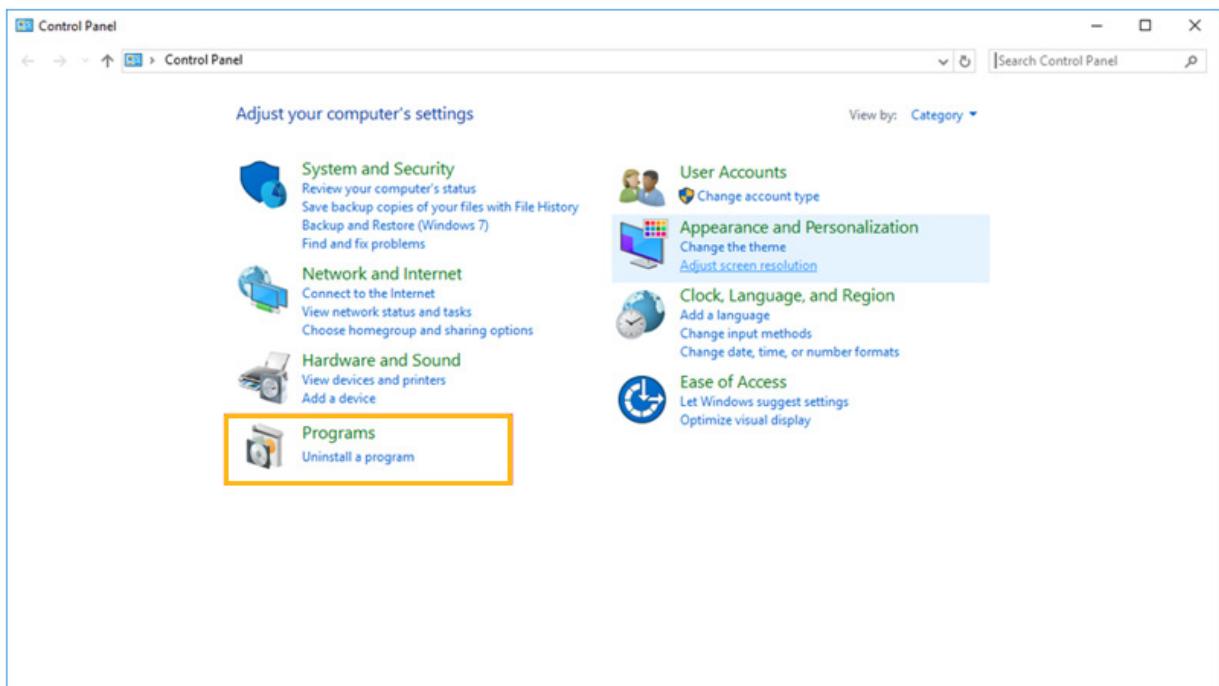
1. Verify that acceleration has been disabled before uninstalling the application.
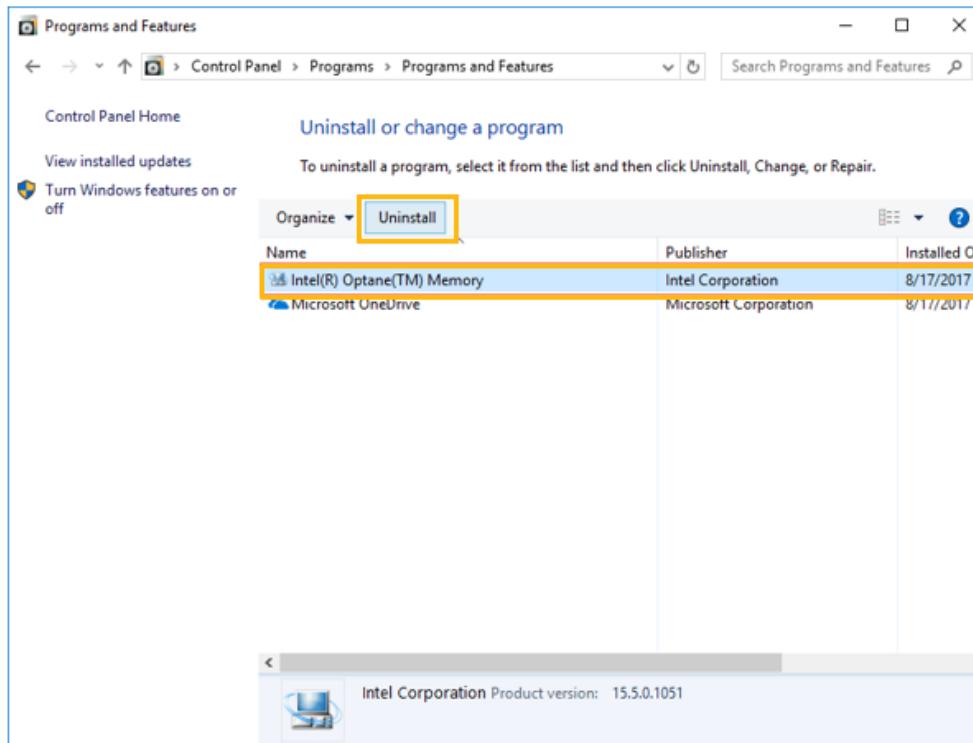
2. **Click** on the *Windows Start menu.* While the menu is open, begin **typing** *Control Panel* to search for 'Control Panel'.
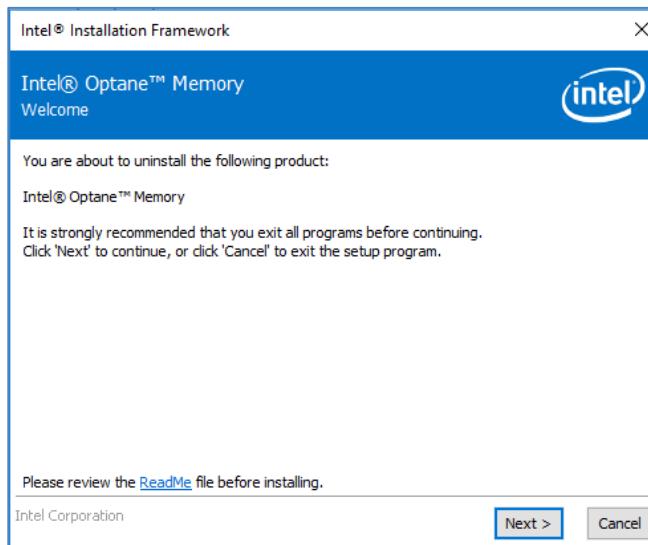
3. In the Control Panel, under 'Programs', **select** the *Uninstall a program* link.
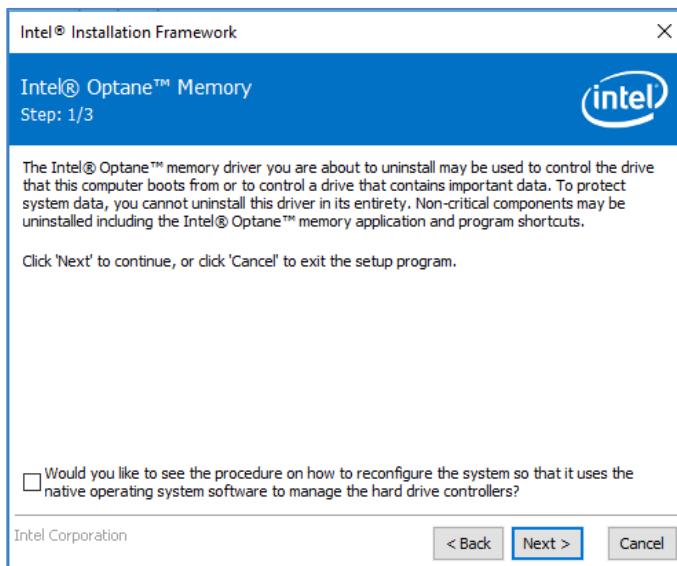
4. **Highlight** the *Intel® Optane™ Memory* application from the list. **Click** the *Uninstall* button.
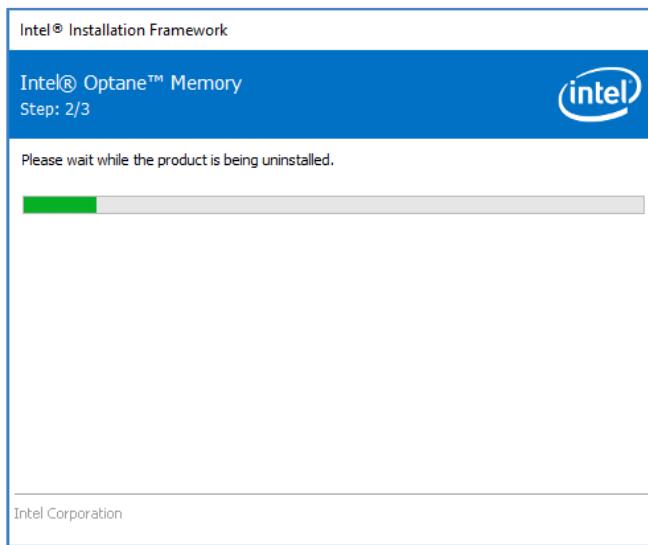
5. After clicking the control panel option to uninstall, the Intel® Optane™ Memory application window below will appear. Click 'next' to continue with uninstalling the Intel® Optane™ Memory application.
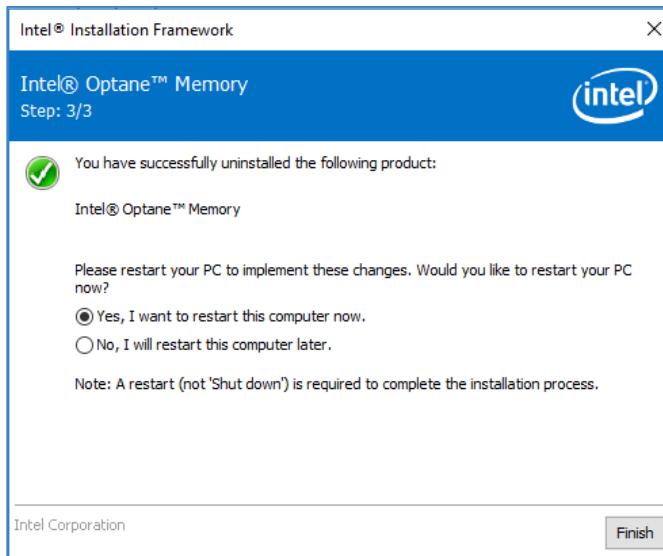
6. The following window provides information about what the Intel® Optane™ memory driver controls on the system. Click 'Next' to continue uninstalling the Intel® Optane™ Memory application.

