User Guide

Storage Executive Command Line Interface

Introduction

This guide describes how to use Micron’s Storage Executive command line interface (CLI) to monitor, manage, and configure Micron solid state drives (SSDs).

The CLI provides a list of commands for configuration and management, including:

• View all drives installed in a system and see current drive status and capacity, temperature, firmware version, and driver information
• View SMART attributes and data/error logs
• Run SMART self tests
• Update firmware
• Retrieve debug data
• Configure drive settings including interrupt coalescing, over-provisioning and Flex Capacity levels
• Remove all data from a drive by performing a sanitize drive, sanitize crypto scramble, physical security ID (PSID) revert, or secure erase operation
• Run the STANDBY IMMEDIATE command
• Prepare an NVMe drive for safe removal from a system
• Manage the namespace on an NVMe drive

For instructions on installing Storage Executive or using the Storage Executive graphical user interface, see the Storage Executive User Guide.
# Contents

- About the CLI ................................................. 4
- Supported SSDs ........................................... 4
- RAID Controller Support ................................. 4
- Running the CLI ............................................. 5
- Common Command Options ............................. 5
- Obtaining Help .............................................. 5
- Using Silent Mode ......................................... 5
- Saving Command Output ................................. 6
- Displaying CLI Usage ................................. 7
  - Displaying NVMe SSD Commands ................ 7
  - Displaying SATA SSD Commands ............... 8
  - Displaying SAS SSD Commands ................. 9
  - Displaying Commands for a Specific SSD .... 10
- Displaying Drive Information ......................... 11
  - Displaying Basic Information for All Drives in a System 11
  - Displaying Basic Information for a Specific Drive 12
  - Displaying Detailed Drive Information ........ 13
  - Displaying Driver Information .................... 14
  - Displaying ATA Identify Device Data .......... 14
  - Displaying Firmware Slot Information (NVMe Drives Only) 16
  - Displaying PCIe Information (NVMe Drives Only) 18
- Displaying SMART Data and Error Logs ......... 19
  - Displaying SMART Data ............................... 19
  - Displaying SMART Logs ............................... 20
  - Displaying a SMART Error Log Directory ...... 21
  - Displaying a SMART Summary Error Log ...... 21
  - Displaying a SMART Comprehensive Error Log 22
  - Displaying a SMART Extended Error Log ...... 22
  - Displaying a SMART Self Test Log .......... 23
  - Displaying a SMART Extended Self Test Log 24
  - Displaying General Purpose Log (GPL) Data 25
- Running SMART Self Tests .............................. 26
- Updating Firmware ....................................... 27
  - Checking the Firmware Version .............. 27
  - Updating Firmware ................................. 27
  - Downloading a Single Firmware Image .... 28
  - Downloading and Activating Later .......... 29
  - Selective Image Download (9200 Series Only) 30
- Retrieving Debug Data .................................. 32
- Erasing a Drive ........................................... 33
  - Performing a Sanitize Drive (Block Erase) Operation 33
  - Performing a Sanitize Crypto Scramble Operation (SATA Drives Only) 34
  - Performing a PSID Revert (SATA and SAS Drives Only) 35
  - Performing a Secure Erase ......................... 36
- Running the STANDBY IMMEDIATE Command 37
- Configuring Drive Over-Provisioning .............. 38
- Managing Drive Physical Capacity ................. 40
- Formatting a Drive (SAS Drives Only) .......... 41
- Configuring Interrupt Coalescing (NVMe Drives Only) 42
- Preparing to Remove a Drive (NVMe Drives Only) 43
About the CLI

The Storage Executive command line interface (CLI) provides a list of commands for managing and monitoring supported Micron and Crucial SSDs in a local system. The CLI is intended for system administrators and can be used to automate Storage Executive operations.

Supported SSDs

<table>
<thead>
<tr>
<th>SSD</th>
<th>Model Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Micron NVMe™</td>
<td>9300 Series</td>
</tr>
<tr>
<td></td>
<td>9200 Series</td>
</tr>
<tr>
<td></td>
<td>9100 Series</td>
</tr>
<tr>
<td></td>
<td>7300 Series</td>
</tr>
<tr>
<td></td>
<td>7100 Series</td>
</tr>
<tr>
<td></td>
<td>2200</td>
</tr>
<tr>
<td></td>
<td>2100IT, 2100AT</td>
</tr>
<tr>
<td>Micron SAS</td>
<td>S610DC</td>
</tr>
<tr>
<td></td>
<td>S630DC</td>
</tr>
<tr>
<td></td>
<td>S650DC</td>
</tr>
<tr>
<td></td>
<td>S655DC</td>
</tr>
<tr>
<td>Micron SATA</td>
<td>5300 Series</td>
</tr>
<tr>
<td></td>
<td>5210</td>
</tr>
<tr>
<td></td>
<td>5200 Series</td>
</tr>
<tr>
<td></td>
<td>5100 Series</td>
</tr>
<tr>
<td></td>
<td>1100</td>
</tr>
<tr>
<td></td>
<td>1300</td>
</tr>
<tr>
<td></td>
<td>M500</td>
</tr>
<tr>
<td>Crucial SATA</td>
<td>MX-series</td>
</tr>
<tr>
<td></td>
<td>BX-series</td>
</tr>
<tr>
<td></td>
<td>M-series</td>
</tr>
<tr>
<td>Crucial NVMe</td>
<td>P-series</td>
</tr>
<tr>
<td></td>
<td>X8 Portable SSD</td>
</tr>
</tbody>
</table>

