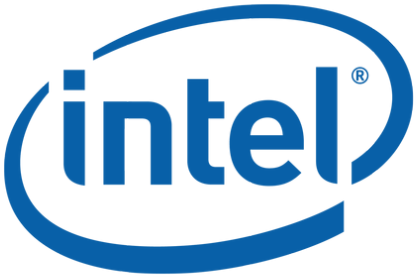

Intel® Optane™ DC Persistent Memory Software Specification for Windows* and Linux*

Revision 1.17

Intel Confidential

Reference Number 598517

Table of Contents

Preface

Legal

Notice: This document contains information on products in the design phase of development. The information here is subject to change without notice. Do not finalize a design with this information.

Intel technologies' features and benefits depend on system configuration and may require enabled hardware, software, or service activation. Learn more at intel.com, or from the OEM or retailer.

No computer system can be absolutely secure. Intel does not assume any liability for lost or stolen data or systems or any damages resulting from such losses.

You may not use or facilitate the use of this document in connection with any infringement or other legal analysis concerning Intel products described herein. You agree to grant Intel a non-exclusive, royalty-free license to any patent claim thereafter drafted which includes subject matter disclosed herein.

No license (express or implied, by estoppel or otherwise) to any intellectual property rights is granted by this document.

The products described may contain design defects or errors known as errata which may cause the product to deviate from published specifications. Current characterized errata are available on request.

This document contains information on products, services and/or processes in development. All information provided here is subject to change without notice.

Contact your Intel representative to obtain the latest Intel product specifications and roadmaps.

Intel disclaims all express and implied warranties, including without limitation, the implied warranties of merchantability, fitness for a particular purpose, and non infringement, as well as any warranty arising from course of performance, course of dealing, or usage in trade.

Copies of documents which have an order number and are referenced in this document may be obtained by calling 1-800-548-4725 or by visiting www.intel.com/design/literature.htm.

Intel, the Intel logo, Intel Optane, and Xeon are trademarks of Intel Corporation in the

U. S. and/or other countries.

*Other names and brands may be claimed as the property of others.

Revision History

1.17

- Added notes to delete-pcd, load-goal and create-goal commands
- Fixed some errors in text

1.16

- Added clarifying note to State field of command Run Diagnostic

1.15

- Added clarifying text to Show Namespaces for HealthStates.
- Added clarifying text to Show Device for HealthStates.
- Corrected text in Create Goal to indicate Reserved capacity will be presented as Reserved in Show Memory Resources.
- Added note to clarify Create Goal capacity values are a target goal and may be different from actual applied by platform firwmare.
- Split Memory Subsytem Provisioning into 2 sections: Provisioning and Security.
- Added clarifying notes to Security section about OSV support.

1.14

- Added section ***DIMM Identification***
- Minor text clarifications
- Updated Show Memory Resources definitions

1.13

- Fixed missing section and misc formatting

1.12

- Added BootStatusRegister to Show Device
- Added asciidoc support
- Styling changes, added logo, modified theme, page/version headers
- Added ControllerRevisionID to show device
- Added new Playback/Record section
- Added clarification that long-operations prevent security state changes
- Changed documented behavior for firmware update: continue on error
- Updated all commands with dimm target so values are optional; treat as ALL if not specified
- Added explicit notes to sections to clearly state changes to persistent memory (goal/namespace/pcd) do not delete/modify user data
- FIS 1.13 changes
  - Dump Debug Log: Will attempt to retrieve FW logs from 3 sources
  - Show Device:
    - LastShutdownStatus now Latched/UnlatchedLastShutdownStatus
    - Added MaxAveragePowerBudget attribute

Supporting Documents

- Intel® NVM Dimm Management Software-Firmware Interface Specification (554415)
- Intel® Optane™ DC Persistent Memory Module Firmware Interface Specification (556488)

1. Introduction

Command line access to Intel® Optane™ DC Persistent Memory Module (DCPMM) management functionality is available through the Command Line Interface (CLI) component.

1.1. Document Formatting

Throughout this specification, the syntax of each command is documented in a shaded text box. Items in [brackets] are optional. For options, targets and properties, each possible value is separated by a '|' meaning "or" and the default value is italicized. Items in (parenthesis) indicate a user supplied value. For example, the following command syntax specifies that the verb "set" is required followed by an optional option "help". The target –example is required and a value for ExampleID can optionally be provided. It also specifies an optional property "Test" in which valid values are "Test1" or "Test2" with Test1 being the default.

```
ipmctl set [-h|-help] –example [(ExampleID)]
[Test=(Test1|Test2)]
```

1.2. Launching the CLI

The CLI application is launched from the OS/UEFI shell. To run a single command, supply the command and parameters immediately following the binary name. The command will run, display the resulting data and return control to the shell. If no command is provided, the CLI will display the help information as documented in the Show Help command.

```
ipmctl (command)
```

1.3. Command Syntax

The command line syntax is case insensitive and is interpreted in English only. It follows the DMTF SM CLP standard (DSP0214) with the exception of the target portion of the command. Generally the form of a user request is:

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

A command has a single verb which represents the action to be taken. Following the

verb are zero or more options which modify the action of the verb; overriding the default behavior with explicitly requested behavior. Options generally have a short and long form (e.g., -a|-all). Generally one or more targets are 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. The ordering of the command parts shown above is enforced (e.g., a target cannot precede an option). However, ordering within the command parts is not enforced (e.g., options can be provided in any order, targets can be provided in any order and properties can be provided in any order). For example, the following command will generate a syntax error because the option -all comes after the target -system and therefore the command parts are mis-ordered (verb then target then option).

```
ipmctl show -system -all
```

Whereas, these commands are both valid even though the options are specified in different order because the command parts are provided in the correct order (verb then options then target).

```
ipmctl show -help -all -system
ipmctl show -all -help -system
```

If an option or target allows input of more than one value, it is expected as a comma separated list without whitespace between the values. For example, "-display value1,value2" instead of "-display value1, value2".

Properties follow the syntax [PROPERTIES]=Value.

1.4. DIMM Identification

Throughout this document, DCPMMs are referenced by one of two unique IDs: DimmHandle & DimmUID. Either ID may be used for commands that utilize a *-dimm* target.

For example, each of the following are equivalent:

```
ipmctl show -d DimmHandle,DimmUID -dimm 8089-a2-
1748-00000001
ipmctl show -d DimmHandle,DimmUID -dimm 0x0001
ipmctl show -d DimmHandle,DimmUID -dimm 1
---DimmID=0x0001---
   DimmHandle=0x0001
   DimmUID=8089-a2-1748-00000001
```

The *-dimm* target also accepts a comma separated list.

```
ipmctl show -d DimmHandle,DimmUID -dimm
0x0001,0x1001
ipmctl show -d DimmHandle,DimmUID -dimm
0x0001,8089-a2-1748-00000002
---DimmID=0x0001---
   DimmHandle=0x0001
   DimmUID=8089-a2-1748-00000001
---DimmID=0x1001---
   DimmHandle=0x1001
   DimmUID=8089-a2-1748-00000002
```

The default DimmID output format can be modified by changing the CLI_DEFAULT_DIMM_ID property of using the Change Preferences command. For example, with *CLI_DEFAULT_DIMM_ID=UID*:

```
ipmctl show -d DimmHandle,DimmUID -dimm 0x0001
---DimmID=8089-a2-1748-00000001---
   DimmHandle=0x0001
   DimmUID=8089-a2-1748-00000001
```

DimmHandle

The DCPMM handle is formatted as 0xABCD.

