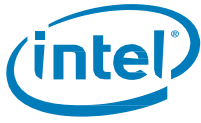


Intel® Solid State Drive Data Center Tool

User Guide

August 2019

Software Version 3.0.20



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Revision History

Document Revision	Description	Revision Date
001	Initial user guide for version 2.2.0.	February 2015
002	Release of tool version 2.2.1 includes: <ul style="list-style-type: none"> • Fix to NativeMaxLBA calculation for NVMe* drives • Modified the default Dump behavior – now set to output to the screen with option to output to file. This change impacts syntax 	March 2015
003	Release of tool version 2.2.3 includes: <ul style="list-style-type: none"> • For the Linux* DCT executable, added capability of the library files being relocated and ran from a different directory • Added functionality to turn On/Off Tool debug log file (Option to specify a name for the log file) • Added functionality to turn On/Off the Tool from loading and using the LSI* Adapter Library • Various bugs fixes 	May 2015
004	Release of tool version 2.2.4 includes: <ul style="list-style-type: none"> • Added support for Windows* 10 operating system 	August 2015
005	Release of tool version 2.3.0 includes: <ul style="list-style-type: none"> • Added functionality to Enable/Disable Latency Tracking • Added functionality to Parse the read and write commands from Latency Tracking logs • Added functionality to read out and/or modify the SM Bus Address for Intel® NVMe SSD Devices only • Updated Power Governor settings to add support for new Intel SSD Product SKUs 	September 2015
006	Release of Intel SSD Data Center Tool 3.0.0 This release of the tool includes enhancements to the syntax including new/modified Targets and Properties.	March 2016
007	Documentation update only - relates to the Intel SSD Data Center Tool 3.0.0. This release includes the addition of namespace management commands (NVMe 1.2 SSDs only)	April 2016



Document Revision	Description	Revision Date
008	<p>Release of version 3.0.2 includes:</p> <ul style="list-style-type: none"> Added Properties and descriptions: BusType, ControllerID, AccessibleMaxAddressSupported, DigitalFenceSupported, DIPMEnabled, DIPMSupported, IntelGen3SATA, IntelNVMe, NamespaceID, NVMeControllerID, NVME_1_0_Supported, NVME_1_2_Supported, PCILinkGenSpeed, PCILINKWidth, PNPString, ProductProtocol, SanitizeBlockEraseSupported, SanitizeCryptoScrambleSupported, SanitizeSupported, SCSIPortNumber, SecuritySupported, SMARTSelfTestSupported, TrimSupported, VolatileWriteCacheEnabled, WriteCacheReorderingStateEnabled. <p>Documentation updates: Corrections to syntax and descriptions.</p>	August 2016
009	<p>Updated Supported SSDs, Section 1.3, to include the following products:</p> <ul style="list-style-type: none"> Intel® Optane™ Solid State Drive DC P4800X Series Intel® Solid State Drive DC S3320 Series Intel® Solid State Drive DC P3100 Series <p>Added VMWare ESXi 6.5 Support</p>	April 2017
010	<p>Updated Supported SSDs, Section 1.3, to include the following products:</p> <ul style="list-style-type: none"> Intel® Solid State Drive DC P4500 Series Intel® Solid State Drive DC P4600 Series 	May 2017
011	<p>Release of version 3.0.5 includes:</p> <ul style="list-style-type: none"> End of Life Notification enhanced for 15% spare left Support for Ubuntu 16.04 Added support for Intel® SSD DC P4500 and DC P4600 Series drive –nvmelog option Added support for IOCTL Nvme format command passthrough Support for firmware update for Intel® SSD DC P3100 Series and DC S3100 Series Updated Power Governor Mode parsing for Intel® Solid State Drive DC P4500 and DC P4600 Series Updated NVMe SMART Attribute F4/F5 reporting in Bytes written Updated display of firmwareupdateavailable property NVME 1.2 Specification support for Async Event Configuration get feature command Updated support for Intel® SSD 600s, Pro 6000s, and E 6000 Series drives with RST driver 	June 2017



Document Revision	Description	Revision Date
012	Documentation updated with the following changes: <ul style="list-style-type: none"> • Added Red Hat* Enterprise Linux* (RHEL) 7.1, SLES 11.4, 12.1, Ubuntu 14.04, and CentOS 7.2.1511 (Kernel 3.10.0) to the list of supported operating systems • Syntax documentation updated to include enhancements – new ability to select a drive based off of the physical drive path 	September 2017
013	Added note regarding Intel® Optane™ SSD DC P4800X Wear Leveling expected behavior.	February 2018
014	Added PhysicalPath Option to select a drive Updated Supported SSDs, Section 1.3, to include the following products: <ul style="list-style-type: none"> • Intel® Optane™ Solid State Drive DC D4800X Series • Intel® Solid State Drive DC P4600 Series • Intel® Solid State Drive DC P4608 Series • Intel® Solid State Drive DC P4511 Series • Intel® Solid State Drive DC P4510 Series • Intel® Solid State Drive DC P4500 Series • Intel® Solid State Drive DC S4500 Series 	June 2018
015	Support for ESXi* 6.7 added. Updated Supported SSDs, Section 1.3, to include the following products:: <ul style="list-style-type: none"> • Intel® Solid State Drive D5-P4320 Series • Intel® Solid State Drive D5-P4326 Series • Intel® Solid State Drive D7-D4512 Series 	July 2018
016	Updated Supported SSDs, Section 1.3, to include the following products: <ul style="list-style-type: none"> • Intel® Solid State Drive DC P4101 Series • Intel® Solid State Drive DC S3110 Series 	October 2018
017	Updated for software version 3.0.16	October 2018
018	<ul style="list-style-type: none"> • Added sample output from ESXi version of Data Center Tool for load/firmware update command. • Added Oracle Linux 7 Update 4 to supported operating systems list. • Installation directory moved from “system” directory to “Program Files” directory • Erase timeout increased to accommodate larger capacity drives. 	December 2018



1 Introduction

This guide describes how to use the Intel® Solid State Drive (SSD) Data Center Tool (DCT). This tool provides a command line interface for interacting with and issuing commands to Intel® SSD Data Center devices. It is intended to configure and check the state of Intel PCIe* SSDs and SATA SSDs for a production environment.

Note: The Intel® SSD Data Center Tool provides manageability and configuration functionality for Intel PCIe and SATA SSDs only.

1.1 Features

The Intel SSD Data Center Tool provides a suite of capabilities for interacting with PCIe and SATA-based Intel® SSDs. The functionality includes:

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

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

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



Intel® Solid State Drive Data Center Tool

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

The following functionality applies to Intel PCIe NVMe drives only:

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

1.2 System Requirements

The Intel SSD Data Center Tool is supported on the following operating systems:

- Windows* Server 2016
- Windows* Server 2012
- Windows* Server 2012 R2
- Windows* Server 2008 SP2 / R2
- Windows* 7
- Windows* 8
- Windows* 8.1
- Windows* 10
- Red Hat* Enterprise Linux* (RHEL) 6.5, 6.6, 7.0, 7.1, 7.2, 7.4 and SLES11.3, 11.4, 12.1
- ESXi 6.0, 6.5, 6.7
- Ubuntu* 14.04, 16.04
- CentOS* 7.2.1511 (Kernel 3.10.0), 7.4
- Oracle Linux 7 Update 4

NOTES:

- On Windows* Server 2012/2008/R2 and Windows* 7/8/8.1/10, administrator access is required. Open a command prompt as administrator and run the tool via the commands as described in this document. Disable UAC where applicable and run the tool in a command prompt.
- On Linux systems, the tool must be run with root privileges. This can be done through either sudo or su commands. If running as a non-root user, the tool will not be able to communicate with the drive. Only basic drive information will be displayed and no drive functions will work. There are two Linux installers: one for 32-bit systems, and one for 64-bit systems.
- On ESXi systems, the tool only works on Intel PCIe NVMe drives using the Intel ESXi NVMe driver. The user will need to set their ESXi host acceptance level to "CommunitySupported" in order to install the tool.
- The tool only works with Intel provided Windows driver. Click [here](#) for the latest drivers. The tool will not work with the in-box Windows NVMe driver found in server 2012 R2. The tool will return an error if this driver is used.