RAID Controller Support

<table>
<thead>
<tr>
<th>RAID Controller</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avago MegaRAID</td>
<td>Drives connected to MegaRAID controllers appear with the following device name: mraidX:Y Where X indicates the ID of the MegaRAID controller and Y indicates the ID of the drive behind the controller.</td>
</tr>
</tbody>
</table>
Running the CLI

To run the CLI, execute the following in a command prompt:

Windows: `msecli.exe`

Linux: `msecli`

Common Command Options

The CLI provides the following options for all commands:

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-r</td>
<td>Runs the CLI in silent mode.</td>
</tr>
<tr>
<td>-n</td>
<td>Retrieves specified information for the given device name.</td>
</tr>
<tr>
<td>-s</td>
<td>Saves the output of the command to the specified file.</td>
</tr>
</tbody>
</table>

Obtaining Help

To obtain CLI usage information, enter the following in the command prompt:

`msecli -?`

Using Silent Mode

In silent mode, the CLI does not display output on the screen and does not request user input, if any, during its operation. If a command requires user confirmation, the default input value (yes) is used for those commands.

To run the CLI in silent mode, enter the following in the command prompt:

`msecli -L -r`

Figure 1: CLI in Silent Mode
Saving Command Output

The output of every command issued in the CLI can be saved as a .txt file. This file is created in the location from which the command is executed (Storage Executive installation folder by default), unless an absolute path is given.

1. At the command prompt, run the command for which output will be saved.
2. Enter the following in the command prompt: `msecli -L -s <output file name>`
   Replace `<output file name>` with the name for the saved file.

   The command prompt displays the content of the saved file.

Figure 2: Displaying Saved Output

```
C:\Users\Administrator\msecli -L -s list.txt

Device Name : Drive0
Model No     : M500.MS100C_WTF0DAK936BGB
Serial No    : 15178F9A0V62
FW-Rev       : 0013
Total Size   : 960.20GB
Drive Status : Drive is in good health
Data Link Speed : Gen3 (6.0 Gbps)
Data Link Max Speed : Gen3 (6.0 Gbps)
Temp(C)      : 24

Device Name : Drive1
Model No     : M500.MS100C_WTF0DAK936BGB
Serial No    : 1411026D5A69
FW-Rev       : 0018A
Total Size   : 960.04GB
Drive Status : Drive is in good health
Data Link Speed : Gen3 (6.0 Gbps)
Data Link Max Speed : Gen3 (6.0 Gbps)
Temp(C)      : 33

Drive Information is retrieved successfully
CMD_STATUS : Success
STATUS_CODE : 0

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C:\Users\Administrator>
Displaying CLI Usage

Storage Executive supports many commands to manage Micron SSDs. Some commands are common to all Micron SSDs while others are specific to a certain type of SSD; for example, NVMe (7100 series, 9100 series, etc.) or SATA (M500, M510, M550, etc.).

To determine the commands available for a specific SSD or type of SSD, issue the following commands in this section.

Displaying NVMe SSD Commands

Enter the following at the command prompt: `msecli -h -t`

Figure 3: NVMe SSD Commands
Displaying SATA SSD Commands

Enter the following at the command prompt: msecli -h -c

**Figure 4: SATA SSD Commands**

```
Figure 4: SATA SSD Commands
```

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Displaying SAS SSD Commands

Enter the following at the command prompt: \texttt{msecli -h -s}

**Figure 5: SAS SSD Commands**

```
 msecli -h [json-file] -j [json-device] [-l] [-o (device-name)] [-r] [-s (out-filename)]

Lists the basic information for all drives available in the system

msecli -l [-i] [-o (device-name)] [-r] [-s (out-filename)]

Lists the SMM values for the supported parameters for the micro drives available in the system.

msecli M [-o (Conn Address)] [-o (device-name)] [-p] [-r] [-s (out-filename)]

To manage micro drives:

msecli X [-P (PID)] [-o (device-name)] [-p] [-r] [-s (out-filename)]

Performs a basic Block Erase, or PID Reset for the specified micro drive.

msecli D [-o (device-name)] [-p] [-r] [-s (out-filename)]

Displays the Driver and Host Information for the given (device-name).

msecli C [-h [device-name]] [-o] [-r] [-s (out-filename)]

Issues a command to the specified drive.

msecli W [-a] [-r] [-s (out-filename)]

Displays the Micron Storage Executive current version.

msecli P [Config file name] [-o (device-name)] [-l (color label)] [-r] [-s (out-filename)]

Collects storage data from the system for each micro drive.

msecli J [-h (NumBlocks)] [-1 (Block Size)] [-o (Protection Type)] [-o (Protection Interval Exposed)] [-d] [-3] [-f] [-o (device-name)]

Performs format on a specified micro drive.

msecli F [-O (Output file) [-h] [-I] [-o (device-name)] [-p] [-r] [-s (out-filename)]

Manages the firmware update for micro drives.

msecli O [-i (force-firmware)] [-o (device-name)] [-o (mdm1number)] [-o (device-name)] [-w] [-j] [-d] [-r] [-s (out-filename)]

Performs firmware update with the firmware folder for the specified micro drive.

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```
Displaying Commands for a Specific SSD

Enter the following at the command prompt: **msecli -h -n <device-name>**

**Figure 6: Specific SSD Commands**
Displaying Drive Information

This section describes how to view:

- Basic and detailed drive information for all drives in a system or a specific drive
- Driver information
- ATA Identify Device data for a drive
- Firmware slot information (NVMe drives only)
- PCIe information (NVMe drives only)

Displaying Basic Information for All Drives in a System

Use the following instructions to view basic information for all drives in a host system, including the drive’s device name, model number, serial number, capacity, and status of each drive. All measurements for storage are displayed in gigabytes (GB). The drive’s device name is necessary to issue subsequent commands to a drive.