- A = Socket
- B = Memory Controller
- C = Channel
- D = Slot

DimmUID

The unique identifier of the DCPMM formatted as VVVV-ML-MMYYSNSNSNSN or VVVV-SNSNSNSN (if the manufacturing information is not available) where:

- VVVV = VendorID
- ML = ManufacturingLocation
- MMYY = ManufacturingDate
- SNSNSNSN = SerialNumber

1.5. Capacities

Capacities can be displayed in bytes (B), binary multiples of bytes (MiB, GiB, TiB), or decimal multiples of bytes (MB, GB, TB) where: * 1 mebibyte (MiB) = 1024^2 bytes * 1 gibibyte (GiB) = 1024^3 bytes * 1 tebibyte (TiB) = 1024^4 bytes * 1 megabyte (MB) = 1000^2 bytes * 1 gigabyte (GB) = 1000^3 bytes * 1 terabyte (TB) = 1000^4 bytes By default, capacities, except bytes, are displayed to 1/10 precision. Therefore, a capacity may be displayed as 0.0 if the value is less than 0.1. The default display of capacities is configurable with the command Change Preferences. The input and display of capacities in an individual command can also be overridden by supplying the -units option. Capacities can be input in either decimal or hexadecimal format with a '0x' prefix.

1.6. DCPMM Long Operations (DEVICE BUSY)

DCPMMs may be busy while processing some operations. These are defined as ‘Long Operations’ in the Firmware Interface Specification (FIS). While a long operation is in progress, some requests may be rejected as indicated by ‘DEVICE BUSY’ status. Commands may be retried and are expected to succeed when the long operation is complete. Show Device may be used to determine if ARS (ARSStatus) or Overwrite DIMM (OverwriteStatus) long operations are in progress.

1.7. DCPMMs Must Be Present

If DCPMMs are not present then the functionality via the CLI will be unavailable.

1.8. Output Format

By default, the CLI formats the output of each command as text to facilitate readability. However, the CLI supports changing the output format from the default text to Extensible Markup Language (XML) with the output option. For example, to retrieve the output of the help command in XML format rather than text, add the output option.

```
ipmctl help -output nvmxml
```

Changes the output format to XML. Refer to the XML Document Type Definition (DTD)

Specification for detailed information about the XML output format of each command.

1.9. Playback and Record

The CLI supports a mechanism for recording events and data that occurs during CLI execution. Recorded events and data are captured into a binary encoded recording file (.pbr) that represents a single CLI run. Events that are captured includes FIS requests and responses initiated by the CLI. Data that is saved includes BIOS generated tables such as ACPI NFIT and PCAT. To make a recording of a particular CLI run use the -record switch at the end.

```
ipmctl show -dimm -record
```

Note, subsequent invocations using the -record switch will override previous runs of the same type, where type is defined by the CLI arguments used (not including -record or -playback). The following example will result in one .pbr file.

```
ipmctl show -dimm -record
ipmctl show -dimm -record
```

But the following example will result in two .pbr files (show-dimm.pbr and show-sensor.pbr).

```
ipmctl show -dimm -record
ipmctl show -sensor -record
```

By default the recording file will be generated under ‘./recordings’, where the filename represents the CLI arguments used, e.g. show-dimm.pbr. To override the default ‘./recordings’ directory add an optional path to -record. The default filename convention will be used but the location of the file will be overridden.

```
ipmctl show -dimm -record /tmp/my-recordings
```

Include a filename with the .pbr extension to override the filename.

```
ipmctl show -dimm -record /tmp/my-recordings/my-
recording.pbr
```

Recorded files can be used by the CLI in "playback" mode to reproduce results that occurred during recording. When the CLI is in playback mode, low level DCPMM driver and BIOS table routines within the CLI are bypassed, therefore giving an opportunity to recreate CLI execution paths that occurred on real DCPMM enabled

platforms on non-DCPMM enabled platforms.

To playback a recording file that is located under the default recording directory use the -playback switch at the end. The below example will fail if ‘./recordings/show-dimm.pbr’ does not exist.

```
ipmctl show -dimm -playback
```

An optional recording file path may be used with -playback (same rules as -record).

1.10. Microsoft Windows* Notes and Limitations

The Windows driver that enables ipmctl communication to Intel’s DCPMMs prevents executing commands that change configuration of any DCPMM when there is a related logical disk (namespace) associated with that DCPMM. This is done to protect user data. If a logical disk (namespace) is associated with the target DCPMM, the command will return an error. The logical disk (namespace) must first be deleted before attempting to execute commands that change configuration.

Generally, all commands that retrieve status will succeed regardless of logical disk presence.

1.11. Debug / Verbose

The CLI provides the capability to view debug messages when executing a command by specifying the verbose mode output option. This is intended to aid diagnosing a problem with the CLI itself and may be useful when submitting a defect.

Changes the output format to XML and view debug message for the command.

```
ipmctl show -verbose -dimm
```

2. Commands

2.1. DIMM Discovery

DIMM Identifiers The default DCPMM identifier "DimmID" is equivalent to DimmHandle as described in the command Show Device. This may be changed to DimmUID using the command Change Preferences. In all commands accepting the -dimm target as input, either the DimmHandle or the DimmUID may be used to identify a DCPMM.

DIMM Manageability Beyond discovery, most DCPMM operations require the ability of host software to manage the DCPMM. Manageability is determined by the interface format code, the vendor identifier, device identifier and the firmware API version and can be retrieved with the command Section Show Device.

DIMM Compatibility If the host software detects that the system is populated with DCPMMs with incompatible SKUs or the DCPMMs are configured in violation of their license, it will indicate such and operate in read-only mode. In this case, the host software will not allow changes to the DCPMMs and their associated capacity.

2.1.1. Show Topology

NAME

ipmctl-show-topology - Shows the topology of the memory installed

SYNOPSIS

```
ipmctl show [OPTIONS] -topology [TARGETS]
```

DESCRIPTION

Shows the topology of the memory installed in the host server. Use the command ipmctl-show-device to view more detailed information about a DCPMM.

OPTIONS

-a

-all

Shows all attributes.

NOTE	The all and display options are exclusive and may not be used together.

-d (attributes)

-display (attributes)

Filters the returned attributes by explicitly specifying a comma-separated list of any of the attributes defined in the Return Data section.

NOTE	The all and display options are exclusive and may not be used together.

-h

-help

Displays help for the command.

-o (text|nvmxml)

-output (text|nvmxml)

Changes the output format. One of: "text" (default) or "nvmxml".

-u (B|MB|MiB|GB|GiB|TB| TiB)

-units (B|MB|MiB|GB|GiB|TB| TiB)

Changes the units that capacities are displayed in for this command. One of: bytes (B), megabytes (MB), mebibytes (MiB), gigabytes (GB), gibibytes (GiB), terabytes (TB) or tebibytes (TiB).

TARGETS

-dimm [(DimmIDs)]

Restricts output to specific DIMMs by optionally supplying the DIMM target and one or more comma-separated DIMM identifiers. The default is to display all DIMMs.

-socket (SocketIDs)

Restricts output to the DIMMs installed on specific sockets by supplying the socket target and one or more comma-separated socket identifiers. The default is to display all sockets.

NOTE	If ACPI PMTT table is not present, then DDR4 memory will not be displayed in the filtered socket list.

EXAMPLES

Displays the system memory topology.

```
ipmctl show -topology
```

RETURN DATA

Displays a table with the attributes listed below for each memory DIMM installed in the host server.

MemoryType

(Default) The DIMM type. One of:

- Unknown
- DDR4
- Logical Non-volatile Device

Capacity

(Default) The raw capacity of the DIMM as reported in the SMBIOS Type 17 table.

DimmID

(Default) The DIMM identifier. For DRAM DIMMs, the DimmID is "N/A".

PhysicalID

(Default) The DIMM physical identifier (i.e., SMBIOS Type 17 handle).

DeviceLocator

(Default) The string that identifies the physically-labeled socket or board position where the DIMM is located.

SocketID

The processor socket identifier (i.e., NUMA node) where the DIMM is installed. For DRAM DIMMs, the socket identifier is "N/A".

MemControllerID

The associated memory controller identifier. For DRAM DIMMs, the memory controller identifier is "N/A".

ChannelID

The associated channel. For DRAM DIMMs, the channel identifier is "N/A".

ChannelPos

The DIMM position in the channel. For DRAM DIMMs, the channel position identifier is "N/A".

