



Intel® Memory and Storage Tool (Intel® MAS)

User Guide - Public

December 2022

Revision 016US



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Revision History

Revision Number	Description	Date
016US	Intel® MAS Version 2.2 <ul style="list-style-type: none"> Added ESXi* 8.0 to the supported OS list in System Requirements 	December 2022
015US	Intel® MAS Version 2.1 <ul style="list-style-type: none"> Added firmware updates for hybrid products Updated Solidigm* links in installer, GUI, and CLI Hid CLI properties when they are not applicable Fixed Intel® MAS GUI crash that occurred with certain Intel® Rapid Storage Technology (Intel® RST) RAID configurations 	July 2022
014US	Intel® MAS Version 2.0 <ul style="list-style-type: none"> Intel® MAS now only supports SSDs based on Intel® Optane™ technology 	May 2022
013US	Intel® MAS Version 1.11 (Documentation change only) <ul style="list-style-type: none"> Deleted Supported Memory and Storage Devices section, as this information is provided in the Release Notes document. 	October 2021
012US	Intel® MAS Version 1.11 <ul style="list-style-type: none"> Updated Supported OS list in System Requirements 	October 2021
011US	Intel® MAS Version 1.10 <ul style="list-style-type: none"> Added Secure Erase* Command for ATA Added RHEL*/CentOS* 8.2 known issue for Delete Namespace 	August 2021
010US	Intel® MAS Version 1.8 <ul style="list-style-type: none"> Added BootDrive option to Section 2.1 and 3.1.2.3 	May 2021
009US	Intel® MAS Version 1.7 <ul style="list-style-type: none"> Added ESXi* 7.0.2 support 	April 2021
008US	Intel® MAS Version 1.6 <ul style="list-style-type: none"> Error injection command updates Updated System Requirements Section 1.2 Updated Supported Memory and Storage Devices Section 1.3 	February 2021
007US	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
006US	Intel® MAS Version 1.4 <ul style="list-style-type: none"> Secure Erase* limitation with Windows Server* 2016 	November 2020
005US	Intel® MAS Version 1.3 includes the following updates: <ul style="list-style-type: none"> Added RHEL* 8.0 to supported distros on User Guide Added persistent event log feature to User Guide Updated endurance analyzer section Updated SMART attribute section 	October 2020



Revision Number	Description	Date
004US	Intel® MAS Version 1.2 includes the addition of the following commands: <ul style="list-style-type: none">• NVMe* Reset• NVMe* Timestamp	August 2020
003US	Added Windows Server* 2019 to Section 1.2 System Requirements	June 2020
002US	Intel® MAS Version 1.0.6	June 2020
001US	Initial Release Intel® MAS Version 1.0.5	January 2020

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.

Note: Intel® SSDs when referred to in this document are related to supported SSDs based on Intel® Optane™ technology.

Intel® MAS Summary:

- Command-Line Interface (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® MAS provides a suite of capabilities for interacting with 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:

1. Product
2. Product Type: Client, Datacenter
3. Interface Type: Advanced Technology Attachment (ATA), NVMe* (1.1, 1.2, 1.3, 1.4)
4. Operating System Version/Support
5. Driver: Intel NVMe* driver, Windows* Inbox NVMe* driver, Intel® Rapid Storage Technology (Intel® RST) driver
6. 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 Self-Monitoring and Reporting Technology (SMART) information

- Resizing the SSD's usable storage capacity by changing its maximum Logical Block Addressing (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 PCI Express* (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 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 SMBus Address
- Namespace Management command support (NVMe* 1.2 and later drives)

1.2 System Requirements

The Intel® MAS is supported on the following:

- Operating systems on x86/x64 Architecture:
 - Windows*:
 - Windows Server* 2008 R2, 2012, 2012 R2, 2016, 2019, 2022
 - Windows* 8.0, 8.1, 10, 11
 - Linux*:
 - Red Hat Enterprise Linux* (RHEL*) 8.0, 8.1, 8.2, 8.3, 8.4
 - CentOS* 8.0, 8.1, 8.2, 8.3, 8.4
 - SLES* 12, 15
 - Ubuntu* 16.04, 18.04, 20.04
 - ESXi*:

- ESXi* 6.5, 6.7, 7.0.0, 7.0.1, 7.0.2, 7.0.3, 8.0
- Available space of 400 MBs

Notes:

- On Windows Server* 2012, 2008, and R2; and Windows* 8, 8.1, and 10; administrator access is required. Open a command prompt as administrator and run the tool via the commands as described in this document. Disable User Account Control (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® Accelerator Management Daemon for VMware ESXi* NVMe* driver. The user will need to set their ESXi* host acceptance level to "CommunitySupported" 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 inbox Windows* NVMe* driver found in server 2012 R2. The tool will return an error if this driver is used.
- Namespace limitations on RHEL*/CentOS* 8.2: Kernel bug can cause deadlock on delete namespace in RHEL*/CentOS* 8.2.
- Earlier OS Versions not listed in supported list are generally expected to work but are not actively validated and not officially supported.