7. The progress bar shows the status of the uninstall process.

8. A restart is required to complete the process of uninstalling the Intel® Optane™ Memory application from the platform. Please **click** *Finish* to continue and restart the system.
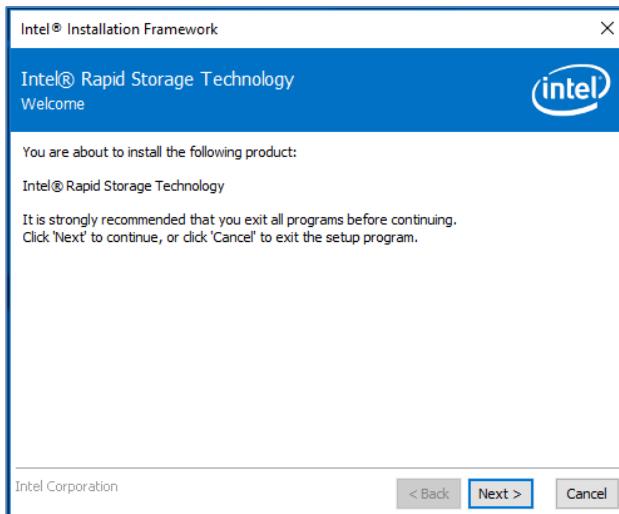
11.2 Intel® Rapid Storage Technology Application
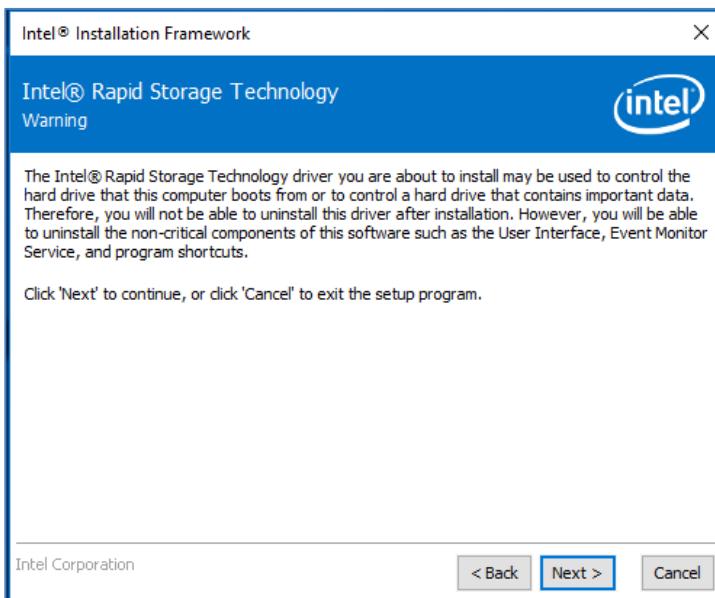
This section provides an overview of the steps to configure Intel® Optane™ memory capable devices with the Intel® Rapid Storage Technology application, on a computer with the operating system already installed, on a platform that meets the requirements outlined in Section 1.2.

