



Intel® Memory and Storage Tool

User Guide - Public

May 2021

Revision History

Revision	Description	Revision Date
001	Initial Release Intel MAS Version 1.0.5	January 2020
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003	Added Windows Server 2019 to Section 1.2 System Requirements	June 2020
004	Intel MAS Version 1.2 includes the addition of the following commands: <ul style="list-style-type: none"> NVMe Reset NVMe Timestamp 	August 2020
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007	Intel MAS Version 1.5 <ul style="list-style-type: none"> Added drive scan, read snapshot and error injection feature Updated System Requirements Section 1.2 	January 2021
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009	Intel MAS Version 1.7 <ul style="list-style-type: none"> Added ESXi 7.0.2 support 	April 2021
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1 Introduction

This guide describes usability of the Command Line Interface Intel® Memory and Storage Tool (Intel® MAS) and provides reference on using the tool to configure and retrieve data from supported products.

Intel® MAS Summary:

- CLI based tool for interacting with Intel® SSDs and Intel® Optane™ memory devices
- Provides firmware updates to all non-OEM drives
- Supports Client and Datacenter drives
- Supports multiple Operating Systems: Windows, Linux and ESXi

1.1 Features

The Intel® Memory and Storage Tool provides a suite of capabilities for interacting with PCIe/SATA-based Intel® SSDs and Intel® Optane™ memory devices.

1.1.1 Feature Availability

Availability of features is dependent on various factors. These factors include, but are not limited to, the following:

- a. Product
- b. Product Type: Client, Datacenter
- c. Interface Type: ATA, NVMe (1.1, 1.2, 1.3)
- d. Operating System Version/Support
- e. Driver: Intel NVMe driver, Windows Inbox NVMe driver, Intel® RST driver
- f. Configuration: RAID

1.1.2 Feature Summary

The functionality includes:

- Detecting drives attached on the system
- Parsing a drive's Identify Device information
- Parsing a drive's SMART (Self-Monitoring and Reporting Technology) information
- Resizing the SSD's usable storage capacity by changing its max LBA
- Option to retrieve output in text, JSON or xml format
- Updating SSD firmware:
 - Firmware binaries for updating the firmware are embedded in the tool.
 - When displaying drive information, the tool will indicate if a new firmware is available.
- Calculating drive life expectancy (Endurance Analyzer)
- Power Governor Mode (vendor unique). Three modes are supported:
 - 0: 25-watts for PCIe NVMe devices; 40W for PCIe NVMe x8 devices; Unconstrained for SATA devices.
 - 1: 20-watts for PCIe NVMe devices; 35W for PCIe NVMe x8 devices; Typical (7-watts) for SATA devices.
 - 2: 10-watts for PCIe NVMe devices; 25W for PCIe NVMe x8 devices; Low (5-watts) for SATA devices.
- Functionality to Enable/Disable Latency Tracking
- Functionality to Parse the read and write commands from Latency Tracking logs
- End of Life notification when 15% of spare is left

The following functionality and features apply to Intel SATA drives only:

- Enabling and disabling Spread Spectrum Clocking (SSC)
- Issuing SCT Error Recover Control command
- Setting drive PHY Speed: 1.5Gbs, 3.0Gbs, and 6.0Gbs
- Setting PHY configurations:
 - 0 (Default Enterprise Settings)
 - 1 (Client Settings)
 - 2 (Alternate Enterprise Settings)

Support for SCT Feature Control:

- Write cache state
- Write cache reordering state
- Temperature logging interval
- PLI Cap test time interval (vendor unique)
- Power Governor Burst power (vendor unique)
- Power Governor Average power (vendor unique)
- Parse ATA HDA Temp (SCT command)
- Parsing PHY Counters (ATA command)
- Reading ATA General Purpose Logs (GPL) (generic)
- ATA Standby Immediate
- ATA Drive Self-Test

The following functionality applies to Intel PCIe NVMe drives only:

- Executing an NVMe Format command
- Parsing device log data
- Reading and setting temperature threshold
- Dumping NLOGS and Event Logs
- Reading and setting the SM Bus Address
- Namespace Management command support (NVMe 1.2 and later drives)

1.2 System Requirements

The Intel® Memory and Storage Tool is supported on x86/x64 processor based systems with the following operating systems:

- Windows Server 2019
- Windows Server 2016
- Windows Server 2012
- Windows Server 2012 R2
- Windows Server 2008 SP2 / R2
- Windows 8
- Windows 8.1
- Windows 10
- Red Hat Enterprise Linux (RHEL) 7.4, 7.5, 7.6, 8.0, 8.1, 8.2
- SLES 11.3, 11.4, 12, 15
- ESXi 6.0, 6.5, 6.7, 7.0, 7.0.1, 7.0.2
- Ubuntu 14.04, 16.04, 18.04, 20.04
- CentOS 7.2.1511 (Kernel 3.10.0), 7.9, 8.0, 8.1, 8.2

NOTES:

- On Windows Server 2012/2008/R2 and Windows 8/8.1/10, administrator access is required. Open a command prompt as administrator and run the tool via the commands as described in this document. Disable UAC where applicable and run the tool in a command prompt.
- On Linux systems, the tool must be run with root privileges. This can be done through either sudo or su commands. If running as a non-root user, the tool will not be able to communicate with the drive. Only basic drive information will be displayed, and no drive functions will work. There are two Linux installers: one for 32-bit systems, and one for 64-bit systems.
- On ESXi systems, the tool only works on Intel PCIe NVMe drives using the Intel ESXi NVMe driver. The user will need to set their ESXi host acceptance level to “CommunitySupported” in order to install the tool.
- On Windows Server 2012, the tool only works with Intel provided Windows driver. Click [here](#) for the latest drivers. The tool will not work with the in-box Windows NVMe driver found in server 2012 R2. The tool will return an error if this driver is used.

1.2.1 RAID Support

Supported:

- The Intel® RST RAID supports direct attached SSD SATA drives only.
- Drives attached to LSI MegaRAID adaptors

Not Supported:

- Drives behind HBAs

RAID Modes Supported:

- RAID 0
- RAID 1
- RAID 5
- VROC RAID

Other Modes Supported:

- AHCI

1.3 Supported Memory and Storage Devices

Intel® MAS Support Data Center and Client drives. The following Intel SATA/PCIe SSDs and Optane devices are recognized and supported by the Intel® Memory and Storage Tool.

Data Center Drives Supported:

- | | |
|---------------------------------------|------------------------------|
| • Intel® SSD D7-P5510 Series | • Intel® SSD DC P4501 Series |
| • Intel® SSD D7-P5500 Series | • Intel® SSD DC P4510 Series |
| • Intel® SSD D7-P5600 Series | • Intel® SSD DC P4511 Series |
| • Intel® Optane™ SSD DC P4800X Series | • Intel® SSD D7-P4512 Series |
| • Intel® Optane™ SSD DC P4801X Series | • Intel® SSD DC P4600 Series |
| • Intel® SSD DC D3600 Series | • Intel® SSD DC P4608 Series |
| • Intel® SSD DC D3700 Series | • Intel® SSD DC P4610 Series |
| • Intel® SSD DC P3100 Series | • Intel® SSD DC P4618 Series |
| • Intel® SSD DC P3320 Series | • Intel® SSD DC S3100 Series |
| • Intel® SSD DC P3500 Series | • Intel® SSD DC S3110 Series |
| • Intel® SSD DC P3520 Series | • Intel® SSD DC S3320 Series |
| • Intel® SSD DC P3600 Series | • Intel® SSD DC S3500 Series |
| • Intel® SSD DC P3608 Series | • Intel® SSD DC S3510 Series |
| • Intel® SSD DC P3700 Series | • Intel® SSD DC S3520 Series |
| • Intel® SSD DC P4101 Series | • Intel® SSD DC S3610 Series |
| • Intel® SSD D5-P4320 Series | • Intel® SSD DC S3700 Series |
| • Intel® SSD D5-P4326 Series | • Intel® SSD DC S3710 Series |
| • Intel® SSD D5-P4420 Series | • Intel® SSD DC S4500 Series |
| • Intel® SSD D5-P4436 Series | • Intel® SSD D3-S4510 Series |
| • Intel® SSD DC P4500 Series | • Intel® SSD DC S4600 Series |
| • Intel® SSD DC P4500 Series | • Intel® SSD D3-S4610 Series |

Client Drives Supported:

- Intel® Optane™ Memory H10 with Solid State Storage
- Intel® Optane™ Memory Series
- Intel® Optane™ SSD 800P Series
- Intel® Optane™ SSD 900P Series
- Intel® Optane™ SSD 905P Series
- Intel® SSD 310 Series
- Intel® SSD 311 Series
- Intel® SSD 320 Series
- Intel® SSD 330 Series
- Intel® SSD 335 Series
- Intel® SSD 510 Series
- Intel® SSD 520 Series
- Intel® SSD 525 Series
- Intel® SSD 530 Series
- Intel® SSD 535 Series
- Intel® SSD 540s Series
- Intel® SSD 545s Series
- Intel® SSD 600p Series
- Intel® SSD 660p Series
- Intel® SSD 665p Series
- Intel® SSD 710 Series
- Intel® SSD 730 Series
- Intel® SSD 750 Series
- Intel® SSD 760p Series
- Intel® SSD E 5100s Series
- Intel® SSD E 5400s Series
- Intel® SSD E 5410s Series
- Intel® SSD E 6000p Series
- Intel® SSD E 6100p Series
- Intel® SSD E 7000s Series
- Intel® SSD Pro 1500 Series
- Intel® SSD Pro 2500 Series
- Intel® SSD Pro 5400s Series
- Intel® SSD Pro 5450s Series
- Intel® SSD Pro 6000p Series
- Intel® SSD Pro 7600p Series
- Intel® SSD X18-M Series
- Intel® SSD X25-E Series
- Intel® SSD X25-M Series
- Intel® SSD X25-V Series

1.4 Document Conventions

Throughout this guide, the format of each command is documented in a gray colored text box.

- Items in [brackets] are optional.
- For options and targets, each possible value is separated by a bar, '|', meaning "or" and the default value is listed first.
- Items in (parenthesis) indicate a user supplied value.

For example, the following **set** command is interpreted as follows:

- The verb **set** can be followed by an optional modifier (help).
- The target **-intelssd** is required followed by Index or Serial number of the drive to be targeted
- It also specifies a required property Test in which valid values are Test1 or Test2.

```
IntelMAS set [-h|-help] -intelssd [(Index|SerialNumber|PhysicalPath)] Test=(Test1|Test2)
```

1.5 Running the Intel® Memory and Storage Tool

Run the Intel® Memory and Storage Tool from either a Windows administrator command prompt or a Linux terminal window. The tool is run as a single command by supplying the command and parameters immediately following the Intel® MAS executable.

```
IntelMAS show -intelssd
```

1.6 Command Syntax

The command line syntax is case insensitive and is interpreted in English-only. It follows the Distributed Management Task Force (DMTF) Server Management (SM) Command Line Protocol (CLP), or DMTF SM-CLP standard with the exception of the target portion of the command. Document number DSP0214 and can be found at <http://www.dmtf.org>.

Target specification in SM-CLP identifies CIM instances using CIM object paths. The modified syntax implemented utilizes key properties of the target without requiring a syntactically correct CIM object path. Generally, the form of a user request is:

```
IntelMAS <verb>[<options>][<targets>][<properties>]
```

A command has a single verb that represents the action to be taken. Following the verb can be one or more options that modify the action of the verb, overriding the default behavior with explicitly requested behavior.

Options generally have a short and long form (for example, -a | -all). One or more targets are normally required to indicate the object of the action. However, there are a few cases where a target is not required. Finally, zero or more properties defined as a key/value pair can be used to modify the target.

1.7 Targets

In general, if there is only one object of a specific target type, a target value is not accepted.

Unless otherwise specified, when there are multiple objects of a specific target type, not supplying a target value implies the command should operate on all targets of that type. This is the case for the show device command, which will display all devices if no target value is specified.

```
IntelMAS show -intelssd
```

The same operation can be limited to a single object by supplying a specific target value.

```
IntelMAS show -intelssd 1
```

2 Feature List

The following table list all features available in Intel® MAS. Features are listed alphabetically. Intel® MAS uses Command Line Interface (CLI). Command Syntax describes the command and command syntax needed to perform each feature. Commands can have different options and ways to specify target drive.

Further details for each command is provided in subsequent sections of this document.

2.1 Quick Command Syntax Guide for Features Table

Options	Description
<code>[-all -a]</code>	Shows all properties.
<code>[-display -d]</code>	Filters the returned properties by explicitly specifying a comma separated list of any of the properties defined in the Return Data section.
<code>[-help -h]</code>	Displays help for the command.
<code>[-output -o (text nvmlxml json)]</code>	Changes the format of the Return Data. Supported output options are: 'text' (Default), 'json', and 'nvmlxml'.
Target	Description
<code>-intelssd [(Index SerialNumber PhysicalPath Bootdrive)]</code>	Restricts output to specific Intel SSD by supplying the device's Index or Serial Number or path or Bootdrive. BootDrive option available in Windows only.

2.2 Features

Feature	Description	Command Syntax	Example
Aggregation (Threshold/Time)	Set the Aggregation Threshold/Time	<pre>set [-help -h] [-output -o (text nvmlxml json)] -intelssd (Index SerialNumber PhysicalPath) AggregationThreshold = (value)</pre> <pre>set [-help -h] [-output -o (text nvmlxml json)] -intelssd (Index SerialNumber PhysicalPath) AggregationTime = (value)</pre>	<pre>intelmas set -intelssd 1 AggregationThreshold = 128</pre> <pre>intelmas set -intelssd 1 AggregationTime = 255</pre>
Assert Log	Read the Assert Log binary and save it to the given filename. NVME only	<pre>dump [-help -h] [-destination (path)] [-output -o (text nvmlxml json)] [-intelssd [(Index SerialNumber PhysicalPath)]] -assertlog</pre>	<pre>intelmas dump -destination assertlog_binary.bin -intelssd 1 -assertlog</pre>
Bridge NLog	Read the Bridge NLog binary and save it to the given filename. Selected NVME only	<pre>dump [-help -h] [-destination (path)] [-output -o (text nvmlxml json)] [-intelssd [(Index SerialNumber PhysicalPath)]] -bridgenlog</pre>	<pre>intelmas dump -destination apl_bridge_binary.bin -intelssd 1 -bridgenlog</pre>

Feature	Description	Command Syntax	Example
Delete	Delete all the data on the selected device. To by-pass the prompt, specify the -force option.	delete [-help -h] [-force -f] [-output -o (text nvxml json)] -intelssd (Index SerialNumber PhysicalPath)	intelmas delete -intelssd 1
DIPM	Disable/Enable drive's DIPM feature. ATA only	set [-help -h] [-output -o (text nvxml json)] -intelssd (Index SerialNumber PhysicalPath) DIPMEnabled = ('true' 'false')	intelmas set -intelssd 1 DIPMEnabled = false intelmas set -intelssd 1 DIPMEnabled = true
Drive Index	Display information of selected drive by index.	show [-help -h] [-display -d (Property1,...)] [-all -a] [-output -o (text nvxml json)] -intelssd [(Index SerialNumber PhysicalPath)]	intelmas show -intelssd 1
Drive List	Display a list of attached drives to the screen.	show [-help -h] [-display -d (Property1,...)] [-all -a] [-output -o (text nvxml json)] -intelssd [(Index SerialNumber PhysicalPath)]	intelmas show -intelssd
Drive Path	Display information of selected drive by drive path.	show [-help -h] [-display -d (Property1,...)] [-all -a] [-output -o (text nvxml json)] -intelssd [(Index SerialNumber PhysicalPath)]	intelmas show -intelssd \\.\PHYSICALDRIVE1
Drive Serial	Display information of selected drive by serial number.	show [-help -h] [-display -d (Property1,...)] [-all -a] [-output -o (text nvxml json)] -intelssd [(Index SerialNumber PhysicalPath)]	intelmas show -intelssd CVP0893749287GN
Drive Scan	Scan the drive for Data Integrity, Read Scans, or Logs.	start [-help -h] [-output -o (text nvxml json)] -scan [(DataIntegrity ReadScan Logs)] [-intelssd [(Index SerialNumber PhysicalPath)]] [IncludeOS = (true false)] [FullScan = (true false)] [Path = ((drive letter))] [DirectoryPath = ((file path))] [IncludeSystemInfo = (true false)]	intelmas start -scan Logs -intelssd 1
eDrive (Set)	Enable eDrive support on the device. Warning: once enabled, eDrive support cannot be disabled. Selected drives only	set [-help -h] [-force -f] [-output -o (text nvxml json)] -intelssd (Index SerialNumber PhysicalPath) eDriveSupported = (true)	intelmas set -intelssd 1 eDriveSupported = true
Endurance Analyzer	Run the endurance analyzer calculation to determine drives life expectancy.	set [-help -h] [-output -o (text nvxml json)] -intelssd (Index SerialNumber PhysicalPath) EnduranceAnalyzer = ('reset')	intelmas set -intelssd 1 EnduranceAnalyzer = reset

Feature	Description	Command Syntax	Example
Error Injection	Inject panic error into an OCP enabled drive.	Set [-help -h] [-output -o (text nvmxml json)] -intelssd (Index SerialNumber PhysicalPath) -ErrorInjection NumberOfErrorInjections = (value) ErrorInjectionDataStructEntry = ((tilde separated entry list))	intelmas set -intelssd 1 -ErrorInjection NumberOfErrorInjections = 2 ErrorInjectionDataStructEntry = 1 0 5 2~0 0 9 A5
Error Recovery Timer (Read/Write)	Set the selected drive's current error read and write recovery timers. ATA only	show [-help -h] [-display -d (Property1,...)] [-all -a] [-output -o (text nvmxml json)] -intelssd (Index SerialNumber PhysicalPath) set [-help -h] [-output -o (text nvmxml json)] -intelssd (Index SerialNumber PhysicalPath) WriteErrorRecoveryTimer = (0-65535)	intelmas show -d ReadErrorRecoveryTimer -intelssd 1 intelmas show -d WriteErrorRecoveryTimer -intelssd 1 intelmas set -intelssd 1 ReadErrorRecoveryTimer = 2 intelmas set -intelssd 1 WriteErrorRecoveryTimer = 5
Event Log	Read the Event Log binary and save it to the given filename.	dump [-help -h] [-destination (path)] [-output -o (text nvmxml json)] [-intelssd [(Index SerialNumber PhysicalPath)]] -eventlog	intelmas dump -destination eventlog_binary.bin -intelssd 1 -eventlog
Firmware Activate and Configuration	Activate the firmware on the selected drive (NVMe only). Configure activation notification Performed after firmware update with source option NVMe only	load [-help -h] [-force -f] [-source (path)] [-output -o (text nvmxml json)] -intelssd (Index SerialNumber PhysicalPath) -firmwareactivate [FirmwareSlot = ('1 2 3 4 5 6 7')] [CommitAction = (2 3)] set [-help -h] [-output -o (text nvmxml json)] -intelssd (Index SerialNumber PhysicalPath) FirmwareActivationNoticesConfiguration = ('true' 'false')	intelmas load -intelssd 1 -firmwareactivate FirmwareSlot = 1 CommitAction = 2 intelmas set -intelssd 1 FirmwareActivationNoticesConfiguration = true
Firmware Update (load)	Update the firmware of the selected drive (if possible).	Load -intelssd (Index SerialNumber PhysicalPath) load [-help -h] [-force -f] [-source (path)] [-output -o (text nvmxml json)] -intelssd (Index SerialNumber PhysicalPath) [FirmwareSlot = ('1 2 3 4 5 6 7')] [CommitAction = (0 1 2 3)]	intelmas load -intelssd 1 intelmas load -source firmwareBinaryFile.bin -intelssd 1 FirmwareSlot = 1 CommitAction = 0
Format	NVMe Format the selected drive. NVMe only.	start [-help -h] [-force -f] [-output -o (text nvmxml json)] -intelssd (Index SerialNumber PhysicalPath) -nvmeformat [-namespace (namespace id)] [LBAFormat = (0-NumLBAFormats)] [SecureEraseSetting = (0 1 2)] [ProtectionInformation = (0 1)] [MetadataSettings = (0 1)]	intelmas start -intelssd 1 -nvmeformat SecureEraseSetting = 1 ProtectionInformation = 2 MetadataSettings = 0
General Purpose Log (GPL)	Read the general purpose log binary and save it to the given filename. ATA only	dump [-help -h] [-destination (path)] [-output -o (text nvmxml json)] [-intelssd [(Index SerialNumber PhysicalPath)]] -gpl (log address) [PageNum = [(page #)]] [SectorCount = [(sectors)]]	intelmas dump -destination supportedGPL.bin -intelssd 1 -gpl 0 PageNum = 0 SectorCount = 1