**Note:** An error message displays if no drives are connected to the host system. PCI path is displayed in hexadecimal value.

**Usage:** msecli -L [-d|-P|-i|-j <json-file>|-J] [-n <device-name>] [-r] [-s <out-filename>]

1. Enter the following at the command prompt: `msecli -L`
2. The CLI displays information about all drives in the host system.

**Figure 7: Details for all Drives in the Host System**
Displaying Basic Information for a Specific Drive

Use the following instructions to view basic information for a specific drive, including the model number, serial number, capacity, and drive status.


1. Enter the following at the command prompt: msecli -L -n <device-name>
   Replace <device-name> with the drive’s device name.

2. The CLI displays information about the specified drive.

Figure 8: Details for a Specific Drive
Displaying Detailed Drive Information

Use the following instructions to view detailed information about all available drives in the host system, including:

- Device name
- Total (available) size
- Drive status
- SMART enabled status
- Estimated life remaining
- TCG status
- Power limit status
- Native max LBA details
- Interrupt coalescing value (NVMe drives)
- Write buffer status (NVMe drives)


1. Enter the following at the command prompt: `msecli -L -d`
2. The CLI displays detailed information about all drives in the host system.

Figure 9: Detailed Drive Information
Displaying Driver Information

Use the following instructions to display information about the driver, host operating system, and host name for a specific drive.

Usage: msecli –D –n <device-name> [-r] [-s <out-filename>]

1. Enter the following at the command prompt: msecli -D -n <device-name>
   Replace <device-name> with the drive’s name.
2. The CLI displays driver information for the specified drive.

Figure 10: Driver Information

---

Displaying ATA Identify Device Data

ATA identify device data can be saved to a text file or output to the screen. It is recommended to save the data to a text file using the -s option to ensure all parsed identify data can be read.

Usage: msecli -C [-i [-a <namespace id>] | -b | -f <feature-code> -c <sector-count> -l <lba>] | -n <device-name> [-r] [-s <out-filename>]

1. Enter the following at the command prompt: msecli –C -i -n <device-name>.
2. When finished, the data outputs to the console or specified file.

Figure 11: Display ATA Identify Device Data
Figure 12: Display NVMe Controller Data
Displaying Firmware Slot Information (NVMe Drives Only)

Use the following command to display firmware slot information for an NVMe drive.


1. Enter the following at the command prompt: `msecli -L [-d|-P|-i|-j <json-file>|-J] [-n <device-name>] [-r] [-s <out-filename>]`
2. The CLI displays firmware slot information about the specified drive.
Figure 14: Firmware Slot Information for an NVMe Drive

```
C:\Users\Administrator>mscsl -c -l -n mtlxmePS121105416
Device Name : mtlxmePS121105416
Active Slot  : 2
Slot 1       : 00000000
Slot 2       : 00010000
Slot 3       : 00010000
Device Name : mtlxmePS121105416
Firmware Slot Information retrieved successfully
CMD_STATUS  : Success
STATUS_CODE : 0
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C:\Users\Administrator>
```
Displaying PCIe Information (NVMe Drives Only)

Use the following instructions to display PCIe information for an NVMe drive, including:

- Device name
- Vendor ID
- Device ID
- Revision ID
- Supported PCIe link speeds
- Maximum PCIe link width
- Current PCIe link speed
- Negotiated PCIe link width
- PCI location (path) of the PCIe controller (PCI bus slot info)
- Subsystem vendor ID
- Subsystem ID
- Class code


1. Enter the following at the command prompt: `msecli -L -P`
2. The CLI displays information for each available NVMe drive.

**Figure 15: PCIe Information**
Displaying SMART Data and Error Logs

Self-Monitoring, Analysis, and Reporting Technology (SMART) is a monitoring framework used to detect and report various indicators of consistency and anticipate failures. SMART must be enabled on a drive to display data and logs for the drive.

This section describes how to:

- Display SMART data
- Display SMART error and self-test logs

Displaying SMART Data

Use the following instructions to display a list of SMART attributes supported by each drive in the system. The CLI displays details for each attribute, including the value, threshold, and status.

For a list of SMART attributes and attribute IDs, see Appendix A. SMART Attributes and Drive Statistics (page 49).


1. To display SMART data for a specific drive, enter the following at the command prompt: msecli -S -n <device-name>
   To display SMART data for all drives, enter the following: msecli -S

2. The CLI displays the SMART data.

   In Figure 16, the **Temp. Throttle Threshold in C** value is the temperature at which the firmware starts to throttle write performance to keep the drive within the operating temperature range. The **Temp. Shutdown Threshold in C** value is the temperature at which the firmware shuts down I/O traffic to prevent the drive’s components from operating out of the specified range.
Displaying SMART Logs

Use the following instructions to display available SMART logs. Analyzing these logs helps to identify errors in a drive.

Use the optional `-b <output-binary>` flag to save log data in a binary file.

**Note:** This feature is not supported by NVMe and SAS drives.

The following SMART logs can be generated:

- **SMART error log directory** (log type 0): Displays the number of log pages.
- **SMART summary error log** (log type 1): Displays a summary of SMART log errors.
- **SMART comprehensive error log** (log type 2): Provides logging for 28-bit addressing only. It includes uncorrectable errors, ID Not Found errors for which the LBA request was valid, server errors, and write fault errors. This log does not include errors attributed to the receipt of faulty commands.
- **SMART extended error log** (log type 3): Provides logging for 28-bit and 48-bit entries. It includes uncorrectable errors, ID Not Found errors for which the LBA request was valid, server errors, and write fault errors. This log does not include errors attributed to the receipt of faulty commands.
- **SMART self test log** (log type 6): Displays the results of the SMART self-test for 28-bit addressing only.
- **Extended SMART self test log** (log type 7): Displays the results of the SMART self-test for 48-bit and 28-bit addressing.