The Intel® Rapid Storage Technology application supports more capabilities then just acceleration with Intel® Optane™ memory capable devices. However, this document will only focus on capabilities related to Intel® Optane™ memory.
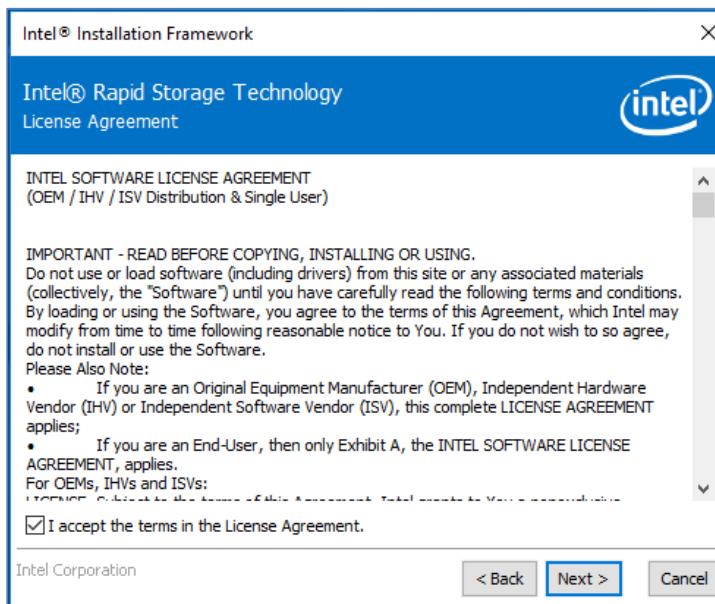
1. Go to https://downloadcenter.intel.com/download/28992?v=t and select the most recent 'SetupRST.exe' package (this includes the driver and application).

2. Run the executable, **click** *Next* to continue.
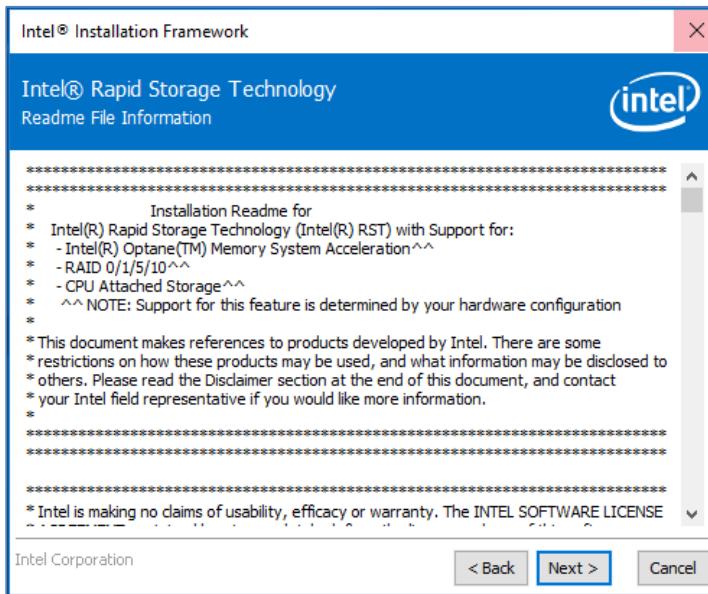
3. The following window provides a brief caution to the user that the driver itself will not be able to be uninstalled after installation completes. The user can **click** *Next* to continue the process.
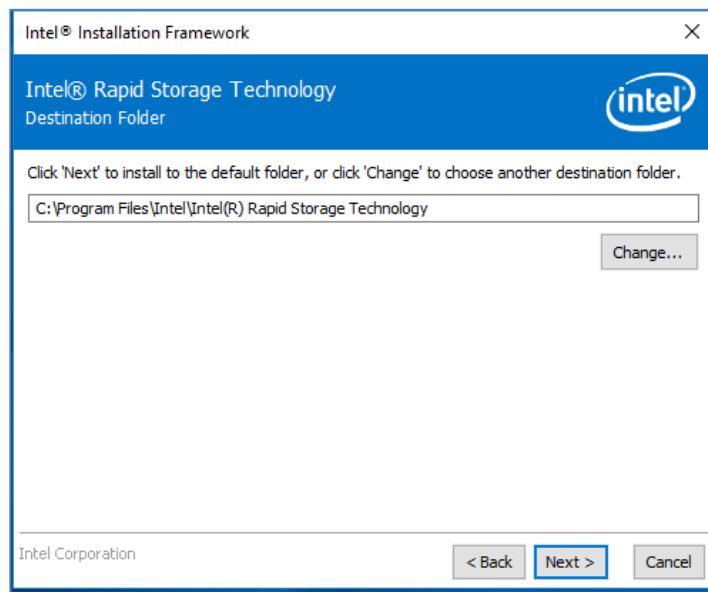
4. The following screen requires the user to read and accept the License Agreement. The user must **check** the *I accept...* box in order to **click** *Next* and continue.
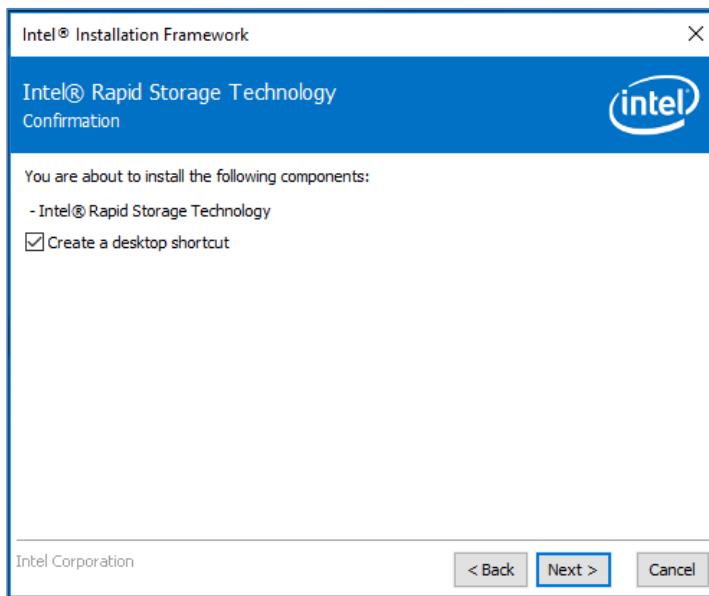
5. The following screen provides the ReadMe information regarding the options of the SetupRST.exe. The user can **click** *Next* to continue with the install.
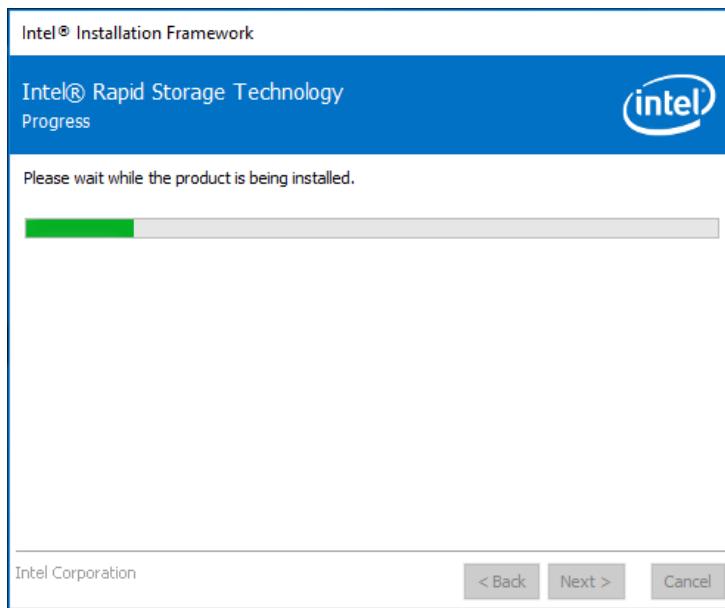
6. The following screen shows the location where the RST files will be saved to. The user can change the location by **clicking** the *Change* button, or continue the install by **clicking** *Next*.
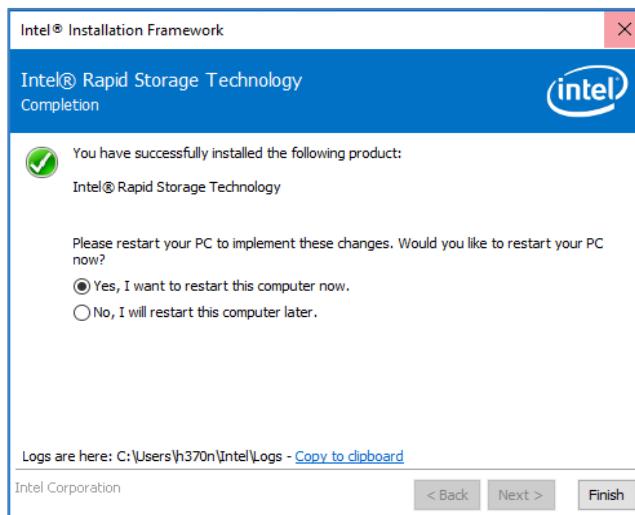
7. The following screen informs the user for a final time that the software is about to be installed. The user can choose to go 'Back', 'Cancel' out the installation or click 'Next' to continue.