Feature	Description	Command Syntax	Example
Get Feature	Display the given NVMe feature ID data to the screen.	show [-help -h] [-display -d (Property1,...)] [-all -a] [-output -o (text nvmxml json)] -intelssd [(Index SerialNumber PhysicalPath)] -getfeature (feature Id -hex)	intelmas show -intelssd 1 -getfeature 0x2 intelmas show -intelssd 1 -getfeature 0xA
HDA Temperature	Display selected drive's HDA Temperature data. ATA only	show [-help -h] [-output -o (text nvmxml json)] -intelssd [(Index SerialNumber PhysicalPath)] -hdtemperature	intelmas show -intelssd 1 -hdtemperature
Health (sensor/warning)	Show properties related to device health sensors. Enable Health Critical Warnings.	show [-help -h] [-display -d (Property1,...)] [-all -a] [-output -o (text nvmxml json)] [-intelssd [(Index SerialNumber PhysicalPath)]] -sensor set [-help -h] [-output -o (text nvmxml json)] -intelssd (Index SerialNumber PhysicalPath) SMARTHealthCriticalWarningsConfiguration = (0-255)	intelmas show -intelssd 1 -sensor intelmas set -intelssd 1 -SMARTHealthCriticalWarningsConfiguration = 255
Help	Display the help string and exit. All other arguments will be ignored.	help [-help -h] [-output -o (text nvmxml json)] [Name = (name)] [verb = (verb)]	intelmas help name = help intelmas help verb = help
Identify	Show the device identify structures. Use the -nvmecontroller and -namespace targets to select specific identify structures for NVMe devices.	show [-help -h] [-output -o (text nvmxml json)] -identify [-namespace (integer 'attached' 'allocated')] [-nvmecontroller] [-intelssd [(Index SerialNumber PhysicalPath)]]	intelmas show -intelssd 1 -identify intelmas show -intelssd 1 -identify -namespace 1 intelmas show -intelssd 1 -identify -namespace attached intelmas show -intelssd 1 -identify -namespace allocated
Latency Tracking	Display the Latency tracking status. Enable or disable the device's Latency Tracking feature. Selected drives only	show [-help -h] [-output -o (text nvmxml json)] -latencystatistics ('reads' 'writes') [-intelssd [(Index SerialNumber PhysicalPath)]] set [-help -h] [-output -o (text nvmxml json)] -intelssd (Index SerialNumber PhysicalPath) LatencyTrackingEnabled = (true false)	intelmas show -intelssd 1 -latencystatistics intelmas show -intelssd 1 -latencystatistics reads intelmas show -intelssd 1 -latencystatistics writes intelmas set -intelssd 1 LatencyTrackingEnabled=true

Feature	Description	Command Syntax	Example
LED Activity	Display the selected drive's LED activity settings. Selected drives only	show [-help -h] [-display -d (Property1,...)] [-all -a] [-output -o (text nvmxml json)] [-intelssd [(Index SerialNumber PhysicalPath)]] -led set [-help -h] [-output -o (text nvmxml json)] -intelssd (Index SerialNumber PhysicalPath) -led [IdleState = (on off)] [DurationBase = (25 50)] [FormatOnMultiplier = (0-15)] [FormatOffMultiplier = (0-15)] [IoOffMultiplier = (0-15)] [IoOnMultiplier = (0-15)]	intelmas show -intelssd 1 -led intelmas set -intelssd 1 -led IdleState = on intelmas set -intelssd 1 -led DurationBase = 25 intelmas set -intelssd 1 -led FormatOnMultiplier = 5 intelmas set -intelssd 1 -led FormatOffMultiplier = 5 intelmas set -intelssd 1 -led IoOnMultiplier = 5 intelmas set -intelssd 1 -led IoOffMultiplier = 5
License	Display the tool's software license.	version [-all -a] [-display -d (Property1,...)] [-help -h] [-output -o (text nvmxml json)]	intelmas version -d license
Max Address	Set the drive's maximum LBA value. Caution: Resizes the drive	set [-help -h] [-output -o (text nvmxml json)] -intelssd (Index SerialNumber PhysicalPath) MaximumLBA = (numGB 1-100% LBA 'native')	intelmas set -intelssd 1 MaximumLBA = native intelmas set -intelssd 1 MaximumLBA = 50GB intelmas set -intelssd 1 MaximumLBA = 25% intelmas set -intelssd 1 MaximumLBA = 4097151
Namespace (Attach/Create Delete/Detach Notification)	Configure the specified namespace ID to the given controller ID. NVMe only	attach [-help -h] [-output -o (text nvmxml json)] -intelssd (Index SerialNumber PhysicalPath) -namespace (namespace id) [-nvmecontroller (controller ID integer)] create [-help -h] [-output -o (text nvmxml json)] -intelssd (Index SerialNumber PhysicalPath) -namespace Size = (blocks) [LBAFormat = (0-NumLBAFormats)] [ProtectionInformation = (0 1)] [MultiPathIoCapabilities = (0 1)] delete [-help -h] [-force -f] [-output -o (text nvmxml json)] -intelssd (Index SerialNumber PhysicalPath) -namespace (namespace id) detach [-help -h] [-force -f] [-output -o (text nvmxml json)] -intelssd (Index SerialNumber PhysicalPath) -namespace (namespace id) set [-help -h] [-output -o (text nvmxml json)] -intelssd (Index SerialNumber PhysicalPath) NamespaceAttributeNoticesConfiguration = ('true' 'false')	intelmas attach -intelssd 1 -namespace 1 -nvmecontroller 0 intelmas create -intelssd 1 -namespace Size = 12345 LBAFormat = 0 ProtectionInformation = 1 MultiPathIoCapabilities = 1 intelmas delete -intelssd 1 -namespace 1 intelmas detach -intelssd 1 -namespace 1 intelmas set -intelssd 1 NamespaceAttributeNoticesConfiguration = true

Feature	Description	Command Syntax	Example
NCQ Support (Enable/Disable)	Set the NCQ bit in the identify block Limitation: ATA DC S3500 (WL_HD) & S3700 (TV) only command	set [-help -h] [-output -o (text nvmxml json)] -intelssd (Index SerialNumber PhysicalPath) -ncqsupport (enable disable)	intelmas set -intelssd 1 -ncqsupport enable intelmas set -intelssd 1 -ncqsupport disable
NLog	Read the NLog binary and save it to the given filename.	dump [-help -h] [-destination (path)] [-output -o (text nvmxml json)] [-intelssd [(Index SerialNumber PhysicalPath)]] -nlog	intelmas dump -destination nlog_binary.bin -intelssd 1 -nlog
NVMe Controller (Show)	Show the devices list of controllers. Use the -namespace target to list controllers attached to that given namespace ID. NVMe only	show [-help -h] [-output -o (text nvmxml json)] [-intelssd [(Index SerialNumber PhysicalPath)]] [-namespace (namespace id)] -nvmecontroller	intelmas show -intelssd 1 -namespace 1 -nvmecontroller
NVMe Get Feature	Show the attributes of the NVMe feature specified (denoted by feature id).	show [-help -h] [-display -d (Property1,...)] [-all -a] [-output -o (text nvmxml json)] -intelssd (Index SerialNumber PhysicalPath) -getfeature (feature id) [-namespace (namespace id)] [Select = ('current' 'default' 'saved' 'capabilities')]	intelmas show -intelssd 1 -getfeature 0x1
NVMe Format	Issue an NVMe format to the selected drive. To by-pass the prompt, specify the -force option. NVMe only	start [-help -h] [-force -f] [-output -o (text nvmxml json)] -intelssd (Index SerialNumber PhysicalPath) -nvmeformat [-namespace (namespace id)] [LBAFormat = (0-NumLBFormats)] [SecureEraseSetting = (0 1 2)] [ProtectionInformation = (0 1)] [MetadataSettings = (0 1)]	intelmas start -intelssd 1 -nvmeformat -namespace 1 SecureEraseSetting = 0
NVMe Log (Show)	Display the given NVMe log data to the screen or save log binary to file. NVMe only	show [-help -h] [-output -o (text nvmxml json)] [-intelssd [(Index SerialNumber PhysicalPath)]] -nvme log [('CommandEffectsLog' 'ChangedNamespaceList' 'ErrorInfo' 'SmartHealthInfo' 'FirmwareSlotInfo' 'TemperatureStatistics' 'QueueMetrics')]	intelmas show -intelssd 1 -nvme log SmartHealthInfo
NVMe Reset	Performs an NVMe reset on the targeted NVMe controller	reset [-help -h] [-output -o (text nvmxml json)] -intelssd (Index SerialNumber PhysicalPath) -nvmecontroller	IntelMas reset -intelssd 1 -nvmecontroller

Feature	Description	Command Syntax	Example
NVMe Timestamp	<p>Returns the current timestamp value for the targeted controller.</p> <p>Sets the timestamp value in the controller.</p> <p>Note: Units are in milliseconds.</p>	<p>ShowTimestamp:</p> <pre>show [-help -h] [-output -o (text nvmxml json)] -intelssd (Index SerialNumber PhysicalPath) -timestamp</pre> <p>SetTimestamp:</p> <pre>set [-help -h] [-output -o (text nvmxml json)] -intelssd (Index SerialNumber PhysicalPath) -timestamp (value)</pre>	<p>IntelMAS show -timestamp -intelssd 1</p> <p>IntelMAS set -timestamp 0 -intelssd 1</p>
Optimizer	Optimizes the selected drive. Used to increase drive performance.	<pre>start [-help -h] [-output -o (text nvmxml json)] -intelssd (Index SerialNumber PhysicalPath) -optimizer [-partition (id)]</pre>	IntelMAS start -intelssd 3 -optimizer
Performance	Show properties related to device performance metrics.	<pre>show [-help -h] [-display -d (Property1,...)] [-all -a] [-output -o (text nvmxml json)] [-intelssd [(Index SerialNumber PhysicalPath)]] -performance</pre>	intelmas show -intelssd 1 -performance
Performance Booster	<p>Boost performance of SSD by flushing cache. User can start, stop, or track progress of cache flushing feature.</p> <p>Selected drives only</p>	<pre>start [-help -h] [-output -o (text nvmxml json)] -intelssd (Index SerialNumber PhysicalPath) -PerformanceBooster</pre> <pre>stop [-help -h] [-output -o (text nvmxml json)] -intelssd (Index SerialNumber PhysicalPath) -PerformanceBooster</pre> <pre>show [-help -h] [-output -o (text nvmxml json)] [-intelssd [(Index SerialNumber PhysicalPath)]] -nvmelog [(['CommandEffectsLog' 'ChangedNamespaces' 'ErrorInfo' 'SmartHealthInfo' 'FirmwareSlotInfo' 'TemperatureStatistics' 'QueueMetrics' 'PerformanceBooster'])]</pre>	<p>intelmas start -intelssd 1 -PerformanceBooster</p> <p>intelmas stop -intelssd 1 -PerformanceBooster</p> <p>intelmas show -intelssd 1 -nvmelog PerformanceBooster</p>
Phy Speed Configuration	<p>Display the PHY Counters data to the screen. Set the drive's PHY settings. Set the drive's negotiated Serial ATA signal speed.</p> <p>ATA only</p>	<pre>show [-help -h] [-output -o (text nvmxml json)] -phycounters [-intelssd [(Index SerialNumber PhysicalPath)]]</pre> <pre>set [-help -h] [-output -o (text nvmxml json)] -intelssd (Index SerialNumber PhysicalPath) PhyConfig = (0 1 2 3)</pre> <pre>set [-help -h] [-output -o (text nvmxml json)] -intelssd (Index SerialNumber PhysicalPath) PhySpeed = (1.5 3 6)</pre>	<p>intelmas show -phycounters -intelssd 1</p> <p>intelmas set -intelssd 1 PhyConfig = 1</p> <p>intelmas set -intelssd 1 PhySpeed = 1.5</p>

Feature	Description	Command Syntax	Example
Physical Sector Size	Display the selected drives physical sector size to the screen. ATA only Caution: Changes drive sector size	set [-help -h] [-output -o (text nvmxml json)] -intelssd (Index SerialNumber PhysicalPath) PhysicalSectorSize = (512 4096)	intelmas set -intelssd PhysicalSectorSize = 512
PLI Test Time Interval	Display the selected drive's PLI test time interval, and option flag. ATA only	show [-help -h] [-display -d (Property1,...)] [-all -a] [-output -o (text nvmxml json)] -intelssd [(Index SerialNumber PhysicalPath)] set [-help -h] [-output -o (text nvmxml json)] -intelssd (Index SerialNumber PhysicalPath) PLITestTimeInterval = (0-6)	intelmas show -d PLITestTimeInterval -intelssd 1 intelmas set -intelssd 1 PLITestTimeInterval = 2
Power Governor Average	Display the selected drive's power governor average power setting.	show [-help -h] [-display -d (Property1,...)] [-all -a] [-output -o (text nvmxml json)] -intelssd [(Index SerialNumber PhysicalPath)]	intelmas show -d PowerGovernorAveragePower -intelssd 1
Power Governor (Burst/Mode)	Display the selected drive's power governor burst power setting. Set the device's Power Governor Mode. Supports SATA and NVMe devices.	show [-help -h] [-display -d (Property1,...)] [-all -a] [-output -o (text nvmxml json)] -intelssd [(Index SerialNumber PhysicalPath)] set [-help -h] [-output -o (text nvmxml json)] -intelssd (Index SerialNumber PhysicalPath) PowerGovernorMode = (0 1 2)	intelmas show -d PowerGovernorBurstPower -intelssd 1 intelmas show -d PowerGovernorMode -intelssd 1
Psid Revert	Issue a PSID revert to an Opal activated device. Caution: Erases your password if forgotten. Data loss	start [-help -h] [-output -o (text nvmxml json)] -intelssd (Index SerialNumber PhysicalPath) -psidrevert (psid)	intelmas start -intelssd 1 -psidrevert 987654321
Read System Snapshot	Read the system snapshot from the device and save it to a binary file.	Dump [-help -h] [-destination (path)] [-output -o (text nvmxml json)] -intelssd (Index SerialNumber PhysicalPath) -SystemSnapshot	intelmas dump -intelssd 1 -systemsnapshot

Feature	Description	Command Syntax	Example
Sanitize	Erase all accessible storage.	start [-help -h] [-force -f] [-output -o (text nvmxml json)] -intelssd (Index SerialNumber PhysicalPath) -sanitize [(block crypto overwrite exit_failure)] [NoDeallocateAfterSanitize = (true false)] [OverwriteInvertPattern = (true false)] [OverwritePassCount = (integer)] [AllowUnrestrictedExit = (true false)] [OverwritePattern = (32-bit hex pattern)] [ReturnImmediately = (true false)]	intelmas start -intelssd 1 -sanitize
Self Test	Execute a drive self-test routine on the selected drive.	start [-help -h] [-output -o (text nvmxml json)] -intelssd (Index SerialNumber PhysicalPath) -selftest [('short' 'extended' 'conveyance')]	intelmas start -intelssd 1 -selftest short
Smart	Display selected drive's SMART data to the screen.	show [-help -h] [-display -d (Property1,...)] [-all -a] [-output -o (text nvmxml json)] -smart [(id)] [-intelssd [(Index SerialNumber PhysicalPath)]]	intelmas show -smart -intelssd 1
SMBus Address	Display the selected drive's SM bus address. NVMe only Caution: May lock system if conflicting address set.	show [-help -h] [-display -d (Property1,...)] [-all -a] [-output -o (text nvmxml json)] -intelssd [(Index SerialNumber PhysicalPath)] set [-help -h] [-output -o (text nvmxml json)] -intelssd (Index SerialNumber PhysicalPath) SMBusAddress = (address)	intelmas show -d SMBusAddress -intelssd 1 intelmas set -intelssd 1 SMBusAddress = 106
Spread Spectrum Clocking (Disable/Enable)	Disable/Enable the drive's spread spectrum clocking feature. ATA only	set [-help -h] [-output -o (text nvmxml json)] -intelssd (Index SerialNumber PhysicalPath) SSCEnabled = ('true' 'false')	intelmas set -intelssd 1 SSCEnabled = false intelmas set -intelssd 1 SSCEnabled = true
Standby Immediate	Send an ATA Standby Immediate command to the selected drive. This will prepare the drive for a power cycle. ATA only	start [-help -h] [-output -o (text nvmxml json)] -intelssd (Index SerialNumber PhysicalPath) -standby	intelmas start -intelssd 1 -standby

Feature	Description	Command Syntax	Example
Telemetry	Read the Telemetry Log binary and save it to the given filename. Configure log notification.	<pre>dump [-help -h] [-destination (path)] [-output -o (text nvmxml json)] [-intelssd [(Index SerialNumber PhysicalPath)]] -telemetrylog set [-help -h] [-output -o (text nvmxml json)] -intelssd (Index SerialNumber PhysicalPath) TelemetryLogNoticesConfiguration = ('true' 'false')</pre>	<pre>intelmas dump -destination telemetry_data.bin -intelssd 1 -telemetrylog</pre>
Temperature Logging Interval	Display the selected drive's temperature logging interval time, and option flag. ATA only	<pre>show [-help -h] [-display -d (Property1,...)] [-all -a] [- output -o (text nvmxml json)] - intelssd [(Index SerialNumber PhysicalPath)] set [-help -h] [-output -o (text nvmxml json)] -intelssd (Index SerialNumber PhysicalPath) TemperatureLoggingInterval = (time)</pre>	<pre>intelmas show -d TemperatureLoggingInterval - intelssd 1 intelmas set -intelssd 1 TemperatureLoggingInterval = 2</pre>
Temp Threshold (Set)	Set the drives temperature threshold value. NVMe only Caution: If set incorrectly could overheat drive.	<pre>set [-help -h] [-output -o (text nvmxml json)] -intelssd (Index SerialNumber PhysicalPath) TempThreshold = (value)</pre>	<pre>intelmas set -intelssd 1 TempThreshold = 65</pre>
Thermal Throttle	Display the Thermal Throttle status. Optional parameter is used to enable/disable thermal throttling.	<pre>show [-help -h] [-display -d (Property1,...)] [-all -a] [- output -o (text nvmxml json)] - intelssd [(Index SerialNumber PhysicalPath)] set [-help -h] [-output -o (text nvmxml json)] -intelssd (Index SerialNumber PhysicalPath) ThermalThrottleEnabled = ('true' 'false')</pre>	<pre>intelmas show -d ThermalThrottleEnabled - intelssd 2 intelmas set -intelssd 2 ThermalThrottleEnabled = false</pre>
Trim	Trim the device. Specify what to trim by specifying the StartLBA and Count properties. WARNING: This command will make your data inaccessible!	<pre>start [-help -h] [-force -f] [- output -o (text nvmxml json)] - intelssd (Index SerialNumber PhysicalPath) - trim StartLBA = (integer) Count = (integer)</pre>	<pre>intelmas start intelssd 1 -trim StartLBA = 0 Count = 1024</pre>

Feature	Description	Command Syntax	Example
Write Cache (Disable/Enable Reordering State)	<p>Display/Disable/Enable drive's write cache/cache reordering statefeature</p> <p>ATA only</p>	<pre>show [-help -h] [-display -d (Property1,...)] [-all -a] [- output -o (text nvmxml json)] - intelssd [(Index SerialNumber PhysicalPath)] set [-help -h] [-output -o (text nvmxml json)] -intelssd (Index SerialNumber PhysicalPath) WriteCacheState = (1 2 3) set [-help -h] [-output -o (text nvmxml json)] -intelssd (Index SerialNumber PhysicalPath) WriteCacheEnabled = ('true' 'false')</pre>	<pre>intelmas show -d WriteCacheEnabled -intelssd 1 intelmas set -intelssd 1 WriteCacheState = 1 intelmas set -intelssd 1 WriteCacheEnabled = false intelmas set -intelssd 1 WriteCacheEnabled = true intelmas show -d WriteCacheReorderingStateEnable d -intelssd 1 intelmas set -intelssd 1 WriteCacheReorderingStateEnable d = true</pre>
Write Same	<p>Issue SCT Write Same command to the selected drive. The start LBA, number of sectors, and data pattern must be specified. The tool will prompt prior to issuing the Write Same command.</p> <p>Caution: Overwrites sectors on drive with a HEX pattern.</p>	<pre>start [-help -h] [-force -f] [- output -o (text nvmxml json)] - intelssd (Index SerialNumber PhysicalPath) - writesame [Count = (sectors)] [HexPattern = (0x00 - 0xFFFFFFFF)] [LBA = (0-Max LBA)]</pre>	<pre>intelmas start -intelssd 1 - writesame Count = 5 LBA = 0 HexPattern = 0x0000ABAB</pre>

Notes on device target options:

- In Windows, device can be targeted with BootDrive option in addition to Index|SerialNumber|PhysicalPath
- PhysicalPath option may not work with some Linux distributions.

3 Feature Details

3.1 Show Device Information

This section provides different options to retrieve device related information.

3.1.1 Show Device List

Show information about one or more Intel SSD devices.

Generally, this command is run as a first step to get list of devices attached and get device index.

3.1.1.1 Syntax

```
IntelMAS show [-help|-h] [-output|-o (text|nvmxml|json)] -intelssd
[(Index|SerialNumber|PhysicalPath)]
```

3.1.1.2 Options

Option	Description
[-display -d]	Filters the returned properties by explicitly specifying a comma separated list of any of the properties defined in the Return Data section.
[-help -h]	Displays help for the command.
[-output -o (text nvmxml json)]	Changes the format of the Return Data. Supported output options are: 'text' (Default), 'json', and 'nvmxml'.