1.3 Supported SSDs

The following Intel SATA and PCIe SSDs are recognized and supported by the Intel SSD Data Center Tool.

- Intel® Solid State Drive DC P4101 Series
- Intel® Solid State Drive DC S3110 Series
- Intel® Solid State Drive D5-P4320 Series
- Intel® Solid State Drive D5-P4326 Series
- Intel® Solid State Drive D7-P4512 Series
- Intel® Optane™ Solid State Drive DC P4800X Series
- Intel® Optane™ Solid State Drive DC P4801X Series
- Intel® Solid State Drive DC S4610 Series
- Intel® Solid State Drive DC S4600 Series
- Intel® Solid State Drive DC S4510 Series
- Intel® Solid State Drive DC S4500 Series
- Intel® Solid State Drive DC S3710 Series
- Intel® Solid State Drive DC S3700 Series
- Intel® Solid State Drive DC S3610 Series
- Intel® Solid State Drive DC S3520 Series
- Intel® Solid State Drive DC S3510 Series
- Intel® Solid State Drive DC S3500 Series
- Intel® Solid State Drive DC S3320 Series
- Intel® Solid State Drive DC S3100 Series
- Intel® Solid State Drive DC P4608 Series
- Intel® Solid State Drive DC P4600 Series
- Intel® Solid State Drive DC P4511 Series
- Intel® Solid State Drive DC P4510 Series
- Intel® Solid State Drive DC P4610 Series
- Intel® Solid State Drive DC P4500 Series
- Intel® Solid State Drive DC P3700 Series
- Intel® Solid State Drive DC P3608 Series
- Intel® Solid State Drive DC P3600 Series
- Intel® Solid State Drive DC P3520 Series
- Intel® Solid State Drive DC P3500 Series
- Intel® Solid State Drive DC P3320 Series
- Intel® Solid State Drive DC P3100 Series
- Intel® Solid State Drive DC D3700 Series
- Intel® Solid State Drive DC D3600 Series
- Intel® Solid State Drive 750 Series

NOTES:

1. Not all functions are available for all drives.
2. The Intel® RST RAID supports direct attached SSD Data Center SATA drives only.
3. The Intel SSD DCT does not support SSD Data Center SATA drives behind HBAs (exception: LSI* Mega RAID adapters).
4. The PCIe Intel® Solid State Drive 910 Series is not supported.



1.4 Document Format

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

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

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

- The verb **set** can be followed by an optional modifier (help).
- The target **-intelssd** is required but the value for *Index* or *SerialNumber* or *PhysicalPath* is optional.
- *Physicalpath* option is valid on Window OS only
- It also specifies a required property *Test* in which valid values are *Test1* or *Test2*.

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

1.5 Running the Data Center Tool

Run the Intel SSD Data Center Tool from either a Windows* command prompt or a Linux* terminal window. The tool is run as a single command by supplying the command and parameters immediately following the **isdct** executable.

```
isdct show -intelssd
```

1.6 Command Syntax

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

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

```
isdct <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** | **-a11**). One or more targets are normally required to indicate the object of the action. However, there are a few cases where a target is not required. Finally, zero or more properties defined as a key/value pair can be used to modify the target.

1.7 Targets

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

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

```
isdct show -intelssd
```

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