8. The following screen shows the progress of the installation. No user input is required.
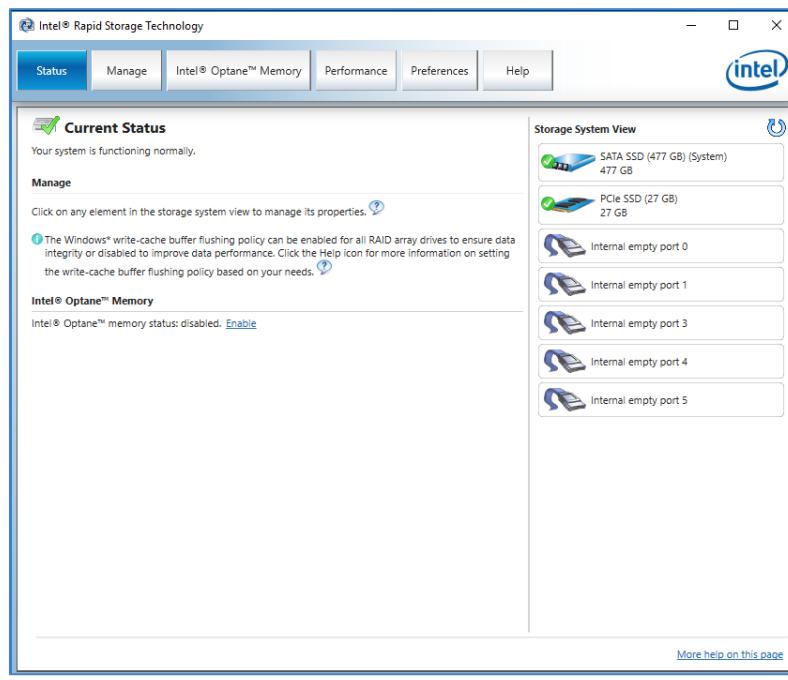
9. Once the installation process has been successful, the system will need to be restarted to complete the installation process. **Click** *Finish* to restart the system.
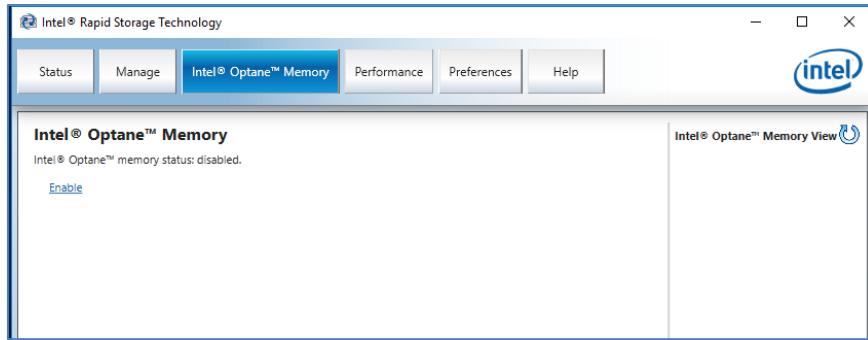
11.2.1 Enabling Acceleration
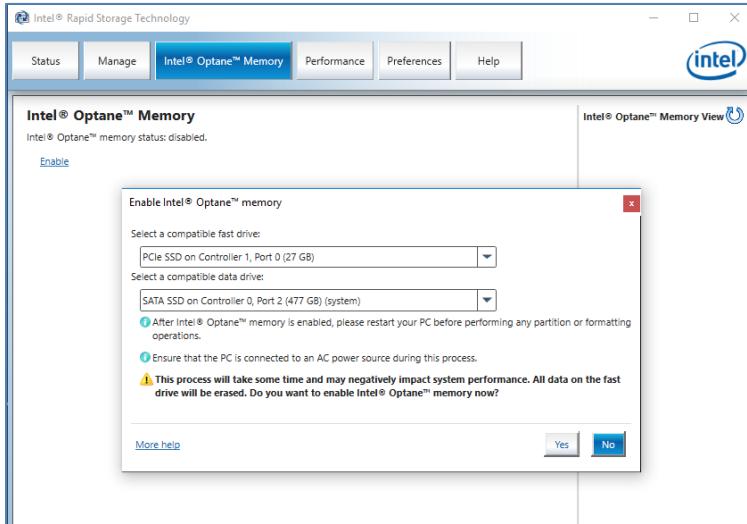
1. Acceleration can be enabled through the 'Status' page or the 'Intel® Optane™ Memory' page. Displayed is the current state of the volume. **Select** *Enable*.