3.1.1.3 Targets

Target	Description
-intelssd [(Index SerialNumber PhysicalPath BootDrive)]	Restricts output to specific Intel SSD by supplying the device's Index or Serial Number. By default, the command displays all Intel SSDs. BootDrive option available in Windows only.

3.1.1.4 Properties

This command does not support any properties

3.1.1.5 Examples

Lists all the devices attached to the system. Basic/default properties are displayed for each device.

```
IntelMAS show -intelssd
```

Lists basic default information for drive at index 0

```
IntelMAS show -intelssd 0
```

3.1.1.6 Sample Output

Default show output for –intelssd target in default text format

```
>IntelMAS.exe show -intelssd
- Intel SSD DC P3608 Series CVF85156007H400AGN-2 -

Bootloader : 8B1B0131 {
DevicePath : \\.\PHYSICALDRIVE1 {
DeviceStatus : Healthy {
Firmware : 8DV10171 {
FirmwareUpdateAvailable : The selected Intel SSD contains current firmware as of this tool release.
{
Index : 0 {
ModelNumber : INTEL SSDPECME400G4 {
ProductFamily : Intel SSD DC P3608 Series {
SerialNumber : CVF85156007H400AGN-2
```

Default show output for –intelssd target in JSON format

```
>IntelMAS.exe show -o json -intelssd
{
  "Intel SSD DC P3608 Series CVF85156007H400AGN-2":
  {
    "Bootloader":"8B1B0131",
    "DevicePath":"\\.\PHYSICALDRIVE1",
    "DeviceStatus":"Healthy",
    "Firmware":"8DV10171",
    "FirmwareUpdateAvailable":"The selected Intel SSD contains current firmware as of
this tool release.",
    "Index":0,
    "ModelNumber":"INTEL SSDPECME400G4",
    "ProductFamily":"Intel SSD DC P3608 Series",
    "SerialNumber":"CVF85156007H400AGN-2"
```

3.1.2 Show Device Data

Show detailed information about one or more Intel SSD devices.

3.1.2.1 Syntax

```
IntelMAS show [-all|-a] [-display|-d] [-help|-h] [-output|-o (text|nvmlxml|json)] -intelssd
[(Index|SerialNumber|PhysicalPath)]
```

3.1.2.2 Options

Option	Description
[-all -a]	Shows all properties.
[-display -d]	Filters the returned properties by explicitly specifying a comma separated list of any of the properties defined in the Return Data section.
[-help -h]	Displays help for the command.
[-output -o (text nvmlxml json)]	Changes the format of the Return Data. Supported output options are: 'text' (Default), 'json', and 'nvmlxml'.

3.1.2.3 Targets

Target	Description
-intelssd [(Index SerialNumber PhysicalPath)]	Restricts output to specific Intel SSD by supplying the device's Index or Serial Number. By default, the command displays all Intel SSDs.

3.1.2.4 Properties

This command does not support any properties.

3.1.2.5 Return Data

By default, a table is displayed with the following default properties. Use the options to show more detail.

Property	Description
AccessibleMaxAddressSupported	(For ATA devices only) True if the devices support the accessible max address commands (Identify device Word 103 bit 8).
AggregationThreshold	(For NVMe devices only) Shows the minimum number of completion queue entries to aggregate per interrupt vector before signaling an interrupt to the host. This value is zero-based.
AggregationTime	(For NVMe devices only) Shows the recommended maximum time in 100 microsecond increments that a controller may delay an interrupt due to interrupt coalescing.
ArbitrationBurst	(For NVMe devices only) Shows the maximum number of commands that the controller may launch at one time. This value is specified in 2^n . A value of 7 indicates no limit.
AsynchronousEventConfiguration	(For NVMe devices only) Determines whether an asynchronous event notification is sent to the host for the corresponding Critical Warning specified in the SMART / Health Information Log.
Bootloader	(Default; For NVMe devices only, if present) Return the devices Bootloader Revision.
BusType	(Windows OS only) The bus type value determined by Windows.
ControllerDescription	(Currently in Windows OS only) Shows a description of the controller the device is attached to.
ControllerID	(Windows OS only) The ID value of the device controller found in the Windows OS registry.
ControllerIDMode	Shows if the controller the device is attached to is in IDE mode. Returns either True or False.
ControllerManufacturer	(Currently in Windows OS only) The manufacturer of the controller that the device is attached to.
ControllerService	(Currently in Windows OS only) Displays the controller driver sys file that the attached device is connected to.

Property	Description
DigitalFenceSupported	(For ATA devices only) True if the device supports the Digital Fence feature.
DIPMEnabled	(For ATA devices only) True if the device has DIPM enabled (Identify device Word 79 bit 3).
DIPMSupported	(For ATA devices only) True if the device supports DIPM (Identify device Word 78 bit 3).
DevicePath	(Default) The OS path to the device (i.e. \\.\PhysicalDrive0).
DeviceStatus	(Default) Report the device's status. In the current implementation this will look at ErrorString and if it is empty it will report "Healthy" otherwise it will report the value of ErrorString.
DriverCommunicationError	(Default; if present) This reports if the tool detected a potential error with communicated with the driver the device is connected to. For example, the tool will detect an error if the Server 2012 R2* system is using the in-box NVMe driver from Microsoft*. Intel® MAS does not support communication with that driver.
DriverDescription	Description of the controller driver that the device is attached to. Currently in Windows OS only.
DriverMajorVersion	Major version of the controller driver that the device is attached to. Currently in Windows OS only.
DriverManufacturer	Manufacturer of the controller driver that the device is attached to. Currently in Windows OS only.
DriverMinorVersion	Minor version of the controller driver that the device is attached to. Currently in Windows OS only.
EnduranceAnalyzer	The drives life expectancy in years. This utilizes the 0xE2, 0xE3 and 0xE4 SMART attributes. If these SMART attributes have a value of 0xFFFF then they are still in the reset state and a 60+ minute workload has yet to run. If the media wear indicator is zero then the workload has not induced enough wear to calculate an accurate life expectancy.
ErrorString	Shows a description of the error state of the drive. NOTE: The drive is not in an error state if the value is blank.
Firmware	(Default) Shows the firmware revision of the device.
FirmwareUpdateAvailable	(Default) Shows the firmware revision available for update. Firmware updates are carried within the tool as a "payload" binary for each supported drive. Tool reports 'Firmware is up to date as of this tool release' if the device's firmware is up to date.
HighPriorityWeightArbitration	(For NVMe devices only) Shows the number of commands that can be executed from the high priority services class in each arbitration round. This is a 0's based value.
IEEE1667Supported	(For ATA devices only) Shows if the IEEE1667 protocol is supported. Reports True or False.

Property	Description
Index	(Default) Shows the Intel SSD device index, used for device selection.
IntelGen3SATA	True if the device is an Intel SATA SSD.
IntelNVMe	True if the device is an Intel NVMe SSD.
IOCompletionQueuesRequested	(For NVMe devices only) Shows the number of IO Completion Queues requested.
IOSubmissionQueuesRequested	(For NVMe devices only) Shows the number of IO Submission Queues requested.
LatencyTrackingEnabled	Shows if the latency tracking feature of the drive is enabled (True) or disabled (False).
LBAFormat	(For NVMe devices only) Shows the LBA Format that the drive is configured with. This has a possible value of 0 to 'NumLBAFormats'. Details of the different LBA formats can be found in Identify Namespace. This value can be changed by NVMe format.
LowPriorityWeightArbitration	(For NVMe devices only) Shows the number of commands that can be executed from the low priority services class in each arbitration round. This is a 0's based value.
MaximumLBA	Shows the devices maximum logical block address.
MediumPriorityWeightArbitration	(For NVMe devices only) Shows the number of commands that can be executed from the medium priority services class in each arbitration round. This is a 0's based value.
MetadataSetting	(For NVMe devices only) Shows the device's Metadata setting. One of either: <ul style="list-style-type: none"> 0: Metadata is transferred as part of a separate contiguous buffer. 1: Metadata is transferred as part of an extended data LBA. This can be changed by issuing an NVMe format.
ModelNumber	(Default) Shows the model number assigned to the device.
NamespaceId	(For NVMe devices only) Shows the value of the namespace ID of the device if it has one. The namespace must be allocated and attached.
NativeMaxLBA	Shows the devices native maximum logical block address set in manufacturing. This value cannot be changed. It represents the physical maximum number of LBAs for the device.
NumErrorLogPageEntries	(For NVMe devices only) Shows the number of Error Information log entries that are stored by the controller. This value is zero-based.
NumLBAFormats	(For NVMe devices only) Shows the number of different LBA Formats the device supports. This value is zero-based. For example, a value of 6 means there are 0 to 6 possible LBA Formats (7 total).

Property	Description
NVMeControllerID	(For NVMe devices only) The value of the NVMe controller ID found in the NVMe identify controller structure.
NVMePowerState	(For NVMe devices only) Shows the power state of the controller. Supported power states are described in the Identify Controller data structure. This is an NVMe Get Feature (feature ID=2)
NVME_1_0_Supported	(For NVMe devices only) True if the device supports the NVMe 1.0 command specification.
NVME_1_2_Supported	(For NVMe devices only) True if the device supports the NVMe 1.2 command specification.
PCILinkGenSpeed	(For NVMe devices only) The devices PCI Gen speed.
PCILinkWidth	(For NVMe devices only) The devices PCI link width. E.g. 4 or 8
PhyConfig	(For ATA devices only) Shows the devices PHY Configuration. One of the following: <ul style="list-style-type: none"> 0: Default enterprise settings 1: Client settings 2: Alternate enterprise settings
PhysicalSectorSize	(For ATA devices only) Shows the physical sector size in bytes. One of either: <ul style="list-style-type: none"> 512 4096
PhysicalSize	The physical size of the device in bytes. Value is in decimal format.
PhySpeed	(For ATA devices only) Shows the maximum physical speed (in gigabits-per-second) of the device. One of the following: <ul style="list-style-type: none"> 1.5 3 6
PLITestTimeInterval	(For ATA devices only) Shows the PLI Test Time interval in minutes of the device. One of: <ul style="list-style-type: none"> 0: 0 min, no immediate test. 1: 0 min, do immediate test. 2: 60 min, do immediate test. 3: 1440 min, do immediate test. 4: 4320 min, do immediate test. 5: 10080 min, do immediate test. 6: 20160 min, do immediate test.
PNPString	(Windows OS only) The devices PNP String from the Windows registry.
ProductProtocol	The devices protocol e.g. ATA or NVME.
PowerGovernorAveragePower	(For ATA devices only) Shows the device's power governor average power in milliwatts.

Property	Description
PowerGovernorBurstPower	(For ATA devices only) Shows the device's power governor burst power in milliwatts.
PowerGovernorMode	<ul style="list-style-type: none"> Shows the devices' Power Governor state. 0: 25-watts for PCIe NVMe devices; 40W for PCIe NVMe x8 devices; Unconstrained for SATA devices. 1: 20-watts for PCIe NVMe devices; 35W for PCIe NVMe x8 devices; Typical (7-watts) for SATA devices. 2: 10-watts for PCIe NVMe devices; 25W for PCIe NVMe x8 devices; Low (5-watts) for SATA devices.
ProductFamily	(Default) Shows the Intel SSD Series name.
ProtectionInformation	<p>(For NVMe devices only) Shows the device's protection information type setting. One of:</p> <ul style="list-style-type: none"> 0: Protection information is not enabled. 1: Protection information type 1 is enabled. <p>This can be changed by issuing an NVMe format.</p>
ProtectionInformationLocation	<p>(For NVMe devices only) Shows the device's protection information location setting. One of:</p> <ul style="list-style-type: none"> 0: Protection information is transferred as the last 8 bytes of metadata. 1: Protection information is transferred as the first 8 bytes of metadata.
RAIDMember	Shows if the device is part of a RAID. Currently only support RST RAID drivers and LSI Mega RAID.
ReadErrorRecoveryTimer	(For ATA devices only) Shows the time limit for read error recovery. Time limit is in 100 millisecond units.
SanitizeBlockEraseSupported	(For ATA devices only) True if the device supports the Sanitize block erase command (Identify device Word 59 bit 15).
SanitizeCryptoScrambleSupported	(For ATA devices only) True if the device supports the Sanitize crypto scramble command (Identify device Word 59 bit 13).
SanitizeSupported	(For ATA devices only) True if the device supports the Sanitize feature (Identify device Word 59 bit 12).
SataGen1	(For ATA devices only) Shows if the device supports SATA Gen 1 speed. Reports True or False.
SataGen2	(For ATA devices only) Shows if the device supports SATA Gen 2 speed. Reports True or False.
SataGen3	(For ATA devices only) Shows if the device supports SATA Gen 3 speed. Reports True or False.
SataNegotiatedSpeed	<p>(For ATA devices only) Coded value indicating current negotiated SATA signal speed. One of:</p> <ul style="list-style-type: none"> 1: SATA Gen1 rate of 1.5 Gbps 2: SATA Gen2 rate of 3 Gbps 3: SATA Gen3 rate of 6 Gbps

Property	Description
SCSIPortNumber	(Windows OS only) The port number of the SCSI path used by Windows.
SectorSize	Shows the sector size in bytes.
SecurityEnabled	(For ATA devices only) Shows if the device is in security enabled state. Reports True or False.
SecurityFrozen	(For ATA devices only) Shows if the device is in security frozen state. Reports True or False.
SecurityLocked	(For ATA devices only) Shows if the device is security locked. Reports True or False.
SecuritySupported	(For ATA devices only) True if the devices supports ATA Security feature (Identify device Word 128 bit 0).
SerialNumber	(Default) Shows the serial number assigned to the device.
SMARTEnabled	Shows if SMART capabilities are enabled on the device. Reports True or False.
SMARTSelfTestSupported	(For ATA devices only) True if the device supports the drive self-test feature (Identify device Word 84 bit 1).
SMBusAddress	(For NVMe devices only) Shows the SM Bus address of the drive. Value of 255 means the SM Bus is disabled.
SSCEnabled	(For ATA devices only) Shows if the device has spread spectrum clocking enabled or not. Reports True or False.
StorageSpaceMember	Shows if the device is a Windows Storage Space member.
TemperatureLoggingInterval	(For ATA devices only) Shows the time interval for temperature logging.
TempThreshold	(For NVMe devices only) Shows the temperature threshold of the overall device. Units are in Celsius.
TimeLimitedErrorRecovery	(For NVMe devices only) Shows the limited retry timeout value in 100 millisecond units. This applies to I/O commands that indicate a time limit is required. A value of 0 indicates that there is no timeout.
TrimSupported	True if the device supports Trim feature.
VolatileWriteCacheEnabled	(For NVMe devices only) True if the volatile write cache is enabled.
WriteAtomicityDisableNormal	(For NVMe devices only) Shows the atomic write status. One of: <ul style="list-style-type: none"> 0: If cleared to '0', the atomic write unit for normal operation shall be honored by the controller. 1: The host specifies that the atomic write unit for normal operation is not required and the controller shall only honor the atomic write unit for power fail operations.
WriteCacheEnabled	(For ATA devices only) Shows if the device has write cache enabled. Reports True or False.

Property	Description
WriteCacheState	(For ATA devices only) Shows the device's write cache state. One of: <ul style="list-style-type: none"> 1: Write cache state is determined by ATA Set Features 2: Write cache is enabled. 3: Write cache is disabled.
WriteCacheSupported	(For ATA devices only) Shows if the device supports write cache capabilities. Reports True or False.
WriteErrorRecoveryTimer	(For ATA devices only) Shows the time limit for write error recovery in 100 millisecond units.
WriteCacheReorderingStateEnabled	(For ATA devices only) True if the write cache reordering state is enabled on the SATA device.

3.1.2.6 Examples

Lists basic properties for the Intel SSD devices at index 1.

```
IntelMAS show -a -intelssd 1
```

3.1.2.7 Sample Output

Default show output for –intelssd target in default text format

```
>IntelMAS.exe show -intelssd
- Intel SSD DC P3608 Series CVF85156007H400AGN-2 -

Bootloader : 8B1B0131 {
DevicePath : \\\\.\\PHYSICALDRIVE1 {
DeviceStatus : Healthy {
Firmware : 8DV10171 {
FirmwareUpdateAvailable : The selected Intel SSD contains current firmware as of this tool release.
{
Index : 0 {
ModelNumber : INTEL SSDPECME400G4 {
ProductFamily : Intel SSD DC P3608 Series {
SerialNumber : CVF85156007H400AGN-2
```

Default show output for –intelssd target in JSON format

```
>IntelMAS.exe show -o json -intelssd
{
  "Intel SSD DC P3608 Series CVF85156007H400AGN-2":
  {
    "Bootloader": "8B1B0131",
    "DevicePath": "\\\\.\\PHYSICALDRIVE1",
    "DeviceStatus": "Healthy",
    "Firmware": "8DV10171",
    "FirmwareUpdateAvailable": "The selected Intel SSD contains current firmware as of this tool release.",
    "Index": 0,
    "ModelNumber": "INTEL SSDPECME400G4",
    "ProductFamily": "Intel SSD DC P3608 Series",
    "SerialNumber": "CVF85156007H400AGN-2"
  }
}
```

3.1.3 Show Health Sensors

The **show –sensor** command shows the health sensor properties of one or more Intel SSDs.

3.1.3.1 Syntax

```
IntelMAS show [-all|-a] [-display|-d] [-help|-h] [-output|-o (text|nvmxml|json)] -sensor [-intelssd (Index|SerialNumber|PhysicalPath)]
```

3.1.3.2 Options

Option	Description
[-all -a]	Show all properties.
[-display -d]	Filters the returned properties by explicitly specifying a comma separated list of any of the properties defined in the Return Data section.
[-help -h]	Displays help for the command.
[-output -o (text nvmxml json)]	Changes the format of the Return Data. Supported output options are: 'text' (Default), 'json', and 'nvmxml'.

3.1.3.3 Targets

Target	Description
-sensor	Displays the health related properties for device(s).
[-intelssd (Index SerialNumber PhysicalPath)]	(Optional) Restricts output to specific Intel SSD by supplying the Intel SSD Index or Serial Number. The default is to display sensors for all manageable Intel SSDs.

3.1.3.4 Limitations

To run this command option, the specified Intel SSD(s) must be manageable by the host software.

3.1.3.5 Return Data

The command displays the following properties for each sensor command option. This output could be filtered by specifying the Properties with the `-display` option. It can be further filtered by specifying the ID property.

Note: Some health sensor properties are not supported some devices.

Property	Description
AvailableSpare	(NVMe Devices Only). Percentage (0 to 100%) of the remaining spare capacity available.
AverageNandEraseCycles	Average number of NAND erase cycles for all blocks.
CrcErrorCount	Total number of interface (SATA or NVMe) CRC errors.
EndToEndErrorDetectionCount	Total number of end to end detected errors.
EnduranceAnalyzer	Reports the expected drive life in years.
EraseFailCount	Total number of raw erase fails.
ErrorInfoLogEntries	(NVMe Devices Only). Number of entries in the Error Info Log page over the life of the controller.

Property	Description
HighestLifetimeTemperature	(NVMe Devices Only). The highest lifetime temperature (in Celsius) of the device.
LowestLifetimeTemperature	(NVMe Devices Only). The lowest lifetime temperature (in Celsius) of the device.
MaxNandEraseCycles	Max number of NAND erase cycles for all blocks.
MediaErrors	(NVMe Devices Only). Number of times where the controller detected an unrecovered data integrity error.
MinNandEraseCycles	Min number of NAND erase cycles for all blocks.
PercentageUsed	Estimate of the percentage of life used of the device.
PowerCycles	(NVMe Devices Only). Number of power cycles.
PowerOnHours	Contains the number of power on hours of the device.
ProgramFailCount	Total number of raw program fails.
SpecifiedPCBMaxOperatingTemp	(NVMe Devices Only). Specified PCB maximum operating temperature in degrees C.
SpecifiedPCBMinOperatingTemp	(NVMe Devices Only). Specified PCB minimum operating temperature in degrees C.
Temperature	Total temperature of the device in degrees C
ThermalThrottleCount	The total number of times thermal throttle has been activated.
ThermalThrottleStatus	The amount that Thermal Throttle that is applied. A value of zero is no throttle. 100 is 100% throttling applied.
UnsafeShutdowns	Reports the number of unsafe shutdowns over the life of the device.

3.1.3.6 Examples

Default show output for –sensor target in default text format.

```
>IntelMAS.exe show -sensor
- Intel SSD DC P3608 Series CVF85156007H400AGN-2 -

AvailableSpare : 100
AverageNandEraseCycles : 1
CrcErrorCount : 0
DeviceStatus : Healthy
EndToEndErrorDetectionCount : 0
EnduranceAnalyzer : Media Workload Indicators have reset values. Run 60+ minute workload
prior to running the endurance analyzer.
EraseFailCount : 0
ErrorInfoLogEntries : 0x00
HighestLifetimeTemperature : 53
LowestLifetimeTemperature : 16
MaxNandEraseCycles : 3
MediaErrors : 0x00
MinNandEraseCycles : 0
PercentageUsed : 0
PowerCycles : 0x01F
PowerOnHours : 0x0667
```

```
ProgramFailCount : 0
SpecifiedPCBMaxOperatingTemp : 85
SpecifiedPCBMinOperatingTemp : 0
Temperature : 317
ThermalThrottleCount : 0
ThermalThrottleStatus : 0
UnsafeShutdowns : 0x05
```

Note: Specified the ID property to limit the output.