**Usage:**
msecli -S [-l <log-type[0 | 1 | 2 | 3 | 6 | 7]>] [-n <device-name>] [-r] [-s <out-file-name>] [-b<output-binary>]
Displaying a SMART Error Log Directory

1. Enter the following at the command prompt: `msecli -S -l 0 -n <device-name>`
   Replace `<device-name>` with the drive’s device name.

2. The SMART error log directory displays.

Figure 17: SMART Error Log Directory

Displaying a SMART Summary Error Log

1. Enter the following at the command prompt: `msecli -S -l 1 -n <device-name>`
   Replace `<device-name>` with the drive’s device name.

2. The SMART summary error log displays.

Figure 18: SMART Summary Error Log
Displaying a SMART Comprehensive Error Log

1. Enter the following at the command prompt: `msecli -S -l2 -n <device-name>`
   Replace `<device-name>` with the drive's device name.

2. The SMART comprehensive error log displays.

Figure 19: SMART Comprehensive Error Log

Displaying a SMART Extended Error Log

1. Enter the following at the command prompt: `msecli -S -l3 -n <device-name>`
   Replace `<device-name>` with the drive's device name.

2. The SMART extended error log displays.

Figure 20: SMART Extended Error Log
Displaying a SMART Self Test Log

1. Enter the following at the command prompt: `msecli -S -l 6 -n <device-name>`
   Replace `<device-name>` with the drive’s device name.

2. The SMART self test log displays.

Figure 21: SMART Self Test Log
Displaying a SMART Extended Self Test Log

1. Enter the following at the command prompt: \texttt{msecli -S -l 7 -n <device-name>}
   Replace \texttt{<device-name>} with the drive's device name.

2. The SMART extended self test log displays.

\textbf{Figure 22: SMART Extended Self Test Log}

\begin{verbatim}
C: \Users\Administrator> msecli -S -l 7 -n Drive0

MKR: (R)MKR
LOG ENTRY COUNT : 7

FAILING LBA  TIMESTAMP (UTC)  LBA  Status  CHECKPOINT
0  179  4  0  255
0  199  255  0  48
0  207  4  0  255
0  208  255  0  48
0  407  255  0  255
0  419  255  0  48
0  0  0  0  0
0  0  0  0  0
0  0  0  0  0
0  0  0  0  0
0  0  0  0  0
0  0  0  0  0
0  0  0  0  0

Device Name : Drive0
Extended SMART Self-Test Log is retrieved successfully
CMD STATUS : SUCCESS
STATUS CODE : 0

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C: \Users\Administrator>
\end{verbatim}
Displaying General Purpose Log (GPL) Data

Use the following command to display GPL page data.

Reading log page 0 displays the GPL directory with a count of available pages for each log address. Use the optional -b <output-binary> to save the log data in a binary file.

Usage: msecli -S -g <GPL Log Address> -n <device-name> [-b <output-binary] [-r] [-s <out-file-name>]

1. Enter the following at the command prompt: msecli -g 0 -n <device-name>
   Replace 0 with the desired log address and device-name with the target device.
2. For log 0, the GPL directory is displayed. For all others, the raw data is displayed.

Figure 23: GPL Data
Running SMART Self Tests

Use the following instructions to run SMART self tests on a specific drive. The supported tests (Short, Extended, Conveyance Self Test) can be run in either offline or captive mode.

Note: This feature is not supported by NVMe drives. With SAS drives, only Self Test types 1 and 2 are supported.

Usage: `msecli -S -t <self-test type> -n <device-name>

Where **self-test type** is an integer:

• 0 = Short Self Test offline mode
• 1 = Extended Self Test offline mode
• 2 = Conveyance Self Test offline mode
• 3 = Short Self Test captive mode
• 4 = Extended Self Test captive mode
• 5 = Conveyance Self Test captive mode

1. Enter the following at the command prompt:
   ```
   msecli -S -t <self-test type> -n <device-name>
   ```

2. Enter **Y** when prompted.

3. The self test can take up to an hour depending on the test being run (Extended Self Test is the longest). A message appears when the test is complete.

Figure 24: Running SMART Self Test
Updating Firmware

This section explains how to check for and perform a firmware update on supported drives.

Checking the Firmware Version

Usage: msecli -F

1. Enter the following at the command prompt: msecli -F
2. The currently installed firmware version displays.

Figure 25: Firmware Version

Updating Firmware


Note: Specify -m <model-number> instead of -n <device-name> to upgrade the firmware on all drives of the same model type. For NVMe drives, specify the firmware slot using the -S su-option.

1. Enter the following at the command prompt: msecli -U -i <fw-folder-path> -n <device-name>
   Replace <fw-folder-path> with the firmware folder for the drive.
2. Confirm the operation when prompted.
3. Press Enter to continue.

   On Windows systems, a message indicates the progress and shows successful when complete. The system will boot into Windows again automatically.
   On Linux systems, a message appears when the upgrade is successful.
Figure 26: Firmware Update Successful

![Firmware Update Successful](image1)

Figure 27: Firmware Update Successful

![Firmware Update Successful](image2)

### Downloading a Single Firmware Image

This option downloads a raw firmware binary image to the specified Micron drive.

The optional `-S <fw-slot>` can be used to specify a firmware slot on an NVMe drive. If `-S` is not specified for an NVMe drive, the slot will be chosen automatically.