   a. Under the **Storage System View** on the right, confirm that both the 'fast' media and 'slower' media are detected. If not, confirm that all of the requirements outlined in Section 1.2 have been met.
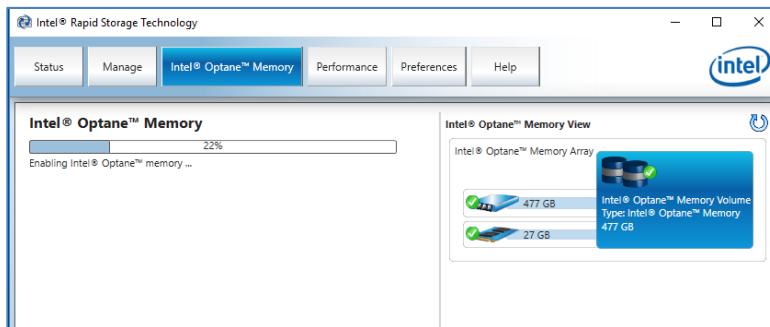
Status Page

Intel® Optane™ Memory Page
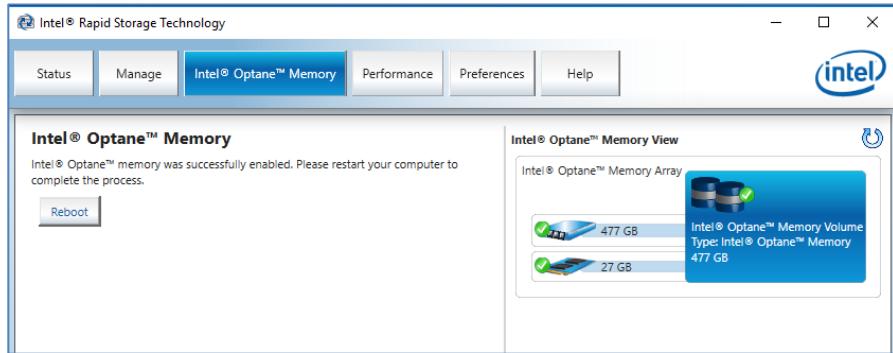
2. Under the Intel® Optane™ memory tab, the drop-down menus display the available Intel® Optane™ memory combinations that can be selected. Select the appropriate combination and **click** *Enable*.

   a. If the words (SYSTEM) appear beside the compatible drive to be accelerated, it means it is the device with the operating system installed on it
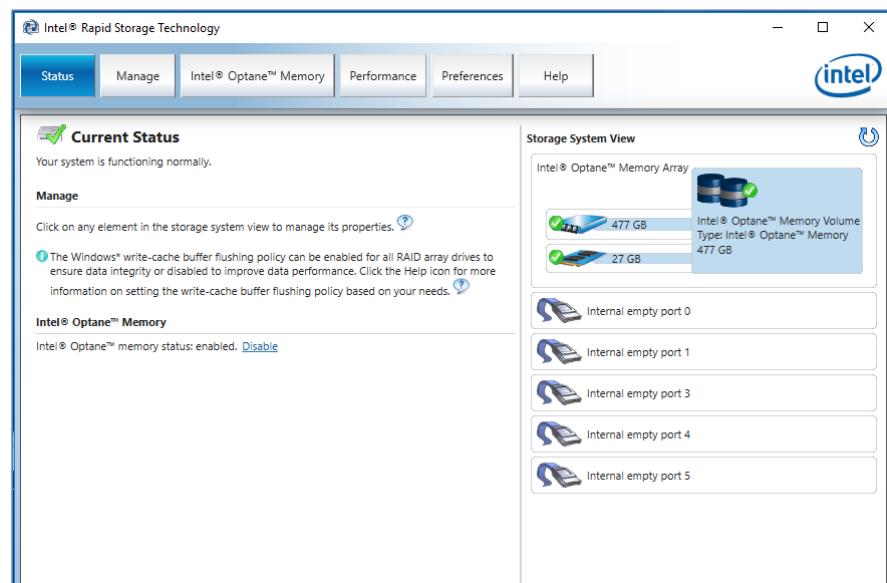
3. Acceleration is being enabled. The Intel® Optane™ memory 'fast' media and the 'slower' media are being 'paired' into a single volume.

4. Once volume creation is complete, a reboot is required. **Click** the *Reboot* button.

   a. If the module contains at least 32GB of Intel® Optane™ memory capacity, just before entering the OS you may see a screen that shows some finishing details of the enabling process. This is related to the scheduling of data cache and is not supported on 16GB devices.
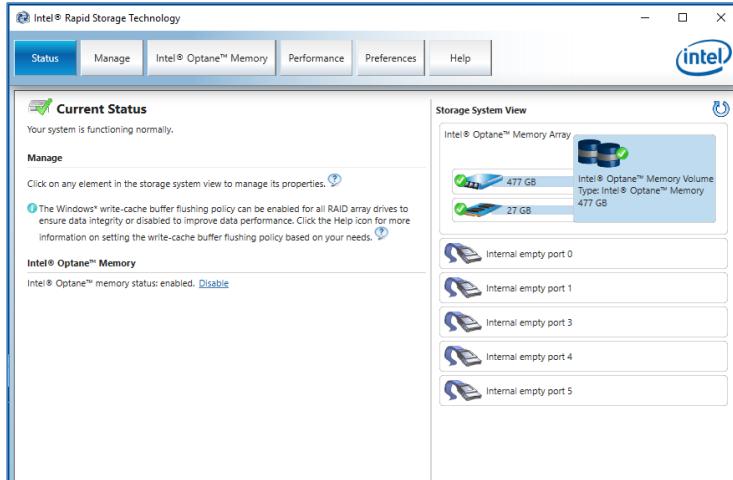
5. Once the system reboot is complete, enter the application and the volume will be shown in the 'Status' and 'Intel® Optane™ Memory' tabs.