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 Host Bus Adapters (HBAs)

RAID Modes Supported:

- RAID 0
- RAID 1
- RAID 5
- Intel® Virtual RAID on CPU (Intel® VROC)

Other Modes Supported:

- AHCI

1.3 Document Conventions

Throughout this guide, the format of each command is documented in a delimited 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 (parentheses) 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 the 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)
```

1.4 Running the Intel® MAS

Run the Intel® MAS 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
```

1.5 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 except for the target portion of the command, see the *Server Management Command Line Protocol Specification(SM CLP)*, document number DSP0214 at <http://www.dmtf.org>.

The target specification in the SM-CLP identifies Common Information Model (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.

1.6 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 must 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 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 are provided in subsequent sections of this document.

2.1 Quick Command Syntax Guide for Features

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: c, "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) set [-help -h] [-output -o (text nvmlxml json)] -intelssd (Index SerialNumber PhysicalPath) AggregationTime = (value)</pre>	<pre>intelmas set -intelssd 1 AggregationThreshold = 128 intelmas set -intelssd 1 AggregationTime = 255</pre>
Assert Log	<p>Read the Assert Log binary and save it to the given filename.</p> <p>NVMe* only</p>	<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>

Feature	Description	Command Syntax	Example
Bridge NLog	Read the Bridge NLog binary and save it to the given filename. Selected NVMe* only	dump [-help -h] [-destination (path)] [-output -o (text nvmxml json)] [-intelssd [(Index SerialNumber PhysicalPath)]] -bridgenlog	intelmas dump -destination apl_bridge_binary.bin -intelssd 1 -bridgenlog
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 nvmxml json)] -intelssd [(Index SerialNumber PhysicalPath)]	intelmas delete -intelssd 1
Drive Index	Display information of selected drive by index.	show [-help -h] [-display -d (Property1,...)] [-all -a] [-output -o (text nvmxml 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 nvmxml 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 nvmxml 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 nvmxml 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 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)]	intelmas start -scan Logs -intelssd 1

Feature	Description	Command Syntax	Example
Endurance Analyzer	Run the endurance analyzer calculation to determine drives life expectancy.	set [-help -h] [-output -o (text nvmxml json)] -intelssd (Index SerialNumber PhysicalPath) EnduranceAnalyzer = ('reset')	intelmas set -intelssd 1 EnduranceAnalyzer = reset
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
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	<p>Activate the firmware on the selected drive (NVMe* only). Configure activation notification</p> <p>Performed after firmware update with source option</p> <p>NVMe* only</p>	<p>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)]</p> <p>set [-help -h] [-output -o (text nvmxml json)] -intelssd (Index SerialNumber PhysicalPath) FirmwareActivationNoticesConfiguration = ('true' 'false')</p>	<p>intelmas load -intelssd 1 -firmwareactivate FirmwareSlot = 1 CommitAction = 2</p> <p>intelmas set -intelssd 1 FirmwareActivationNoticesConfiguration = true</p>
Firmware Update (load)	Update the firmware of the selected drive (if possible).	<p>Load -intelssd (Index SerialNumber PhysicalPath)</p> <p>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)]</p>	<p>intelmas load -intelssd 1</p> <p>intelmas load -source firmwareBinaryFile.bin -intelssd 1 FirmwareSlot = 1 CommitAction = 0</p>

Feature	Description	Command Syntax	Example
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
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
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

Feature	Description	Command Syntax	Example
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 nvmmxml json)] -latencystatistics ('reads' 'writes') [-intelssd [(Index SerialNumber PhysicalPath)]] set [-help -h] [-output -o (text nvmmxml 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
LED Activity	Display the selected drive's LED activity settings. Selected drives only	show [-help -h] [-display -d (Property1,...)] [-all -a] [-output -o (text nvmmxml json)] [-intelssd [(Index SerialNumber PhysicalPath)]] -led set [-help -h] [-output -o (text nvmmxml 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 nvmmxml json)]	intelmas version -d license
Max Address	Set the drive's maximum Logical Block Address (LBA) value. Caution: Resizes the drive	set [-help -h] [-output -o (text nvmmxml 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