NodeControllerID

The node controller identifier. For DRAM DIMMs, the node controller identifier is "N/A".

BankLabel

The string that identifies the physically-labeled bank where the DIMM is located.

2.1.2. Show Socket

NAME

ipmctl-show-socket - Shows basic information about the physical processors

SYNOPSIS

```
ipmctl show [OPTIONS] -socket [TARGETS]
```

DESCRIPTION

Shows basic information about the physical processors in the host server.

OPTIONS

-a

-all

Shows all attributes.

NOTE	The all and display options are exclusive and may not be used together.

-d (attributes)

-display (attributes)

Filters the returned attributes by explicitly specifying a comma-separated list of any of the attributes defined in the Return Data section.

-h

-help

Displays help for the command.

-o (text|nvmxml)

-output (text|nvmxml)

Changes the output format. One of: "text" (default) or "nvmxml".

-u (B|MB|MiB|GB|GiB|TB| TiB)

-units (B|MB|MiB|GB|GiB|TB| TiB)

Changes the units that capacities are displayed in for this command. One of: bytes (B), megabytes (MB), mebibytes (MiB), gigabytes (GB), gibibytes (GiB), terabytes (TB) or tebibytes (TiB).

TARGETS

-socket (SocketIDs)

Restricts output to the DIMMs installed on specific sockets by supplying the socket target and one or more comma-separated socket identifiers. The default is to display all sockets.

EXAMPLES

Displays information about all the processors.

```
ipmctl show -socket
```

Lists all properties for socket 1.

```
ipmctl show -socket 1
```

Retrieves specific properties for each processor.

```
ipmctl show -d MappedMemoryLimit -socket
```

RETURN DATA

Displays a table with the attributes listed below for each physical processor installed in the host server.

SocketID

(Default) The processor socket identifier.

MappedMemoryLimit

(Default) The maximum amount of memory that is allowed to be mapped into the system physical address space for this processor based on its SKU.

TotalMappedMemory

(Default) The total amount of memory that is currently mapped into the system physical address space for this processor.

2.1.3. Show Device

NAME

ipmctl-show-device - Shows information about one or more DCPMMs

SYNOPSIS

```
ipmctl show [OPTIONS] -dimm [TARGETS]
```

DESCRIPTION

Shows information about one or more DCPMMs.

OPTIONS

-a

-all

Shows all attributes.

NOTE	The all and display options are exclusive and may not be used together.

-d (attributes)

-display (attributes)

Filters the returned attributes by explicitly specifying a comma-separated list of any of the attributes defined in the Return Data section.

NOTE	The all and display options are exclusive and may not be used together.

-h

-help

Displays help for the command.

-o (text|nvmxml)

-output (text|nvmxml)

Changes the output format. One of: "text" (default) or "nvmxml".

-u (B|MB|MiB|GB|GiB|TB| TiB)

-units (B|MB|MiB|GB|GiB|TB| TiB)

Changes the units that capacities are displayed in for this command. One of: bytes (B), megabytes (MB), mebibytes (MiB), gigabytes (GB), gibibytes (GiB), terabytes (TB) or tebibytes (TiB).

TARGETS

-dimm (DimmIDs)

Restricts output to specific DCPMMs by supplying the DIMM target and one or more comma-separated DCPMM identifiers. The default is to display all DCPMMs.

-socket (SocketIDs)

Restricts output to the DCPMMs installed on specific sockets by supplying the socket target and one or more comma-separated socket identifiers. The default is to display all sockets.

NOTE	If ACPI PMTT table is not present, then DDR4 memory will not be displayed in the filtered socket list.

EXAMPLES

Lists a few key fields for each DCPMM.

```
ipmctl show -dimm
```

Lists all properties for DCPMM 0x0001.

```
ipmctl show -a -dimm 0x0001
```

Retrieves specific properties for each DCPMM.

```
ipmctl show -d HealthState,LockState -dimm
```

RETURN DATA

The default behavior is to display a table with the default attributes listed below; applying options changes the output to a more detailed format. Limited information (noted in the table below) is applicable if the DCPMM is not manageable by the software as indicated by the "ManageabilityState" property.

NOTE	Some data is endian-swapped for human readability.

DimmID

(Default) The DCPMM identifier.

Capacity

(Default) The usable capacity of the DCPMM as reported by the firmware.

HealthState

(Default) Overall DCPMM health. One of:

- Healthy
- Noncritical: Maintenance is required.
- Critical: Features or performance are degraded due to failure.
- Fatal: Data loss has occurred or is imminent. In this case, the firmware will disable the media and access to user data and operations that require use of the media will fail.
- Non-functional: The DCPMM is present but is non-responsive via the DDRT communication path. It may be possible to communicate with this DCPMM via SMBus for a subset of commands.
- Unmanageable: The DCPMM is not supported by this version of the software
- Unknown: Unable to determine the DCPMM health state.

HealthStateReason

Indicates why the DCPMM is in the current Health State. One or more of:

- None
- Percentage Remaining less than 1%
- Package Sparing occurred
- CAP Self-Test warning
- Percentage Remaining is 0
- Die Failure
- AIT DRAM disabled
- CAP Self-Test fail
- Critical internal failure
  Refer to the *Intel® Optane™ DC Persistent Memory Firmware Interface Specification*, document number 556488, Section 4.8 SMART and Health.

ActionRequired

(Default) If there are events for this device that require corrective action or acknowledgment. Refer to the command Section Show Events for more information about events. One of:

- 0: No action required events
- 1: One or more action required events

InterfaceFormatCode

A comma-delimited list of the JEDEC standard format interface code(s) for the DCPMM where each code is formatted as: code (JEDEC Description or "Unknown").

ManageabilityState

Ability of the DCPMM host software to manage the DCPMM. Manageability is determined by the interface format code, the vendor identifier, device identifier and the firmware API version. One of:

- Manageable: The DCPMM is manageable by the software.
- Unmanageable: The DCPMM is not supported by this version of the software.

PhysicalID

The DCPMM physical identifier (i.e., SMBIOS Type 17 handle).

DimmHandle

The DCPMM handle formatted as 0xABCD.

- A = Socket
- B = Memory Controller
- C = Channel
- D = Slot

DimmUID

The unique identifier of the DCPMM formatted as VVVV-ML-MMYYSNSNSNSN or VVVV-SNSNSNSN (if the manufacturing information is not available) where:

- VVVV = VendorID
- ML = ManufacturingLocation
- MMYY = ManufacturingDate
- SNSNSNSN = SerialNumber

SocketID

The processor socket identifier (i.e., NUMA node) where the DCPMM is installed.

MemControllerID

The associated memory controller identifier.

ChannelID

The associated channel.

ChannelPos

The DCPMM position in the channel.

MemoryType

The memory type. One of:

- Unknown
- DDR4
- Logical Non-Volatile Device

VendorID

The vendor identifier of the DCPMM. This value is presented in big endian format.

DeviceID

The device identifier of the DCPMM. This value is presented in big endian format.

RevisionID

The revision identifier of the DCPMM.

SubsystemVendorID

The vendor identifier of the non-volatile memory subsystem controller. This value is presented in big endian format.

SubsystemDeviceID

The device identifier of the non-volatile memory subsystem controller.

SubsystemRevisionID

The revision identifier of the non-volatile memory subsystem controller retrieved from NFIT. This field uses a different encoding than ControllerRevisionID.

ManufacturingInfoValid

If the manufacturing location and date are valid. One of:

- 0: Not valid
- 1: Valid

ManufacturingLocation

The manufacturing location assigned by the vendor or "N/A" if ManufacturingInfoValid is 0.

ManufacturingDate

The manufacturing date assigned by the vendor or "N/A" if ManufacturingInfoValid is 0.

SerialNumber

The serial number assigned by the vendor. This value is presented in big endian format.

PartNumber

The part number assigned by the vendor

DeviceLocator

A string describing the physically-labeled socket or board position where the memory device is located from the SMBIOS Type 17 Memory Device table.