1. Enter the following at the command prompt: `msecli -F -U <firmware binary image> -n <devicename>`
2. Confirm the operation when prompted.

A message indicates the firmware image update is in progress. When finished, a message indicates the operation was successful.
Figure 28: Firmware Update

![Figure 28: Firmware Update](image)

**Figure 29: Download Firmware for Later Use**

The standard firmware update options activate firmware immediately. The following commands can be used to download firmware to a SATA drive and activate it at a later time.

To download firmware for later use:
```
mscli -F -U <firmware binary image> -l -n <device-name>
```

**Figure 29: Download Firmware for Later Use**

![Figure 29: Download Firmware for Later Use](image)
To activate downloaded firmware:

msecli -F -A -n <device-name>

Figure 30: Activating Downloaded Firmware

To activate the firmware slot for NVMe drives:

msecli -F -S <slot number> -n <drive-name>

Figure 31: Activating Downloaded Firmware

Selective Image Download (9200 Series Only)

The 9200 series firmware binaries have multiple firmware components that occasionally need to be updated individually. The following command lets you update specific components from the given firmware binary. The valid component options are: ALL, EEPROM and OOB.

Usage: msecli -F -U <firmware_binary> -m <component> -n <device-name>

1. Enter the following at the command prompt: msecli -F -U <firmware_binary> -m [ALL|EEP|OOB] -n <device>
2. The specified firmware component will be updated.
Figure 32: Selective Image Download

```
C:\Users\Administrator\Desktop\msecli -F -U allBinary.tar -m ALL -n mtnvme17217879382
Firmware update for mtnvme17217879382 will take a few minutes to complete.
Please wait
........................................
Device Name : mtnvme17217879382
Firmware update operation completed successfully.
Restart the server for the downloaded microcode to take effect.

CMD_STATUS : Success
STATUS_CODE : 0

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```

C:\Users\Administrator\Desktop\.
Retrieving Debug Data

Debug data from the device and operating system is provided to help debug any potential issues. If using VMware, debug data is saved as a .tar file. Otherwise, debug data is saved as a .zip file.

The optional `-l <debug-level>` flag can be used to specify the level of collected debug data. By default, the ALL level is selected and both OS and drive data are collected. OS data includes information about the operation system environment in which the drive is running. Drive data collected includes various SMART, GPL and vendor-specific logs.

Valid options for `-l <debug-level>` are: ALL, OS and CTRL.

Usage: `msecli -P <.zip or .tar filename> -n <device-name> [-r] [-s <out-filename>] [-l <debug-level>]`

1. Enter the following at the command prompt: `msecli -P <.zip or .tar file name> -n <device-name>`
   Replace `<.zip or .tar file name>` with the debug data file and `<device-name>` with the drive’s device name. If a file path is not specified, the .zip or .tar file is saved to the current directory.

2. A message appears when the operation completes.

Figure 33: Zip File Created Successfully
Erasing a Drive

This section explains how to remove all data from a drive by performing a sanitize erase, sanitize crypto scramble, PSID revert, or secure erase operation.

Performing a Sanitize Drive (Block Erase) Operation

The sanitize drive (block erase) operation is supported on all drives except for encrypted drives (those with TCG-enabled/password-protected). These drives must use the PSID revert operation to remove data. See Performing a PSID Revert (SATA and SAS Drives Only) (page 35).

This operation:

• Cannot be performed on mounted drives. Unmount the drive before proceeding.
• Cannot be performed on Windows systems in which the system partition is encrypted with Bitlocker.
• Will not complete on systems in IDE mode. Change to AHCI mode and then proceed with the operation.
• Cannot be performed on drives connected behind a RAID controller.

CAUTION: This operation completely removes all data from a drive. If possible, back up important data before performing the operation.

Usage: `msecli -X -B -n <device-name> [-r] [-s <out-filename>]`

1. Enter the following at the command prompt: `msecli -X -B -n <device-name>`
2. Confirm the operation when prompted.
3. Press Enter to continue.

A message indicates the operation is in progress. When finished, a message indicates the operation was successful.

Figure 34: Sanitize Drive Successful
Performing a Sanitize Crypto Scramble Operation (SATA Drives Only)

This operation is not supported on encrypted drives (those with TCG-enabled/password-protected) and the BX100, BX200 and P400m drives. Encrypted drives must use the PSID revert operation to remove data. BX100, BX200 and P400m drives must use the Sanitize Block Erase operation to remove data.

This operation:
- Cannot be performed on mounted drives. Unmount the drive before proceeding.
- Cannot be performed on Windows systems in which the system partition is encrypted with Bitlocker.