Feature	Description	Command Syntax	Example
Namespace (Attach/Create Delete/Detach Notification)	Configure the specified namespace ID to the given controller ID. NVMe* only	<pre>attach [-help -h] [-output -o (text nvmxml json)] -intelssd (Index SerialNumber Physical Path) -namespace (namespace id) [-nvmecontroller (controller ID integer)] create [-help -h] [-output -o (text nvmxml json)] -intelssd (Index SerialNumber Physical Path) -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 Physical Path) -namespace (namespace id) detach [-help -h] [-force -f] [-output -o (text nvmxml json)] -intelssd (Index SerialNumber Physical Path) -namespace (namespace id) set [-help -h] [-output -o (text nvmxml json)] -intelssd (Index SerialNumber Physical Path) NamespaceAttributeNoticesConfiguration = ('true' 'false')</pre>	<pre>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</pre>
NLog	Read the NLog binary and save it to the given filename.	<pre>dump [-help -h] [-destination (path)] [-output -o (text nvmxml json)] [-intelssd [(Index SerialNumber Physical Path)]] -nlog</pre>	<pre>intelmas dump -destination nlog_binary.bin -intelssd 1 -nlog</pre>
NVMe* Controller (Show)	Show the devices list of controllers. Use the -namespace target to list controllers attached to that given namespace ID. NVMe* only	<pre>show [-help -h] [-output -o (text nvmxml json)] [-intelssd [(Index SerialNumber Physical Path)]] [-namespace (namespace id)] -nvmecontroller</pre>	<pre>intelmas show -intelssd 1 -namespace 1 -nvmecontroller</pre>

Feature	Description	Command Syntax	Example
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 Physical Path) -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 Physical Path) -nvmeformat [-namespace (namespace id)] [LBAFormat = (0-NumLBAFormats)] [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 Physical Path)]] -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 Physical Path) -nvmecontroller	IntelMas reset - intelssd 1 - nvmecontroller
NVMe* Timestamp	Returns the current timestamp value for the targeted controller. Sets the timestamp value in the controller. Note: Units are in milliseconds.	ShowTimestamp: show [-help -h] [-output -o (text nvmxml json)] -intelssd (Index SerialNumber Physical Path) -timestamp SetTimestamp: set [-help -h] [-output -o (text nvmxml json)] -intelssd (Index SerialNumber Physical Path) -timestamp (value)	IntelMAS show -timestamp -intelssd 1 IntelMAS set -timestamp 0 -intelssd 1

Feature	Description	Command Syntax	Example
Performance	Show properties related to device performance metrics.	show [-help -h] [-display -d (Property1,...)] [-all -a] [-output -o (text nvmxml json)] [-intelssd [(Index SerialNumber PhysicalPath)]] -performance	intelmas show -intelssd 1 -performance
Performance Booster	Boost performance of SSD by flushing cache. User can start, stop, or track progress of cache flushing feature. Selected drives only	start [-help -h] [-output -o (text nvmxml json)] -intelssd (Index SerialNumber PhysicalPath) -PerformanceBooster stop [-help -h] [-output -o (text nvmxml json)] -intelssd (Index SerialNumber PhysicalPath) -PerformanceBooster show [-help -h] [-output -o (text nvmxml json)] [-intelssd [(Index SerialNumber PhysicalPath)]] -nvme-log ['CommandEffectsLog' 'ChangedNamespaceList' 'ErrorInfo' 'SmartHealthInfo' 'FirmwareSlotInfo' 'TemperatureStatistics' 'QueueMetrics' 'PerformanceBooster']	intelmas start -intelssd 1 -PerformanceBooster intelmas stop -intelssd 1 -PerformanceBooster intelmas show -intelssd 1 -nvme-log PerformanceBooster
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

Feature	Description	Command Syntax	Example
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
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

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>
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>

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|nvmlxml|json)] -intelssd
[ (Index|SerialNumber|PhysicalPath) ]
```

3.1.1.2 Options

Option	Description
<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".

3.1.1.3 Targets

Target	Description
<code>-intelssd</code> <code>[(Index SerialNumber PhysicalPath BootDrive)]</code>	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 and default properties are displayed for each device.

```
IntelMAS show -intelssd
```

Lists basic default information for drive at index 0.