3.1.4 Show SMART

The **show –smart** command shows the SMART attributes for one or more Intel SSDs.

3.1.4.1 Syntax

```
IntelMAS show [-all|-a] [-display|-d] [-help|-h] [-output|-o (text|nvmxml|json)] -smart
[(id)] [-intelssd (Index|SerialNumber|PhysicalPath)]
IncludeNVMeSmartHealthLog=(true|false)
```

3.1.4.2 Options

Option	Description
[-all -a]	Show all properties.
[-display -d]	Filters the returned properties by explicitly specifying a comma separated list of any of the properties defined in the Return Data section.
[-help -h]	Displays help for the command.
[-output -o (text nvmxml json)]	Changes the format of the Return Data. Supported output options are: 'text' (Default), 'json', and 'nvmxml'.

3.1.4.3 Targets

Target	Description
-smart [(id)]	Displays SMART attributes for device(s). Specific SMART attributes can be selected if (id) is given.
[-intelssd (Index SerialNumber PhysicalPath)]	(Optional) Restricts output to specific Intel SSD by supplying the Intel SSD Index or Serial Number. The default is to display sensors for all manageable Intel SSDs.

3.1.4.4 Properties

Property	Description
IncludeNVMeSmartHealthLog=(true false)	Determines whether to return NVMe SMART health log attributes in addition to standard SMART attributes. Default is false. Supported for NVMe only.

3.1.4.5 Limitations

To run this command option, the specified Intel SSD(s) must be manageable by the host software.

3.1.4.6 Return Data

The command displays the following properties for each SMART attribute. This output could be filtered by specifying the Properties with the `-display` option.

Note: Some optional properties are not supported on all device sensors and SMART Attributes F4/F5 are reported in Bytes.

Property	Description
Action	(Optional) Shows the Pass/Fail status based on the Pre-failure/advisory status bit.
Description	Shows a string representation of the ID token.
ID	The SMART Attribute ID token. Smart ID: 03, 04, 05, 0C, AA, B8, BB, C1, E2, E9, F2 Not all drives have the same SMART Id's
Normalized	Shows the normalized value of the SMART attribute.
Raw	Shows the raw value of the SMART Attribute. Value is in decimal.
Status	(Optional) Shows the status flags for the SMART attribute: <ul style="list-style-type: none"> • Bit 0 Pre-failure/advisory bit • Bit 1 Online data collection • Bit 2 Performance attribute • Bit 3 Error rate attribute • Bit 4 Event count attribute • Bit 5 Self-preserving attribute • Bits 6 – 15 Reserved
Threshold	(Optional) Shows the SMART Attributes threshold value.
Worst	(Optional) Shows the SMART attributes worst normalized value. Maintained for the life of the device.

3.1.4.7 Examples

Default show output for `-smart` target in default text format.

```
>IntelMAS.exe show -smart E9
- SMART Attributes CVLV119200C4300DGN -

- E9 -

Action : Pass
Description : Media Wearout Indicator
ID : E9
Normalized : 100
Raw : 0
Status : 50
Threshold : 0
Worst : 100
```

Note: Specified the ID property to limit the output.

Default show output for –smart target in JSON format.

```
>IntelMAS.exe show -o json -smart E9
{
  "SMART Attributes CVLV119200C4300DGN":
  {
    "E9":
    {
      "Action": "Pass",
      "Description": "Media Wearout Indicator",
      "ID": "E9",
      "Normalized": 100,
      "Raw": 0,
      "Status": 50,
      "Threshold": 0,
      "Worst": 100
    }
  }
}
```

Note: Specified the ID property to limit the output I.

Show all the properties of the SMART E9 Attribute for the Intel SSD at Index 1.

```
show -smart E9 -intelssd 1
```

Shows only the raw value of the SMART E9 Attribute for all Intel SSDs.

```
IntelMAS show -d raw -smart E9
```

3.1.5 Show Performance Metrics

The **show –performance** command shows the performance metrics for one or more Intel SSDs.

3.1.5.1 Syntax

```
IntelMAS show [-all|-a] [-display|-d] [-help|-h] [-output|-o (text|nvmxml|json)] -
performance [-intelssd (Index|SerialNumber|PhysicalPath)]
```

3.1.5.2 Options

Option	Description
[-all -a]	Show all properties.
[-display -d]	Filters the returned properties by explicitly specifying a comma separated list of any of the properties defined in the Return Data section.
[-help -h]	Displays help for the command.
[-output -o (text nvmxml json)]	Changes the format of the Return Data. Supported output options are: 'text' (Default), 'json', and 'nvmxml'.

3.1.5.3 Targets

Target	Description
-performance	Displays performance metrics for device(s).
[-intelssd (Index SerialNumber PhysicalPath)]	(Optional) Restricts output to specific Intel SSD by supplying the Intel SSD Index or Serial Number. The default is to display sensors for all manageable Intel SSDs.

3.1.5.4 Limitations

To run this command option, the specified Intel SSD(s) must be manageable by the host software.

3.1.5.5 Return Data

The command displays the following properties associated with performance metrics. This output could be filtered by specifying the Properties with the -display option.

Note: Some optional properties are not supported on some devices.

Property	Description
TotalLBAsRead	(ATA Devices only). Total number of sectors read by the Host.
TotalLBAsWritten	(ATA Devices only). Total number of sectors written by the Host.
ControllerBusyTime	(NVMe Devices only). Amount of time the controller is busy with I/O commands. Value is reported in minutes.
DataUnitsRead	(NVMe Devices only). The number of 512 byte data units the host has read from the device. Value is reported in units of 1000 (1 = 1000 units of 512 bytes).
DataUnitsWritten	(NVMe Devices only). The number of 512 byte data units the host has written to the device. Value is reported in units of 1000 (1 = 1000 units of 512 bytes).
HostReadCommands	(NVMe Devices only). The number of read commands completed by the controller.
HostWriteCommands	(NVMe Devices only). The number of write commands completed by the controller.

3.1.5.6 Examples

Default show output for –performance target in default text format.

```
>IntelMAS.exe show -performance
- Intel SSD DC P3608 Series CVF85156007H400AGN-2 -

ControllerBusyTime : 0x0
DataUnitsRead : 0x01F097
DataUnitsWritten : 0x0
HostReadCommands : 0x86A392
HostWriteCommands : 0x7772E3

- Intel SSD DC P3608 Series CVF85156007H400AGN-1 -

ControllerBusyTime : 0x0
DataUnitsRead : 0x10
DataUnitsWritten : 0x0
HostReadCommands : 0x777E07
HostWriteCommands : 0x7772E3
```

3.1.6 Show Device Identification Structures

The **show –identify** command shows the device identification structures for one or more Intel SSDs.

3.1.6.1 Syntax

```
IntelMAS show [-help|-h] [-output|-o (text|nvmxml|json)] [-intelssd
(Index|SerialNumber|PhysicalPath)] -identify [-nvmecontroller] [-namespace
(id|'attached'|'allocated')]
```

3.1.6.2 Options

Option	Description
[-help -h]	Displays help for the command.
[-output -o (text nvmxml json)]	Changes the format of the Return Data. Supported output options are: 'text' (Default), 'json', and 'nvmxml'.

3.1.6.3 Targets

Target	Description
-identify	Displays identification structures for Intel SSDs.
[-intelssd (Index SerialNumber PhysicalPath)]	(Optional) Restricts output to specific Intel SSD by supplying the Intel SSD Index or Serial Number.
[-nvmecontroller]	(Optional) Specify it to parse the NVMe identify controller structure.
[-namespace (id 'attached' 'allocated')]	(Optional) Specify it to parse the NVMe namespace structure for the given namespace ID. If 'attached' is given, parse the list of attached NVMe namespaces. If 'allocated' is given, parse the list of allocated NVMe namespaces (these are created and may, or may not, be attached).

3.1.6.4 Limitations

To run this command option, the specified Intel SSD(s) must be manageable by the host software.

3.1.6.5 Return Data

This command will return human readable text of the specified Identify structure. Use the `-output` option to return the parsed data in different formats.

Note: Some identify structures are not supported on all devices.

3.1.6.6 Examples

Parse the ATA identify device structure. Only a snippet of the output is shown below:

```
>IntelMAS.exe show -identify
- ATA Identify Device CVLV119200C4300DGN -

- Word 0 -

General Configuration : 0040
Bit 15 - ATA Device Identifier : 0
Bit 14:8 - Retired : 00
Bit 7:6 - Obsolete : 1
Bit 5:3 - Retired : 0
Bit 2 - Response Incomplete : 0
Bit 1 - Retired : 0
Bit 0 - Reserved : 0

- Word 1 -

Obsolete : 3FFF

- Word 2 -

Specific Configuration : C837

- Word 3 -

Obsolete : 0010

- Word 4 -

Retired : 0000

- Word 5 -

Retired : 0000

- Word 6 -

Obsolete : 003F

- Word 7-8 -

Reserved : 00000000

- Word 9 -

Retired : 0000

- Word 10-19 -

Serial Number : CVLV119200C4300DGN
```

Display the NVMe controller identify structure in JSON format. Not all of the data is show below. Only supported on NVMe devices.

```
>IntelMAS.exe show -o json -identify -nvmecontroller
{
  "Identify Controller CVF85156007H400AGN-1":
  {
    "Byte 0-1":
    {
      "PCI Vendor ID (VID)":8086
    },
    "Byte 2-3":
    {
      "PCI Subsystem Vendor ID (SSVID)":8086
    },
    "Byte 4-23":
    {
      "Serial Number":"CVF85156007H400AGN-1"
    },
    "Byte 24-63":
    {
      "Model Number":"INTEL SSDPECM400G4"
    },
    "Byte 64-71":
    {
      "Firmware Revision":"8DV10171"
    },
  },
}
```

Display the list of Namespace ID's that have been created.

```
>IntelMAS.exe show -intelssd 2 -identify -namespace allocated
- Allocated Namespace IDs CVEK5316004R800AGN -
Namespace ID : 1
Namespace ID : 2
```

3.1.7 Show NVMe Controller Information

The **show -nvmecontroller** command lists the NVMe controller IDs for one or more Intel SSDs. Only supported on NVMe devices.

3.1.7.1 Syntax

```
IntelMAS show [-help|-h] [-output|-o (text|nvmxml|json)] [-intelssd
(Index|SerialNumber|PhysicalPath)] -nvmecontroller [-namespace (id)]
```

3.1.7.2 Options

Option	Description
[-help -h]	Displays help for the command.
[-output -o (text nvmxml json)]	Changes the format of the Return Data. Supported output options are: 'text' (Default), 'json', and 'nvmxml'.

3.1.7.3 Targets

Target	Description
-nvmecontroller	(Required) Will parse the list of all NVMe controllers of the device. You can change the behavior if -namespace target is given.
[-intelssd (Index SerialNumber PhysicalPath)]	(Optional) Restricts output to specific Intel SSD by supplying the Intel SSD Index or Serial Number.
[-namespace (id)]	(Optional) If given, with a valid namespace ID value, then the list of controllers attached to that given namespace ID is returned. The Tool will issue the NVMe identify command with CNS=0x12.

3.1.7.4 Limitations

To run this command option, the specified Intel SSD(s) must be manageable by the host software. The specified device must be an Intel NVMe SSD.

3.1.7.5 Return Data

This command will parse, and return human readable text. Use the -output option to return the parsed data in different formats.

3.1.7.6 Examples

Parsed list of NVMe controller ID's on all drives.

```
>IntelMAS.exe show -nvmecontroller
- BTWL238602AM800DGN -

Status : The selected drive does not support this feature.

- All Controllers CVEK5316004R800AGN -

Number of Controller Entries : 2
Controller ID : 0
Controller ID : 1
```

Parsed list of controllers that a given namespace ID is attached to.

```
>IntelMAS.exe show -namespace 1 -nvmecontroller -intelssd 2

- Attached Controllers CVEK5316004R800AGN -

Number of Controller Entries : 1
Controller ID : 1
```

3.1.8 Show NVMe Log Information

The **show -nvmelog** command parses NVMe Logs for one or more Intel SSDs. Only supported on NVMe devices.

3.1.8.1 Syntax

```
IntelMAS show [-help|-h] [-output|-o (text|nvmxml|json)] [-intelssd
(Index|SerialNumber|PhysicalPath)] -nvmelog
('ErrorInfo'| 'SmartHealthInfo'| 'FirmwareSlotInfo' | 'TemperatureStatistics' | 'QueueMetrics'
| 'CommandEffectsLog' | 'ChangedNamespaceLog' | 'PerformanceBooster')
```

3.1.8.2 Options

Option	Description
[-help -h]	Displays help for the command.
[-output -o (text nvmxml json)]	Changes the format of the Return Data. Supported output options are: 'text' (Default), 'json', and 'nvmxml'.

3.1.8.3 Targets

Target	Description
-nvmelog ('ErrorInfo' 'SmartHealthInfo' 'FirmwareSlotInfo' 'TemperatureStatistics' 'QueueMetrics')	Parse the NVMe log structures. Valid input would be <ul style="list-style-type: none"> • ErrorInfo – Error Information Log • SmartHealthInfo – SMART Health Information Log • FirmwareSlotInfo – Firmware Slot Information Log • TemperatureStatistics – Temperature Statistics Log • QueueMetrics – Submission and completion queue metrics
[-intelssd (Index SerialNumber PhysicalPath)]	(Optional) Restricts output to specific Intel SSD by supplying the Intel SSD Index or Serial Number.

3.1.8.4 Limitations

To run this command option, the specified Intel SSD(s) must be manageable by the host software. The specified device must be an Intel NVMe SSD.

To run this command option with Target 'QueueMetrics', the specified device must be an Intel NVMe SSD and have firmware 8DV101F0 or newer firmware. With earlier firmware, Intel® MAS will report command failure.

3.1.8.5 Return Data

This command will parse, and return human readable text of the specified NVMe log. Use the -output option to return the parsed data in different formats.

3.1.8.6 Examples

Parsed output of the SMART and Health information log in text format

```
>IntelMAS.exe show -nvme log smarthealthinfo
- SMART and Health Information CVF85156007H400AGN-2 -

Available Spare Normalized percentage of the remaining spare capacity available : 100
Available Spare Threshold Percentage : 10
Available Spare Space has fallen below the threshold : False
Controller Busy Time : 0x0
Critical Warnings : 0
Data Units Read : 0x01F097
Data Units Written : 0x0
Host Read Commands : 0x86A392
Host Write Commands : 0x7772E3
Media Errors : 0x0
Number of Error Info Log Entries : 0x0
Percentage Used : 0
Power Cycles : 0x1F
Power On Hours : 0x0668
Media is in a read-only mode : False
Device reliability has degraded : False
Temperature - (Kelvin) : 318
Temperature has exceeded a critical threshold : False
Unsafe Shutdowns : 0x05
Volatile memory backup device has failed : False
```

Parsed output of the Temperature Statistics log in JSON format.

```
>IntelMAS.exe show -o json -nvme log TemperatureStatistics
{
  "Temp Statistics CVF85156007H400AGN-2":
  {
    "Current Temperature":45,
    "Overtemp shutdown Flag for Last Drive Overheat":0,
    "Overtemp shutdown Flag for Life Drive Overheat":0,
    "Highest Temperature":53,
    "Lowest Temperature":16,
    "Maximum operating temperature":85,
    "Minimum operating temperature":0,
    "Estimated offset in Celsius":-5
  }
}
```

3.1.9 Show Phy Counters

The **show -phycounters** command parses the phy counter information for one or more Intel SSDs. Only supported on SATA devices.

3.1.9.1 Syntax

```
IntelMAS show [-help|-h] [-output|-o (text|nvme xml|json)] -phycounters [-intelssd
(Index|SerialNumber|PhysicalPath)]
```

3.1.9.2 Options

Option	Description
<code>[-help -h]</code>	Displays help for the command.
<code>[-output -o (text nvml json)]</code>	Changes the format of the Return Data. Supported output options are: 'text' (Default), 'json', and 'nvml'.

3.1.9.3 Targets

Target	Description
<code>-phycounters</code>	Displays the device Phy Counters. ATA only
<code>[-intelssd (Index SerialNumber PhysicalPath)]</code>	(Optional) Restricts output to a specific Intel SSD by supplying the Intel SSD Index or Serial Number.

3.1.9.4 Limitations

To run this command option, the specified Intel SSD(s) must be manageable by the host software. The specified device must be a SATA device.

3.1.9.5 Return Data

This command will parse and return human readable text of the PHY Counters structure. Use the `–output` option to return the parsed data in different formats.

3.1.9.6 Examples

Parsed output of the PHY Counters structure in text format. Not all counters are shown below.

```
>IntelMAS.exe show -phycounters
- PHY Counters CVLV119200C4300DGN -

- Counter ID 0x001 -

ID : 001
Description : Command failed and ICRC error bit set to one in Error register
Value : 0

- Counter ID 0x004 -

ID : 004
Description : R_ERRP response for Host-to-Device Data FIS
Value : 0

- Counter ID 0x007 -

ID : 007
Description : R_ERRP response for Host-to-Device non-Data FIS
Value : 0

- Counter ID 0x008 -

ID : 008
Description : Device-to-Host non-Data FIS retries
Value : 0
```

Parsed output of the PHY Counters in JSON output. Not all counters are shown below.

```
>IntelMAS.exe show -o json -phycounters
{
  "PHY Counters CVLV119200C4300DGN":
  {
    "Counter ID 0x001":
    {
      "ID": "001",
      "Description": "Command failed and ICRC error bit set to one in Error register",
      "Value": 0
    },
    "Counter ID 0x004":
    {
      "ID": "004",
      "Description": "R_ERRP response for Host-to-Device Data FIS",
      "Value": 0
    },
    "Counter ID 0x007":
    {
      "ID": "007",
      "Description": "R_ERRP response for Host-to-Device non-Data FIS",
      "Value": 0
    },
    "Counter ID 0x008":
    {
      "ID": "008",
      "Description": "Device-to-Host non-Data FIS retries",
      "Value": 0
    },
    ...
  }
}
```

3.1.10 Show HDA Temperature

The **show -hdtemperature** command parses the HDA Temperature and temperature history information for one or more Intel SSDs. Only supported on SATA devices.

3.1.10.1 Syntax

```
IntelMAS show [-help|-h] [-output|-o (text|nvmxml|json)] -hdtemperature [-intelssd (Index|SerialNumber|PhysicalPath)]
```

3.1.10.2 Options

Option	Description
[-help -h]	Displays help for the command.
[-output -o (text nvmxml json)]	Changes the format of the Return Data. Supported output options are: 'text' (Default), 'json', and 'nvmxml'.

3.1.10.3 Targets

Target	Description
-hdateemperature	Displays HDA Temperature and history information.
[-intelssd (Index SerialNumber PhysicalPath)]	Restricts output to a specific Intel SSD by supplying the Intel SSD Index or Serial Number.

3.1.10.4 Limitations

To run this command option, the specified Intel SSD(s) must be manageable by the host software. The specified device must be a SATA device.

3.1.10.5 Return Data

This command will parse, and return human readable text of the HDA temperature and history structure. Use the – output option to return the parsed data in different formats.

3.1.10.6 Examples

Parsed output of the HDA Temperature structure in text format. Not all data is shown below.

```
>IntelMAS.exe show -hdateemperature
- HDA Temperature BTWL238602AM800DGN -

Format Version : 2
Sampling period : 1
Interval : 1
Maximum recommended continuous operating temperature : 70
Maximum Temperature Limit : 70
Minimum recommended continuous operating temperature : 0
Minimum Temperature Limit : 0
Circular buffer size : 478
Last Updated Entry in the circular buffer : 372

- Temperatures -

Index 0 : Initial value or discontinuity in temperature recording.
Index 1 : 17
Index 2 : Initial value or discontinuity in temperature recording.
Index 3 : 13
Index 4 : 15
Index 5 : 15
Index 6 : 16
Index 7 : 16
Index 8 : 16
Index 9 : 17
Index 10 : 17
Index 11 : 17
Index 12 : 17
Index 13 : 18
Index 14 : 18
Index 15 : 18
Index 16 : 18
Index 17 : 18
Index 18 : 18
```

3.1.11 Show Read and Write Latency Statistics Tracking Information

The **show -latencystatistics** command parses the Latency Statistics Logs for one or more Intel SSDs. The **LatencyTrackingEnabled** must be set to true in order to read the logs.

3.1.11.1 Syntax

```
IntelMAS show [-help|-h] [-output|-o (text|nvmxml|json)] -latencystatistics  
( 'reads' | 'writes' ) [-intelssd (Index|SerialNumber|PhysicalPath)]
```

3.1.11.2 Options

Option	Description
[-help -h]	Displays help for the command.
[-output -o (text nvmxml json)]	Changes the format of the Return Data. Supported output options are: 'text' (Default), 'json', and 'nvmxml'.