   a. The volume will also be shown in OS system related applications such as 'Device Manager' and 'Disk Management' as well. The individual drives will no longer be visible in these windows
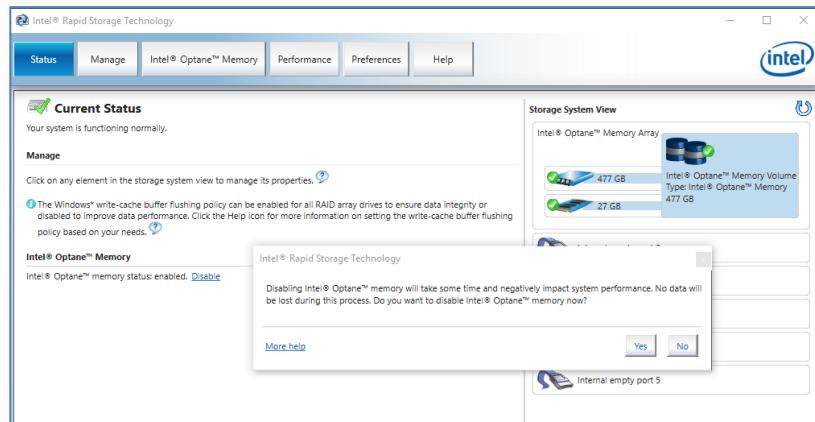
11.2.2 Disabling Acceleration
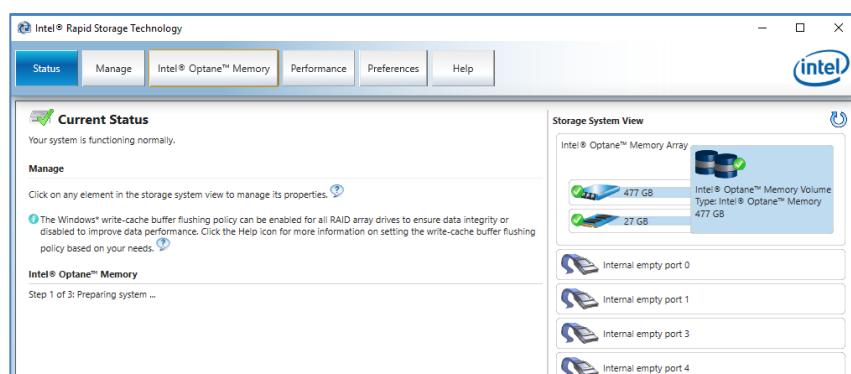
1. Acceleration can be disabled on the 'Status' or 'Intel® Optane™ Memory' tabs. On the 'Status' page, **click** the *Disable* link.


2. The user will be presented with a pop up asking to confirm that they want to disable Intel® Optane™ memory. **Click** *Yes* to disable and continue.
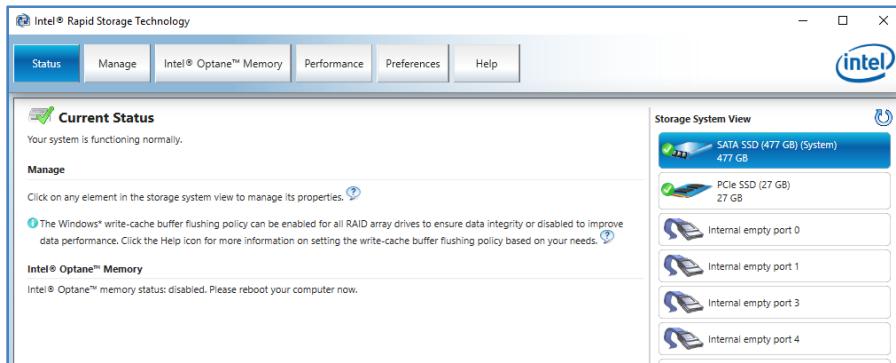

3. Acceleration is being disabled. The Intel® Optane™ memory 'fast' media and 'slower' media are being separated (un-paired).
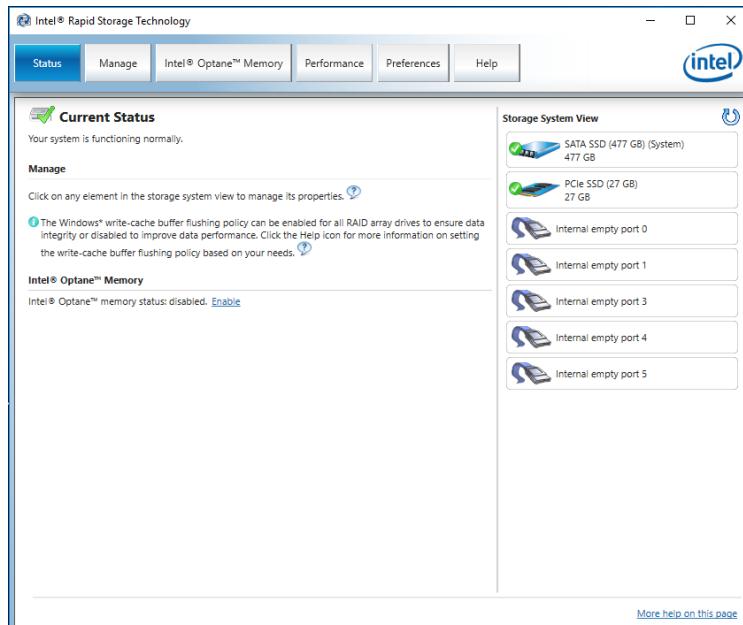
4. Once the volume is disabled, a system reboot from the Windows Start Menu is required.