```
IntelMAS show -intelssd 0
```

3.1.2 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.

Property	Description
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 that the device is attached to.
ControllerID	(Windows* OS only) The ID value of the device controller found in the Windows* OS registry.
ControllerIDEMode	Shows if the controller the device is attached to is in Integrated Device Electronics (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.
DevicePath	(Default) The OS path to the device (for example \\.\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 Windows Server* 2012 R2 system is using the inbox 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.

Property	Description
EnduranceAnalyzer	<p>The drives life expectancy in years. This utilizes the 0xE2, 0xE3, and 0xE4 SMART attributes.</p> <p>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.</p> <p>If the media wear indicator is zero, then the workload has not induced enough wear to calculate an accurate life expectancy.</p>
ErrorString	<p>Shows a description of the error state of the drive.</p> <p>Note: The drive is not in an error state if the value is blank.</p>
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.
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 NVMe* Intel® SSD.
IOCompletionQueuesRequested	(For NVMe* devices only) Shows the number of I/O Completion Queues requested.
IOSubmissionQueuesRequested	(For NVMe* devices only) Shows the number of I/O 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 “NumLBFormats”. 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	<p>(For NVMe* devices only) Shows the device’s Metadata setting.</p> <p>One of either:</p> <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. <p>This can be changed by issuing an NVMe* format.</p>

Property	Description
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 that there are 0 to 6 possible LBA Formats (7 total).
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. For example, 4 or 8.
PhysicalSize	The physical size of the device in bytes. Value is in decimal format.
PNPString	(Windows* OS only) The devices PNP String from the Windows* registry.
ProductProtocol	The devices protocol, for example ATA or NVMe*.
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	(For NVMe* devices only) Shows the device's protection information type setting. One of: <ul style="list-style-type: none"> 0: Protection information is not enabled. 1: Protection information type 1 is enabled. This can be changed by issuing an NVMe* format.

Property	Description
ProtectionInformationLocation	(For NVMe* devices only) Shows the device's protection information location setting. One of: <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 MegaRAID*.
SCSIPortNumber	(Windows* OS only) The port number of the Small Computer System Interface (SCSI) path used by Windows*.
SectorSize	Shows the sector size in bytes.
SerialNumber	(Default) Shows the serial number assigned to the device.
SMARTEnabled	Shows if SMART capabilities are enabled on the device. Reports True or False.
SMBusAddress	(For NVMe* devices only) Shows the SMBus address of the drive. Value of 255 means that the SMBus is disabled.
StorageSpaceMember	Shows if the device is a Windows* Storage Space member.
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.

3.1.2.6 Examples

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

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

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|nvmlxml|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 nvmlxml json)]	Changes the format of the Return Data. Supported output options are: "text" (Default), "json", and "nvmlxml".

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® SSDs 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 erases 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	Maximum 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.
SpecifiedPCBMaxOperaratingTemp	(NVMe* Devices Only). Specified PCB maximum operating temperature in degrees Celsius.
SpecifiedPCBMinOperaratingTemp	(NVMe* Devices Only). Specified PCB minimum operating temperature in degrees Celsius.
Temperature	Total temperature of the device in degrees Celsius
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.

3.1.4 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|nvmlxml|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 nvmlxml json)]	Changes the format of the Return Data. Supported output options are: "text" (Default), "json", and "nvmlxml".

3.1.4.3 Targets

Target	Description
<code>-smart [(id)]</code>	Displays SMART attributes for device(s). Specific SMART attributes can be selected if (id) is given.
<code>[-intelssd (Index SerialNumber PhysicalPath)]</code>	(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
<code>IncludeNVMeSmartHealthLog=(true false)</code>	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® SSDs 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.

Property	Description
Worst	(Optional) Shows the SMART attributes worst normalized value. Maintained for the life of the device.

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|nvmlxml|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 nvmlxml json)]	Changes the format of the Return Data. Supported output options are: "text" (Default), "json", and "nvmlxml".

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® SSDs 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
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.

3.1.6 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|nvmlxml|json)] [-intelssd  
(Index|SerialNumber|PhysicalPath)] -identify [-nvmecontroller] [-namespace  
(id|'attached'|'allocated')]
```

3.1.6.2 Options

Option	Description
<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".

3.1.6.3 Targets

Target	Description
<code>-identify</code>	Displays identification structures for Intel® SSDs.
<code>[-intelssd (Index SerialNumber PhysicalPath)]</code>	(Optional) Restricts output to specific Intel® SSD by supplying the Intel® SSD index or serial number.
<code>[-nvmecontroller]</code>	(Optional) Specify it to parse the NVMe* identify controller structure.

Target	Description
<code>[-namespace (id 'attached' 'allocated')]</code>	(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® SSDs 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.