3.1.11.3 Targets

Target	Description
-latencystatistics (reads writes)	Used to display latency statistics logs for read or write commands. In order to successfully read the logs the LatencyTrackingEnabled property must be set to True. See Modify Device
[-intelssd (Index SerialNumber PhysicalPath)]	Restricts output to a specific Intel SSD by supplying the Intel SSD Index or Serial Number.

3.1.11.4 Limitations

To run this command option, the specified Intel SSD(s) must be manageable by the host software.

3.1.11.5 Return Data

This command will parse and return human readable text of the Latency Statistics Log structure. Use the **-output** option to return the parsed data in different formats.

3.1.11.6 Examples

Parsed output of the Latency Statistics log structure for read commands. Output is in text format. Not all data is shown below.

```
>IntelMAS.exe show -latencystatistics reads

- Latency Statistics For Read Commands CVF85156007H400AGN-1 -

Major Version : 3
Minor Version : 0
Group 1 Details : Range is 0-1ms. Step is 32us. Bucket size is 4 bytes. Total 32 buckets.
Group 2 Details : Range is 1-32ms. Step is 1ms. Bucket size is 4 bytes. Total 31 buckets.
Group 3 Details : Range is 32ms-1s. Step is 32ms. Bucket size is 4 bytes. Total 31 buckets.

- Group 1 Group 1 -

Bucket 1 : 0
Bucket 2 : 0
Bucket 3 : 0
Bucket 4 : 0
Bucket 5 : 0
Bucket 6 : 0
Bucket 7 : 0
Bucket 8 : 0
Bucket 9 : 0
Bucket 10 : 0
Bucket 11 : 0
Bucket 12 : 0
Bucket 13 : 0
Bucket 14 : 0
Bucket 15 : 0
Bucket 16 : 0
Bucket 17 : 0
Bucket 18 : 0
Bucket 19 : 0
Bucket 20 : 0
Bucket 21 : 0
Bucket 22 : 0
Bucket 23 : 0
Bucket 24 : 0
Bucket 25 : 0
Bucket 26 : 0
Bucket 27 : 0
Bucket 28 : 0
Bucket 29 : 0
Bucket 30 : 0
Bucket 31 : 0
Bucket 32 : 0

- Group 2 Group 2 -

Bucket 1 : 0
Bucket 2 : 0
Bucket 3 : 0
```

3.1.12 Show Parsed Persistent Event Log Data

The **show -persistenteventlog** command parses persistent event log data either from a binary file saved on the system or pulled directly from the drive.

3.1.12.1 Syntax

```
IntelMAS show [-help|-h] [-source (path)] [-destination (path)] [-output|-o (text|nvmxml|json)] [-intelssd (Index|SerialNumber|PhysicalPath)] -persistenteventlog
```

3.1.12.2 Options

Option	Description
[-help -h]	Displays help for the command.
[-source (path)]	If used, will parse a persistent event log binary file at this path. If this option is not used, data will instead be pulled from the drive and parsed immediately (if a persistent event log context is established).
[-destination (path)]	If used, will output the parsed persistent event log data to a text file at the specified path. If not used, the parsed data will be displayed to the user.
[-output -o (text nvmxml json)]	Changes the format of the Return Data. Supported output options are: 'text' (Default), 'json', and 'nvmxml'.

3.1.12.3 Targets

Target	Description
-persistenteventlog	Used to parse persistent event log data.
[-intelssd (Index SerialNumber PhysicalPath)]	Restricts output to a specific Intel SSD by supplying the Intel SSD Index or Serial Number.

3.1.12.4 Limitations

The persistent event log command must be supported by the drive. In order to pull the persistent event log data from the drive and parse it (by omitting the -source option) a persistent event log context must be established using the **dump** command, See [section 3.4.3](#).

3.1.12.5 Return Data

This command will parse and return human readable text of the persistent event log. Use the -output option to return the parsed data in different formats.

3.1.12.6 Examples

Parse a previously dumped persistent event log binary (see [section 3.4.3](#))

```
IntelMAS.exe show -source PEL_binary.bin -destination PEL_parsed.txt -persistenteventlog
```

Parse persistent event log data directly from a drive

```
IntelMAS.exe show -destination PEL_parsed.txt -intelssd 1 -persistenteventlog
```

3.1.13 Configure Intel SSDs Show NVMe Get Feature Information

The **show -getfeature** command sends a get feature command with the specified feature id (FID) for Intel SSDs. Only supported on NVMe devices.

3.1.13.1 Syntax

```
IntelMAS show [-help|-h] [-display|-d (Property1,...)] [-all|-a] [-output|-o (text|nvmxml|json)] -intelssd (Index|SerialNumber|PhysicalPath) -getfeature (feature id) [-namespace (namespace id)] [Select = ('current'|'default'|'saved'|'capabilities')]
```

3.1.13.2 Options

Option	Description
[-help -h]	Displays help for the command.
[-output -o (text nvmxml json)]	Changes the format of the Return Data. Supported output options are: 'text' (Default), 'json', and 'nvmxml'.

3.1.13.3 Targets

Target	Description
-getfeature (feature id)	Specify the feature id (FID) of the NVMe get feature command Examples of valid input would be <ul style="list-style-type: none"> • 0x1 - Arbitration • 0x2 - Power Management • 0x3 - LBA Range Type • 0x4 - Temp Threshold • 0x5 - Error Recovery • 0x6 - Volatile Write Cache • 0x7 - Number Of Queues • 0x8 - Interrupt Coalescing • 0x9 - Interrupt Vector Config • 0xA - Write Atomicity • 0xB - Event Config
[-intelssd (Index SerialNumber PhysicalPath)]	(Optional) Restricts output to specific Intel SSD by supplying the Intel SSD Index or Serial Number.
-namespace (namespace Id)	Namespace target is optional. Must specify namespace ID if being used.

3.1.13.4 Properties

Below are the properties that can be modified.

Property	Description
Select	Sets the select value Valid values are: <ul style="list-style-type: none"> • Current • Default • Saved • Capabilities

3.1.13.5 Limitations

To run this command option, the specified Intel SSD(s) must be manageable by the host software. The specified device must be an Intel NVMe SSD.

The command is entirely dependent on valid feature id values. Different drive families will support different feature ids.

3.1.13.6 Return Data

This command will parse and return human readable text of the specified NVMe get feature. Use the `-output` option to return the parsed data in different formats.

3.1.13.7 Examples

Parsed output of get feature with FID=1

```
> IntelMAS show -intelssd 0 -getfeature 1

- BTLJ723607AK2P0BGN -

ArbitrationBurst : 0

HighPriorityWeightArbitration : 0

LowPriorityWeightArbitration : 0

MediumPriorityWeightArbitration : 0
```

3.1.14 Show NVMe IEEE 16667 Silo Information

The **show -IEEEESilo** command sends a get feature command with the specified feature id (FID) for Intel SSDs. Used to show IEEE 16667 Silo information.

Only supported on NVMe devices that support the NVMe Cloud SSD Specification from the Open Compute Project.

3.1.14.1 Syntax

```
IntelMAS show [-help|-h] [-output|-o (text|nvmxml|json)] -intelssd
(Index|SerialNumber|PhysicalPath) -IEEEESilo [Select =
('current'|'default'|'saved'|'capabilities')]
```

3.1.14.2 Options

Option	Description
<code>[-help -h]</code>	Displays help for the command.
<code>[-output -o (text nvmxml json)]</code>	Changes the format of the Return Data. Supported output options are: 'text' (Default), 'json', and 'nvmxml'.

3.1.14.3 Targets

Target	Description
<code>-IEEEESilo</code>	Specifies that IEEE 16667 Silo information is requested. No input required.
<code>[-intelssd (Index SerialNumber PhysicalPath)]</code>	(Optional) Restricts output to specific Intel SSD by supplying the Intel SSD Index or Serial Number.

3.1.14.4 Properties

Below are the properties that can be modified.

Property	Description
Select	<p>Sets the select value</p> <p>Valid values are:</p> <ul style="list-style-type: none"> • Current • Default • Saved • Capabilities

3.1.14.5 Limitations

To run this command option, the specified Intel SSD(s) must be manageable by the host software. The specified device must be an Intel NVMe SSD.

This command is only supported on NVMe devices that support the NVMe Cloud SSD Specification from the Open Compute Project.

3.1.14.6 Return Data

This command will parse and return human readable text of the specified NVMe get feature. Use the `-output` option to return the parsed data in different formats.

3.1.14.7 Examples

```
> IntelMAS show -intelssd 0 -IEEESilos
- BTLJ723607AK2P0BGN -
Silo : Currently Enabled
```

3.1.15 Show NVMe Read Only/Write Through Mode Information

The **show -ReadOnlyWriteThrough** command sends a get feature command with the specified feature id (FID) for Intel SSDs. Used to show Read Only/Write Through mode information.

Only supported on NVMe devices that support the NVMe Cloud SSD Specification from the Open Compute Project.

3.1.15.1 Syntax

```
IntelMAS show [-help|-h] [-output|-o (text|nvmxml|json)] -intelssd
(Index|SerialNumber|PhysicalPath) -ReadOnlyWriteThrough [Select =
('current'|'default'|'saved'|'capabilities')]
```

3.1.15.2 Options

Option	Description
<code>[-help -h]</code>	Displays help for the command.
<code>[-output -o (text nvmxml json)]</code>	Changes the format of the Return Data. Supported output options are: 'text' (Default), 'json', and 'nvmxml'.

3.1.15.3 Targets

Target	Description
-ReadOnlyWriteThrough	Specifies that Read Only/Write Through Mode information is requested. No input required.
[-intelssd (Index SerialNumber PhysicalPath)]	(Optional) Restricts output to specific Intel SSD by supplying the Intel SSD Index or Serial Number.

3.1.15.4 Properties

Below are the properties that can be modified.

Property	Description
Select	Sets the select value Valid values are: <ul style="list-style-type: none"> • Current • Default • Saved • Capabilities

3.1.15.5 Limitations

To run this command option, the specified Intel SSD(s) must be manageable by the host software. The specified device must be an Intel NVMe SSD.

This command is only supported on NVMe devices that support the NVMe Cloud SSD Specification from the Open Compute Project.

3.1.15.6 Return Data

This command will parse and return human readable text of the specified NVMe get feature. Use the `-output` option to return the parsed data in different formats.

3.1.15.7 Examples

```
> IntelMAS show -intelssd 1 -ReadOnlyWriteThrough Select=Default
- BTLJ723607AK2P0BGN -
Mode : Read Only Mode (ROM) is the factory default
```

3.1.16 Show NVMe Error Injection Information

The **show -ErrorInjection** command sends a get feature command with the specified feature id (FID) for Intel SSDs. Used to show error injection information.

Only supported on NVMe devices that support the NVMe Cloud SSD Specification from the Open Compute Project.

3.1.16.1 Syntax

```
IntelMAS show [-help|-h] [-output|-o (text|nvmxml|json)] -intelssd
(Index|SerialNumber|PhysicalPath) -ErrorInjection
```

3.1.16.2 Options

Option	Description
[-help -h]	Displays help for the command.
[-output -o (text nvmxml json)]	Changes the format of the Return Data. Supported output options are: 'text' (Default), 'json', and 'nvmxml'.

3.1.16.3 Targets

Target	Description
-ErrorInjection	Specifies that Error Injection information is requested. No input required.
[-intelssd (Index SerialNumber PhysicalPath)]	(Optional) Restricts output to specific Intel SSD by supplying the Intel SSD Index or Serial Number.

3.1.16.4 Properties

No properties available for this feature

3.1.16.5 Limitations

To run this command option, the specified Intel SSD(s) must be manageable by the host software. The specified device must be an Intel NVMe SSD.

This command is only supported on NVMe devices that support the NVMe Cloud SSD Specification from the Open Compute Project.

3.1.16.6 Return Data

This command will parse and return human readable text of the specified NVMe get feature. Use the `-output` option to return the parsed data in different formats.

3.1.16.7 Examples

```
> IntelMAS show -intelssd 1 -ErrorInjection
- BTLJ723607AK2P0BGN -
- Error Injection Info Error Injection Info -
Number of Error Injections : 0
```

3.2 Configure Intel SSDs

Configuring SSDs requires the CLI verbs **Load** (Firmware Update), **Set** (Modify Device), and **Start** (Execute Drive Function).

3.2.1 Firmware Update

Updates the firmware on the Intel SSD. On the next reset, the firmware will become active.

Intel® MAS show devices (intelmas.exe show -intelssd) will indicate if there is firmware update available. Run the load command to update the firmware. Firmware update binaries are embedded in the tool. User doesn't have to provide firmware binary.

Note: Systems configured with the SATA Controller set to IDE mode are not supported

3.2.1.1 Syntax

```
IntelMAS load [-force|-f] [-help|-h] [-output|-o (text|nvml|json)] -intelssd
(Index|SerialNumber|PhysicalPath)
```

3.2.1.2 Options

Option	Description
[-force -f]	Displays a prompt by default when invoking the Firmware Update command. Use this option to bypass the prompt.
[-help -h]	Displays help for the command.
[-output -o (text nvml json)]	Changes the format of the Return Data. Supported output options are: 'text' (Default), 'json', and 'nvml'.

3.2.1.3 Targets

Target	Description
-intelssd (Index SerialNumber PhysicalPath)	Updates the firmware on the specified Intel SSD. Firmware binaries are embedded into the tool. See the FirmwareUpdateAvailable property for firmware update eligibility.

3.2.1.4 Properties

This command does not support any properties.

3.2.1.5 Limitations

To run this command, you must have the appropriate host system privileges and the specified Intel SSDs must be manageable by the host software.

3.2.1.6 Return Data

The CLI indicates the status of the firmware update operation.

3.2.1.6.1 Sample Output

```
>IntelMAS.exe load -intelssd 0
WARNING! You have selected to update the drives firmware!
Proceed with the update? (Y|N): y
Updating firmware...The selected Intel SSD contains current firmware as of this tool release.

>IntelMAS.exe load -intelssd 0
WARNING! You have selected to update the drives firmware!
Proceed with the update? (Y|N): n
Canceled.

>IntelMAS.exe load -f -intelssd 0
Updating firmware...
The selected Intel SSD contains current firmware as of this tool release.

>IntelMAS.exe load -intelssd 0
WARNING! You have selected to update the drives firmware!
Proceed with the update? (Y|N): y
Updating firmware...
Firmware update successful.
```

3.2.1.7 Examples

Updates the firmware on the device at index 1.

```
IntelMAS load -intelssd 1
```

3.2.2 Firmware Update (with binary file)

This method is only to be used if firmware update binaries are available and update is not available in the tool.

Use this method with caution and at your own risk as drive may become unresponsive if invalid binary is loaded.

For NVMe drives, user can also choose the following options:

Commit Action to indicate when the firmware should be activated.

Firmware Slot the firmware should be loaded into if drive supports multiple slots.

3.2.2.1 Syntax

```
IntelMAS load -source firmwareBinaryFile.bin -intelssd (Index|SerialNumber|PhysicalPath)

NVMe only:

IntelMAS load -source firmwareBinaryFile.bin -intelssd (Index|SerialNumber|PhysicalPath)
[FirmwareSlot=(0,1..7)] CommitAction=(2,3)
```

3.2.2.2 Options

Option	Description
<code>[-force -f]</code>	Displays a prompt by default when invoking the Firmware Update command. Use this option to bypass the prompt.
<code>[-help -h]</code>	Displays help for the command.
<code>[-output -o (text nvmlxml json)]</code>	Changes the format of the Return Data. Supported output options are: 'text' (Default), 'json', and 'nvmlxml'.

3.2.2.3 Targets

Target	Description
<code>-intelssd (Index SerialNumber PhysicalPath)</code>	Updates the firmware on the specified Intel SSD. Firmware binaries are embedded into the tool. See the <code>FirmwareUpdateAvailable</code> property for firmware update eligibility.
<code>-source</code>	Provide firmware binary for the update
<code>[FirmwareSlot]</code>	Slot number that should be updated
<code>[CommitAction]</code>	Numeric data indicating Commit option according to NVMe specification.

3.2.2.4 Properties

This command does not support any properties.

3.2.2.5 Limitations

To run this command, you must have the appropriate host system privileges and the specified Intel SSDs must be manageable by the host software.

3.2.2.6 Return Data

The CLI indicates the status of the firmware update operation.

3.2.2.6.1 Sample Output

```
>IntelMAS.exe load -intelssd 0
WARNING! You have selected to update the drives firmware!
Proceed with the update? (Y|N): y
Updating firmware...The selected Intel SSD contains current firmware as of this tool release.

>IntelMAS.exe load -intelssd 0
WARNING! You have selected to update the drives firmware!
Proceed with the update? (Y|N): n
Canceled.

>IntelMAS.exe load -f -intelssd 0
Updating firmware...
The selected Intel SSD contains current firmware as of this tool release.

>IntelMAS.exe load -intelssd 0
WARNING! You have selected to update the drives firmware!
Proceed with the update? (Y|N): y
Updating firmware...
Firmware update successful.
```

3.2.2.7 Examples

Updates the firmware on the device at index 1.

```
IntelMAS load -intelssd 1
```

3.2.3 Modify Device

Changes the configurable settings on an Intel SSD.

Note: You can only change one setting at a time.

3.2.3.1 Syntax

```
IntelMAS set [-help|-h] [-output|-o (text|nvmxml|json)] -intelssd
(Index|SerialNumber||PhysicalPath) [...]
```

3.2.3.2 Options

Option	Description
[-help -h]	Displays help for the command.
[-output -o (text nvmxml json)]	Changes the format of the Return Data. Supported output options are: 'text' (Default), 'json', and 'nvmxml'.

3.2.3.3 Targets

Target	Description
-intelssd (Index SerialNumber PhysicalPath)	Modifies the selected Intel SSD by supplying its Index or Serial Number value. An -intelssd must be specified for this command.

3.2.3.4 Properties

Below are the properties that can be modified. One, and only one, property must be specified.

Property	Description
DIPMEnabled	<p>Enable or disable the SATA device's DIPM.</p> <p>Valid values are:</p> <ul style="list-style-type: none"> True – enables DIPM False – disables DIPM
EnduranceAnalyzer	<p>Resets the SMART attributes: E2, E3, and E4.</p> <p>The Valid value is reset. As a result, the reported raw value of these attributes will be 0xFFFF. Once the values have been reset, the device must go through a 60+ minute workload for the attributes to trip.</p>
LatencyTrackingEnabled	<p>Enables or disables latency tracking feature. This must be enabled in order to successfully read the latency statistics logs (Show Read and Write Latency Statistics Tracking Information)</p> <p>Valid values are:</p> <ul style="list-style-type: none"> True – enables latency tracking. False – disables latency tracking.
MaximumLBA	<p>Sets the device's Maximum LBA value. This operation will overprovision the drive. The MaximumLBA can be specified in the following ways:</p> <ul style="list-style-type: none"> xGB - Sets the devices maximum LBA such that the total capacity is the specified GB value. Value must be at least 1 and cannot exceed devices total native capacity. X% - Sets the devices maximum LBA to the given percentage. Allowed values are 1-100%. 100% equals native maximum LBA. LBA - Sets the devices maximum LBA value to the given LBA. Given value must be a decimal literal. The LBA value must be at least XYZ and it cannot exceed the native maximum LBA value. "native" - Sets the devices maximum LBA value back to its native maximum.
PhyConfig	<p>(For ATA devices only) Changes the PHY configuration of the selected device. Valid values are:</p> <ul style="list-style-type: none"> 0: Default enterprise settings. 1: Client settings 2: Alternate enterprise settings 3: Server Settings
PhysicalSectorSize	<p>(For ATA devices only) Changes the devices physical sector size. Values are in byte units. Valid values are:</p> <ul style="list-style-type: none"> 512 4096

Property	Description
PhySpeed	<p>(For ATA devices only) Changes the devices maximum allowed PHY Speed it is allowed to negotiate. Valid values are:</p> <ul style="list-style-type: none"> 1.5: SATA Gen 1 speed of 1.5 Gbs 3: SATA Gen 2 speed of 3 Gbs 6: SATA Gen 3 speed of 6 Gbs <p>Actual negotiated speed is also determined by the controller the device is attached to.</p>
PLITestTimeInterval	<p>(For ATA devices only) Changes the devices PLI test time interval setting. Valid values are:</p> <ul style="list-style-type: none"> 0: 0 min, no immediate test 1: 0 min, do immediate test 2: 60 min, do immediate test 3: 1440 min, do immediate test 4: 4320 min, do immediate test 5: 10080 min, do immediate test 6: 20160 min, do immediate test
PowerGovernorMode	<p>Changes the devices power governor mode settings. Valid values are:</p> <ul style="list-style-type: none"> 0: 25-watts for PCIe NVMe devices; 40W for PCIe NVMe x8 devices; Unconstrained for SATA devices. 1: 20-watts for PCIe NVMe devices 35W for PCIe NVMe x8 devices; Typical (7-watts) for SATA devices. 2: 10-watts for PCIe NVMe devices; 25W for PCIe NVMe x8 devices; Low (5-watts) for SATA devices.
ReadErrorRecoveryTimer	<p>(For ATA devices only) Sets the devices error recovery timer for reads. Value is in 100-microsecond units (e.g., a value of 1 = 100 ms, 2 = 200 ms). Valid values are:</p> <ul style="list-style-type: none"> 0-65535
SMBusAddress	<p>(For NVMe devices only) Sets the devices SM Bus Address for MI Basic communication</p> <p>Valid values are:</p> <ul style="list-style-type: none"> 1-255. A value of 255 will disable SM Bus
SSCEnabled	<p>(For ATA devices only) Toggles the devices spread spectrum clocking (SSC) feature on and off.</p> <ul style="list-style-type: none"> "True" - enable SSC "False" - disable SSC <p>Device must be power cycled after setting.</p>
TempLoggingInterval	<p>(For ATA devices only) Sets the devices temperature logging interval. Value is in seconds. Valid values are:</p> <ul style="list-style-type: none"> 0-65535
TempThreshold	<p>(For NVMe devices only) Sets the devices temperature threshold. Value is in degrees Celsius. Valid values are:</p> <ul style="list-style-type: none"> 0-75

Property	Description
WriteCacheEnabled	Enable or disable the SATA device's Write Cache via ATA set features command. Valid values are: <ul style="list-style-type: none"> True – enables Write Cache False – disables Write Cache
WriteCacheState	(For ATA devices only) Sets the devices write cache state. Valid values are: <ul style="list-style-type: none"> 1: Write cache state is determined by ATA Set Features 2: Write cache is enabled. 3: Write cache is disabled.
WriteCacheReorderingStateEnabled	Enable or disable the SATA device's write cache reordering state. Valid values are: <ul style="list-style-type: none"> True – enables write cache reordering state False – disables write cache reordering state
WriteErrorRecoveryTimer	(For ATA devices only) Set the devices error recovery timer for writes. Value is in 100-microsecond units (e.g., a value of 1 = 100 ms, 2 = 200 ms). Valid values are: <ul style="list-style-type: none"> 0-65535

3.2.3.5 Limitations

To run this command, you must have the appropriate host system privileges and the specified Intel SSD must be manageable by the host software.