- Will not complete on systems in IDE mode. Change to AHCI mode and then proceed with the operation.
- Cannot be performed on drives connected behind a RAID controller.

CAUTION: This operation completely removes all data from the drive. If possible, back up important data before performing the operation.

Usage: `msecli -X -S -n <device-name> [-r] [-s <output-filename>]`

1. Enter the following at the command prompt: `msecli -X -S -n <device-name>`
2. Confirm the operation when prompted.
3. Press Enter to continue.

A message indicates the operation is in progress. Another appears when the operation is successful.

Figure 35: Sanitize Crypto Scramble Successful
Performing a PSID Revert (SATA and SAS Drives Only)

This operation is supported on encrypted SATA and SAS drives only.

The PSID revert operation removes all data from an encrypted drive (one with TCG enabled/password-protected). It can also be used in the event that you have an encrypted drive for which you have lost the authentication code to return the drive to its factory default state.

TCG is automatically enabled on drives that are initialized in systems running Windows 8 or later, or it can be enabled with third-party software utilities. For more information on TCG, refer to http://www.trustedcomputinggroup.org/.

This operation cannot be performed on mounted drives. Unmount the drive before proceeding.

**CAUTION:** A PSID revert operation completely removes all data from the drive and returns the drive to its factory default state. If possible, back up important data before performing the operation.

Usage: `msecli -X -P -p <PSID-value> -n <device-name> [-r] [-s <output-filename>]`

1. Enter the following at the command prompt: `msecli -X -P -p <PSID-value> -n <device-name>`
   Replace `<PSID-value>` with the drive’s PSID value. This value can be found on the drive’s front label.
2. Confirm the operation when prompted.
3. Press Enter to continue.
   A message indicates the operation was successful.

![Figure 36: PSID Revert Successful](image)
Performing a Secure Erase

CAUTION: This operation completely removes all data from a drive. If possible, back up important data before performing the operation.

This operation cannot be performed on mounted drives. Unmount the drive before proceeding.

This command is not supported by drives in a security frozen state. For drives in this state, use the Sanitize Drive operation to remove user data.

Usage: msecli -X -p <password> -n <device-name> [-r] [-s <output-filename>]

1. Enter the following at the command prompt: msecli -X -p <password> -n <device-name>
   Replace <password> with ffff and <device-name> with the drive’s name.
2. Confirm the operation when prompted.
3. Press Enter to continue.

A message indicates the operation is in progress. When finished, a message indicates the operation was successful.

Figure 37: Secure Erase Successful
Running the STANDBY IMMEDIATE Command

This command places the specified drive in standby mode. This is useful when preparing a drive for removal from a system or prior to shutdown. The drive will remain capable of processing commands but performance may be slower than if the drive were in an idle state.

Usage: `msecli -C [-i [-a <namespace id>]] -b | -f <feature-code> -c <sector-count> -l <lba> | -n <device-name> [-r] [-s <out-filename>]`

1. Enter the following at the command prompt: `msecli -C -b -n <device-name>
   Replace `<device-name>` with the drive’s name.
2. Enter Y when the warning message appears.
   A message indicates the operation was successful.

Figure 38: STANDBY IMMEDIATE Command
Configuring Drive Over-Provisioning

Over-provisioning reduces the accessible capacity of a drive while allocating more capacity for performing background tasks. The CLI provides two methods of changing over-provisioning capacity: specify the max number of LBAs or set desired drive capacity in GB (whole GB only).

Warning: Over-provisioning erases all data on the drive. Back up all required data before performing this operation.

Note: NVMe support is limited to the 9200, 2100IT and 2100AT Series.

Usage: msecli -M [-k <value> | -l <state-value> | -u <value> | -i <value> | -w <state-value> | -p <state-value> | -P <state-value> | -o <Max Address> | -O <size in GB> ] -n <device-name> [-r] [-s <out-filename>]

1. Enter the following at the command prompt to set the maximum number of LBAs:
   msecli –M –o <Max Address> -n <device-name>
   If specifying max address, replace <Max Address> with the new max addressable LBA, not to exceed the default for the drive. The default max LBA can be determined using the following command: msecli -L -d -n <device name>
   Or, enter the following at the command prompt to set desired drive capacity in GB:
   msecli -M -O <Capacity in GB> -n <device-name>

2. Enter Y to proceed with the operation.

3. A message indicates the operation was successful.

4. Power cycle the system for the settings to take effect.

Figure 39: Changing Over-Provisioning Capacity via Max Address
Figure 40: Changing Over-Provisioning via Drive Capacity