3.1.7 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|nvmlxml|json)] [-intelssd (Index|SerialNumber|PhysicalPath)] -nvmecontroller [-namespace (id)]
```

3.1.7.2 Options

Option	Description
<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".

3.1.7.3 Targets

Target	Description
<code>-nvmecontroller</code>	(Required) Will parse the list of all NVMe* controllers of the device. You can change the behavior if <code>-namespace</code> target is given.
<code>[-intelssd (Index SerialNumber PhysicalPath)]</code>	(Optional) Restricts output to specific Intel® SSD by supplying the Intel® SSD index or serial number.
<code>[-namespace (id)]</code>	(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® SSDs 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.

3.1.8 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.

3.1.8.1 Syntax

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

3.1.8.2 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".

3.1.8.3 Targets

Target	Description
<code>-latencystatistics (reads writes)</code>	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 Section 3.2.3
<code>[-intelssd (Index SerialNumber PhysicalPath)]</code>	Restricts output to a 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® SSDs must be manageable by the host software.

3.1.8.5 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.

3.1.9 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.

3.1.9.1 Syntax

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

3.1.9.2 Options

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

3.1.9.3 Targets

Target	Description
<code>-persistenteventlog</code>	Used to parse persistent event log data.
<code>[-intelssd (Index SerialNumber PhysicalPath)]</code>	Restricts output to a specific Intel® SSD by supplying the Intel® SSD index or serial number.

3.1.9.4 Limitations

The persistent event log command must be supported by the drive. 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](#).



3.1.9.5 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.

3.1.9.6 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
```

3.1.10 Configure Intel® SSDs Show NVMe* Get Feature Information

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

3.1.10.1 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')]
```

3.1.10.2 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".

3.1.10.3 Targets

Target	Description
<code>-getfeature (feature id)</code>	Specify the 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
<code>[-intelssd (Index SerialNumber PhysicalPath)]</code>	(Optional) Restricts output to specific Intel® SSD by supplying the Intel® SSD index or serial number.
<code>-namespace (namespace Id)</code>	Namespace target is optional. Must specify namespace ID if being used.

3.1.10.4 Properties

The following 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

3.1.10.5 Limitations

To run this command option, the specified Intel® SSDs 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.

3.1.10.6 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.



3.1.11 Show NVMe* IEEE* 16667 Silo Information

The show `-IEEESSilo` 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 (OCP).

3.1.11.1 Syntax

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

3.1.11.2 Options

Option	Description
<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".

3.1.11.3 Targets

Target	Description
<code>-IEEESSilo</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.

3.1.11.4 Properties

The following 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

3.1.11.5 Limitations

To run this command option, the specified Intel® SSDs must be manageable by the host software. The specified device must be an NVMe* Intel® SSD.

This command is only supported on NVMe* devices that support the *NVMe* Cloud SSD Specification* from the OCP.

3.1.11.6 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.

3.1.12 Show NVMe* Read Only/Write Through Mode Information

The `show -ReadOnlyWriteThrough` command sends a get feature command with the specified 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 OCP.

3.1.12.1 Syntax

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

3.1.12.2 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".

3.1.12.3 Targets

Target	Description
<code>-ReadOnlyWriteThrough</code>	Specifies that Read Only/Write Through Mode 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.

3.1.12.4 Properties

The following 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

3.1.12.5 Limitations

To run this command option, the specified Intel® SSDs must be manageable by the host software. The specified device must be an NVMe* Intel® SSD.

This command is only supported on NVMe* devices that support the *NVMe* Cloud SSD Specification* from the OCP.

3.1.12.6 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 Show NVMe* Error Injection Information

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

Only supported on NVMe* devices that support the *NVMe* Cloud SSD Specification* from the OCP.

3.1.13.1 Syntax

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

3.1.13.2 Options

Option	Description
<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".

3.1.13.3 Targets

Target	Description
<code>-ErrorInjection</code>	Specifies that Error Injection information is requested. No input required.

Target	Description
<code>[-intelssd (Index SerialNumber PhysicalPath)]</code>	(Optional) Restricts output to specific Intel® SSD by supplying the Intel® SSD index or serial number.

3.1.13.4 Properties

No properties available for this feature

3.1.13.5 Limitations

To run this command option, the specified Intel® SSDs must be manageable by the host software. The specified device must be an NVMe* Intel® SSD.

This command is only supported on NVMe* devices that support the *NVMe* Cloud SSD Specification* from the OCP.

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.

3.2 Configure Intel® SSDs

Configuring Intel® 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 does not 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|nvmxml|json)] -
intelssd (Index|SerialNumber|PhysicalPath)
```



3.2.1.2 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".

3.2.1.3 Targets

Target	Description
<code>-intelssd</code> <code>(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.

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.