3.2.3.6 Return Data

The CLI indicates the status of the operation.

3.2.3.6.1 Sample Output

```
Set WriteCacheState successful.
```

3.2.3.7 Examples

Disables the write cache state of the Intel SSD at index 0 by setting its WriteCacheState to 3.

```
IntelMAS set -intelssd 0 WriteCacheState=3
```

3.2.4 Execute Device Function

Use the **start** verb to execute a function on the selected device.

3.2.4.1 Syntax

```
start [-help|-h] [-force|-f] [-output|-o (text|nvmlxml|json)] -intelssd
(Index|SerialNumber||PhysicalPath) -selftest [(‘short’|‘extended’|‘conveyance’)]

start [-help|-h] [-force|-f] [-output|-o (text|nvmlxml|json)] -intelssd
(Index|SerialNumber||PhysicalPath) -nvmeformat [LBAFormat=(0-NumLBAFormats)]
[SecureEraseSetting=(0|1|2)] [ProtectionInformation=(0|1)] [MetadataSettings=(0|1)]

start [-help|-h] [-force|-f] [-output|-o (text|nvmlxml|json)] -intelssd
(Index|SerialNumber||PhysicalPath) -standby
```

3.2.4.2 Options

Option	Description
[-help -h]	Displays help for the command.
[-force -f]	Displays a prompt by default when invoking NVMe Format functionality. Use this option to bypass the prompt.
[-output -o (text nvmlxml json)]	Changes the format of the Return Data. Supported output options are: ‘text’ (Default), ‘json’, and ‘nvmlxml’.

3.2.4.3 Targets

Target	Description
-intelssd (Index SerialNumber PhysicalPath)	A specific Intel SSD selected by supplying the Intel SSD Index or Serial Number must be provided.
-selftest (‘short’ ‘extended’ ‘conveyance’)	Runs a device self-test on the selected ATA device. If no test is specified, a short test is executed.
-nvmeformat	Issues an NVMe format to the selected drive. See the properties below for details on how to configure the NVMe format. To by-pass the prompt, specify the -force option.
-standby	(ATA devices only) Put the selected device into standby power state. This prepares the drive for removal from the system.

3.2.4.4 Properties

Properties supported for the **start** verb are list below. Properties are specific to different targets.

The properties: LBAFormat, SecureEraseSetting, ProtectionInformation, and MetadataSettings are used with the `-nvmeformat` target.

The target that they correspond to is also listed in the Description.

Property	Description
LBAFormat	(-nvmeFormat) Sets a value that corresponds to one of the supported LBA Formats described in Identify Namespace. If not provided, the tool will use the current value of the selected Intel SSD. Valid values are: <ul style="list-style-type: none"> 0-NumLBAFormats: See NumLBAFormats Property for max value.
SecureEraseSetting	(-nvmeFormat) Specifies the setting for Secure Erase. If not provided, the tool will use a value of 2. Valid values are: <ul style="list-style-type: none"> 0: No secure erase. 1: User data erase. 2: Crypto erase.
ProtectionInformation	(-nvmeFormat) Enables different protection information types. If not provided, the tool will use the current value of the selected Intel SSD. Valid values are: <ul style="list-style-type: none"> 0: Protection information is not enabled. 1: Protection information type 1 is enabled.
MetadataSettings	(-nvmeFormat) Specifies how metadata is transferred. If not provided, the tool will use the current value of the selected Intel SSD Valid values are: <ul style="list-style-type: none"> 0: Metadata is transferred as part of a separate contiguous buffer. 1: Metadata is transferred as part of an extended data LBA.

3.2.4.5 Limitations

To run this command, you must have the appropriate host system privileges and the specified Intel SSD must be manageable by the host software.

- Secure Erase is blocked by the Windows 8.1, Windows 10 and Windows Server operating systems on SATA drives

3.2.4.6 Return Data

The CLI returns the status of the command.

3.2.4.7 Examples

Issues NVMe Format to the Intel SSD at index 1 using the default values.

```
start -intelssd 1 -nvmeformat
```

Issues NVMe Format to the Intel SSD at index 1 and set the LBA Format to 3 and enable Type 1 protection information.

```
start -intelssd 1 -nvmeformat LBAFormat=3 ProtectionInformation=1
```

Issues an ATA Standby Immediate to the Intel SSD at index 1. This will prepare the drive for power removal.

```
start -intelssd 1 -standby
```

Issues an extended ATA DriveSelfTest to the Intel SSD at index 1.

```
start -intelssd 1 -selftest extended
```

3.2.5 Delete Device

Delete Intel SSD will erase all the data on the drive. For SATA devices, this will issue an ATA Secure Erase if supported, or Sanitize erase if supported. For NVMe devices, this will issue an NVMe Format command with SecureEraseSetting = 2. The function will keep the drive's current configuration.

When invoked, the tool will prompt you to proceed with the delete. To bypass the prompt, use the `-force` option.

3.2.5.1 Syntax

```
delete [-help|-h] [-force|-f] [-output|-o (text|nvmxml|json)] -intelssd  
(Index|SerialNumber|PhysicalPath)
```

3.2.5.2 Options

Option	Description
<code>[-help -h]</code>	Displays help for the command.
<code>[-force -f]</code>	The tool will display a prompt by default when invoking delete. Use this option to bypass the prompt. This option will also ignore partitions on the device.
<code>[-output -o (text nvmxml json)]</code>	Change the format of the Return Data. Supported output options are: 'text' (Default), 'json', and 'nvmxml'.

3.2.5.3 Targets

Target	Description
-intelssd (Index SerialNumber PhysicalPath)	Delete the selected Intel SSD Device and erase all data.

3.2.5.4 Properties

This command does not support any properties.

3.2.5.5 Limitations

To successfully execute this command, the caller must have the appropriate privileges and the specified Intel SSD must be manageable by the host software.

3.2.5.6 Return Data

The CLI will return status of the command.

3.2.5.7 Examples

Delete the device at index 1 and erase all user data.

```
delete -intelssd 1
```

3.2.6 NVMe Format

3.2.6.1 Syntax

```
start [-help|-h] [-force|-f] [-output|-o (text|nvmxml|json)] -intelssd  
(Index|SerialNumber||PhysicalPath) -nvmeformat [-namespace (namespace id)] [LBAFormat =  
(0|NumLBAFormats)] [SecureEraseSetting = (0|1|2)] [ProtectionInformation = (0|1)]  
[MetadataSettings = (0|1)]
```

3.2.6.2 Options

Option	Description
[-help -h]	Displays help for the command.
[-output -o (text nvmxml json)]	Change the format of the Return Data. Supported output options are: 'text' (Default), 'json', and 'nvmxml'.

3.2.6.3 Targets

Target	Description
-intelssd (Index SerialNumber PhysicalPath)	(Required) A specific Intel SSD selected by supplying the Intel SSD Index or Serial Number must be provided.

3.2.7 Set NVMe Feature

The **set** **-setfeature** command sends a set feature command with the specified feature id (FID) for Intel SSDs. Only supported on NVMe devices.

3.2.7.1 Syntax

```
IntelMAS set [-help|-h] [-output|-o (text|nvmxml|json)] -intelssd
(Index|SerialNumber|PhysicalPath) -setfeature (feature id) [-namespace (namespace id)]
DWORD11 = (32 bit hex) [DWORD12 = (32 bit hex)] [DWORD13 = (32 bit hex)]
```

3.2.7.2 Options

Option	Description
[-help -h]	Displays help for the command.
[-output -o (text nvmxml json)]	Changes the format of the Return Data. Supported output options are: 'text' (Default), 'json', and 'nvmxml'.

3.2.7.3 Targets

Target	Description
-setfeature (feature id)	Specify the feature id (FID) of the NVMe set feature command Examples of valid input would be <ul style="list-style-type: none"> • 0x1 - Arbitration • 0x2 - Power Management • 0x4 - Temp Threshold • 0x5 - Error Recovery • 0x6 - Volatile Write Cache • 0x7 - Number of Queues • 0x8 - Interrupt Coalescing • 0x9 - Interrupt Vector Config • 0xA - Write Atomicity • 0xB - Event Config
[-intelssd (Index SerialNumber PhysicalPath)]	(Optional) Restricts output to specific Intel SSD by supplying the Intel SSD Index or Serial Number.
-namespace (namespace Id)	Namespace target is optional. Must specify namespace ID if being used.

3.2.7.4 Properties

Below are the properties that can be modified.

Property	Description
DWORD11	32 bit command dword 11 structure value that is used to set the chosen feature value. See Set Features Command specification in NVMe 1.4 spec (section 5.21) for details.
DWORD12	32 bit command dword 12 structure value.
DWORD13	32 bit command dword 13 structure value.

3.2.7.5 Limitations

To run this command option, the specified Intel SSD(s) must be manageable by the host software. The specified device must be an Intel NVMe SSD.

The command is entirely dependent on valid feature id values. Different drive families will support different feature ids.

3.2.7.6 Return Data

This command will send and return the status of the NVMe set feature. There is usually a corresponding get feature command (see [get feature](#)).

3.2.7.7 Examples

Parsed output of get feature with FID=1

```
> IntelMAS set -intelssd 0 -setfeature 4 DWORD11=1
- NVMeFeatures BTLJ723607AK2P0BGN -
Status : Completed successfully.
```

3.2.8 Set NVMe IEEE 1667 Silo

The **set -IEEESSilo** command sends a set feature command with the specified feature id (FID) for Intel SSDs. Used to set IEEE 16667 Silo information.

Only supported on NVMe devices that support the NVMe Cloud SSD Specification from the Open Compute Project.

Syntax:

```
IntelMAS set [-help|-h] [-output|-o (text|nvmxml|json)] -intelssd
(Index|SerialNumber|PhysicalPath) -IEEESSilo Enable = ('true'|'false')Options
```

Option	Description
[-help -h]	Displays help for the command.
[-output -o (text nvmxml json)]	Changes the format of the Return Data. Supported output options are: 'text' (Default), 'json', and 'nvmxml'.

3.2.8.1 Targets

Target	Description
-IEEESSilo	Specifies that IEEE 16667 Silo is requested. No input required.
[-intelssd (Index SerialNumber PhysicalPath)]	(Optional) Restricts output to specific Intel SSD by supplying the Intel SSD Index or Serial Number.

3.2.8.2 Properties

Below are the properties that can be modified.

Property	Description
Enable	True to enable, false to disable.

3.2.8.3 Limitations

To run this command option, the specified Intel SSD(s) must be manageable by the host software. The specified device must be an Intel NVMe SSD.

This command is only supported on NVMe devices that support the NVMe Cloud SSD Specification from the Open Compute Project.

3.2.8.4 Return Data

This command will send and return the status of the NVMe set IEEE 16667 Silo. See the following section for the corresponding get feature:

[Show IEEE 16667 Silo](#)

3.2.8.5 Examples

```
> IntelMAS set -intelssd 1 -IEEESSilo Enable=True
Set Enable successful. Completed successfully.
```

3.2.9 Set NVMe Read Only/Write Through Mode

The **set -ReadOnlyWriteThrough** command sends a set feature command with the specified feature id (FID) for Intel SSDs. Used to set read only or write through mode as the desired device transition and end of life.

Only supported on NVMe devices that support the NVMe Cloud SSD Specification from the Open Compute Project.

Syntax:

```
IntelMAS set [-help|-h] [-output|-o (text|nvmxml|json)] -intelssd
(Index|SerialNumber|PhysicalPath) -ReadOnlyWriteThrough Mode = (1|2)
```

Option	Description
[-help -h]	Displays help for the command.
[-output -o (text nvmxml json)]	Changes the format of the Return Data. Supported output options are: 'text' (Default), 'json', and 'nvmxml'.

3.2.9.1 Targets

Target	Description
-ReadOnlyWriteThrough	Specifies that Read Only/Write Through mode is requested. No input required.
[-intelssd (Index SerialNumber PhysicalPath)]	(Optional) Restricts output to specific Intel SSD by supplying the Intel SSD Index or Serial Number.

3.2.9.2 Properties

Below are the properties that can be modified.

Property	Description
Mode	1 to transition to read only mode, 2 to transition to write through mode.

3.2.9.3 Limitations

To run this command option, the specified Intel SSD(s) must be manageable by the host software. The specified device must be an Intel NVMe SSD.

This command is only supported on NVMe devices that support the NVMe Cloud SSD Specification from the Open Compute Project.

3.2.9.4 Return Data

This command will send and return the status of the NVMe set Read Only/Write Through mode. See the following section for the corresponding get feature:

[Show Read Only/Write Through](#)

3.2.9.5 Examples

```
> IntelMAS set -intelssd 1 -ReadOnlyWriteThrough Mode=1

Set Mode successful. Completed successfully.
```

3.2.10 Set NVMe Error Injection

The **set -ErrorInjection** command sends a set feature command with the specified feature id (FID) for Intel SSDs. Used to forcibly inject errors into the device.

Only supported on NVMe devices that support the NVMe Cloud SSD Specification from the Open Compute Project.

Syntax:

```
set [-help|-h] [-output|-o (text|nvmxml|json)] -intelssd (Index|SerialNumber|PhysicalPath)
-ErrorInjection

[ErrorInjectionEntries = ((tilde separated entry list))] [ErrorInjectionEntryFile =
(path to input file)]

ShowErrorInjection:

show [-help|-h] [-output|-o (text|nvmxml|json)] -intelssd
(Index|SerialNumber|PhysicalPath) -ErrorInjection
```

Option	Description
[-help -h]	Displays help for the command.
[-output -o (text nvmxml json)]	Changes the format of the Return Data. Supported output options are: 'text' (Default), 'json', and 'nvmxml'.

3.2.10.1 Targets

Target	Description
-ErrorInjection	Specifies that error injection set feature is requested. No input required.
[-intelssd (Index SerialNumber PhysicalPath)]	(Optional) Restricts output to specific Intel SSD by supplying the Intel SSD Index or Serial Number.

3.2.10.2 Properties

Below are the properties that can be modified.

Property	Description
ErrorInjectionEntries	<p>A tilde separated list of error injection entries. See the Open Compute Project NVMe Cloud SSD Specification for more details.</p> <p>Note: Each entry shall be formatted in a specific way. Each item in the entry is separated by a period (.). The general format is as follows:</p> <ul style="list-style-type: none"> • First item is the injection enable attribute (0 or 1) • The second item is the single instance attribute (0 or 1) • The third item is the error injection type (always interpreted as hex value) • The fourth entry is a 27-byte hex value indicating the type specific data. A user doesn't have to specify all 27-bytes. If less than 27-bytes are specified, then 0's are prepended. <p>Example: ErrorInjectionEntries= 1.0.0x3.0x44~0.1.0x12.0x3D~1.1.0x3.0xA16E</p> <p>Note: ErrorInjectionEntries properties and ErrorInjectionEntryFile are mutually exclusive.</p>
ErrorInjectionEntryFile	<p>Specifies an XML file that contains the error injection info data. This option serves to streamline the injection formatting (which is cumbersome).</p> <p>Note: ErrorInjectionEntries properties and ErrorInjectionEntryFile are mutually exclusive.</p>

3.2.10.3 Limitations

To run this command option, the specified Intel SSD(s) must be manageable by the host software. The specified device must be an Intel NVMe SSD.

This command is only supported on NVMe devices that support the NVMe Cloud SSD Specification from the Open Compute Project.

3.2.10.4 Return Data

This command will send and return the status of the NVMe set error injections. See the following section for the corresponding get feature:

[Show Error Injection](#)

3.2.10.5 Examples

```
> C:\Users\remlab>IntelMAS set -intelssd 1 -ErrorInjection
ErrorInjectionEntryFile=errorinjection.xml

Completed successfully.

> C:\Users\remlab>IntelMAS set -intelssd 1 -ErrorInjection > C:\Users\remlab>IntelMAS set
-intelssd 1 -ErrorInjection
ErrorInjectionEntries=1.0.0x3.0x44~0.1.0x12.0x3D~1.1.0x3.0xA16E

Completed successfully.
```

3.2.11 Clear PCIe Correctable

The **set -PCleCorrectable** command sends a set feature command with the specified feature id (FID) for Intel SSDs. Used to clear the PCIe correctable counter.

Only supported on NVMe devices that support the NVMe Cloud SSD Specification from the Open Compute Project.
Syntax:

```
IntelMAS set [-help|-h] [-output|-o (text|nvmxml|json)] -intelssd
(Index|SerialNumber|PhysicalPath) -PCleCorrectable ClearCounter = ((true))
```

Option	Description
[-help -h]	Displays help for the command.
[-output -o (text nvmxml json)]	Changes the format of the Return Data. Supported output options are: 'text' (Default), 'json', and 'nvmxml'.

3.2.11.1 Targets

Target	Description
-PCleCorrectable	Specifies that clear PCIe correctable counter is requested. No input required.
[-intelssd (Index SerialNumber PhysicalPath)]	(Optional) Restricts output to specific Intel SSD by supplying the Intel SSD Index or Serial Number.

3.2.11.2 Properties

Below are the properties that can be modified.

Property	Description
ClearCounter	Set to 'true' to clear the counter.

3.2.11.3 Limitations

To run this command option, the specified Intel SSD(s) must be manageable by the host software. The specified device must be an Intel NVMe SSD.

This command is only supported on NVMe devices that support the NVMe Cloud SSD Specification from the Open Compute Project.

3.2.11.4 Return Data

This command will send and return the status of the NVMe clear PCIe correctable counter. Examples

```
> IntelMAS set -intelssd 1 -PCIeCorrectable ClearCounter=True
Set ClearCounter successful. Completed successfully.
```

3.2.12 Optimizer

The **Optimizer** command optimizes the selected drive and partition. This feature is analogous to the Intel MAS GUI's Optimizer feature.

The optimizer feature works by discovering and issuing trims to out-of-date LBAs. This functionality is similar to defragmentation. Used to speed up drive performance.

3.2.12.1 Syntax

```
IntelMAS start [-help|-h] [-output|-o (text|nvmxml|json)] -intelssd
(Index|SerialNumber|PhysicalPath) -optimizer [-partition (id)]
```

3.2.12.2 Options

Option	Description
[-help -h]	Displays help for the command.
[-output -o (text nvmxml json)]	Changes the format of the Return Data. Supported output options are: 'text' (Default), 'json', and 'nvmxml'.

3.2.12.3 Targets

Target	Description
-optimizer	Specifies that the optimizer feature is to be run. No input is required.
[-intelssd (Index SerialNumber PhysicalPath)]	(Optional) Restricts output to specific Intel SSD by supplying the Intel SSD Index or Serial Number.
-partition (id)	Select a partition (e.g. C). This value corresponds to the partition id of the partition you want to run optimizer on (which should be an alphabetical character). This target is optional. If none is selected the feature will select the partition.

3.2.12.4 Properties

No properties are applicable for this command.

3.2.12.5 Limitations

The drive must be formatted and have a valid NTFS partition in order to run this command.

3.2.12.6 Return Data

The command will invoke optimizer functionality and report progress. After completion, a status will be returned indicating success or failure.

3.2.12.7 Examples

```
> IntelMAS start -intelssd 3 -optimizer
100%
Status : Completed successfully.
```

3.2.13 Drive Scan

Scan the drive for Data Integrity, Read Scans, or Logs.