    a. If using the 'Intel® Optane™ Memory' tab, a reboot button will appear.
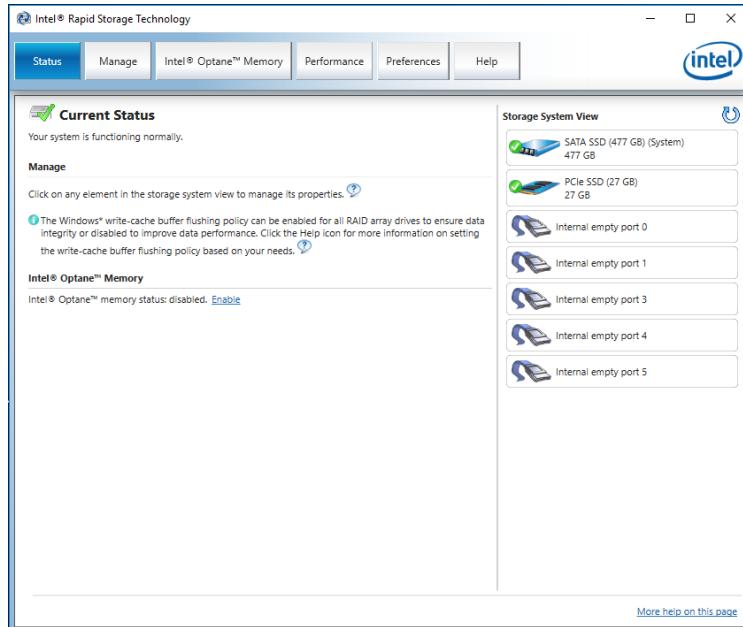

5. Once the system has rebooted into the OS, the user can open the application and verify that the volume is no longer enabled.
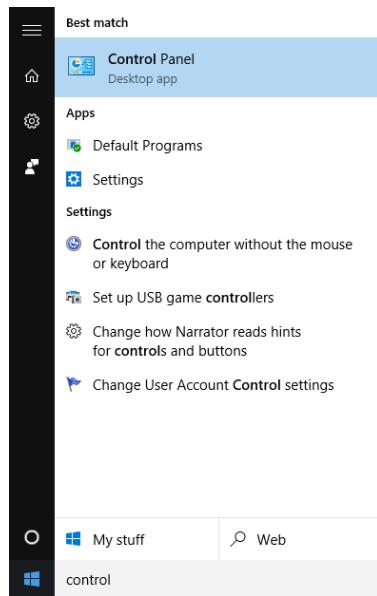
11.2.3 Uninstalling the Application
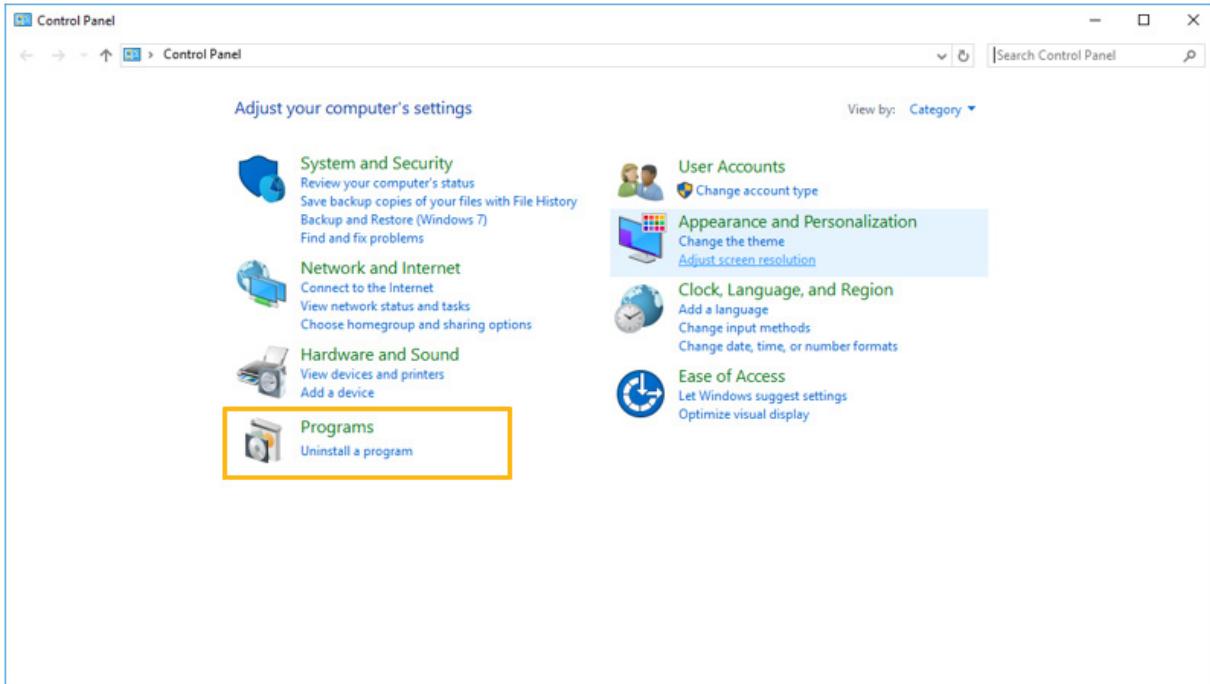
1. Verify that acceleration has been disabled before uninstalling the application.
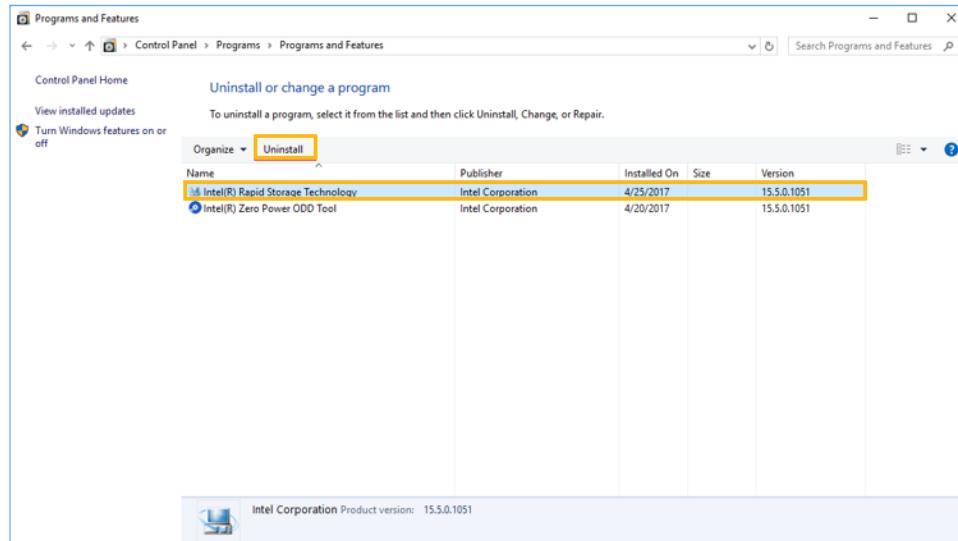
2. **Click** on the *Windows Start Menu* and search for 'Control Panel' by **typing** *Control Panel* while the menu is open.
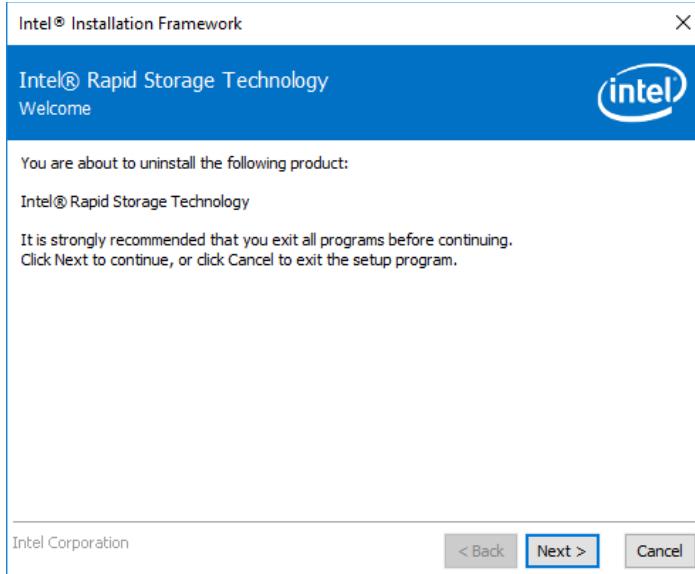
3. **Select** the *Uninstall a program* link, located under 'Programs' in the Control Panel.
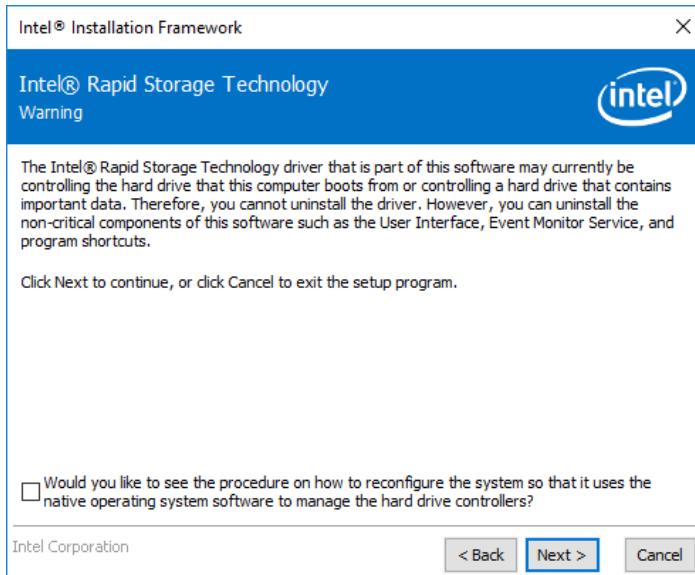