BankLabel

A string that identifies the physically labeled bank where the memory device is located from the SMBIOS Type 17 Memory Device table.

DataWidth

The width in bits used to store user data from the SMBIOS Type 17 Memory Device table.

TotalWidth

The width in bits for data and error correction and/or data redundancy from the SMBIOS Type 17 Memory Device table.

Speed

The maximum capable speed of the device in megahertz (MHz) from the SMBIOS Type 17 Memory Device table.

FormFactor

The DCPMM form factor (i.e., SMBIOS Type 17 Memory Device Form Factor). One of:

- Unknown

- DIMM
- SODIMM

LockState

(Default) The current security state of the persistent memory on the DCPMM. One of:

- Unknown - The security state cannot be determined (e.g., when the DCPMM is not manageable by the software).
- Disabled - Security is not enabled.
- Disabled, Frozen - Security is not enabled. A reboot is required to change the security state.
- Unlocked - Security is enabled and unlocked.
- Unlocked, Frozen - Security is enabled and unlocked. A reboot is required to change the security state.
- Locked - Security is enabled and locked.
- Exceeded - The passphrase limit has been reached. A power cycle is required to change the security state.
- Not Supported - Security is not supported on the DCPMM.

FWVersion

(Default) The BCD-formatted revision of the active firmware in the format PN.RN.SV.bbbb where:

- PN = 2-digit product number
- RN = 2-digit revision number
- SN = 2-digit security revision number
- bbbb = 4-digit build version

```
Value may be N/A if the DCPMM is not manageable by the software.
```

FWAPIVersion

The firmware supported interface revision in the format aa.bb where:

- aa = 2-digit major version
- bb = 2-digit minor version
  The firmware interface is intended to be backwards compatible. Therefore, the

host software allows management of DCPMMs where this version is less than or equal to the version stored in the host software. Value may be N/A if the DCPMM is not manageable by the software.

ActionRequiredEvents

A list of the events for this device that require corrective action or acknowledgment in the format: Event [ID] - [Message]. Refer to the command Show Events for more information about events.

The following information is only applicable when the DCPMM is manageable by the software as indicated by the "ManageabilityState".

ManufacturerID

The manufacturer identifier of the DCPMM. This value is presented in big endian format.

ControllerRevisionID

The controller stepping and revision ID retrieved from the controller FW. This field uses a different encoding than SubsystemRevisionID.

IsNew

Whether or not the DCPMM is incorporated with the rest of the DCPMM in the system. One of:

- 0: Configured
- 1: The DCPMM requires configuration.

MemoryCapacity

Usable DCPMM Memory Mode capacity.

AppDirectCapacity

Usable DCPMM App Direct capacity.

UnconfiguredCapacity

DCPMM capacity that is inaccessible because it is not mapped into the system physical address space.

InaccessibleCapacity

DCPMM capacity that is inaccessible due to:

- licensing issue
- platform configuration prevents accessing this capacity. For example, MemoryCapacity is configured and available on a DCPMM but MemoryMode is

not enabled by BIOS.

ReservedCapacity

DCPMM capacity reserved for proper alignment.

PeakPowerBudget

If the DCPMM firmware power management policy is enabled, the power budget in mW used for instantaneous power. Refer to FIS for allowable range and default value.

AvgPowerBudget

If the DCPMM firmware power management policy is enabled, the power budget in mW used for average power. Refer to FIS for allowable range and default value.

MaxAveragePowerBudget

Maximum average power budget supported by the DCPMM.

PackageSparingCapable

Whether or not the DCPMM supports package sparing. One of:

- 0: False
- 1: True

PackageSparingEnabled

Whether or not the DCPMM package sparing policy is enabled. One of:

- 0: Disabled
- 1: Enabled

PackageSparesAvailable

The number of spare devices available for package sparing.

LatchedLastShutdownStatus

The status of the last shutdown of the DCPMM. One or more of:

- Unknown: The last shutdown status cannot be determined.
- FW Flush Complete: FW flush completed.
- PM ADR Command: Power management ADR command received.
- PM S3: Power management S3 command received.
- PM S5: Power management S5 command received.
- DDRT Power Fail Command: DDR power fail command received.

- PMIC 12V/DDRT 1.2V Power Loss (PLI)
- PM Warm Reset: Power management warm reset received.
- Thermal Shutdown: Thermal shutdown triggered.
- Controller's FW State Flush Complete: Flush Completed.
- Viral Interrupt: Viral interrupt received.
- Surprise Clock Stop: Surprise clock stop received.
- Write Data Flush Complete: Write data flush completed.
- PM S4: Power management S4 command received.
- PM Idle: Power management idle received
- DDRT Surprise Reset: Surprise reset received

UnlatchedLastShutdownStatus

The status of the last shutdown status of the DCPMM. Same fields as the Latched Last Shutdown Status with the only difference that LLS details on a dirty shutdown is logged, even if the Latch System Shutdown Status was not enabled. One or more of:

- Unknown: The last shutdown status cannot be determined.
- FW Flush Complete: FW flush completed.
- PM ADR Command: Power management ADR command received.
- PM S3: Power management S3 command received.
- PM S5: Power management S5 command received.
- DDRT Power Fail Command: DDR power fail command received.
- PMIC 12V/DDRT 1.2V Power Loss (PLI)
- PM Warm Reset: Power management warm reset received.
- Thermal Shutdown: Thermal shutdown triggered.
- Controller's FW State Flush Complete: Flush Completed.
- Viral Interrupt: Viral interrupt received.
- Surprise Clock Stop: Surprise clock stop received.
- Write Data Flush Complete: Write data flush completed.
- PM S4: Power management S4 command received.
- PM Idle: Power management idle received
- DDRT Surprise Reset: Surprise reset received

LastShutdownTime

The time the system was last shutdown.

ModesSupported

A list of the modes supported by the DCPMM. Refer to the command Show System Capabilities to determine the modes supported by the platform. One or more of:

- Memory Mode: DCPMMs act as system memory under the control of the operating system. In Memory Mode, any DDR in the platform will act as a cache working in conjunction with the DCPMM.
- App Direct: DCPMMs and DDR act as independent memory resources under direct load/store control of the application.

SecurityCapabilities

The security features supported by the DCPMM. Zero or more of:

- Encryption: The DCPMM supports persistent memory encryption by setting a passphrase.
- Erase: The DCPMM is erasable.

MasterPassphraseEnabled

This property indicates if master passphrase is enabled. If it is disabled, then it cannot be enabled. One of:

- 0: Disabled - Cannot be enabled
- 1: Enabled - Master passphrase can be changed. Cannot be disabled.

ConfigurationStatus

The status of the DCPMM memory configuration. One of:

- Valid: The configuration is valid.
- Not Configured: The DCPMM has not been configured.
- Failed - Bad configuration: The configuration is corrupt.
- Failed - Broken interleave: This DCPMM is part of an interleave set that is not complete.
- Failed - Reverted: The configuration failed and was reverted to the last known good configuration.
- Failed - Unsupported: The configuration is not compatible with the installed BIOS.
- Unknown: The configuration cannot be determined.

SKUViolation

The configuration of the DCPMM is unsupported due to a license issue. One of:

- 0: False
- 1: True

ARSStatus

The address range scrub (ARS) operation status for the DCPMM. The status is a reflection of the last requested ARS, but not necessarily within the current platform power cycle. One of:

- Unknown - The ARS operation status cannot be determined.
- Not started - An ARS operation has not started.
- In progress - An ARS operation is currently in progress.
- Completed - The last ARS operation has completed.
- Aborted - The last ARS operation was aborted.

OverwriteStatus

The overwrite DIMM operation status for the DCPMM. One of:

- Unknown - The overwrite DIMM operation status cannot be determined.
- Not started - An overwrite DIMM operation was not started on the last boot.
- In progress - An overwrite DIMM operation is currently in progress.
- Completed - An overwrite DIMM operation completed and a reboot is required to use the DCPMM.