```bash
C:\Users\Administrator>msacli -w -o 400 -n drive0
WARNING: Setting the Max Addressable LBA will erase all data on the drive. Backup all required data before performing this operation.
Are you sure you want to continue(Y/N):y

Device Name: Drive0
Successfully erased and changed the own provision on the drive. Please power cycle the system for setting to take full effect.

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C:\Users\Administrator>
```
Managing Drive Physical Capacity

This section describes how to manage the physical capacity of a 2100IT or 2100AT drive. Physical capacity management (PCM) is also known as SLC namespaces or enhanced partitions.

Usage: `msecli -M [-k <value> | -l <state-value> | -u <value> | -i <value> | -w <state-value> | -p <state-value> | -P <state-value> | -b <state-value> | -L | -o <Max Address> | -O <size in GB> | -n <device-name> [-r] [-s <out-filename>]`

-b <% of TLC as SLC>
Suboption of `-M`. Sets percentage of TLC as SLC on 2100IT and 2100AT. Valid inputs are 10, 20, 30, 40, 50, 100.

-L
Suboption of `-M`. Sets lock for physical configuration command on 2100IT and 2100AT.

Figure 41: Allocating SLC Namespace Capacity (30% of Total Capacity)
Formatting a Drive (SAS Drives Only)

This section describes how to format a supported SAS drive.

This option can be used to change the LBA size configuration from the default 512 bytes to any other LBA size supported by the drive. Changing LBA data size is not required for this operation to complete. See the product data sheet (available on micron.com) for supported LBA sizes.

CAUTION: All data on the drive will be lost when performing this operation.

Usage: msecli -J [-b <Number of Blocks> -l <LBA block size>] [-p <Protection type> [-e <Protection Interval Exponent>]] [-d] [-c] [-f] -n <device-name>

1. Enter the following at the command prompt: msecli -J -n <device-name>
   Replace <device-name> with the name of the drive.
2. Confirm the operation when prompted.
3. Press Enter to continue.
4. A message indicates the operation is in progress. When finished, a message indicates the operation was successful.

Figure 42: Format Drive Successful
Configuring Interrupt Coalescing (NVMe Drives Only)

Interrupt coalescing is the process of taking successive command completion events and coalescing them into a single interrupt. When a high queue depth is used on an NVMe drive, this coalescing leads to fewer system interrupts, lower CPU utilization, and higher IOPS. For lower queue depth I/O activity, coalescing can increase latency. Changing this value increases or decreases the internal timeout length, enabling more or less I/Os to be completed with a single interrupt.

For NVMe drives, valid data values must be in the following hexadecimal format:
Bits 15:8 - Aggregation Time
Bits 7:0 - Aggregation Threshold

Usage: msecli -M [-k <value> | -l <state-value> | -u <value> | -i <value> | -w <state-value> | -p <state-value> | -P <state-value> | -o <Max Address> | -O <size in GB> ] -n <device-name> [-r] [-s <out-filename>]

1. Enter the following at the command prompt: msecli –M –i <coalescing value> -n <device-name>
   Replace <coalescing value> with the new interrupt coalescing value and <device-name> with the name of the drive.
2. Confirm the operation when prompted.
3. Press Enter to continue.
   A message indicates the operation was successful.

Figure 43: Interrupt Coalescing Value Changed Successfully
Preparing to Remove a Drive (NVMe Drives Only)

This section describes how to prepare an NVMe drive to be safely removed from a system.

During the removal process, any cached data is automatically flushed to the drive and the driver unregisters the drive from the kernel. The drive can then be safely removed from the system. Users do not have permission to read, write, or monitor the drive after it is logically removed from system.

Note: Because of kernel limitations, these instructions are supported on RHEL 6.x, SLES, and Windows platforms only. The instructions are not supported on RHEL 5.x platforms.

CAUTION: Do not perform a remove command when an I/O operation is in progress. Doing so will cause the remaining I/O to fail without any indication.

This operation cannot be performed on mounted drives. Unmount the drive before proceeding.

Usage: `msecli -Z -n <drive-id> [-r] [-s <out-filename>]`

1. Enter the following at the command prompt: `msecli -Z -n <device-name>`
   Replace `<device-name>` with the name of the drive.

2. A message indicates the drive was shut down successfully and has been prepared for removal. The drive can now be physically removed from the system.

**Figure 44: Drive Shut Down Successfully**

To use the drive again, restart the system.
Namespace Management (NVMe Drives Only)

This section explains the options for managing the namespace on an NVMe drive.

Displaying Namespace Details

The following option displays details about the namespace on an NVMe drive, including the namespace ID which is used for namespace-specific operations.

Usage:
```
msecli -N [-l | [-c -b <namespace size> | -a <lba index> | -o | -v | -u | -i | -d <namespace ID>[-e <ieee EUl> -y] | -q <% of TLC as SLC> | [-f <namespace ID> -m <metadata size> -g <lba data size> | -j <secure erase> | -i | -t] | [-S <namespace ID> -H <Selftest Type>] | -n <NVME device-name>
```

1. Enter the following at the command prompt: `msecli -N -l -n <device-name>

Figure 45: Display Namespace Details Command

Displaying LBA Formats for a Namespace

NVMe namespaces can support several different LBA formats (512 byte vs. 4096 byte). The following command displays the supported LBA formats for a given namespace.

Usage: `msecli -N [-l | [-c -b <namespace size> | -a <lba index> | -o | -v | -u | -i | -d <namespace ID>[-e <ieee EUl> -y] | -q <% of TLC as SLC> | [-f <namespace ID> -m <metadata size> -g <lba data size> | -j <secure erase> | -i | -t] | [-S <namespace ID> -H <Selftest Type>] | -n <NVME device-name>`

1. Enter the following at the command prompt: `msecli -N -f <namespace-ID> -n <device-name>`
2. LBA formats for the specified namespace appear.

Figure 46: Display LBA Formats for a Namespace

![Display LBA Formats for a Namespace](image)

Changing LBA Format on a Namespace

The following command changes the LBA format of a specified namespace. This can be used to change the LBA or metadata size of the namespace.

**WARNING:** This command causes all data on the namespace to be erased. Backup any data before proceeding. If you want to perform a secure erase as part of the format, see the Secure Erase Namespace section below. Make sure to offline/unmount the namespace OS device before attempting this operation.

**Usage:**
```
Usage: msecli -N -f <namespace-ID> -m <metadata size> -g <LBA size> -n <device-name>
```

1. Enter the following at the command prompt: 
```
 msecli -N -f <namespace-ID> -m <metadata size> -g <LBA size> -n <device-name>
```

2. When prompted, enter Y to proceed with the format.

3. The operation begins and may take up to a few minutes to complete.

4. After the operation completes, the namespace format is changed.
Create SLC/TLC Namespace

This section describes how to create an SLC/TLC namespace on a 2100IT or 2100AT drive.

Usage: `msecli -N -c -y -n <device-name>`

- `-y` Optional subption of `-c`. This option creates a namespace command to specify SLC mode instead of the default TLC mode for 2100IT/AT drives.
- `-q <% of TLC as SLC>`

Suboption of `-N`. This option is used to perform multiple operations, including NVME format, detach NS, delete NS, PCM(Physical Capacity Management), PCM Lock, Create SLC NS, Attach SLC NS.

Allocate and create SLC namespace using the following namespace management command (50% of total capacity):