```
isdct show -intelssd 1
```



2 Command Line Options

The Intel SSD Data Center Tool uses a Command Line Interface (CLI). The following table is a summary of the types of action commands (verbs), targets, and command option properties available with the tool. Further details for each command is provided in subsequent sections of this document.

Verb	Description	Target	Properties
help	Shows help for the supported commands.		[Verb=(verb)] [Name=(command)]
load	Updates the firmware on the selected Intel SSD.	-intelssd (<i>Index/SerialNumber/Physical Path</i>)	
set	Modifies the configurable settings on the selected Intel SSD.	-intelssd (<i>Index/SerialNumber/Physical Path</i>)	[DIPMEnabled=('True' 'False')] [EnduranceAnalyzer='reset'] [LatencyTrackingEnabled=('True' 'False')] [MaximumLBA=(xGB x% LBA 'native')] [PhyConfig=(0 1 2 3)] [PhysicalSectorSize=(512 4096)] [PhySpeed=(1.5 3 6)] [PLITestTimeInterval=(0-6)] [PowerGovernorMode=(0 1 2)] [ReadErrorRecoveryTimer=(0-65535)] [SSCEnabled=('True' 'False')] [SMBusAddress=(1-255)] [TempLoggingInterval=(0-65535)] [TempThreshold=(0-75)] [WriteCacheEnabled=('True' 'False')] [WriteCacheState=(1 2 3)] [WriteCacheReorderingStateEnabled=('True' 'False')] [WriteErrorRecoveryTimer=(0-65535)]
start	Start NVMe Format on the selected Intel SSD.	-intelssd (<i>Index/SerialNumber/Physical Path</i>) -nvmeformat	[LBAFormat=(0-NumLBAFormats)] [SecureEraseSetting=(0 1 2)] [ProtectionInformation=(0 1)] [MetadataSettings=(0 1)]
start	Start Self Test on the selected Intel SSD.	-intelssd (<i>Index/SerialNumber/Physical Path</i>) -selftest [('short' 'extended' 'conveyance')]	
start	Standby Immediate on the selected Intel SSD.	-intelssd (<i>Index/SerialNumber/Physical Path</i>) -standby	
dump	Dumps the nlog binary for one or more Intel SSDs	[-intelssd (<i>Index/SerialNumber/Physical Path</i>)] [-destination (filename)] -nlog	
dump	Dumps the eventlog binary for one or more Intel SSDs	[-intelssd (<i>Index/SerialNumber/Physical Path</i>)] [-destination (filename)] -eventlog	



Verb	Description	Target	Properties
dump	Dumps the assert binary for one or more Intel SSDs	<code>[-intelssd (<i>Index/SerialNumber/Physical Path</i>)] [-destination (filename)] -assertlog</code>	
dump	Dumps the SATA GPL binary for one or more Intel SSDs	<code>[-intelssd (<i>Index/SerialNumber/Physical Path</i>)] [-destination (filename)] -gpl (LogAddress)</code>	<code>[PageNum=(y)] [SectorCount=(z)]</code>
show	Shows information about one or more Intel SSDs.	<code>-intelssd [(<i>Index/SerialNumber/Physical Path</i>)]</code>	
show	Shows SMART Attributes for one or more Intel SSDs.	<code>[-intelssd (<i>Index/SerialNumber/Physical Path</i>)] -smart [(id)]</code>	
show	Parse device health sensors on the selected Intel SSD.	<code>-intelssd (<i>Index/SerialNumber/Physical Path</i>) -sensor</code>	
show	Parse device performance metrics on the selected Intel SSD.	<code>-intelssd (<i>Index/SerialNumber/Physical Path</i>) -performance</code>	
show	Parse device identification structure for one or more Intel SSDs	<code>[-intelssd (<i>Index/SerialNumber/Physical Path</i>)] -identify [-nvmecontroller] [-namespace (nsid)]</code>	
show	Show list of namespaces attached for one or more Intel SSDs	<code>[-intelssd (<i>Index/SerialNumber/Physical Path</i>)] -identify -namespace attached</code>	
show	Show list of namespaces allocated for one or more Intel SSDs	<code>[-intelssd (<i>Index/SerialNumber/Physical Path</i>)] -identify -namespace allocated</code>	
show	Show list of NVMe controller IDs that are attached to one or more namespaces	<code>[-intelssd (<i>Index/SerialNumber/Physical Path</i>)] -nvmecontroller [-namespace (id)]</code>	
show	Parse NVMe Log structure for one or more Intel SSDs	<code>[-intelssd (<i>Index/SerialNumber/Physical Path</i>)] -nvme log ('ErrorInfo' 'SmartHealthInfo' 'FirmwareSlotInfo' 'TemperatureStatistics' 'QueueMetrics')</code>	



Verb	Description	Target	Properties
show	Parse PHY Counters for one or more Intel SSDs	[-intelssd (<i>Index/SerialNumber/Physical Path</i>)] -phycounters	
show	Parse HDA Temperature for one or more Intel SSDs	[-intelssd (<i>Index/SerialNumber/Physical Path</i>)] -hdatemperature	
show	Parse Read and Write Latency Tracking logs for one or more Intel SSDs	[-intelssd (<i>Index/SerialNumber/Physical Path</i>)] -latencystatistics (reads writes)	
show	Show system and tool configuration information	-system	
version	Shows Version and End-User License Information.		
create	Create a new namespace on the selected Intel SSD	-intelssd (<i>Index/SerialNumber/Physical Path</i>) -namespace	Size = (blocks) [LBAFormat=(0-NumLBAFormats)] [ProtectionInformation=(0 1)] [MultiPathIoCapabilities = (0 1)]
attach	Attach a namespace to one or more NVMe controllers on the selected Intel SSD	-intelssd (<i>Index/SerialNumber/Physical Path</i>) -namespace (nsid) [-nvmecontroller (controllerID)]	
detach	Detach a namespace from one or more NVMe controllers on the selected Intel SSD	-intelssd (<i>Index/SerialNumber/Physical Path</i>) -namespace (nsid) [-nvmecontroller (controllerID)]	
delete	Delete Intel SSD erasing all data on the selected Intel SSD	[-force] -intelssd (<i>Index/SerialNumber/Physical Path</i>)	
delete	Delete a namespace on the selected Intel SSD	[-force] -intelssd (<i>Index/SerialNumber/Physical Path</i>) -namespace (id)	
set	Modify tool configuration properties	-system	[EnableLog='true' 'false'] [EnableLSIAdapter='true' 'false'] [LogFile=<valid filename and path>]



2.1 Show Device Information

2.1.1 Show Device

Show information about one or more Intel SSD devices. The tool only recognizes the Intel SSD Data Center Family.

2.1.1.1 Syntax

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

2.1.1.2 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 nvmxml json)]	Changes the format of the Return Data. Supported output options are: 'text' (Default), 'json', and 'nvmxml'.

2.1.1.3 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.

2.1.1.4 Properties

This command does not support any properties.



2.1.1.5 Return Data

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

Property	Description
AccessibleMaxAddressSupported	(For ATA devices only) True if the devices support the accessible max address commands (Identify device Word 103 bit 8).
AggregationThreshold	(For NVMe devices only) Shows the minimum number of completion queue entries to aggregate per interrupt vector before signaling an interrupt to the host. This value is zero-based.
AggregationTime	(For NVMe devices only) Shows the recommended maximum time in 100 microsecond increments that a controller may delay an interrupt due to interrupt coalescing.
ArbitrationBurst	(For NVMe devices only) Shows the maximum number of commands that the controller may launch at one time. This value is specified in 2 ⁿ . A value of 7 indicates no limit.
AsynchronousEventConfiguration	(For NVMe devices only) Determines whether an asynchronous event notification is sent to the host for the corresponding Critical Warning specified in the SMART / Health Information Log.
Bootloader	(Default; For NVMe devices only, if present) Return the devices Bootloader Revision.
BusType	(Windows* OS only) The bus type value determined by Windows.
ControllerDescription	(Currently in Windows* OS only) Shows a description of the controller the device is attached to.
ControllerID	(Windows* OS only) The ID value of the device controller found in the Windows OS registry.
ControllerIDEMode	Shows if the controller the device is attached to is in IDE mode. Returns either True or False.
ControllerManufacturer	(Currently in Windows OS only) The manufacturer of the controller that the device is attached to.
ControllerService	(Currently in Windows OS only) Displays the controller driver sys file that the attached device is connected to.
DigitalFenceSupported	(For ATA devices only) True if the device supports the Digital Fence feature.
DIPMEnabled	(For ATA devices only) True if the device has DIPM enabled (Identify device Word 79 bit 3).
DIPMSupported	(For ATA devices only) True if the device supports DIPM (Identify device Word 78 bit 3).
DevicePath	(Default) The OS path to the device (i.e. \\.\PhysicalDrive0).
DeviceStatus	(Default) Report the device's status. In the current implementation this will look at ErrorString and if it is empty it will report "Healthy" otherwise it will report the value of ErrorString.



Property	Description
DriverCommunicationError	(Default; if present) This reports if the tool detected a potential error with communicated with the driver the device is connected to. For example, the tool will detect an error if the Server 2012 R2* system is using the in-box NVMe driver from Microsoft*. DCT does not support communicated with that driver.
DriverDescription	Description of the controller driver that the device is attached to. Currently in Windows OS only.
DriverMajorVersion	Major version of the controller driver that the device is attached to. Currently in Windows OS only.
DriverManufacturer	Manufacturer of the controller driver that the device is attached to. Currently in Windows OS only.
DriverMinorVersion	Minor version of the controller driver that the device is attached to. Currently in Windows OS only.
EnduranceAnalyzer	The drives life expectancy in years. This utilizes the 0xE2, 0xE3 and 0xE4 SMART attributes. If these SMART attributes have a value of 0xFFFF then they are still in the reset state and a 60+ minute workload has yet to run. If the media wear indicator is zero then the workload has not induced enough wear to calculate an accurate life expectancy.
ErrorString	Shows a description of the error state of the drive. NOTE: The drive is not in an error state if the value is blank.