ViralPolicy

Whether viral policies are enabled on the DCPMM. One of:

- 0: Disabled - This is the default.
- 1: Enabled - The persistent memory on the DCPMM will be put into read-only mode if the host operating system software detects an uncorrectable error situation and indicates a viral state in order to prevent the spread of damage.

ViralState

Whether the DCPMM is currently viral. One of:

- 0: Not Viral
- 1: Viral - The viral policies of the DCPMM have switched the persistent memory to read-only mode due to the host operating system software detecting an

uncorrectable error situation and indicating a viral state.

AitDramEnabled

If the DCPMM AIT DRAM is enabled. One of:

- 0: Disabled - The device will suffer performance degradation if the AIT DRAM becomes disabled.
- 1: Enabled

BootStatus

The initialization status of the DCPMM as reported by the firmware in the boot status register. One or more of:

- Unknown - The boot status register cannot be read.
- Success - No errors were reported during initialization.
  The following statuses indicate that the media is not functional and therefore access to user data and operations that require use of the media will fail.
- Media Not Ready - The firmware did not complete media training.
- Media Error - The firmware detected an error during media training.
- Media Disabled - The firmware disabled the media due to a critical issue.
  The following statuses indicate that communication with the firmware is not functional.
- FW Assert - The firmware reported an assert during initialization.

BootStatusRegister

The raw hex value of the DCPMM Boot Status Register of the DCPMM

ErrorInjectionEnabled

Error injection status.

- 0: Disabled - This is the default.
- 1: Enabled

MediaTemperatureInjectionEnabled

Media temperature injection status.

- 0: Disabled - This is the default.
- 1: Enabled

SoftwareTriggersEnabled

Software trigger status.

- 0: Disabled - This is the default.
- 1: At least one software trigger enabled.

SoftwareTriggersEnabledDetail

Comma separated list of software triggers currently enabled. One or more of:

- None
- Package Sparing
- Fatal Error
- Percentage Remaining
- Dirty Shutdown

PoisonErrorInjectionsCounter

This counter is incremented each time the set poison error is successfully executed.

PoisonErrorClearCounter

This counter is incremented each time the clear poison error is successfully executed.

MediaTemperatureInjectionsCounter

This counter is incremented each time the media temperature is injected.

SoftwareTriggersCounter

This counter is incremented each time a software trigger is enabled.

2.1.4. Show Memory Resources

NAME

ipmctl-show-memory-resources - Shows the total DCPMM memory resource allocation

SYNOPSIS

```
ipmctl show [OPTIONS] -memoryresources
```

DESCRIPTION

Shows the total DCPMM memory resource allocation across the host server.

OPTIONS

-h

-help

Displays help for the command.

-o (text|nvmxml)

-output (text|nvmxml)

Changes the output format. One of: "text" (default) or "nvmxml".

-u (B|MB|MiB|GB|GiB|TB| TiB)

-units (B|MB|MiB|GB|GiB|TB| TiB)

Changes the units that capacities are displayed in for this command. One of: bytes (B), megabytes (MB), mebibytes (MiB), gigabytes (GB), gibibytes (GiB), terabytes (TB) or tebibytes (TiB).

EXAMPLES

Shows the DCPMM memory resource allocation.

```
ipmctl show -memoryresources
```

RETURN DATA

Returns the default attributes listed below.

NOTE	Capacities from unmanageable DCPMMs are not included in the following aggregated totals.

Capacity

Total system DCPMM capacity.

MemoryCapacity

Total usable system DCPMM Memory Mode capacity.

AppDirectCapacity

Total usable system DCPMM App Direct capacity.

UnconfiguredCapacity

Total system DCPMM capacity that is unusable because it has not been configured.

ReservedCapacity

Total system DCPMM persistent memory capacity that is reserved. This capacity is the persistent memory partition capacity (rounded down for alignment) less any App Direct capacity. Reserved capacity typically results from a Memory Allocation Goal request that specified the Reserved property. This capacity is not mapped to system physical address (SPA) space.

InaccessibleCapacity

Total system DCPMM capacity that is inaccessible due any of:

- Platform configuration prevents accessing this capacity. e.g. MemoryCapacity is configured but MemoryMode is not enabled by platform FW (current Memory Mode is 1LM).
- Capacity is inaccessible because it is not mapped into the system physical address space (SPA). This is usually due to platform firmware memory alignment requirements.
- DCPMM configured capacity but SKU prevents usage. e.g. AppDirectCapcity but DCPMM SKU is MemoryMode only.

DETAILS

DCPMMs are partitioned into Memory and Persistent partitions. ipmctl will align the Memory partition on a 1 GiB boundary with the Persistent partition consuming the remaining capacity. An exception: if DCPMM is configured for 100% Memory Mode then Memory partition will consume 100% of the capacity, while Persistent partition will be 0 length. Any capacity that falls outside the Memory and Persistent partitions is InaccessibleCapacity and is not useable.

Platform firmware alignment restrictions may result in some capacity from the Memory and Persistent partitions not mapped to system physical address (SPA) space. This memory is considered InaccessibleCapacity and is not usable.

Definitions:

Total Capacity (TC)

Raw Capacity (total usable) reported by DCPMM DIMM Partition Info

Memory Partition Capacity (MPC)

Volatile Capacity reported by DCPMM DIMM Partition Info

Persistent Partition Capacity (PPC)

Persistent Capacity reported by DCPMM DIMM Partition Info

Volatile Memory Size (VMS)

Usable volatile memory capacity as reported by platform FW via *Intel NVDIMM Current Config→Volatile Memory Size Mapped into SPA* field

Persistent Memory Size (PMS)

Usable persistent memory capacity as reported by platform FW via *Intel NVDIMM Current Config→Persistent Memory Size Mapped into SPA* field

DCPMM DIMM Partition Info

DIMM Partition Info provided by DCPMM firmware. See *Intel® Optane™ DC Persistent Memory Module Firmware Interface Specification* for details.

Intel NVDIMM Current Config

See *Intel® NVM Dimm Management Software-Firmware Interface Specification* for details.

Calculations:

```
MemoryCapacity = Volatile Memory Size
```

```
AppDirectCapacity = Persistent Memory Size
```

```
ReservedCapacity = PPC (rounded down for PM
alignment) - PMS
```

```
InaccessibleCapacity =
  + (TC - MPC - PPC)
  + (TC - PMS - ReservedCapacity)
 if (CurrentMode == 1LM) then
  + VMS (rounded down for alignment)
```

2.1.5. Show System Capabilities

NAME

ipmctl-show-system-capabilities - Shows the platform supported DCPMM capabilities

SYNOPSIS

```
ipmctl show [OPTIONS] -system -capabilities
```

DESCRIPTION

Shows the total DCPMM memory resource allocation across the host server.

OPTIONS

-a

-all

Shows all attributes.

NOTE	The all and display options are exclusive and may not be used together.

-d (attributes)

-display (attributes)

Filters the returned attributes by explicitly specifying a comma-separated list of any of the attributes defined in the Return Data section.

NOTE	The all and display options are exclusive and may not be used together.

-h

-help

Displays help for the command.

-o (text|nvmxml)

-output (text|nvmxml)

Changes the output format. One of: "text" (default) or "nvmxml".

-u (B|MB|MiB|GB|GiB|TB| TiB)

-units (B|MB|MiB|GB|GiB|TB| TiB)

Changes the units that capacities are displayed in for this command. One of: bytes (B), megabytes (MB), mebibytes (MiB), gigabytes (GB), gibibytes (GiB), terabytes (TB) or tebibytes (TiB).

EXAMPLES

Displays the supported DCPMM capabilities

```
ipmctl show -system -capabilities
```

RETURN DATA

The default behavior is to return the default attributes listed below; the options can be used to expand or restrict the output.

PlatformConfigSupported

(Default) Whether the platform level configuration of DCPMMs can be modified with the host software. One of:

- 0: Changes must be made in the BIOS.
- 1: The command ***Create Memory Allocation Goal*** is supported. Alignment (Default) Capacity alignment requirement for all memory types as reported by the BIOS.