3.2.1.7 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.
```

3.2.1.8 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 must be activated.
- Firmware Slot the firmware must 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
[-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 nvmlxml json)]	Changes the format of the Return Data. Supported output options are: "text" (Default), "json", and "nvmlxml".

3.2.2.3 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.
-source	Provide firmware binary for the update.
[FirmwareSlot]	Slot number that must be updated.

Target	Description
[CommitAction]	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

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

Property	Description
EnduranceAnalyzer	Resets the SMART attributes: E2, E3, and E4. 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.
LatencyTrackingEnabled	Enables or disables latency tracking feature. This must be enabled to successfully read the latency statistics logs (see Show Read and Write Latency Statistics Tracking Information) Valid values are: <ul style="list-style-type: none"> • True – enables latency tracking. • False – disables latency tracking.
MaximumLBA	Sets the device's Maximum LBA value. This operation will overprovision the drive. The MaximumLBA can be specified in the following ways: <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.
PowerGovernorMode	Changes the devices power governor mode settings. Valid values are: <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.
SMBusAddress	(For NVMe* devices only) Sets the devices SMBus Address for MI Basic communication Valid values are: <ul style="list-style-type: none"> • 1-255. A value of 255 will disable SMBus
TempThreshold	(For NVMe* devices only) Sets the devices temperature threshold. Value is in degrees Celsius. Valid values are: <ul style="list-style-type: none"> • 0-75

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-
NumLBASettings)] [SecureEraseSetting=(0|1|2)] [ProtectionInformation=(0|1)]
[MetadataSettings=(0|1)]
```

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.
-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.

3.2.4.4 Properties

Properties supported for the start verb are list as follows. 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 maximum 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.

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 extended NVMe* 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 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|nvmlxml|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 nvmlxml json)]</code>	Change the format of the Return Data. Supported output options are: "text" (Default), "json", and "nvmlxml".



3.2.5.3 Targets

Target	Description
<code>-intelssd (Index SerialNumber PhysicalPath)</code>	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|nvmlxml|json)] -intelssd  
(Index|SerialNumber||PhysicalPath) -nvmeformat [-namespace (namespace id)]  
[LBAFormat = (0-NumLBASettings)] [SecureEraseSetting = (0|1|2)]  
[ProtectionInformation = (0|1)] [MetadataSettings = (0|1)]
```

3.2.6.2 Options

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

3.2.6.3 Targets

Target	Description
<code>-intelssd (Index SerialNumber PhysicalPath)</code>	(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 FID for Intel® SSDs. Only supported on NVMe* devices.

3.2.7.1 Syntax

```
IntelMAS set [-help|-h] [-output|-o (text|nvmlxml|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 nvmlxml json)]	Changes the format of the Return Data. Supported output options are: "text" (Default), "json", and "nvmlxml".

3.2.7.3 Targets

Target	Description
-setfeature (feature id)	Specify the 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

The following 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 the NVMe* 1.4 Specification (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® SSDs 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 [Section 3.1.10](#)).

3.2.8 Set NVMe* IEEE* 16667 Silo

The **set -IEEESilo** command sends a set feature command with the specified 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 OCP.

3.2.8.1 Syntax

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

Option	Description
[-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".

3.2.8.2 Targets

Target	Description
-IEEESilo	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.

3.2.8.3 Properties

The following are the properties that can be modified.

Property	Description
Enable	True to enable, false to disable.

3.2.8.4 Limitations

To run this command option, the specified Intel® SSDs must be manageable by the host software. The specified device must be an NVMe* Intel® SSD.

This command is only supported on NVMe* devices that support the *NVMe* Cloud SSD Specification* from the OCP.

3.2.8.5 Return Data

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

[Show NVMe* IEEE* 16667 Silo Information](#)

3.2.8.6 Examples

```
> IntelMAS set -intelssd 1 -IEEESilo 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 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 OCP.

Syntax:

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

Option	Description
[-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".

3.2.9.1 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

The following 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® SSDs 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 OCP.

3.2.9.4 Return Data

This command will send and return the status of the NVMe* set Read Only/Write Through mode. See [Section 3.1.12](#) for the corresponding get feature.

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 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 OCP.

Syntax:

```
set [-help|-h] [-output|-o (text|nvmlxml|json)] -intelssd  
(Index|SerialNumber|PhysicalPath) -ErrorInjection  
  
[ErrorInjectionEntries = ((tilde separated entry list))]  
[ErrorInjectionEntryFile = (path to input file)]  
  
ShowErrorInjection:  
  