Firmware	(Default) Shows the firmware revision of the device.
FirmwareUpdateAvailable	(Default) Shows the firmware revision available for update. Firmware updates are carried within the tool as a "payload" binary for each supported drive. Tool reports 'Firmware is up to date as of this tool release' if the device's firmware is up to date.
HighPriorityWeightArbitration	(For NVMe devices only) Shows the number of commands that can be executed from the high priority services class in each arbitration round. This is a 0's based value.
IEEE1667Supported	(For ATA devices only) Shows if the IEEE1667 protocol is supported. Reports True or False.
Index	(Default) Shows the Intel SSD device index, used for device selection.
IntelGen3SATA	True if the device is an Intel SATA SSD.
IntelNVMe	True if the device is an Intel NVMe SSD.
IOCompletionQueuesRequested	(For NVMe devices only) Shows the number of IO Completion Queues requested.
IOSubmissionQueuesRequested	(For NVMe devices only) Shows the number of IO Submission Queues requested.
LatencyTrackingEnabled	Shows if the latency tracking feature of the drive is enabled (True) or disabled (False).



Property	Description
LBAFormat	(For NVMe devices only) Shows the LBA Format that the drive is configured with. This has a possible value of 0 to 'NumLBAFormats'. Details of the different LBA formats can be found in Identify Namespace. This value can be changed by NVMe format.
LowPriorityWeightArbitration	(For NVMe devices only) Shows the number of commands that can be executed from the low priority services class in each arbitration round. This is a 0's based value.
MaximumLBA	Shows the devices maximum logical block address.
MediumPriorityWeightArbitration	(For NVMe devices only) Shows the number of commands that can be executed from the medium priority services class in each arbitration round. This is a 0's based value.
MetadataSetting	(For NVMe devices only) Shows the device's Metadata setting. One of either: <ul style="list-style-type: none">• 0: Metadata is transferred as part of a separate contiguous buffer.• 1: Metadata is transferred as part of an extended data LBA. This can be changed by issuing an NVMe format.
ModelNumber	(Default) Shows the model number assigned to the device.
NamespaceId	(For NVMe devices only) Shows the value of the namespace ID of the device if it has one. The namespace must be allocated and attached.
NativeMaxLBA	Shows the devices native maximum logical block address set in manufacturing. This value cannot be changed. It represents the physical maximum number of LBAs for the device.
NumErrorLogPageEntries	(For NVMe devices only) Shows the number of Error Information log entries that are stored by the controller. This value is zero-based.
NumLBAFormats	(For NVMe devices only) Shows the number of different LBA Formats the device supports. This value is zero-based. For example, a value of 6 means there are 0 to 6 possible LBA Formats (7 total).
NVMeControllerID	(For NVMe devices only) The value of the NVMe controller ID found in the NVMe identify controller structure.
NVMePowerState	(For NVMe devices only) Shows the power state of the controller. Supported power states are described in the Identify Controller data structure. This is an NVMe Get Feature (feature ID=2)
NVME_1_0_Supported	(For NVMe devices only) True if the device supports the NVMe 1.0 command specification.
NVME_1_2_Supported	(For NVMe devices only) True if the device supports the NVMe 1.2 command specification.
PCILinkGenSpeed	(For NVMe devices only) The devices PCI Gen speed.
PCILinkWidth	(For NVMe devices only) The devices PCI link width. E.g. 4 or 8



Property	Description
PhyConfig	(For ATA devices only) Shows the devices PHY Configuration. One of the following: <ul style="list-style-type: none"> 0: Default enterprise settings 1: Client settings 2: Alternate enterprise settings
PhysicalSectorSize	(For ATA devices only) Shows the physical sector size in bytes. One of either: <ul style="list-style-type: none"> 512 4096
PhysicalSize	The physical size of the device in bytes. Value is in decimal format.
PhySpeed	(For ATA devices only) Shows the maximum physical speed (in gigabits-per-second) of the device. One of the following: <ul style="list-style-type: none"> 1.5 3 6
PLITestTimeInterval	(For ATA devices only) Shows the PLI Test Time interval in minutes of the device. One of: <ul style="list-style-type: none"> 0: 0 min, no immediate test. 1: 0 min, do immediate test. 2: 60 min, do immediate test. 3: 1440 min, do immediate test. 4: 4320 min, do immediate test. 5: 10080 min, do immediate test. 6: 20160 min, do immediate test.
PNPString	(Windows OS only) The devices PNP String from the Windows registry.
ProductProtocol	The devices protocol e.g. ATA or NVME.
PowerGovernorAveragePower	(For ATA devices only) Shows the device's power governor average power in milliwatts.
PowerGovernorBurstPower	(For ATA devices only) Shows the device's power governor burst power in milliwatts.
PowerGovernorMode	<ul style="list-style-type: none"> Shows the devices' Power Governor state. 0: 25-watts for PCIe NVMe devices; 40W for PCIe NVMe x8 devices; Unconstrained for SATA devices. 1: 20-watts for PCIe NVMe devices; 35W for PCIe NVMe x8 devices; Typical (7-watts) for SATA devices. 2: 10-watts for PCIe NVMe devices; 25W for PCIe NVMe x8 devices; Low (5-watts) for SATA devices.
ProductFamily	(Default) Shows the Intel SSD Series name.



Property	Description
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.
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 Mega RAID.
ReadErrorRecoveryTimer	(For ATA devices only) Shows the time limit for read error recovery. Time limit is in 100 millisecond units.
SanitizeBlockEraseSupported	(For ATA devices only) True if the device supports the Sanitize block erase command (Identify device Word 59 bit 15).
SanitizeCryptoScrambleSupported	(For ATA devices only) True if the device supports the Sanitize crypto scramble command (Identify device Word 59 bit 13).
SanitizeSupported	(For ATA devices only) True if the device supports the Sanitize feature (Identify device Word 59 bit 12).
SataGen1	(For ATA devices only) Shows if the device supports SATA Gen 1 speed. Reports True or False.
SataGen2	(For ATA devices only) Shows if the device supports SATA Gen 2 speed. Reports True or False.
SataGen3	(For ATA devices only) Shows if the device supports SATA Gen 3 speed. Reports True or False.
SataNegotiatedSpeed	(For ATA devices only) Coded value indicating current negotiated SATA signal speed. One of: <ul style="list-style-type: none"> 1: SATA Gen1 rate of 1.5 Gbps 2: SATA Gen2 rate of 3 Gbps 3: SATA Gen3 rate of 6 Gbps
SCSIPortNumber	(Windows OS only) The port number of the SCSI path used by Windows.
SectorSize	Shows the sector size in bytes.
SecurityEnabled	(For ATA devices only) Shows if the device is in security enabled state. Reports True or False.
SecurityFrozen	(For ATA devices only) Shows if the device is in security frozen state. Reports True or False.
SecurityLocked	(For ATA devices only) Shows if the device is security locked. Reports True or False.



Property	Description
SecuritySupported	(For ATA devices only) True if the devices supports ATA Security feature (Identify device Word 128 bit 0).
SerialNumber	(Default) Shows the serial number assigned to the device.
SMARTEnabled	Shows if SMART capabilities are enabled on the device. Reports True or False.
SMARTSelfTestSupported	(For ATA devices only) True if the device supports the drive self-test feature (Identify device Word 84 bit 1).
SMBusAddress	(For NVMe devices only) Shows the SM Bus address of the drive. Value of 255 means the SM Bus is disabled.
SSCEnabled	(For ATA devices only) Shows if the device has spread spectrum clocking enabled or not. Reports True or False.
StorageSpaceMember	Shows if the device is a Windows Storage Space member.
TemperatureLoggingInterval	(For ATA devices only) Shows the time interval for temperature logging.
TempThreshold	(For NVMe devices only) Shows the temperature threshold of the overall device. Units are in Celsius.
TimeLimitedErrorRecovery	(For NVMe devices only) Shows the limited retry timeout value in 100 millisecond units. This applies to I/O commands that indicate a time limit is required. A value of 0 indicates that there is no timeout.
TrimSupported	True if the device supports Trim feature.
VolatileWriteCacheEnabled	(For NVMe devices only) True if the volatile write cache is enabled.
WriteAtomicityDisableNormal	(For NVMe devices only) Shows the atomic write status. One of: <ul style="list-style-type: none"> 0: If cleared to '0', the atomic write unit for normal operation shall be honored by the controller. 1: The host specifies that the atomic write unit for normal operation is not required and the controller shall only honor the atomic write unit for power fail operations.
WriteCacheEnabled	(For ATA devices only) Shows if the device has write cache enabled. Reports True or False.
WriteCacheState	(For ATA devices only) Shows the device's write cache state. One of: <ul style="list-style-type: none"> 1: Write cache state is determined by ATA Set Features 2: Write cache is enabled. 3: Write cache is disabled.
WriteCacheSupported	(For ATA devices only) Shows if the device supports write cache capabilities. Reports True or False.
WriteErrorRecoveryTimer	(For ATA devices only) Shows the time limit for write error recovery in 100 millisecond units.
WriteCacheReorderingStateEnabled	(For ATA devices only) True if the write cache reordering state is enabled on the SATA device.



2.1.1.6 Examples

Lists the default fields for each Intel Data Center SSD.