AllowedVolatileMode

(Default) The volatile mode allowed as determined by BIOS setup. One of:

- 1LM: One-level volatile mode. All memory resources in the platform are independently accessible, and not captive of the other resources.
- Memory Mode: DCPMMs act as system memory under the control of the operating system. In Memory Mode, any DDR in the platform will act as a cache working in conjunction with the DCPMMs.
- Unknown: The allowed volatile mode cannot be determined.

CurrentVolatileMode

(Default) The current volatile mode. One of:

- 1LM: One-level volatile mode. All memory resources in the platform are independently accessible, and not captive of the other resources.
- Memory Mode: DCPMMs act as system memory under the control of the operating system. In Memory Mode, any DDR in the platform will act as a cache working in conjunction with the DCPMMs.
- Unknown: The current volatile mode cannot be determined.

AllowedAppDirectMode

(Default) The App Direct mode allowed as determined by BIOS setup. One of:

- Disabled: App Direct support is currently disabled by the BIOS.
- App Direct: App Direct support is currently enabled by the BIOS.
- Unknown: The current App Direct support cannot be determined.

ModesSupported

A list of DCPMM modes supported by the BIOS. Refer to the command ***Show Device*** to determine the modes supported by the individual DCPMMs. One or more of:

- 1LM: One-level volatile mode. All memory resources in the platform are independently accessible, and not captive of the other resources.
- Memory Mode: DCPMMs act as system memory under the control of the operating system. In Memory Mode, any DDR in the platform will act as a cache working in conjunction with the DCPMMs.
- App Direct: DCPMMs and DDR act as independent memory resources under direct load/store control of the application.

SupportedAppDirectSettings

The BIOS supported list of App Direct interleave settings in the format:

- x[Way] - [(IMCSize) iMC x (ChannelSize) Channel] followed by the input format for the command ***Change Preferences***: (ByOne|(IMCSize)_(ChannelSize)).

RecommendedAppDirectSettings

The BIOS recommended list of App Direct interleave settings in the format:

- x[Way] - [(IMCSize) iMC x (ChannelSize) Channel] followed by the input format for the command ***Change Preferences***: (ByOne|(IMCSize)_(ChannelSize)).

MinNamespaceSize

The minimum allowed namespace size as reported by the driver.

AppDirectMirrorSupported

If the BIOS supports App Direct mirroring. One of:

- 0: Not supported.
- 1: Supported

DimmSpareSupported

If the BIOS supports DCPMM sparing. One of:

- 0: Not supported
- 1: Supported

AppDirectMigrationSupported

If the BIOS supports App Direct migration. One of:

- 0: Not supported
- 1: Supported

RenameNamespaceSupported

If the host software supports renaming a namespace with the command Section [Modify Namespace]. One of:

- 0: Not supported
- 1: Supported

GrowAppDirectNamespaceSupported

If the host software supports increasing the capacity of an App Direct namespace with the command Section [Modify Namespace]. One of:

- 0: Not supported
- 1: Supported

ShrinkAppDirectNamespaceSupported

If the host software supports decreasing the capacity of an App Direct namespace with the command Section [Modify Namespace]. One of:

- 0: Not supported
- 1: Supported

InitiateScrubSupported

If the platform and host software support initiating an address range scrub on the DCPMMs in the system. One of:

- 0: Not supported
- 1: Supported

AdrSupported

Whether the platform supports asynchronous DRAM refresh (ADR). One of:

- 0: Not supported. If ADR is not supported, App Direct data integrity cannot be assured during system interruptions.
- 1: Supported

EraseDeviceDataSupported

Whether Erase Device Data is supported.

- 0: Not supported

- 1: Supported

EnableDeviceSecuritySupported

Whether Enable Device Security is supported.

- 0: Not supported
- 1: Supported

DisableDeviceSecuritySupported

Whether Change Device Security property Lockstate = Disabled is supported.

- 0: Not supported
- 1: Supported

UnlockDeviceSecuritySupported

Whether Change Device Security property Lockstate = Unlocked is supported.

- 0: Not supported
- 1: Supported

FreezeDeviceSecuritySupported

Whether Change Device Security property Lockstate = Frozen is supported.

- 0: Not supported
- 1: Supported

ChangeDevicePassphraseSupported

Whether Change Device Passphrase is supported.

- 0: Not supported
- 1: Supported

ChangeMasterPassphraseSupported

Whether Change Master Passphrase is supported.

- 0: Not supported
- 1: Supported

MasterEraseDeviceDataSupported

Whether Master Erase Device Data is supported.

- 0: Not supported

- 1: Supported

2.2. Provisioning

Next generation memory controller and media technologies provide a number of opportunities to optimize a server's memory subsystem for a given workload. Three such opportunities are supported by the CLI and are covered in this section: memory tiering, reliability and performance options, and data-at-rest security options.

A system with both DRAM and DCPMMs can be configured to use memory tiering. The CLI supports configuring a "near" performance tier and a "far" capacity tier. In this two level memory system the near tier acts as a cache for the far tier. When memory tiering is enabled, DRAM DIMMs are utilized as near memory. The near memory tier utilizes all available DRAM capacity. The far memory tier is created from DCPMMs. Because the capacity of a DCPMM is so large (relative to DRAM) it may not be necessary to use all available DCPMM capacity as far memory (a typical near to far ratio is 1:8). So in addition to enabling memory tiering, the CLI provides for designating the amount of DCPMM capacity to be used as far memory. The remaining capacity can be used as App Direct persistent memory. Changing the tiering configuration on a running system is generally not supported. The CLI supports the creation of a tiering "goal configuration" which will take effect after a system reboot. A valid goal migrates into Memory Mode capacity and one or more persistent memory regions after it is successfully parsed and activated by BIOS on the next boot. See the command Create Memory Allocation Goal for more details on configuring the system for memory tiering.

Since modifying the memory tiering and persistent memory configuration requires a reboot to take affect it is possible to have both a current configuration and a pending "goal" configuration. Once the system is rebooted the goal configuration is applied and becomes the current configuration. Prior to rebooting it's possible to see the goal configuration using the command Show Memory Allocation Goal. It is also possible to delete a goal prior to the reboot. See the command Delete Memory Allocation Goal for more details.

WARNING	**This command may result in data loss. Data should be backed up to other storage before executing this command**.

NOTE	Changing a memory allocation goal modifies how the platform firmware maps persistent memory in the system address space (SPA) which may result in data loss or inaccessible data, but does not explicitly delete or modify user data found in persistent memory.

2.2.1. Create Memory Allocation Goal

NAME

ipmctl-create-goal - Creates a memory allocation goal on one or more DCPMM

SYNOPSIS

```
ipmctl create [OPTIONS] -goal [TARGETS]
[PROPERTIES]
```

DESCRIPTION

Creates a memory allocation goal on one or more for the BIOS to read on the next reboot in order to map the DCPMM capacity into the system address space. Persistent memory can then be utilized by creating a namespace.

NOTE	The capacity values presented by this command are a target goal or request to platform firmware. The actual capacity values are subject to change due to rounding and alignment requirements. If the goal request is invalid or not possible it may be rejected by platform firmware.

NOTE	Deleting the PCD can be used as a way to prepare individual DCPMMs for provisioning. See the delete -pcd command.

WARNING	**This command may result in data loss. Data should be backed up to other storage before executing this command**.

NOTE	Changing a memory allocation goal modifies how the platform firmware maps persistent memory in the system address space (SPA) which may result in data loss or inaccessible data, but does not explicitly delete or modify user data found in persistent memory.

OPTIONS

-f

-force

Reconfiguring DCPMMs is a destructive operation which requires confirmation from the user. This option suppresses the confirmation.

-h

-help

Displays help for the command.

-o (text|nvmxml)

-output (text|nvmxml)

Changes the output format. One of: "text" (default) or "nvmxml".