show [-help|-h] [-output|-o (text|nvmlxml|json)] -intelssd  
(Index|SerialNumber|PhysicalPath) -ErrorInjection
```

Option	Description
<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".

3.2.10.1 Targets

Target	Description
<code>-ErrorInjection</code>	Specifies that error injection set feature 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.

3.2.10.2 Properties

The following are the properties that can be modified.

Property	Description
<code>ErrorInjectionEntries</code>	<p>A tilde separated list of error injection entries. See the OCP <i>NVMe* Cloud SSD Specification</i> 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 does not have to specify all 27-bytes. If less than 27-bytes are specified, then 0's are prepended. <p>Example: <code>ErrorInjectionEntries= 1.0.0x3.0x44~0.1.0x12.0x3D~1.1.0x3.0xA16E</code></p> <p>Note: <code>ErrorInjectionEntries</code> properties and <code>ErrorInjectionEntryFile</code> are mutually exclusive.</p>
<code>ErrorInjectionEntryFile</code>	<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: <code>ErrorInjectionEntries</code> properties and <code>ErrorInjectionEntryFile</code> are mutually exclusive.</p>

3.2.10.3 Limitations

To run this command option, the specified Intel® SSDs must be manageable by the host software. The specified device must be an NVMe* Intel® SSD.

This command is only supported on NVMe* devices that support the *NVMe* Cloud SSD Specification* from the OCP.



3.2.10.4 Return Data

This command will send and return the status of the NVMe* set error injections. See [Section 3.1.13](#) for the corresponding get feature.

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 **-PCIeCorrectable** command sends a set feature command with the specified 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 OCP.

3.2.11.1 Syntax

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

3.2.11.2 Targets

Target	Description
-PCIeCorrectable	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.

3.2.11.3 Properties

The following are the properties that can be modified.

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

3.2.11.4 Limitations

To run this command option, the specified Intel® SSDs must be manageable by the host software. The specified device must be an NVMe* Intel® SSD.

This command is only supported on NVMe* devices that support the *NVMe* Cloud SSD Specification* from the OCP.

3.2.11.5 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 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.

3.2.12.1 Syntax

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

3.2.12.2 Options

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



3.2.12.3 Targets

Target	Description
<code>-intelssd</code> (Index SerialNumber PhysicalPath)	(Required) A specific Intel® SSD selected by supplying the Intel® SSD index or serial number must be provided.
<code>-scan</code> [(DataIntegrity ReadScan Logs)]	(Required) Command to scan information on the drive. Options: DataIntegrity ReadScan Logs

3.2.12.4 Properties

Property	Description
[IncludeOS = (true false)]	(Optional) Scan OS partition and/or drive as part of scan.
[FullScan = (true false)]	(Optional) Must 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 must be saved Default is "output/" in current directory.
[IncludeSystemInfo = (true false)]	(Optional) Must system information be included in the scan.

3.2.12.5 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.

3.2.12.6 Return Data

This will return status of the command.

3.2.13 Read System Snapshot

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

3.2.13.1 Syntax

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

3.2.13.2 Options

Option	Description
<code>[-help -h]</code>	Displays help for the command.
<code>[-destination (path)]</code>	Specify an alternate destination and file name for the output file.

Option	Description
<code>[-output -o (text nvmlxml json)]</code>	Change the format of the Return Data. Supported output options are: "text" (Default), "json", and "nvmlxml".

3.2.13.3 Targets

Target	Description
<code>-intelssd (Index SerialNumber PhysicalPath)</code>	(Required) A specific Intel® SSD selected by supplying the Intel® SSD index or serial number must be provided.
<code>-SystemSnapshot</code>	(Required) Read the System Snapshot from the device.

3.2.13.4 Properties

No properties are applicable for this command.

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

```
> 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 nvmlxml json)]</code>	Change the format of the Return Data. Supported output options are: "text" (Default), "json", and "nvmlxml".

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 -namespace 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 show -intelssd. The main thing that 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.

3.3.2 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|nvmlxml|json)] -namespace (id) -
intelssd (Index|SerialNumber||PhysicalPath) [-nvmecontroller (controller
ID integer)]
```

3.3.2.2 Options

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

3.3.2.3 Targets

Target	Description
-intelssd (Index SerialNumber PhysicalPath)	A specific Intel® SSD selected by supplying the Intel® SSD index or serial number must be provided.
-namespace (id)	The -namespace target is required and a valid namespace ID. It specifies that a namespace is to be attached.
[-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.

3.3.2.4 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.

3.3.3 Detach a Namespace

Detach a namespace. Supported on NVMe* 1.2+ devices.

3.3.3.1 Syntax

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



3.3.3.2 Options

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

3.3.3.3 Targets

Target	Description
<code>-intelssd (Index SerialNumber PhysicalPath)</code>	(Required) A specific Intel® SSD selected by supplying the Intel® SSD index or serial number must be provided.
<code>-namespace (id)</code>	(Required) The -namespace target is required and a valid namespace ID. It specifies that a namespace is to be detached.
<code>[-nvmecontroller (controller ID integer)]</code>	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.

3.3.4 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|nvmlxml|json)] -namespace (id) -intelssd (Index|SerialNumber||PhysicalPath)
```

3.3.4.2 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.

Option	Description
<code>[-output -o (text nvmlxml json)]</code>	Change the format of the Return Data. Supported output options are: "text" (Default), "json", and "nvmlxml".