```
isdct show -intelssd
```

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

```
isdct show -a -intelssd 1
```

2.1.1.7 Sample output

Default show output for `-intelssd` target in default text format

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

Default show output for `-intelssd` target in JSON format

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

2.1.2 Show Health Sensors

The `show -sensor` command shows the health sensor properties of one or more Intel SSDs.

2.1.2.1 Syntax

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



2.1.2.2 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.
<code>[-help -h]</code>	Displays help for the command.
<code>[-output -o (text nvmexml json)]</code>	Changes the format of the Return Data. Supported output options are: 'text' (Default), 'json', and 'nvmexml'.

2.1.2.3 Targets

Target	Description
<code>-sensor</code>	Displays the health related properties for device(s).
<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.

2.1.2.4 Limitations

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

2.1.2.5 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
<code>AvailableSpare</code>	(NVMe Devices Only). Percentage (0 to 100%) of the remaining spare capacity available.
<code>AverageNandEraseCycles</code>	Average number of NAND erase cycles for all blocks.
<code>CrcErrorCount</code>	Total number of interface (SATA or NVMe) CRC errors.
<code>EndToEndErrorDetectionCount</code>	Total number of end to end detected errors.
<code>EnduranceAnalyzer</code>	Reports the expected drive life in years.
<code>EraseFailCount</code>	Total number of raw erase fails.
<code>ErrorInfoLogEntries</code>	(NVMe Devices Only). Number of entries in the Error Info Log page over the life of the controller.
<code>HighestLifetimeTemperature</code>	(NVMe Devices Only). The highest lifetime temperature (in Celsius) of the device.
<code>LowestLifetimeTemperature</code>	(NVMe Devices Only). The lowest lifetime temperature (in Celsius) of the device.
<code>MaxNandEraseCycles</code>	Max number of NAND erase cycles for all blocks.



Property	Description
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 C.
SpecifiedPCBMinOperaratingTemp	(NVMe Devices Only). Specified PCB minimum operating temperature in degrees C.
Temperature	Total temperature of the device in degrees C.
ThermalThrottleCount	The total number of times thermal throttle has been activated.
ThermalThrottleStatus	The amount that Thermal Throttle that is applied. A value of zero is no throttle. 100 is 100% throttling applied.
UnsafeShutdowns	Reports the number of unsafe shutdowns over the life of the device.

2.1.2.6 Examples

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

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

AvailableSpare : 100
AverageNandEraseCycles : 1
CrcErrorCount : 0
DeviceStatus : Healthy
EndToEndErrorDetectionCount : 0
EnduranceAnalyzer : Media Workload Indicators have reset values. Run 60+ minute workload
prior to running the endurance analyzer.
EraseFailCount : 0
ErrorInfoLogEntries : 0x00
HighestLifetimeTemperature : 53
LowestLifetimeTemperature : 16
MaxNandEraseCycles : 3
MediaErrors : 0x00
MinNandEraseCycles : 0
PercentageUsed : 0
PowerCycles : 0x01F
PowerOnHours : 0x0667
ProgramFailCount : 0
SpecifiedPCBMaxOperatingTemp : 85
SpecifiedPCBMinOperatingTemp : 0
Temperature : 317
ThermalThrottleCount : 0
ThermalThrottleStatus : 0
UnsafeShutdowns : 0x05
```

Note: Specified the ID property to limit the output.



2.1.3 Show SMART

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

2.1.3.1 Syntax

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

2.1.3.2 Options

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

2.1.3.3 Targets

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

2.1.3.4 Limitations

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

2.1.3.5 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.
Normalized	Shows the normalized value of the SMART attribute.
Raw	Shows the raw value of the SMART Attribute. Value is in decimal.



Property	Description
Status	(Optional) Shows the status flags for the SMART attribute: <ul style="list-style-type: none">• Bit 0 Pre-failure/advisory bit• Bit 1 Online data collection• Bit 2 Performance attribute• Bit 3 Error rate attribute• Bit 4 Event count attribute• Bit 5 Self-preserving attribute• Bits 6 – 15 Reserved
Threshold	(Optional) Shows the SMART Attributes threshold value.
Worst	(Optional) Shows the SMART attributes worst normalized value. Maintained for the life of the device.

2.1.3.6 Examples

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

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

- E9 -

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

Note: Specified the ID property to limit the output.

Default show output for `-smart target` in JSON format.

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

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

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

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



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

```
isdct show -d raw -smart E9
```

2.1.4 Show Performance Metrics

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

2.1.4.1 Syntax

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

2.1.4.2 Options

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

2.1.4.3 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.

2.1.4.4 Limitations

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

2.1.4.5 Return Data

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

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

Property	Description
TotalLBAsRead	(ATA Devices only). Total number of sectors read by the Host.
TotalLBAsWritten	(ATA Devices only). Total number of sectors written by the Host.
ControllerBusyTime	(NVMe Devices only). Amount of time the controller is busy with I/O commands. Value is reported in minutes.



Property	Description
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.

2.1.4.6 Examples

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

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

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

- Intel SSD DC P3608 Series CVF85156007H400AGN-1 -

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

2.1.5 Show Device Identification Structures

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

2.1.5.1 Syntax

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

2.1.5.2 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'.



2.1.5.3 Targets

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

2.1.5.4 Limitations

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

2.1.5.5 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.

2.1.5.6 Examples

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

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

- Word 0 -

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

- Word 1 -

Obsolete : 3FFF

- Word 2 -

Specific Configuration : C837

- Word 3 -

Obsolete : 0010

- Word 4 -

Retired : 0000

- Word 5 -
```



```
Retired : 0000
- Word 6 -
Obsolete : 003F
- Word 7-8 -
Reserved : 00000000
- Word 9 -
Retired : 0000
- Word 10-19 -
Serial Number : CVLV119200C4300DGN
```

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

```
>isdct.exe show -o json -identify -nvmecontroller
{
  "Identify Controller CVF85156007H400AGN-1":
  {
    "Byte 0-1":
    {
      "PCI Vendor ID (VID)":8086
    },
    "Byte 2-3":
    {
      "PCI Subsystem Vendor ID (SSVID)":8086
    },
    "Byte 4-23":
    {
      "Serial Number":"CVF85156007H400AGN-1"
    },
    "Byte 24-63":
    {
      "Model Number":"INTEL SSDPECME400G4"
    },
    "Byte 64-71":
    {
      "Firmware Revision":"8DV10171"
    },
  },
}
```

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

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

2.1.6 Show NVMe Controller Information

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

2.1.6.1 Syntax

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



2.1.6.2 Options

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

2.1.6.3 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 <code>CNS=0x12</code> .

2.1.6.4 Limitations

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

2.1.6.5 Return Data

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



2.1.6.6 Examples

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

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

Status : The selected drive does not support this feature.

- All Controllers CVEK5316004R800AGN -

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

Parsed list of controller's that a given namespace ID is attached to.

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

- Attached Controllers CVEK5316004R800AGN -

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

2.1.7 Show NVMe Log Information

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

2.1.7.1 Syntax

```
isdct show [-help|-h] [-output|-o (text|nvmxml|json)] [-intelssd
(Index|SerialNumber|PhysicalPath)] -nvme
('ErrorInfo'|'SmartHealthInfo'|'FirmwareSlotInfo' |'TemperatureStatistics'|
'QueueMetrics')
```

2.1.7.2 Options

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



2.1.7.3 Targets

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

2.1.7.4 Limitations

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

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

2.1.7.5 Return Data

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

2.1.7.6 Examples

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

```
>isdct.exe show -nvmelog smarthealthinfo
- SMART and Health Information CVF85156007H400AGN-2 -

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



```

Temperature - (Kelvin) : 318
Temperature has exceeded a critical threshold : False
Unsafe Shutdowns : 0x05
Volatile memory backup device has failed : False

```

Parsed output of the Temperature Statistics log in JSON format.

```

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

```

2.1.8 Show Phy Counters

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

2.1.8.1 Syntax

```

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

```

2.1.8.2 Options

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

2.1.8.3 Targets

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

2.1.8.4 Limitations

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



2.1.8.5 Return Data

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

2.1.8.6 Examples

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

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

- Counter ID 0x001 -

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

- Counter ID 0x004 -

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

- Counter ID 0x007 -

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

- Counter ID 0x008 -

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

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

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



```

        "Description": "R_ERRP response for Host-to-Device non-Data FIS",
        "Value": 0
    },
    "Counter ID 0x008":
    {
        "ID": "008",
        "Description": "Device-to-Host non-Data FIS retries",
        "Value": 0
    },
    ...
}