-u (B|MB|MiB|GB|GiB|TB| TiB)

-units (B|MB|MiB|GB|GiB|TB| TiB)

Changes the units that capacities are displayed in for this command. One of: bytes (B), megabytes (MB), mebibytes (MiB), gigabytes (GB), gibibytes (GiB), terabytes (TB) or tebibytes (TiB).

TARGETS

-dimm [(DimmIDs)]

Creates a memory allocation goal on specific DCPMMs by optionally supplying one or more comma-separated DCPMM identifiers. This list must include all unconfigured DCPMMs on the affected socket(s). The default is to configure all manageable DCPMMs on all sockets.

-socket (SocketIds)

Creates the memory allocation goal onto all manageable DCPMMs on specific sockets by supplying the socket target and one or more comma-separated socket identifiers. The default is to create the memory allocation goal onto all manageable DCPMMs on all sockets.

PROPERTIES

MemoryMode

Percentage of the total capacity to use in Memory Mode (0-100). Default = 0.

PersistentMemoryType

If MemoryMode is not 100%, the type of persistent memory to create.

- "AppDirect": (Default) Create App Direct capacity utilizing hardware interleaving across the requested DCPMMs if applicable given the specified target.
- "AppDirectNotInterleaved": Create App Direct capacity that is not interleaved any other DCPMMs.

NamespaceLabelVersion

The version of the namespace label storage area (LSA) index block

- "1.2": (Default) Defined in UEFI 2.7a - sections 13.19
- "1.1": Legacy 1.1 namespace label support

Reserved

Reserve a percentage (0-100) of the requested DCPMM App Direct capacity that will not be mapped into the system physical address space and will be presented as Reserved Capacity with Show Device and Show Memory Resources Commands.

EXAMPLES

Configures all the DCPMM capacity in Memory Mode.

```
ipmctl create -goal MemoryMode=100
```

Configures all the DCPMM capacity as App Direct.

```
ipmctl create -goal PersistentMemoryType=AppDirect
```

Configures the capacity on each DCPMM with 20% of the capacity in Memory Mode and the remaining as App Direct capacity that does not use hardware interleaving.

```
ipmctl create -goal MemoryMode=20
PersistentMemoryType=AppDirectNotInterleaved
```

Configures the DCPMM capacity across the entire system with 25% of the capacity in Memory Mode, 25% reserved and the remaining 50% as App Direct. Configures the DCPMM capacity across the entire system with 25% of the capacity in Memory Mode and the remaining 75% as App Direct.

```
ipmctl create -goal MemoryMode=25
PersistentMemoryType=AppDirect Reserved=25
```

LIMITATIONS

In order to successfully execute this command:

- The caller must have the appropriate privileges.
- The specified DCPMM(s) must be manageable by the host software and must all have the same SKU.
- Existing memory allocation goals that have not been applied and any namespaces

associated with the requested DCPMM(s) must be deleted before running this command.

- Security state must be disabled. Changing the memory configuration is a destructive operation which results in loss of data stored in the persistent memory region. Therefore, data should be backed up to other storage before executing this command. Targets may be limited to individual DCPMMs or sockets, but all DCPMMs on affected sockets must be configured when the command finishes. If the selected targets make this impossible, the command will be rejected. Refer to ***Show System Capabilities*** for a list of BIOS supported modes.
- Some requests are dependent on BIOS and/or platform configuration. For details, refer to the *Intel® Optane™ DC Persistent Memory Software Memory Allocation Rules*, document number 564194. For example:
- Provisioning DCPMMs for Memory Mode while BIOS is configured for 1LM only will result in unused capacity.
- Provisioning DCPMMs for Memory Mode while not all iMCs have at least one DCPMM will result in unused capacity.

RETURN DATA

Minor adjustments (up to 10%) in the requested capacities are sometimes necessary to align properly according to the platform rules. There are also some situations that require additional confirmation from the user because they may result in a non-optimal configuration (i.e., reduced performance). These are described below.:

The requested goal may result in a non-optimal configuration due to the population of DIMMs in the system

Memory Mode capacity requested but the population of DRAM DIMMs and DCPMMs in the system may result in reduced performance (i.e., the ratio of DRAM and DCPMMs is not balanced, DRAM and DCPMMs are not on the same channel or not all the same size).

The requested goal may result in a non-optimal configuration due to the population of DIMMs in the system.
App Direct capacity requested but the population of DCPMMs in the system may result in reduced performance (i.e., DCPMMs are not the same size or populated asymmetrically across the socket).

The requested goal will result in App Direct capacity which is not supported by the host software.
App Direct capacity requested but App Direct is not supported by the currently installed host software.

The requested goal will result in Memory Mode capacity that is unusable with the currently selected platform BIOS volatile mode.
Memory Mode capacity requested by the platform BIOS is currently set to 1LM Mode.

The requested goal was adjusted more than 10% to find a valid configuration.
> 10% adjustment from the requested goal

The amount of mapped memory was limited based on the SKU resulting in un-mapped capacity.
Mapped memory was limited based on the CPU SKU.

Therefore, before making any changes to the configuration, a prompt is displayed showing the memory allocation goals that will be created on each DCPMM as documented in the command Section Show Memory Allocation Goal, along with any additional confirmation messages. The force option can be used to override this confirmation and proceed directly with creating the goals.

```
The following configuration will be applied:
SocketID DimmID MemorySize AppDirect1Size
AppDirect2Size (Refer to
the command Section Show Memory Allocation Goal)
[Additional Confirmation Messages (see above)] Do
you want to
continue?
```

2.2.2. Show Memory Allocation Goal

NAME

ipmctl-show-goal - Shows the memory allocation goal on one or more DCPMM

SYNOPSIS

```
ipmctl show [OPTIONS] -goal [TARGETS] [PROPERTIES]
```

DESCRIPTION

Shows the memory allocation goal on one or more DCPMMs. Once the goal is successfully applied by the BIOS, it is no longer displayed. Use the command Section Show Memory Resources to view the system-wide memory resources or the command ***Show Persistent Memory*** for detailed persistent memory information.

OPTIONS

-a

-all

Shows all attributes.

NOTE	The all and display options are exclusive and may not be used together.

-d (attributes)

-display (attributes)

Filters the returned attributes by explicitly specifying a comma-separated list of any of the attributes defined in the Return Data section.

NOTE	The all and display options are exclusive and may not be used together.

-h

-help

Displays help for the command.

-o (text|nvmxml)

-output (text|nvmxml)

Changes the output format. One of: "text" (default) or "nvmxml".

-u (B|MB|MiB|GB|GiB|TB| TiB)

-units (B|MB|MiB|GB|GiB|TB| TiB)

Changes the units that capacities are displayed in for this command. One of: bytes (B), megabytes (MB), mebibytes (MiB), gigabytes (GB), gibibytes (GiB), terabytes (TB) or tebibytes (TiB).

TARGETS

-dimm (DimmIDs)

Restricts output to specific DCPMMs by supplying one or more comma separated DCPMM identifiers. The default is to display all manageable DCPMMs with memory allocation goals.

-socket (SocketIds)

Restricts output to the DCPMMs on specific sockets by supplying the socket target and one or more comma-separated socket identifiers. The default is to display all manageable DCPMMs on all sockets with memory allocation goals.

EXAMPLES

Shows the default memory allocation goal attributes for each DCPMM.

```
ipmctl show -goal
```

Shows all the memory allocation goal attributes for the DCPMMs on socket 1.

```
ipmctl show -a -goal -socket 1
```

LIMITATIONS

The specified DCPMMs must be manageable by the host software.

RETURN DATA

The default behavior is to display a table with the default attributes for each DCPMM; applying options changes the output to a more detailed format.

SocketID

(Default) The processor socket identifier where the DCPMM is installed.

DimmID

(Default) The DCPMM identifier

MemorySize

(Default) The DCPMM capacity that will be configured in Memory Mode.

AppDirect1Size

(Default) The DCPMM capacity that will be configured as the first App Direct interleave set if applicable.