Note: Log scan output will be saved to the output/TIME_STAMP directory relative to the directory in which the command was run unless overridden by the DirectoryPath property.

3.2.13.1 Syntax

```
start [-help|-h] [-output|-o (text|nvmxml|json)] -scan [(DataIntegrity|ReadScan|Logs)] [-
intelssd [(Index|SerialNumber|PhysicalPath)]] [IncludeOS = (true|false)] [FullScan =
(true|false)] [Path = ((drive letter))] [DirectoryPath = ((file path))] [IncludeSystemInfo
= (true|false)]
```

3.2.13.2 Options

Option	Description
[-help -h]	Displays help for the command.
[-output -o (text nvmxml json)]	Change the format of the Return Data. Supported output options are: 'text' (Default), 'json', and 'nvmxml'.

3.2.13.3 Targets

Target	Description
-intelssd (Index SerialNumber PhysicalPath)	(Required) A specific Intel SSD selected by supplying the Intel SSD Index or Serial Number must be provided.
-scan [(DataIntegrity ReadScan Logs)]	(Required) Command to scan information on the drive. Options: DataIntegrity ReadScan Logs

3.2.13.4 Properties

Property	Description
[IncludeOS = (true false)]	(Optional) Scan OS partition and/or drive as part of scan.
[FullScan = (true false)]	(Optional) Should the command perform Full or Quick scan.
[Path = ((drive letter))]	(Optional) Path to drive partition to scan. Only applicable for DataIntegrity
[DirectoryPath = ((file path))]	(Optional) Specify path where drive and system logs should be saved Default is "output/" in current directory.
[IncludeSystemInfo = (true false)]	(Optional) Should system information be included in the scan.

3.2.13.5 Limitations

To successfully execute this command, the caller must have the appropriate privileges and the specified Intel SSD must be manageable by the host software.

3.2.13.6 Return Data

This will return status of the command.

3.2.13.7 Examples

```
> - Scan Results -
- Intel SSD PHYF830403701P9DGN -
- StoreLogs -
Result : Completed successfully.
```

3.2.14 Read System Snapshot

Read the system snapshot from the device and save it to a binary file.

3.2.14.1 Syntax

```
Dump [-help|-h] [-destination (path)] [-output|-o (text|nvmlxml|json)] -intelssd  
(Index|SerialNumber|PhysicalPath) -SystemSnapshot
```

3.2.14.2 Options

Option	Description
[-help -h]	Displays help for the command.
[-destination (path)]	Specify an alternate destination and file name for the output file.
[-output -o (text nvmlxml json)]	Change the format of the Return Data. Supported output options are: 'text' (Default), 'json', and 'nvmlxml'.

3.2.14.3 Targets

Target	Description
-intelssd (Index SerialNumber PhysicalPath)	(Required) A specific Intel SSD selected by supplying the Intel SSD Index or Serial Number must be provided.
-SystemSnapshot	(Required) Read the System Snapshot from the device.

3.2.14.4 Properties

No properties are applicable for this command.

3.2.14.5 Limitations

To successfully execute this command, the caller must have the appropriate privileges and the specified Intel SSD must be manageable by the host software.

3.2.14.6 Return Data

This will return status of the command.

3.2.14.7 Examples

```
> IntelMAS dump -intelssd 1 -systemsnapshot
SystemSnapshot_SerialNumber : Successfully written SystemSnapshot to
SystemSnapshot_SerialNumber.bin
```

3.3 Configure Namespaces

3.3.1 Create a Namespace

Create a namespace. Supported on NVMe 1.2+ devices. The NVMe controller of the device will determine the Namespace ID of the newly created namespace.

3.3.1.1 Syntax

```
create [-help|-h] [-output|-o (text|nvmlxml|json)] -namespace -intelssd
(Index|SerialNumber||PhysicalPath) Size = (blocks) [LBAFormat = (0-NumLBAFormats)]
[ProtectionInformation = (0|1)] [MultiPathIoCapabilities = (0|1)]
```

3.3.1.2 Options

Option	Description
<code>[-help -h]</code>	Displays help for the command.
<code>[-output -o (text nvml json)]</code>	Change the format of the Return Data. Supported output options are: 'text' (Default), 'json', and 'nvml'.

3.3.1.3 Targets

Target	Description
<code>-intelssd (Index SerialNumber PhysicalPath)</code>	A specific Intel SSD selected by supplying the Intel SSD Index or Serial Number must be provided.
<code>-namespace</code>	The <code>-namespace</code> target is required. It specifies that a namespace is to be created.

3.3.1.4 Properties

Properties	Description
<code>Size = (blocks)</code>	The size property is required. It specifies the size of the new namespace in terms of blocks.
<code>[LBAFormat = (0-NumLBAFormats)]</code>	The LBAFormat property is optional. By default an LBAFormat of 0 will be used. Valid options are 0 to Number of supported LBA Formats specified in the Identify Controller structure. See the NumLBAFormats from <code>show -intelssd</code> . The main thing this value determines is the formatted sector size. NOTE: you cannot have different namespaces with different LBA sector sizes.
<code>[ProtectionInformation = (0 1)]</code>	The ProtectionInformation property is optional. By default a value of 0 will be used. 0 = protection information is disabled. 1 = protection information type 1 is used.
<code>[MultiPathIoCapabilities = (0 1)]</code>	The MultiPathIoCapabilities property is optional. By default a value of 1 will be used. 0 = Private namespace is created. 1 = shared namespace is created.

3.3.1.5 Limitations

To successfully execute this command, the caller must have the appropriate privileges and the specified Intel SSD must be manageable by the host software.

3.3.1.6 Return Data

The CLI will return status of the command.

3.3.1.7 Examples

Create a given namespace with a size of 100000 blocks.

```
create -namespace -intelssd 2 size=100000
- Intel SSD CVEK5316004R800AGN -
```

```
Status : create namespace successful.
```

Create a given namespace with a size of 100000 blocks, that is private and has protection type 1.

```
create -namespace -intelssd 2 size=100000 MultiPathIoCapabilities=0
ProtectionInformation=1
```

```
- Intel SSD CVEK5316004R800AGN -
```

```
Status : create namespace successful.
```

3.3.2 Attach a Namespace

Attach a namespace. May specify an NVMe controller ID using the `-nvmecontrollerid` target. Supported on NVMe 1.2+ devices.

3.3.2.1 Syntax

```
attach [-help|-h] [-output|-o (text|nvmxml|json)] -namespace (id) -intelssd
(Index|SerialNumber||PhysicalPath) [-nvmecontroller (controller ID integer)]
```

3.3.2.2 Options

Option	Description
<code>[-help -h]</code>	Displays help for the command.
<code>[-output -o (text nvmxml json)]</code>	Change the format of the Return Data. Supported output options are: 'text' (Default), 'json', and 'nvmxml'.

3.3.2.3 Targets

Target	Description
<code>-intelssd (Index SerialNumber PhysicalPath)</code>	A specific Intel SSD selected by supplying the Intel SSD Index or Serial Number must be provided.
<code>-namespace (id)</code>	The <code>-namespace</code> target is required and a valid namespace ID. It specifies that a namespace is to be attached.
<code>[-nvmecontroller (controller ID integer)]</code>	The <code>-nvmecontroller</code> target is optional. If used, a valid controller ID must be given. Used in the case of dual port drives in which a device may have more than one NVMe controller.

3.3.2.4 Properties

This command does not support any properties.

3.3.2.5 Limitations

To successfully execute this command, the caller must have the appropriate privileges and the specified Intel SSD must be manageable by the host software.

3.3.2.6 Return Data

The CLI will return status of the command.

3.3.2.7 Examples

Attach namespace 1 on the device at index 2.

```
attach -namespace 1 -intelssd 2
- Intel SSD CVEK5316004R800AGN -
Status : attach namespace successful.
```

3.3.3 Detach a Namespace

Detach a namespace. Supported on NVMe 1.2+ devices.

3.3.3.1 Syntax

```
detach [-help|-h] [-output|-o (text|nvmxml|json)] -namespace (id) -intelssd
(Index|SerialNumber||PhysicalPath) [-nvmecontroller (controller ID integer)]
```

3.3.3.2 Options

Option	Description
[-help -h]	Displays help for the command.
[-output -o (text nvmxml json)]	Change the format of the Return Data. Supported output options are: 'text' (Default), 'json', and 'nvmxml'.

3.3.3.3 Targets

Target	Description
-intelssd (Index SerialNumber PhysicalPath)	(Required) A specific Intel SSD selected by supplying the Intel SSD Index or Serial Number must be provided.
-namespace (id)	(Required) The -namespace target is required and a valid namespace ID. It specifies that a namespace is to be detached.
[-nvmecontroller (controller ID integer)]	The -nvmecontroller target is optional. If used, a valid controller ID must be given. Used in the case of dual port drives in which a device may have more than one NVMe controller.

3.3.3.4 Properties

This command does not support any properties.

3.3.3.5 Limitations

To successfully execute this command, the caller must have the appropriate privileges and the specified Intel SSD must be manageable by the host software.

3.3.3.6 Return Data

The CLI will return status of the command.

3.3.3.7 Examples

Detach namespace 1 on the device at index 2.

```
detach -namespace 1 -intelssd 2
- Intel SSD CVEK5316004R800AGN -
Status : detach namespace successful.
```

3.3.4 Delete a Namespace

Delete a namespace. Supported on NVMe 1.2+ devices.

3.3.4.1 Syntax

```
delete [-help|-h] [-force|-f] [-output|-o (text|nvmxml|json)] -namespace (id) -intelssd
(Index|SerialNumber||PhysicalPath)
```

3.3.4.2 Options

Option	Description
[-help -h]	Displays help for the command.
[-force -f]	The tool will display a prompt by default when invoking delete. Use this option to bypass the prompt. This option will also ignore partitions on the device.
[-output -o (text nvmxml json)]	Change the format of the Return Data. Supported output options are: 'text' (Default), 'json', and 'nvmxml'.

3.3.4.3 Targets

Target	Description
-intelssd (Index SerialNumber PhysicalPath)	(Required) A specific Intel SSD selected by supplying the Intel SSD Index or Serial Number must be provided.
-namespace (id)	The -namespace target is required and a valid namespace id must be provided. This selects which namespace to delete.

3.3.4.4 Properties

This command does not support any properties.

3.3.4.5 Limitations

To successfully execute this command, the caller must have the appropriate privileges and the specified Intel SSD must be manageable by the host software.

3.3.4.6 Return Data

The CLI will return status of the command.

3.3.4.7 Examples

Delete namespace 1 on the device at index 2.

```
delete -namespace 1 -intelssd 2

WARNING! You have selected to delete the namespace!
Proceed with the delete? (Y|N): y

- Intel SSD CVEK5316004R800AGN -

Status : delete namespace successful.
```

Use the -force option to bypass the prompt.

```
delete -f -namespace 1 -intelssd 2

- Intel SSD CVEK5316004R800AGN -

Status : delete namespace successful.
```

3.4 Instrumentation Commands

3.4.1 Show Tool Configuration

Show tool configuration properties.

3.4.1.1 Syntax

```
IntelMAS show [-all|-a] [-display|-d] [-help|-h] [-output|-o (text|nvmxml|json)] -system
```

3.4.1.2 Options

Option	Description
[-all -a]	Show all properties.
[-display -d]	Filters the returned properties by explicitly specifying a comma separated list of any of the properties defined in the Return Data section.
[-help -h]	Displays help for the command.
[-output -o (text nvmxml json)]	Changes the format of the Return Data. Supported output options are: 'text' (Default), 'json', and 'nvmxml'.

3.4.1.3 Targets

Target	Description
-system	Represents the host system. This target has no parameters.

3.4.1.4 Properties

This command option does not support any properties.

3.4.1.5 Limitations

To run this command option, the specified Intel SSD(s) must be manageable by the host software.

3.4.1.6 Return Data

The command displays the following Tool configuration properties. This output could be filtered by specifying the Properties with the `-display` option.

Property	Description
EnableLSIAAdapter	True or False. Whether or not the LSIAAdapter library is loaded. This affects LSI Mega RAID Controller Support. (Default value is False)
EnableLog	True or False. Whether or not to save the Tool's debug log file. (Default value is False)
LogFile	Filename of the Tool's debug log file. Only saved if EnableLog is true. Can contain full qualified file system path. Log location: Windows: c:\Program Files(x86)\Intel\ Linux: /usr/bin/IntelSSDDataCenterTool/TDKI.log

3.4.1.7 Examples

Default show output for `-system` target in default text format.

```
>IntelMAS.exe show -system
- IntelMAS Config -
EnableLSIAAdapter: false
EnableLog: false
LogFile: C:\Intel\log\TDKI.log
```

3.4.2 Modify Tool Configuration

Change the Tool's configurable settings on the host system. You can only change one setting at a time.

3.4.2.1 Syntax

```
IntelMAS set [-help|-h] [-output|-o (text|nvmxml|json)] -system [Property=]
```

3.4.2.2 Options

Option	Description
<code>[-help -h]</code>	Displays help for the command.
<code>[-output -o (text nvmxml json)]</code>	Changes the format of the Return Data. Supported output options are: 'text' (Default), 'json', and 'nvmxml'.

3.4.2.3 Targets

Target	Description
<code>-system</code>	Represents the host system. This target has no parameters.

3.4.2.4 Properties

One, and only one, property can be specified at a time.

Property	Description
EnableLSIAdapter	Enable or disable the loading of the LSI Adapter library. Supported values are "True" and "False"
EnableLog	Enable or disable the Tool from saving a debug log file. Supported values are "True" and "False"
LogFile	Specify the filename (and path if desired) of the Debug log file. Debug log is only saved if EnableLog=True and LogFile is a valid file name and path.

3.4.2.5 Limitations

To run this command option, the specified Intel SSD(s) must be manageable by the host software.

3.4.2.6 Return Data

The CLI will indicate the status of the operation.

Sample Output:

```
Set EnableLog successful.
```

3.4.2.7 Examples

```
set -system EnableLog=True
```

Enable the tool's debug log file.

```
set -system LogFile=myNewLogFile.txt
```

Set the tool's debug log file. If no path is given the file will be saved in the working directory.

```
set -system EnableLSIAdapter=False
```

Disable the loading of the LSIAdapter library.

3.4.3 Dump Device Data

This command will read binary data from the device and save it to a file. This feature currently supports dumping:

- nLog
- Event Log
- Assert Log
- Telemetry Log

3.4.3.1 Syntax

```
dump[-help|-h] [-destination (filename)] [-output|-o (text|nvmxml|json)] [-intelssd
(Index|SerialNumber|PhysicalPath)] -nlog

dump[-help|-h] [-destination (filename)] [-output|-o (text|nvmxml|json)] [-intelssd
(Index|SerialNumber|PhysicalPath)] -eventlog

dump[-help|-h] [-destination (filename)] [-output|-o (text|nvmxml|json)] [-intelssd
(Index|SerialNumber|PhysicalPath)] -assertlog

dump -destination <output binary> -intelssd <index|serial|physicalpath> -telemetrylog

dump[-help|-h] [-destination (filename)] [-output|-o (text|nvmxml|json)] [-intelssd
(Index|SerialNumber|PhysicalPath)] -persistenteventlog ('read'|'release') [NewContext =
[('true'|'false')]]
```

3.4.3.2 Options

Option	Description
[-help -h]	Displays help for the command.
[-destination (filename)]	Specifies a filename to save the dump data to. If -destination option is not given, default filename is assigned based on target and drive serial number.
[-output -o (text nvmxml json)]	Changes the format of the Return Data. Supported output options are: 'text' (Default), 'json', and 'nvmxml'. This option does not affect the output in the binary file.

3.4.3.3 Targets

Target	Description
-intelssd (Index SerialNumber PhysicalPath)	Dump the selected data from the given Intel SSD.
-nlog	Read the nlog binary data from the device and save it to binary file.
-eventlog	Read the event log binary data from the device and save it to binary file.
-assertlog	Read the Assert log binary data from the device and save it to binary file.
-telemetrylog	Read the telemetry log binary data from the device and save it to binary file
-persistenteventlog ('read' 'release')	Read the persistent event log binary data from the current context, create a new context, or release the current context

3.4.3.4 Properties

This command does not support any properties.

3.4.3.5 Limitations

To run this command, the specified Intel SSD must be manageable by the host software.

Telemetry is only available on selected drives.

3.4.3.6 Return Data

Binary data is saved to default file destination or if `-destination` option is given, output will be saved to given filename. Status of reading the binary data from the selected device, and saving it to file, is returned.

3.4.3.7 Examples

Read the nlog binary from all attached Intel SSDs. Save to default files.

```
> dump -nlog
Nlog_CVF85156007H400AGN-2 : Successfully written Nlog data to Nlog_CVF85156007H400AGN-2.bin
Nlog_CVF85156007H400AGN-1 : Successfully written Nlog data to Nlog_CVF85156007H400AGN-1.bin
Nlog_BTWL238602AM800DGN : Successfully written Nlog data to Nlog_BTWL238602AM800DGN.bin
```

Read 600 sectors the GPL at address 0xDF, Page Number 0 and save it to binary file: gpl.bin.

```
> dump -destination gpl.bin -intelssd 1 -gpl 0xDF PageNum=0 SectorCount=600

GPL_BTWL238602A
M800DGN : Successfully written GPL data to gpl.bin
```

Extract Telemetry log to file telemetry_data.bin

```
IntelMAS.exe dump -destination telemetry_data.bin -intelssd 1 -telemetrylog
```

Read Persistent event log data from the current context

```
IntelMAS.exe dump -destination PEL_data.bin -intelssd 1 -persistenteventlog read
```

Establish a new persistent event log context and read from it

```
IntelMAS.exe dump -destination PEL_data.bin -intelssd 1 -persistenteventlog read
NewContext = true
```

Release the current persistent event log context (does not read or output any data)

```
IntelMAS.exe dump -destination PEL_data.bin -intelssd 1 -persistenteventlog release
```

3.5 Support Commands

Support commands consist of **Help** and **Version**.

3.5.1 Help Command

Shows help for the supported commands.

3.5.1.1 Syntax

```
IntelMAS help [-help|-h] [-output|-o (text|nvmxml|json)] [Verb=(verb)] [Name=(command)]
```

3.5.1.2 Options

Option	Description
<code>[-help -h]</code>	Displays help for the command.
<code>[-output -o (text nvxml json)]</code>	Changes the format of the Return Data. Supported output options are: 'text' (Default), 'json', and 'nvxml'.

3.5.1.3 Targets

This command does not support any targets.

3.5.1.4 Properties

Property	Default	Description
Verb	All Verbs	Filters help to a specific verb. One of: <ul style="list-style-type: none"> • delete • dump • help • load • set • show • start • version
Name	All commands	Filters help to a specific command by name.

3.5.1.5 Return Data

By default, the command displays an introduction to Intel® MAS followed by a list of the supported commands. When the command list can be filtered to just one command, detailed information is displayed. When the command list includes more than one command, only the command name and synopsis are displayed.