3.3.4.3 Targets

Target	Description
<code>-intelssd (Index SerialNumber PhysicalPath)</code>	(Required) A specific Intel® SSD selected by supplying the Intel® SSD index or serial number must be provided.
<code>-namespace (id)</code>	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.

Red Hat* and CentOS*: Kernel bug can cause deadlock on delete namespace in RHEL*/CentOS* 8.2

3.3.4.6 Return Data

The CLI will return status of the command.

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|nvmlxml|json)] -system
```

3.4.1.2 Options

Option	Description
<code>[-all -a]</code>	Show 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.

Option	Description
<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".

3.4.1.3 Targets

Target	Description
<code>-system</code>	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® SSDs 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
EnableLSIAdapter	True or False. Whether or not the LSI Adapter library is loaded. This affects LSI MegaRAID* Controller Support. (Default value is False)
EnableLog	True or False. Whether 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 -
EnableLSIAdapter: 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
[-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".

3.4.2.3 Targets

Target	Description
-system	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® SSDs 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 LSI Adapter 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|nvmlxml|json)]  
[-intelssd (Index|SerialNumber|PhysicalPath)] -nlog  
  
dump[-help|-h] [-destination (filename)] [-output|-o (text|nvmlxml|json)]  
[-intelssd (Index|SerialNumber|PhysicalPath)] -eventlog  
  
dump[-help|-h] [-destination (filename)] [-output|-o (text|nvmlxml|json)]  
[-intelssd (Index|SerialNumber|PhysicalPath)] -assertlog  
  
dump -destination <output binary> -intelssd <index|serial|physicalpath> -  
telemetrylog  
  
dump[-help|-h] [-destination (filename)] [-output|-o (text|nvmlxml|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.

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

3.4.3.3 Targets

Target	Description
<code>-intelssd (Index SerialNumber PhysicalPath)</code>	Dump the selected data from the given Intel® SSD.
<code>-nlog</code>	Read the nlog binary data from the device and save it to binary file.
<code>-eventlog</code>	Read the event log binary data from the device and save it to binary file.
<code>-assertlog</code>	Read the Assert log binary data from the device and save it to binary file.
<code>-telemetrylog</code>	Read the telemetry log binary data from the device and save it to binary file
<code>-persistenteventlog ('read' 'release')</code>	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

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|nvmlxml|json)] [Verb=(verb)]
[Name=(command)]
```

3.5.1.2 Options

Option	Description
[-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".

3.5.1.3 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|nvmlxml|json)] [Name = (name)] [verb = (verb)]

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

EnduranceAnalyzer:
  set [-help|-h] [-output|-o (text|nvmlxml|json)] -intelssd (Index|SerialNumber|PhysicalPath) EnduranceAnalyzer = ('reset')

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

FirmwareUpdate:
  load [-help|-h] [-force|-f] [-output|-o (text|nvmlxml|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)]] -nvme-log

[('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|nvmlxml|json)] -performance [-intelssd

  [(Index|SerialNumber|PhysicalPath)]]

NVMeLog:
  show [-help|-h] [-output|-o (text|nvmlxml|json)] [-intelssd
[(Index|SerialNumber|PhysicalPath)]] -nvmeelog

[('ErrorInfo'|'SmartHealthInfo'|'FirmwareSlotInfo'|'TemperatureStatistics'
)]

IdentifyDevice:
  show [-help|-h] [-output|-o (text|nvmlxml|json)] -identify [-namespace
[(integer | 'attached' | 'allocated')]]

  [-nvmecontroller] [-intelssd [(Index|SerialNumber|PhysicalPath)]]

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

NVMeControllerList:
  show [-help|-h] [-output|-o (text|nvmlxml|json)] [-namespace (namespace
id)] -nvmecontroller [-intelssd

  [(Index|SerialNumber|PhysicalPath)]]

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

```

3.5.1.5.1 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|nvmlxml|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® MAS 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
<code>[-help -h]</code>	Displays help for the command.
<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>[-output -o (text nvmxml json)]</code>	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® MAS version information. With the `-display` option, it shows the `License` property.

Property	Description
License	Shows the End-User License for the Intel® MAS.

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® MAS 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 [Section 3.4.1](#) and [Section 3.4.2](#) 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. 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[®] MAS.

```
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 [Section 3.6](#) for details.

5.6 Display Drive Information

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 [Section 3.1.6](#) 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 from 1 to 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® MAS 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. 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.

```
IntelMAS.exe set -intelssd 2 enduranceanalyzer=reset
```

2. Optionally, remove the Intel® SSD and install in test system.
3. Apply minimum 60-minute workload to Intel® SSD.
4. Reinstall Intel® 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 Intel® 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. 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
```