```

2.1.9 Show HDA Temperature

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

2.1.9.1 Syntax

```

isdct show [-help|-h] [-output|-o (text|nvmexml|json)] -hdatemperature [-intelssd
(Index|SerialNumber|PhysicalPath)]

```

2.1.9.2 Options

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

2.1.9.3 Targets

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

2.1.9.4 Limitations

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

2.1.9.5 Return Data

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



2.1.9.6 Examples

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

```
>isdct.exe show -hdateperature
- HDA Temperature BTWL238602AM800DGN -

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

- Temperatures -

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

2.1.10 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.

2.1.10.1 Syntax

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



2.1.10.2 Options

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

2.1.10.3 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 Modify Device
<code>[-intelssd (Index SerialNumber PhysicalPath)]</code>	Restricts output to a specific Intel SSD by supplying the Intel SSD Index or Serial Number.

2.1.10.4 Limitations

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

2.1.10.5 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.



2.1.10.6 Examples

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

```
>isdct.exe show -latencystatistics reads

- Latency Statistics For Read Commands CVF85156007H400AGN-1 -

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

- Group 1 Group 1 -

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

- Group 2 Group 2 -

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



2.2 Configure Intel SSDs

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

2.2.1 Firmware Update

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

2.2.1.1 Syntax

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

2.2.1.2 Options

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

2.2.1.3 Targets

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

2.2.1.4 Properties

This command does not support any properties.

2.2.1.5 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.

2.2.1.6 Return Data

The CLI indicates the status of the firmware update operation.



2.2.1.6.1 Sample Output

```
>isdct.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.

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

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

>isdct.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.
```

Sample output from the ESXi version of Data Center Tool only:

```
isdct load -intelssd 0

WARNING! You have selected to update the drives firmware!

Proceed with the update? (Y|N): y

WARNING! If relevant, please check
https://www.vmware.com/resources/compatibility/search.php?deviceCategory=ssd&details=1&vsan\_type=vsansd
for vSAN certification of firmware before updating.
```

2.2.1.7 Examples

Updates the firmware on the device at index 1.

```
isdct load -intelssd 1
```

2.2.2 Modify Device

Changes the configurable settings on an Intel SSD.

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

2.2.2.1 Syntax

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

2.2.2.2 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'.



2.2.2.3 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.

2.2.2.4 Properties

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

Property	Description
DIPMEnabled	Enable or disable the SATA device's DIPM. Valid values are: <ul style="list-style-type: none"> • True – enables DIPM • False – disables DIPM
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 in order to successfully read the latency statistics logs (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.
PhyConfig	(For ATA devices only) Changes the PHY configuration of the selected device. Valid values are: <ul style="list-style-type: none"> • 0: Default enterprise settings. • 1: Client settings • 2: Alternate enterprise settings • 3: Server Settings



Property	Description
PhysicalSectorSize	(For ATA devices only) Changes the devices physical sector size. Values are in byte units. Valid values are: <ul style="list-style-type: none"> • 512 • 4096
PhySpeed	(For ATA devices only) Changes the devices maximum allowed PHY Speed it is allowed to negotiate. Valid values are: <ul style="list-style-type: none"> • 1.5: SATA Gen 1 speed of 1.5 Gbs • 3: SATA Gen 2 speed of 3 Gbs • 6: SATA Gen 3 speed of 6 Gbs Actual negotiated speed is also determined by the controller the device is attached to.
PLITestTimeInterval	(For ATA devices only) Changes the devices PLI test time interval setting. Valid values are: <ul style="list-style-type: none"> • 0: 0 min, no immediate test • 1: 0 min, do immediate test • 2: 60 min, do immediate test • 3: 1440 min, do immediate test • 4: 4320 min, do immediate test • 5: 10080 min, do immediate test • 6: 20160 min, do immediate test
PowerGovernorMode	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.
ReadErrorRecoveryTimer	(For ATA devices only) Sets the devices error recovery timer for reads. Value is in 100-microsecond units (e.g., a value of 1 = 100 ms, 2 = 200 ms). Valid values are: <ul style="list-style-type: none"> • 0-65535
SMBusAddress	(For NVMe devices only) Sets the devices SM Bus Address. Valid values are: <ul style="list-style-type: none"> • 1-255. A value of 255 will disable SM Bus
SSCEnabled	(For ATA devices only) Toggles the devices spread spectrum clocking (SSC) feature on and off. <ul style="list-style-type: none"> • "True" - enable SSC • "False" - disable SSC Device must be power cycled after setting.
TempLoggingInterval	(For ATA devices only) Sets the devices temperature logging interval. Value is in seconds. Valid values are: <ul style="list-style-type: none"> • 0-65535



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

2.2.2.5 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.

2.2.2.6 Return Data

The CLI indicates the status of the operation.

2.2.2.6.1 Sample Output

```
Set WriteCacheState successful.
```

2.2.2.7 Examples

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

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

2.2.3 Execute Device Function

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



2.2.3.1 Syntax

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

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

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

2.2.3.2 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 nvmxml json)]	Changes the format of the Return Data. Supported output options are: 'text' (Default), 'json', and 'nvmxml'.

2.2.3.3 Targets

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



2.2.3.4 Properties

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

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

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

Property	Description
LBAFormat	<p>(-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.</p> <p>Valid values are:</p> <ul style="list-style-type: none">• 0-NumLBAFormats: See NumLBAFormats Property for max value.
SecureEraseSetting	<p>(-nvmeFormat) Specifies the setting for Secure Erase. If not provided, the tool will use a value of 2.</p> <p>Valid values are:</p> <ul style="list-style-type: none">• 0: No secure erase.• 1: User data erase.• 2: Crypto erase.
ProtectionInformation	<p>(-nvmeFormat) Enables different protection information types. If not provided, the tool will use the current value of the selected Intel SSD.</p> <p>Valid values are:</p> <ul style="list-style-type: none">• 0: Protection information is not enabled.• 1: Protection information type 1 is enabled.
MetadataSettings	<p>(-nvmeFormat) Specifies how metadata is transferred. If not provided, the tool will use the current value of the selected Intel SSD</p> <p>Valid values are:</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.

2.2.3.5 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.



2.2.3.6 Return Data

The CLI returns the status of the command.

2.2.3.7 Examples

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

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

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

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

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

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

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

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

2.2.4 Delete Device

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

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

2.2.4.1 Syntax

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

2.2.4.2 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.
<code>[-output -o (text nvmxml json)]</code>	Change the format of the Return Data. Supported output options are: 'text' (Default), 'json', and 'nvmxml'.



2.2.4.3 Targets

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

2.2.4.4 Properties

This command does not support any properties.

2.2.4.5 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.

2.2.4.6 Return Data

The CLI will return status of the command.

2.2.4.7 Examples

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

```
delete -intelssd 1
```

2.3 Configure Namespaces

2.3.1 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.

2.3.1.1 Syntax

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

2.3.1.2 Options

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



2.3.1.3 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	The -namespace target is required. It specifies that a namespace is to be created.

2.3.1.4 Properties

Properties	Description
Size = (blocks)	The size property is required. It specifies the size of the new namespace in terms of blocks.
[LBAFormat = (0-NumLBAFormats)]	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 this value determines is the formatted sector size. Note: you cannot have different namespaces with different LBA sector sizes.
[ProtectionInformation = (0 1)]	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.
[MultiPathIoCapabilities = (0 1)]	The MultiPathIoCapabilities property is optional. By default a value of 1 will be used. 0 = Private namespace is created. 1 = shared namespace is created.

2.3.1.5 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.

2.3.1.6 Return Data

The CLI will return status of the command.