4. **Highlight** the *Intel® Rapid Storage Technology* application from the list. **Click** the *Uninstall* option.
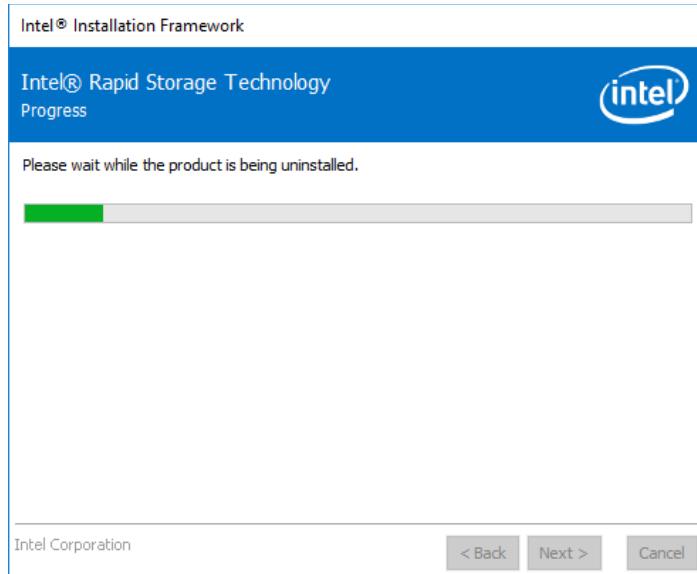
5. At this point, the Intel® RST installer will begin the uninstallation process. **Click** *Next* to continue.
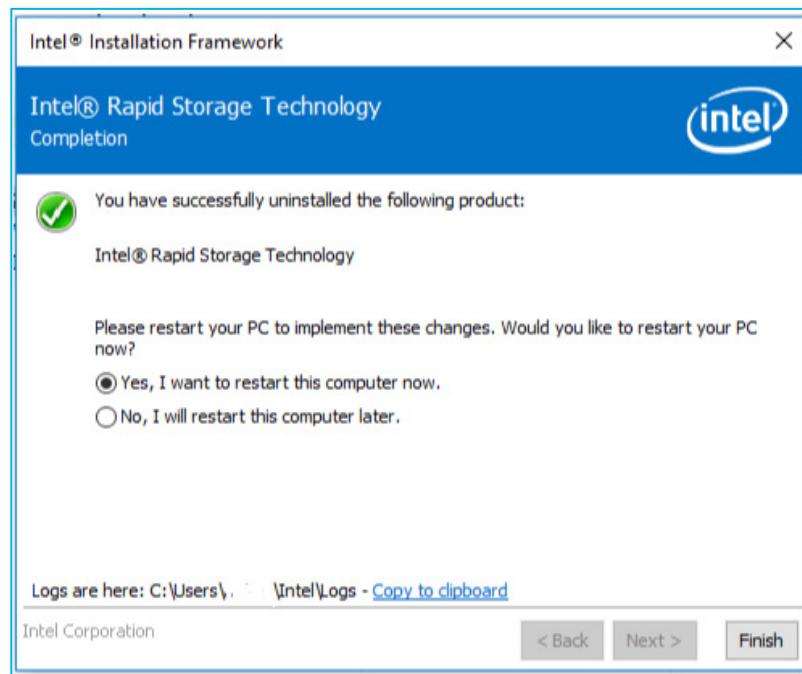
6. **Click** *Next* to continue uninstalling. The user is given the option to see the process on reconfiguring the system so that it uses the native operating system software. Most uninstalls do not require this step.

7. The next window will show a progress bar of the driver installation.

8. Once prompter, **click** the *Finish* button to complete the uninstall process. This will cause the system to restart.

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