3.5.1.5.1 Sample Output (Multiple Commands)

Note: Not all commands are displayed. This is just to view how the output appears.

```
>IntelMAS.exe help
Usage: IntelMAS.exe <verb>[<options>][<targets>][<properties>]

Commands:
Help:
  help [-help|-h] [-output|-o (text|nvxml|json)] [Name = (name)] [verb = (verb)]
IntelSSD:
  show [-help|-h] [-display|-d (Property1,...)] [-all|-a] [-output|-o (text|nvxml|json)] -intelssd
  [(Index|SerialNumber|PhysicalPath)]
EnduranceAnalyzer:
  set [-help|-h] [-output|-o (text|nvxml|json)] -intelssd (Index|SerialNumber|PhysicalPath)
  EnduranceAnalyzer = ('reset')
PhyConfig:
  set [-help|-h] [-output|-o (text|nvxml|json)] -intelssd (Index|SerialNumber|PhysicalPath)
  PhyConfig = (0|1|2|3)
PhysicalSectorSize:
  set [-help|-h] [-output|-o (text|nvxml|json)] -intelssd (Index|SerialNumber|PhysicalPath)
  PhysicalSectorSize = (512|4096)
```

```

PLITestTimeInterval:
    set [-help|-h] [-output|-o (text|nvmxml|json)] -intelssd (Index|SerialNumber||PhysicalPath)
PLITestTimeInterval = (0-6)

PowerGovernorMode:
    set [-help|-h] [-output|-o (text|nvmxml|json)] -intelssd (Index|SerialNumber||PhysicalPath)
PowerGovernorMode = (0|1|2)

ReadErrorRecoveryTime:
    set [-help|-h] [-output|-o (text|nvmxml|json)] -intelssd (Index|SerialNumber||PhysicalPath)
ReadErrorRecoveryTimer = (value)

PhySpeed:
    set [-help|-h] [-output|-o (text|nvmxml|json)] -intelssd (Index|SerialNumber||PhysicalPath)
PhySpeed = (1.5|3|6)

SSCEnabled:
    set [-help|-h] [-output|-o (text|nvmxml|json)] -intelssd (Index|SerialNumber||PhysicalPath)
SSCEnabled = ('true'|'false')

TemperatureLoggingInterval:
    set [-help|-h] [-output|-o (text|nvmxml|json)] -intelssd (Index|SerialNumber||PhysicalPath)
TemperatureLoggingInterval = (time)

TempThreshold:
    set [-help|-h] [-output|-o (text|nvmxml|json)] -intelssd (Index|SerialNumber||PhysicalPath)
TempThreshold = (value)

WriteErrorRecoveryTime:
    set [-help|-h] [-output|-o (text|nvmxml|json)] -intelssd (Index|SerialNumber||PhysicalPath)
WriteErrorRecoveryTimer = (value)

WriteCacheState:
    set [-help|-h] [-output|-o (text|nvmxml|json)] -intelssd (Index|SerialNumber||PhysicalPath)
WriteCacheState = (1|2|3)

MaximumLBA:
    set [-help|-h] [-output|-o (text|nvmxml|json)] -intelssd (Index|SerialNumber||PhysicalPath)
MaximumLBA = (numGB|1-100%|LBA|'native')

FirmwareUpdate:
    load [-help|-h] [-force|-f] [-output|-o (text|nvmxml|json)] -intelssd
(Index|SerialNumber||PhysicalPath)

SMART:
    show [-help|-h] [-display|-d (Property1,...)] [-all|-a] [-output|-o (text|nvmxml|json)] -smart
[(id)] [-intelssd
    [(Index|SerialNumber|PhysicalPath)]]

Sensors:
    show [-help|-h] [-display|-d (Property1,...)] [-all|-a] [-output|-o (text|nvmxml|json)] -sensor [-
intelssd
    [(Index|SerialNumber|PhysicalPath)]]

Performance:
    show [-help|-h] [-display|-d (Property1,...)] [-all|-a] [-output|-o (text|nvmxml|json)] -
performance [-intelssd
    [(Index|SerialNumber|PhysicalPath)]]

NVMeLog:
    show [-help|-h] [-output|-o (text|nvmxml|json)] [-intelssd [(Index|SerialNumber|PhysicalPath)]] -
nvmelog
    [('ErrorInfo'|'SmartHealthInfo'|'FirmwareSlotInfo'|'TemperatureStatistics')]

Delete:
    delete [-help|-h] [-force|-f] [-output|-o (text|nvmxml|json)] -intelssd
(Index|SerialNumber||PhysicalPath)

```

3.5.1.5.2 Sample Output (verb filter to multiple commands)

Specifying the verb property filters the list to only the commands starting with the specified verb.

```
IntelMAS.exe help verb=show
Usage: IntelMAS.exe <verb>[<options>][<targets>][<properties>]

Commands:
IntelSSD:
    show [-help|-h] [-display|-d (Property1,...)] [-all|-a] [-output|-o (text|nvmxml|json)] -intelssd
    [(Index|SerialNumber|PhysicalPath)]

SMART:
    show [-help|-h] [-display|-d (Property1,...)] [-all|-a] [-output|-o (text|nvmxml|json)] -smart
    [(id)] [-intelssd
    [(Index|SerialNumber|PhysicalPath)]]

Sensors:
    show [-help|-h] [-display|-d (Property1,...)] [-all|-a] [-output|-o (text|nvmxml|json)] -sensor [-
    intelssd
    [(Index|SerialNumber|PhysicalPath)]]

Performance:
    show [-help|-h] [-display|-d (Property1,...)] [-all|-a] [-output|-o (text|nvmxml|json)] -
    performance [-intelssd
    [(Index|SerialNumber|PhysicalPath)]]

NVMeLog:
    show [-help|-h] [-output|-o (text|nvmxml|json)] [-intelssd [(Index|SerialNumber|PhysicalPath)]] -
    nvmelog
    [('ErrorInfo'|'SmartHealthInfo'|'FirmwareSlotInfo'|'TemperatureStatistics')]

IdentifyDevice:
    show [-help|-h] [-output|-o (text|nvmxml|json)] -identify [-namespace [(integer | 'attached' |
    'allocated')]]
    [-nvmecontroller] [-intelssd [(Index|SerialNumber|PhysicalPath)]]

LatencyStatistics:
    show [-help|-h] [-output|-o (text|nvmxml|json)] -latencystatistics ('reads'|'writes') [-intelssd
    [(Index|SerialNumber|PhysicalPath)]]

HDATemperature:
    show [-help|-h] [-output|-o (text|nvmxml|json)] -hdatemperature [-intelssd
    [(Index|SerialNumber|PhysicalPath)]]

PhyCounters:
    show [-help|-h] [-output|-o (text|nvmxml|json)] -phycounters [-intelssd
    [(Index|SerialNumber|PhysicalPath)]]

NVMeControllerList:
    show [-help|-h] [-output|-o (text|nvmxml|json)] [-namespace (namespace id)] -nvmecontroller [-
    intelssd
    [(Index|SerialNumber|PhysicalPath)]]

System:
    show [-help|-h] [-display|-d (Property1,...)] [-all|-a] [-output|-o (text|nvmxml|json)] -system
```

3.5.1.5.3 Sample Output (single command)

Specifying the Name property filters the list to a specific command and detailed information is returned.

```
IntelMAS.exe help Name=Firmware
Name: FirmwareUpdate

Description:
    Update the device's firmware. See the device's FirmwareUpdateAvailable property for any eligible updates. To by-pass the prompt specify the -force option.

Synopsis:
    load [-help|-h] [-force|-f] [-output|-o (text|nvmxml|json)] -intelssd
    (Index|SerialNumber|PhysicalPath)

Verb:
    load

Options:
    [-help|-h] -- Display help for the command.

    [-force|-f] -- Force the operation

    [-output|-o (text|nvmxml|json)] -- Change the output format. One of "text", "nvmxml" or "json".

Targets:
    -intelssd (Index|SerialNumber|PhysicalPath) -- Device index or serial number is required.

Properties:
```

3.5.1.6 Examples

Lists all supported commands

```
IntelMAS help
```

Lists all commands where the verb is set

```
IntelMAS help verb=show
```

Lists the detailed help for the given Name WriteCacheState

```
IntelMAS help Name=WriteCacheState
```

3.5.2 Version Command

Shows the Intel® Memory and Storage Tool's version and End-User License.

3.5.2.1 Syntax

```
IntelMAS version [-help|-h] [-display|-d] [-all|-a] [-output|-o (text|nvmxml|json)]
```

3.5.2.2 Options

Option	Description
[-help -h]	Displays help for the command.
[-display -d]	Filters the returned properties by explicitly specifying a comma separated list of any of the properties defined in the Return Data section.
[-output -o (text nvmxml json)]	Changes the format of the Return Data. Supported output options are: 'text' (Default), 'json', and 'nvmxml'.

3.5.2.3 Targets

This command does not support any targets.

3.5.2.4 Properties

This command does not support any properties.

3.5.2.5 Return Data

By default, the command returns the Intel® Memory and Storage Tool's version information. With the `-display` option, it shows the License property.

Property	Description
License	Shows the End-User License for the Intel® Memory and Storage Tool.

3.5.2.5.1 Sample Output

Default output in text.

```
> IntelMAS.exe version
- Version Information -

Name: Intel(R) Intel® Memory and Storage Tool
Version: 3.0.0
Description: Interact and configure Intel SSDs.
```

Default output in JSON.

```
> IntelMAS.exe version -o json
{
  "Version Information":
  {
    "Name":"Intel(R) Intel® Memory and Storage Too",
    "Version":"3.0.0",
    "Description":"Interact and configure Intel SSDs."
  }
}
```

3.5.2.6 Examples

Display the available version information for the Intel® MAS software.

```
version
```

Display the End-User License for the Intel® MAS software components.

```
version -d license
```

3.6 Debug

3.6.1 Tool Debug File

The Intel® Memory and Storage Tool saves appends to a debug file that contains detailed information on the tool execution. This file is very useful for the Tool Developers when having to debug issues. Whenever requesting assistance from the Tools team on a potential issue with the tool this file will be requested. See [Show Tool Configuration](#) and [Modify Tool Configuration](#) for more information on enabling the debug log.

4 Response Codes

The following table lists all the possible error and status codes that are returned from the Intel® MAS Tool. The first column lists the numeric value of the error/status code returned by the tool. In Windows, to display the numeric return value, type the following at the command prompt after running the tool:

```
>echo %errorlevel%
```

Code	Description
0	Completed successfully.
1	Failed to load the Intel TDK Interface library.
2	An error occurred with interacting with the TDK Interface Library.
3	An error was returned from the TDK Interface when executing the given CLI functionality.
4	Encountered a read file error.
5	Encountered a write file error.
6	Invalid Boolean values were given.
7	Invalid property given.
8	Invalid CLI argument given.

5 Examples

5.1 Display Tool Help

Use **help** command line option to display the help table.

```
IntelMAS.exe help
```

5.2 Display Tool License

Use the **version** command with the license property to display the End-User license agreement for Intel® Memory and Storage Tool.

```
IntelMAS.exe version -d license
```

5.3 Display Drives

Use the **show** command to display a list of drives on the system.

```
IntelMAS.exe show -intelssd
```

5.4 Bypass Prompts (force)

Use the force option to bypass the warning prompts associated with **load** and **start** commands.

5.5 Debug Log Files

The tool generates a detailed log of the tool's functionality that you can use for debugging purposes and send out for further analysis of tool issues. See [Debug](#) section.

5.6 Display Drive Info

Use the **show** command's **-intelssd** option to select which drive to execute functions on and provides a simple summary of each drive found. Use the **show** command's **-a -intelssd 1** option to display a verbose output of all the information the tool can get on that particular drive.

```
IntelMAS.exe show -a -intelssd 1
```

5.7 Identify Device

Use the **show** verb along with the **-identify** target to read and parse identify information. See [Show Device Identification Structures](#) for details.

Note: Identify device contains a large amount of data and the console window may not be large enough to display it in a readable format.

```
IntelMAS.exe show -identify -intelssd 1  
IntelMAS.exe show -identify -intelssd 1 -nvmecontroller
```

5.8 Sensor or SMART Data

Use the **-sensor** command to read and parse the Health Sensors. Use the **-smart** command to read and parse the SMART attribute information of the selected drive.

Show all the sensor information for all Intel SSDs

```
IntelMAS.exe show -sensor
```

Show all the SMART properties for the Intel SSD at index 1.

```
IntelMAS.exe show -smart -intelssd 1
```

5.9 Delete

Use the **Delete** command to erase all the data on the drive.

```
IntelMAS.exe delete -intelssd 1
```

You will be prompted unless using the **-force** option.

```
WARNING: You have selected to delete the drive!  
Proceed with the delete? (Y/N)
```

To bypass the warning prompts, use the **-force** option.

```
IntelMAS.exe delete -f -intelssd 1
```

5.10 Change Maximum LBA

Use the MaximumLBA property to change the drive's maximum storage capacity up to the native capacity of the drive (that is, MAX LBA).

Note: Always run the **delete** command before altering the Maximum LBA of a drive. After modifying the maximum LBA, you must perform a complete power shutdown to properly reflect the changes.

The MaximumLBA property has four options:

The native option resets the drive back to its native Max LBA, or 100% of the drive.

```
IntelMAS.exe set -intelssd 1 MaximumLBA=native
```

The LBA option specifies the drive's max LBA with a specific number. The number entered must be a decimal literal.

This example sets the drive's Max LBA to 55555:

```
IntelMAS.exe set -intelssd 1 MaximumLBA=55555
```

The x% percent changes the drive's size based on a percentage of native max. Values of 1-100 are valid, where a value of 100 is equivalent to using the native option.

```
IntelMAS.exe set -intelssd 1 MaximumLBA=80%
```

The xGB capacity option sets the drive to a specific capacity in gigabytes. This will result in an error if the given number of gigabytes is less than 1 or is greater than the drive's max capacity.

```
IntelMAS.exe set -intelssd 1 MaximumLBA=80GB
```

5.11 Update Firmware

Firmware Update is achieved through the load command verb and is used to update the firmware of the selected drive:

```
IntelMAS.exe load -intelssd 1
```

The Intel® Memory and Storage Tool handles both updates using Windows process or Linux process.

Full Windows Process: The tool handles both updates automatically. For example:

```
IntelMAS.exe show -intelssd 1
- IntelSSD Index 1 -
Bootloader: 8B1B012E
DevicePath: \\.\PHYSICALDRIVE1
DeviceStatus: Healthy
Firmware: 8DV10131
FirmwareUpdateAvailable: Firmware=8DV10151 Bootloader=8B1B012F
Index: 1
ProductFamily: Intel SSD DC P3700 Series
ModelNumber: INTEL SSDPEDMD800G4
SerialNumber: CVFT4174002A800CGN

IntelMAS.exe load -intelssd 1
WARNING! You have selected to update the drives firmware!
Proceed with the update? (Y|N): y
Updating firmware...
Firmware update successful. Please reboot the system.

IntelMAS.exe show -intelssd 1
- IntelSSD Index 1 -
Bootloader: 8B1B012F
DevicePath: \\.\PHYSICALDRIVE1
DeviceStatus: Healthy
Firmware: 8DV10151
FirmwareUpdateAvailable: Firmware is up to date as of this tool release.
Index: 1
ProductFamily: Intel SSD DC P3700 Series
ModelNumber: INTEL SSDPEDMD800G4
SerialNumber: CVFT4174002A800CGN
```

Linux Process: User must call the “load” function twice with a system shutdown and reboot in between.

First update:

```
IntelMAS show -intelssd
- IntelSSD Index 0 -
Bootloader: 8B1B012E
DevicePath: /dev/nvme0n1
DeviceStatus: Healthy
Firmware: 8DV10131
FirmwareUpdateAvailable: Firmware=8DV10151
Index: 0
ProductFamily: Intel SSD DC P3700 Series
ModelNumber: INTEL SSDPEDMD800G4
SerialNumber: CVFT4174002A800CGN

[root@linuxul2br remlab]# IntelMAS load -intelssd 0
WARNING! You have selected to update the drives firmware!
Proceed with the update? (Y|N): y
Updating firmware...
Firmware update successful. Please reboot the system.
[root@linuxul2br remlab]#
```

The user then shuts down the system and reboots.

In the second update, the tool shows the next update to the BL12E and FW 131 combined package:

```
IntelMAS show -intelssd
- IntelSSD Index 0 -
Bootloader: 8B1B012E
DevicePath: /dev/nvme0n1
DeviceStatus: Healthy
Firmware: 8DV10131
FirmwareUpdateAvailable: Firmware=8DV10151 Bootloader=8B1B012F
Index: 0
ProductFamily: Intel SSD DC P3700 Series
ModelNumber: INTEL SSDPEDMD800G4
SerialNumber: CVFT4174002A800CGN

[root@linuxul2br remlab]# IntelMAS load -intelssd 0
WARNING! You have selected to update the drives firmware!
Proceed with the update? (Y|N): y
Updating firmware...
Firmware update successful. Please reboot the system.
[root@linuxul2br remlab]#
```

The user shuts down the system and reboots.

```
IntelMAS show -intelssd
- IntelSSD Index 0 -
Bootloader: 8B1B012F
DevicePath: /dev/nvme0n1
DeviceStatus: Healthy
Firmware: 8DV10151
FirmwareUpdateAvailable: Firmware is up to date as of this tool release
Index: 0
ProductFamily: Intel SSD DC P3700 Series
ModelNumber: INTEL SSDPEDMD800G4
SerialNumber: CVFT4174002A800CGN
```

5.12 Endurance Analyzer

Use the enduranceanalyzer property to calculate the life expectancy of the drive's media based on a user workload. Please note that this feature specifically measures the expected lifetime of the media, not the overall expected lifetime of the drive.

The steps are:

1. Reset SMART Attributes using the reset option.
2. Optionally, remove the SSD and install in test system.
3. Apply minimum 60-minute workload to SSD.
4. Reinstall SSD in original system if needed. Compute endurance using the show command. You can also specify the EnduranceAnalyzer property specifically using the `-display (-d)` option.

```
IntelMAS.exe show -a -intelssd 2
```

```
IntelMAS.exe show -d EnduranceAnalyzer -intelssd 2
```

5. Read the Endurance Analyzer value which represents the life expectancy of the drive's media in years.

Note: The wear leveling of Optane™ based SSDs will stay at 0% until after several thousand full pack writes. The counter will update normally for all other drives.

Note: Endurance analyzer measures **media wear only**. Using media wear, calculations are performed to determine the expected life of the drive media. Please do not use this feature as an overall indicator of drive life expectancy. Media is one component of many affecting drive lifespan.

5.13 Power Governor Mode

Use PowerGovernorMode to display and/or change the selected drive's power governor mode. The supported modes are:

- 0 – 25 watts for NVMe drives, unconstrained for ATA devices
- 1 – 20 watts for NVMe drives, Typical (7W) for ATA devices
- 2 – 10 watts for NVMe drives, Low (5W) for ATA devices

To view the current setting, use the **show** command and view the current setting. You can also specify the PowerGovernorMode property specifically using the **-display (-d)** option.

```
IntelMAS.exe show -a -intelssd 1
IntelMAS.exe show -d PowerGovernorMode -intelssd 1
```

To explicitly set the power governor mode, provide one of the supported mode options.

```
IntelMAS.exe set -intelssd 1 PowerGovernorMode=0
```

5.14 JSON – Output

Supports output to all verbs.

Note: The parsed output from "dump" still goes to the file. The output to the screen is status/error text and that is what is affected by the **--output** option.

Example:

```
IntelMAS.exe show -o json -intelssd
{
  "IntelSSD Index 0":
  {
    "DevicePath": "\\.\PHYSICALDRIVE0",
    "DeviceStatus": "Healthy",
    "Firmware": "D2010370",
    "FirmwareUpdateAvailable": "Firmware is up to date as of this tool release.",
    "Index": 0,
    "ProductFamily": "Intel SSD DC S3500 Series",
    "ModelNumber": "INTEL SSDSC2BB080G4",
    "SerialNumber": "BTWL2390005K080DGN"
  }
  "IntelSSD Index 1":
  {
    "DevicePath": "\\.\PHYSICALDRIVE01",
    "DeviceStatus": "Healthy",
    "Firmware": "5DV10270",
    "FirmwareUpdateAvailable": "Firmware is up to date as of this tool release.",
    "Index": 1,
    "ProductFamily": "Intel SSD DC S3700 Series",
    "ModelNumber": "INTEL SSDSC2BA400G3",
    "SerialNumber": "BTTV220600B5400HGN"
  }
  "IntelSSD Index 2":
  {
    "Bootloader": "8B1B012E",
    "DevicePath": "\\.\PHYSICALDRIVE02",
    "DeviceStatus": "Healthy",
    "Firmware": "8DV10131",
    "FirmwareUpdateAvailable": "Firmware is up to date as of this tool release.",
```

```

    "Index":2,
    "ProductFamily":"Intel SSD DC P3600 Series",
    "ModelNumber":"INTEL SSDPEDME800G4D HHHL NVME 800GB",
    "SerialNumber":"CVFT4174002C800CGN"
  }
}

```

5.15 NVMLXML – Output

Supports output to all verbs.

Note: The parsed output from "dump" still goes to the file. The output to the screen is status/error text and that is what is affected by the --output option.

Example:

```

IntelMAS.exe show -o nvmlxml -intelssd
<RootList>
<IntelSSD_Index_0>
  <DevicePath>\\\\.\\PHYSICALDRIVE0</DevicePath>
  <DeviceStatus>Healthy</DeviceStatus>
  <Firmware>D2010370</Firmware>
  <FirmwareUpdateAvailable>Firmware is up to date as of this tool
release.</FirmwareUpdateAvailable>
  <Index>0</Index>
  <ProductFamily>Intel SSD DC S3500 Series</ProductFamily>
  <ModelNumber>INTEL SSDSC2BB080G4</ModelNumber>
  <SerialNumber>BTWL2390005K080DGN</SerialNumber>
</IntelSSD_Index_0>

<IntelSSD_Index_1>
  <DevicePath>\\\\.\\PHYSICALDRIVE1</DevicePath>
  <DeviceStatus>Healthy</DeviceStatus>
  <Firmware>5DV10270</Firmware>
  <FirmwareUpdateAvailable>Firmware is up to date as of this tool
release.</FirmwareUpdateAvailable>
  <Index>1</Index>
  <ProductFamily>Intel SSD DC S3700 Series</ProductFamily>
  <ModelNumber>INTEL SSDSC2BA400G3</ModelNumber>
  <SerialNumber>BTTV220600B5400HGN</SerialNumber>
</IntelSSD_Index_1>
<IntelSSD_Index_2>
  <DevicePath>\\\\.\\PHYSICALDRIVE2</DevicePath>
  <DeviceStatus>Healthy</DeviceStatus>
  <Firmware>8DV10131</Firmware>
  <FirmwareUpdateAvailable>Firmware is up to date as of this tool
release.</FirmwareUpdateAvailable>
  <Index>2</Index>
  <ProductFamily>Intel SSD DC P3600 Series</ProductFamily>
  <ModelNumber>INTEL SSDPEDME800G4D HHHL NVME 800GB</ModelNumber>
  <SerialNumber>CVFT4174002C800CGN</SerialNumber>
</IntelSSD_Index_2>
</RootList>

```