2.3.1.7 Examples

Create a given namespace with a size of 100000 blocks.

```
create -namespace -intelssd 2 size=100000
- Intel SSD CVEK5316004R800AGN -
Status : create namespace successful.
```

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

```
create -namespace -intelssd 2 size=100000 MultiPathIoCapabilities=0
ProtectionInformation=1
- Intel SSD CVEK5316004R800AGN -
Status : create namespace successful.
```

2.3.2 Attach a namespace

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

2.3.2.1 Syntax

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

2.3.2.2 Options

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

2.3.2.3 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.

2.3.2.4 Properties

This command does not support any properties.



2.3.2.5 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.

2.3.2.6 Return Data

The CLI will return status of the command.

2.3.2.7 Examples

Attach namespace 1 on the device at index 2.

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

2.3.3 Detach a namespace

Detach a namespace. Supported on NVMe 1.2+ devices.

2.3.3.1 Syntax

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

2.3.3.2 Options

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



2.3.3.3 Targets

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

2.3.3.4 Properties

This command does not support any properties.

2.3.3.5 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.

2.3.3.6 Return Data

The CLI will return status of the command.

2.3.3.7 Examples

Detach namespace 1 on the device at index 2.

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

2.3.4 Delete a namespace

Delete a namespace. Supported on NVMe 1.2+ devices.

2.3.4.1 Syntax

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



2.3.4.2 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.
<code>[-output -o (text nvmxml json)]</code>	Change the format of the Return Data. Supported output options are: 'text' (Default), 'json', and 'nvmxml'.

2.3.4.3 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 <code>-namespace</code> target is required and a valid namespace id must be provided. This selects which namespace to delete.

2.3.4.4 Properties

This command does not support any properties.

2.3.4.5 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.

2.3.4.6 Return Data

The CLI will return status of the command.



2.3.4.7 Examples

Delete namespace 1 on the device at index 2.

```
delete -namespace 1 -intelssd 2

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

- Intel SSD CVEK5316004R800AGN -

Status : delete namespace successful.
```

Use the -force option to bypass the prompt.

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

- Intel SSD CVEK5316004R800AGN -

Status : delete namespace successful.
```

2.4 Instrumentation Commands

2.4.1 Show Tool Configuration

Show tool configuration properties.

2.4.1.1 Syntax

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

2.4.1.2 Options

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

2.4.1.3 Targets

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

2.4.1.4 Properties

This command option does not support any properties.



2.4.1.5 Limitations

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

2.4.1.6 Return Data

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

Property	Description
EnableLSIAAdapter	True or False. Whether or not the LSIAAdapter library is loaded. This affects LSI* Mega RAID Controller Support. (Default value is False)
EnableLog	True or False. Whether or not to save the Tool's debug log file. (Default value is False)
LogFile	Filename of the Tool's debug log file. Only saved if EnableLog is true. Can contain full qualified file system path. (Default value is current working directory on Windows. /usr/bin/IntelSSDDataCenterTool/TDKI.log on Linux)

2.4.1.7 Examples

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

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

2.4.2 Modify Tool Configuration

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

2.4.2.1 Syntax

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

2.4.2.2 Options

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



2.4.2.3 Targets

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

2.4.2.4 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.

2.4.2.5 Limitations

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

2.4.2.6 Return Data

The CLI will indicate the status of the operation.

Sample Output:

```
Set EnableLog successful.
```

2.4.2.7 Examples

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

Enable the tool's debug log file.

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

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

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

Disable the loading of the LSIAdapter library.



2.4.3 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
- SATA General Purpose Logs (GPL)

2.4.3.1 Syntax

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

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

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

dump[-help|-h] [-destination (filename)] [-output|-o (text|nvmxml|json)] [-intelssd
(Index|SerialNumber|PhysicalPath)] -gpl (LogAddress) [PageNum=(y)] [Sectors=(z)]
```

2.4.3.2 Options

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

2.4.3.3 Targets

Target	Description
-intelssd (Index SerialNumber PhysicalPath)	Dump the selected data from the given Intel SSD.
-nlog	Read the nlog binary data from the device and save it to binary file.
-eventlog	Read the event log binary data from the device and save it to binary file.
-assertlog	Read the Assert log binary data from the device and save it to binary file.
-gpl (LogAddress) [PageNum=(y)] [Sectors=(z)]	Read the general purpose log from the device and save it to binary file. Only supported on SATA devices. LogAddress is required. This specifies which GPL log to read. Allowed values are: 0-255. Note: not all values correspond to a GPL.



2.4.3.4 Properties

Properties supported for the `dump` verb are listed below. Properties are specific to different targets.

The properties `PageNum` and `Sectors` are used with the `-gpl` target.

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

Property	Description
PageNum	(-gpl) Optional; Default = 0. This specifies which page offset to read from the given LogAddress. Allowed values are: 0-65535.
Sectors	(-gpl). Optional; Default = 1. This specifies the number of sectors to read from the given LogAddress. Allowed values are: 1-65535.

2.4.3.5 Limitations

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

2.4.3.6 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.

2.4.3.7 Examples

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

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

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

```
> dump -destination gpl.bin -intelssd 1 -gpl 0xDF PageNum=0 SectorCount=600
GPL_BTWL238602AM800DGN : Successfully written GPL data to gpl.bin
```

2.4.4 Telemetry Logs

This command will dump telemetry logs

2.4.4.1 Syntax

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

2.4.4.2 Example

```
isdct dump -destination telem.bin -telemetrylog -intelssd 1
```



2.5 Support Commands

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

2.5.1 Help Command

Shows help for the supported commands.

2.5.1.1 Syntax

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

2.5.1.2 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'.

2.5.1.3 Targets

This command does not support any targets.

2.5.1.4 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.

2.5.1.5 Return Data

By default, the command displays an introduction to DCT 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.

2.5.1.5.1 Sample Output (Multiple Commands)

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

```
>isdct.exe help
Usage: isdct_Win32.exe <verb>[<options>][<targets>][<properties>]

Commands:
```



```
Help:
  help [-help|-h] [-output|-o (text|nvmxml|json)] [Name = (name)] [verb = (verb)]

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

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

PhyConfig:
  set [-help|-h] [-output|-o (text|nvmxml|json)] -intelssd (Index|SerialNumber|PhysicalPath)
  PhyConfig = (0|1|2|3)

PhysicalSectorSize:
  set [-help|-h] [-output|-o (text|nvmxml|json)] -intelssd (Index|SerialNumber|PhysicalPath)
  PhysicalSectorSize = (512|4096)

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

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

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

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

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

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

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

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

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

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

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

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

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



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

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

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



2.5.1.5.2 Sample output (verb filter to multiple commands)

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

```
isdct.exe help verb=show
Usage: isdct_Win32.exe <verb>[<options>][<targets>][<properties>]