```
```

Figure 48: SLC Namespace Command

Figure 49: Creating SLC Namespace in Already Allocated SLC Space
Secure Erase Namespace

The section above covers changing the LBA format on a given namespace, which causes user data to be erased. This same command can be used to perform a secure erase or cryptographic erase (where supported) on the namespace. You do not need to change LBA format to perform a secure erase, simply set the metadata and LBA size to the current settings.

**WARNING:** A secure erase operation removes all user data on the namespace. Backup data before proceeding. Make sure to offline/unmount the namespace OS device before attempting this operation.

Usage: `msecli -N -f <namespace-ID> -m <metadata size> -g <LBA size> -j [ 1 (Secure Erase) | 2 (Cryptographic Erase)] -n <device-name>`

1. Enter the following at the command prompt: `msecli -N -f <namespace-ID> -m <metadata size> -g <LBA size> -j [ 1 | 2 ] -n <device-name>`
2. When prompted, enter Y to proceed with the secure erase operation.
3. The operation begins and may take up to a few minutes to complete.

*Figure 50: Secure Erase Namespace*
Displaying Storage Executive, API, and CLI Versions

Use the following instructions to display the installed version of Storage Executive, the API, and the CLI.

Usage:  - msecli -V [-a] [-r] [-s <out-filename>]

1. Enter the following at the command prompt:  - msecli -V [-a] [-r] [-s <out-filename>]

2. The currently installed version numbers display.

Figure 51: Storage Executive, API, and CLI Versions

```
C:\WINDOWS\system32> msecli -V -a
MSECLI VERSION : 5.05.082019.01
API VERSION     : 5.05.082019.01
ABSOLUTE PATH   : C:\Program Files\Micron Technology\Micron Storage Executive\msecli.exe
Copyright (C) 2019 Micron Technology, Inc.
C:\WINDOWS\system32>
```
Appendix A. SMART Attributes and Drive Statistics

This section lists standard SMART attributes, attribute IDs, and drive statistics supported by drive interface. For a customer-specific list of SMART attribute details, contact your Micron customer representative.

SATA Drives

Table 1: SMART IDs and Attributes—SATA Drives

<table>
<thead>
<tr>
<th>ID</th>
<th>SMART Attribute Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Raw Read Error Rate</td>
</tr>
<tr>
<td>5</td>
<td>Retired NAND Blocks</td>
</tr>
<tr>
<td>9</td>
<td>Power On Hours Count</td>
</tr>
<tr>
<td>12</td>
<td>Power Cycle Count</td>
</tr>
<tr>
<td>171</td>
<td>Program Fail Count</td>
</tr>
<tr>
<td>172</td>
<td>Erase Fail Count</td>
</tr>
<tr>
<td>173</td>
<td>Average Block-Erase Count</td>
</tr>
<tr>
<td>174</td>
<td>Unexpected Power Loss Count</td>
</tr>
<tr>
<td>180</td>
<td>Unused Reserved Block Count</td>
</tr>
<tr>
<td>183</td>
<td>SATA Interface Downshift</td>
</tr>
<tr>
<td>184</td>
<td>Error Correction Count</td>
</tr>
<tr>
<td>187</td>
<td>Reported Uncorrectable Errors</td>
</tr>
<tr>
<td>194</td>
<td>Enclosure Temperature</td>
</tr>
<tr>
<td>196</td>
<td>Reallocation Event Count</td>
</tr>
<tr>
<td>197</td>
<td>Current Pending Sector Count</td>
</tr>
<tr>
<td>198</td>
<td>SMART Off-Line Scan Uncorrectable Errors</td>
</tr>
<tr>
<td>199</td>
<td>Ultra-DMA CRC Error Count</td>
</tr>
<tr>
<td>202</td>
<td>Percentage Lifetime Used</td>
</tr>
<tr>
<td>206</td>
<td>Write Error Rate</td>
</tr>
<tr>
<td>210</td>
<td>RAIN Successful Recovery Page Count</td>
</tr>
<tr>
<td>246</td>
<td>Cumulative Host Write Sector Count</td>
</tr>
<tr>
<td>247</td>
<td>Host Program Page Count</td>
</tr>
<tr>
<td>248</td>
<td>FTL Program Page Count</td>
</tr>
</tbody>
</table>
SAS drives do not natively support SMART. For these drives, Storage Executive pulls pertinent drive statistics from various sense log pages.

**Table 2: Drive Statistics—SAS Drives**

<table>
<thead>
<tr>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Temperature</td>
</tr>
<tr>
<td>Highest Lifetime Temperature</td>
</tr>
<tr>
<td>Power Cycle Count</td>
</tr>
<tr>
<td>Percent Lifetime Used</td>
</tr>
<tr>
<td>Negotiated Logical Link Rate (Gbps)</td>
</tr>
<tr>
<td>Power on Hours Count</td>
</tr>
</tbody>
</table>
Revision History

Rev. H – 1/20
- Added 2100IT, 2100AT drives to supported drive list
- Added Manage Drive Physical Capacity section
- Added Create SLC Namespace section

Rev. G – 10/19
- Added 7300, Crucial P-series, X8 Portable SSD drives to supported drive list
- Updated various screen shots

Rev. F – 7/19
- Added 2200, P1, 9300 Series, 1300 drives to supported drive list
- Updated various screen shots and usage statements

Rev. E – 3/19
- Updated Configuring Drive Over-Provisioning section

Rev. D – 1/19
- Updated Formatting a Drive section (new screen shot)

Rev. C – 4/18
- Added support for 5210, 5200 Series
- Added Displaying GPL Data section
- Updated Displaying SMART Logs and Retrieving Debug Data sections
- Added new firmware sections: Download and Activate Later and Selective Image Download

Rev. B – 10/17
- Added support for 9200 Series
- Updated Configuring Drive Over-Provisioning section

Rev. A – 3/17
- Initial release