Commands:
IntelSSD:
  show [-help|-h] [-display|-d (Property1,...)] [-all|-a] [-output|-o (text|nvmxml|json)] -intelssd
  [(Index|SerialNumber|PhysicalPath)]
SMART:
  show [-help|-h] [-display|-d (Property1,...)] [-all|-a] [-output|-o (text|nvmxml|json)] -smart
  [(id)] [-intelssd
  [(Index|SerialNumber|PhysicalPath)]]
Sensors:
  show [-help|-h] [-display|-d (Property1,...)] [-all|-a] [-output|-o (text|nvmxml|json)] -sensor [-
  intelssd
  [(Index|SerialNumber|PhysicalPath)]]
Performance:
  show [-help|-h] [-display|-d (Property1,...)] [-all|-a] [-output|-o (text|nvmxml|json)] -
  performance [-intelssd
  [(Index|SerialNumber|PhysicalPath)]]
NVMeLog:
  show [-help|-h] [-output|-o (text|nvmxml|json)] [-intelssd [(Index|SerialNumber|PhysicalPath)]] -
  nvmelog
  [(('ErrorInfo'|'SmartHealthInfo'|'FirmwareSlotInfo'|'TemperatureStatistics'))]
IdentifyDevice:
  show [-help|-h] [-output|-o (text|nvmxml|json)] -identify [-namespace [(integer | 'attached' |
  'allocated')]]
  [-nvmecontroller] [-intelssd [(Index|SerialNumber|PhysicalPath)]]
LatencyStatistics:
  show [-help|-h] [-output|-o (text|nvmxml|json)] -latencystatistics ('reads'|'writes') [-intelssd
  [(Index|SerialNumber|PhysicalPath)]]
HDATemperature:
  show [-help|-h] [-output|-o (text|nvmxml|json)] -hdatemperature [-intelssd
  [(Index|SerialNumber|PhysicalPath)]]
PhyCounters:
  show [-help|-h] [-output|-o (text|nvmxml|json)] -phycounters [-intelssd
  [(Index|SerialNumber|PhysicalPath)]]
NVMeControllerList:
  show [-help|-h] [-output|-o (text|nvmxml|json)] [-namespace (namespace id)] -nvmecontroller [-
  intelssd
  [(Index|SerialNumber|PhysicalPath)]]
System:
  show [-help|-h] [-display|-d (Property1,...)] [-all|-a] [-output|-o (text|nvmxml|json)] -system
```



2.5.1.5.3 Sample output (single command)

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

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

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

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

Verb:
  load

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

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

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

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

Properties:
```

2.5.1.6 Examples

Lists all supported commands

```
isdct help
```

Lists all commands where the verb is set

```
isdct help verb=show
```

Lists the detailed help for the given Name WriteCacheState

```
isdct help Name=WriteCacheState
```

2.5.2 Version Command

Shows the Intel SSD Data Center Tool's version and End-User License.

2.5.2.1 Syntax

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



2.5.2.2 Options

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

2.5.2.3 Targets

This command does not support any targets.

2.5.2.4 Properties

This command does not support any properties.

2.5.2.5 Return Data

By default, the command returns the Intel SSD Data Center Tool's version information. With the `-display` option, it shows the License property.

Property	Description
License	Shows the End-User License for the Intel SSD Data Center Tool.

2.5.2.5.1 Sample Output

Default output in text.

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

Name: Intel(R) Data Center Tool
Version: 3.0.0
Description: Interact and configure Intel SSDs.
```

Default output in JSON.

```
> isdct.exe version -o json
{
  "Version Information":
  {
    "Name":"Intel(R) Data Center Tool",
    "Version":"3.0.0",
    "Description":"Interact and configure Intel SSDs."
  }
}
```




2.5.2.6 Examples

Display the available version information for the DCT software.

```
version
```

Display the End-User License for the DCT software components.

```
version -d license
```

2.6 Debug

2.6.1 Tool Debug File

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



3 Response Codes

The following table lists all the possible error and status codes that are returned from the Intel SSD Data Center Tool. The first column lists the numeric value of the error/status code that is returned by the tool. In Windows, to display the numeric return value, type the following in 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.



4 Examples

4.1 Display Tool Help

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

```
isdct.exe help
```

4.2 Display Tool License

Use the **version** command with the license property to display the End-User license agreement for Intel SSD Data Center Tool.

```
isdct.exe version -d license
```

4.3 Display Drives

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

```
isdct.exe show -intelssd
```

4.4 Bypass Prompts (force)

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

4.5 Debug Log Files

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

4.6 Display Drive Info

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

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

4.7 Identify Device

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

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

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



4.8 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

```
isdct.exe show -sensor
```

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

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

4.9 Delete

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

```
isdct.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.

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

4.10 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: You should run the **delete** command before altering the Maximum LBA of a drive. After modifying the maximum LBA, a complete power shutdown is required 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.

```
isdct.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:

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

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

```
isdct.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.

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



4.11 Update Firmware

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

```
isdct.exe load -intelssd 1
```

The Intel SSD Data Center Tool handles both updates using Windows process or Linux process.

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

```
C:\isdct>isdct.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

C:\isdct>isdct.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.

C:\isdct>isdct.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:

```
[root@linuxul2br remlab]# isdct 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]# isdct 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:

```
[root@linuxul2br remlab]# isdct 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]# isdct 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.

```
[root@linuxul2br remlab]# isdct 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
```



4.12 Endurance Analyzer

Use the `enduranceanalyzer` property to calculate the life expectancy of the drive based on a user workload. The steps are:

1. Reset SMART Attributes using the reset option..

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

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

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

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

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

Note: The Intel® Optane™ SSD DC P4800X wear levelling will stay at 0% until after several thousand full pack writes. The counter will update normally for all other drives.

4.13 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.

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

```
isdct.exe show -d PowerGovernorMode -intelssd 1
```

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

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



4.14 JSON – Output

Supports output to all verbs.

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

Example:

```
C:\Users\remlab\Desktop\CLITester>isdct.exe show -o json -intelssd
{
  "IntelSSD Index 0":
  {
    "DevicePath": "\\.\PHYSICALDRIVE0",
    "DeviceStatus": "Healthy",
    "Firmware": "D2010370",
    "FirmwareUpdateAvailable": "Firmware is up to date as of this tool release.",
    "Index": 0,
    "ProductFamily": "Intel SSD DC S3500 Series",
    "ModelNumber": "INTEL SSDSC2BB080G4",
    "SerialNumber": "BTWL2390005K080DGN"
  }
  "IntelSSD Index 1":
  {
    "DevicePath": "\\.\PHYSICALDRIVE01",
    "DeviceStatus": "Healthy",
    "Firmware": "5DV10270",
    "FirmwareUpdateAvailable": "Firmware is up to date as of this tool release.",
    "Index": 1,
    "ProductFamily": "Intel SSD DC S3700 Series",
    "ModelNumber": "INTEL SSDSC2BA400G3",
    "SerialNumber": "BTTV220600B5400HGN"
  }
  "IntelSSD Index 2":
  {
    "Bootloader": "8B1B012E",
    "DevicePath": "\\.\PHYSICALDRIVE02",
    "DeviceStatus": "Healthy",
    "Firmware": "8DV10131",
    "FirmwareUpdateAvailable": "Firmware is up to date as of this tool release.",
    "Index": 2,
    "ProductFamily": "Intel SSD DC P3600 Series",
    "ModelNumber": "INTEL SSDPEDME800G4D HHHH NVME 800GB",
    "SerialNumber": "CVFT4174002C800CGN"
  }
}
```




4.15 NVML – Output

Supports output to all verbs.

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

Example:

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

<IntelSSD_Index_1>
  <DevicePath>\\\\.\\PHYSICALDRIVE1</DevicePath>
  <DeviceStatus>Healthy</DeviceStatus>
  <Firmware>5DV10270</Firmware>
  <FirmwareUpdateAvailable>Firmware is up to date as of this tool
release.</FirmwareUpdateAvailable>
  <Index>1</Index>
  <ProductFamily>Intel SSD DC S3700 Series</ProductFamily>
  <ModelNumber>INTEL SSDSC2BA400G3</ModelNumber>
  <SerialNumber>BTTV220600B5400HGN</SerialNumber>
</IntelSSD_Index_1>

<IntelSSD_Index_2>
  <DevicePath>\\\\.\\PHYSICALDRIVE2</DevicePath>
  <DeviceStatus>Healthy</DeviceStatus>
  <Firmware>8DV10131</Firmware>
  <FirmwareUpdateAvailable>Firmware is up to date as of this tool
release.</FirmwareUpdateAvailable>
  <Index>2</Index>
  <ProductFamily>Intel SSD DC P3600 Series</ProductFamily>
  <ModelNumber>INTEL SSDPEDME800G4D HHL NVME 800GB</ModelNumber>
  <SerialNumber>CVFT4174002C800CGN</SerialNumber>
</IntelSSD_Index_2>
</RootList>
```