AppDirect1Index

Unique identifier of the first App Direct interleave set.

- N/A: If no App Direct interleave set
- Numeric value if App Direct interleave set is present.

AppDirect1Settings

The settings for the first App Direct interleave set in the format: x(Way) [- (Size) iMC] [x (Size) Channel]

AppDirect2Size

(Default) The DCPMM capacity that will be configured as the second App Direct

interleave set if applicable.

AppDirect2Index

Unique identifier of the second App Direct interleave set.

- N/A: If no App Direct interleave set
- Numeric value if App Direct interleave set is present.

AppDirect2Settings

The settings for the second App Direct interleave set in the format: x(Way) [- (Size) iMC] [x (Size) Channel]

Status

The status of the memory allocation goal. One of:

- Unknown: The status cannot be determined.
- New: A reboot is required for the memory allocation goal to be processed by the BIOS.
- Failed - Bad request: The BIOS failed to process the memory allocation goal because it was invalid.
- Failed - Not enough resources: There were not enough resources for the BIOS to process the memory allocation goal.
- Failed - Firmware error: The BIOS failed to process the memory allocation goal due to a firmware error.
- Failed - Unknown: The BIOS failed to process the memory allocation goal due to an unknown error.

SAMPLE OUTPUT

If a new memory allocation goal has been created, a prompt to reboot will be presented.

```
A reboot is required to process new memory
allocation goals.
```

2.2.3. Dump Memory Allocation Settings

NAME

ipmctl-dump-goal - Stores the current system configuration in a file

SYNOPSIS

```
ipmctl dump [OPTIONS] -destination (path) -system
-config
```

DESCRIPTION

Store the currently configured memory allocation settings for all DCPMMs in the system to a file in order to replicate the configuration elsewhere. Apply the stored memory allocation settings using the command Section Load Memory Allocation Goal.

OPTIONS

-h

-help

Displays help for the command.

-o (text|nvmxml)

-output (text|nvmxml)

Changes the output format. One of: "text" (default) or "nvmxml".

EXAMPLES

Stores the memory allocation settings from all the DCPMMs into the file "config.txt".

```
ipmctl dump -destination config.txt -system -config
```

LIMITATIONS

Only memory allocation settings for manageable DCPMMs that have been successfully applied by the BIOS are stored in the file. Unconfigured DCPMMs are not included, nor are memory allocation goals that have not been applied.

RETURN DATA

The CLI will indicate the overall status of the operation when complete. If a failure occurs when dumping the memory allocation from multiple DCPMMs, the process will stop and the output file will be removed.

The output file is formatted as an ASCII file with one row per DCPMM containing the

following comma-separated values.

SocketID

unsigned short int Identifier for the socket the DCPMM is associated with.

DimmHandle

unsigned int DCPMM device handle.

Capacity

unsigned long long int Total capacity of the DCPMM in GiB.

MemorySize

unsigned long long int Capacity of the DCPMM allocated as Memory Mode in GiB.

AppDirect1Size

unsigned long long int Capacity of the DCPMM allocated for the first App Direct interleave set in GiB.

AppDirect1Format

unsigned short int Bit mask representing the interleave format of the first App Direct interleave set.

AppDirect1Mirrored

unsigned char 1 if the first App Direct interleave set is mirrored, 0 otherwise.

AppDirect1Index

unsigned short int Unique index of the first App Direct interleave set.

AppDirect2Size

unsigned long long int Capacity of the DCPMM allocated for the second App Direct interleave set in GiB.

AppDirect2Format

unsigned short int Bit mask representing the interleave format of the second App Direct interleave set.

AppDirect2Mirrored

unsigned char 1 if the second App Direct interleave set is mirrored, 0 otherwise.

AppDirect2Index

unsigned short int Unique index of the second App Direct interleave set.

SAMPLE OUTPUT

```
Successfully dumped system configuration to file:
config.csv
```

config.csv contents:

```
#SocketID,DimmHandle,Capacity,MemorySize,AppDirect1
Size,AppDirect
1Format,AppDirect
1Mirrored,AppDirect1Index,AppDirect2Size,AppDirect2
Format,AppDire
ct2Mirrored,AppDirect2Index
1,4385,64,64,0,0,0,0,0,0,0,0
1,4401,64,64,0,0,0,0,0,0,0,0
1,4417,64,64,0,0,0,0,0,0,0,0
1,4433,64,64,0,0,0,0,0,0,0,0
1,4449,64,64,0,0,0,0,0,0,0,0
```

2.2.4. Load Memory Allocation Goal

NAME

ipmctl-load-goal - Load a memory allocation goal from a file onto DCPMMs

SYNOPSIS

```
ipmctl load [OPTIONS] -source (path) -goal
[TARGETS]
```

DESCRIPTION

Load a memory allocation goal from a file onto one or more DCPMMs.

NOTE	Deleting the PCD can be used as a way to prepare individual DCPMMs for provisioning. See the delete -pcd command.
WARNING	**This command may result in data loss. Data should be backed up to other storage before executing this command**.

NOTE	Changing a memory allocation goal modifies how the platform firmware maps persistent memory in the system address space (SPA) which may result in data loss or inaccessible data, but does not explicitly delete or modify user data found in persistent memory.

OPTIONS

-f

-force

Reconfiguring DCPMMs is a destructive operation which requires confirmation from the user. This option suppresses the confirmation.

-h

-help

Displays help for the command.

-o (text|nvmxml)

-output (text|nvmxml)

Changes the output format. One of: "text" (default) or "nvmxml".

-u (B|MB|MiB|GB|GiB|TB| TiB)

-units (B|MB|MiB|GB|GiB|TB| TiB)

Changes the units that capacities are displayed in for this command. One of: bytes (B), megabytes (MB), mebibytes (MiB), gigabytes (GB), gibibytes (GiB), terabytes (TB) or tebibytes (TiB).

TARGETS

-dimm (DimmIDs)

Loads the memory allocation goal onto specific DCPMMs by supplying one or more comma separated DCPMM identifiers. The default is to load the memory allocation goal onto all manageable DCPMMs.

-socket (SocketIds)

Loads the memory allocation goal onto all manageable DCPMMs on specific sockets by supplying the socket target and one or more comma-separated socket identifiers. The default is to load the memory allocation goal onto all manageable DCPMMs on all sockets.

EXAMPLES

Loads the configuration settings stored in "config.txt" onto all the DCPMMs in the

system as a memory allocation goal to be applied by the BIOS on the next reboot.

```
ipmctl load -source config.txt -goal
```

Loads the configuration settings stored in "config.txt" onto a specified set of DCPMMs as a memory allocation goal to be applied by the BIOS on the next reboot.

```
ipmctl load -source config.txt -goal -dimm 1,2,3
```

Loads the configuration settings stored in "config.txt" onto all manageable DCPMMs on sockets 1 and 2 as a memory allocation goal to be applied by the BIOS on the next reboot.

```
ipmctl load -source config.txt -goal -socket 1,2
```

LIMITATIONS

In order to successfully execute this command:

- The caller must have the appropriate privileges.
- The specified DCPMM(s) must be manageable by the host software and must all have the same SKU.
- Existing memory allocation goals that have not been applied and any namespaces associated with the requested DCPMM(s) must be deleted before running this command.
- Security state must be disabled. Changing the memory configuration is a destructive operation which results in loss of data stored in the persistent memory region. Therefore, data should be backed up to other storage before executing this command. Targets may be limited to individual DCPMMs or sockets, but all DCPMMs on affected sockets must be configured when the command finishes. If the selected targets make this impossible, the command will be rejected. Refer to ***Show System Capabilities*** for a list of BIOS supported modes.
- Some requests are dependent on BIOS and/or platform configuration. For details, refer to the *Intel® Optane™ DC Persistent Memory Software Memory Allocation Rules*, document number 564194. For example:
- Provisioning DCPMMs for Memory Mode while BIOS is configured for 1LM only will result in unused capacity.
- Provisioning DCPMMs for Memory Mode while not all iMCs have at least one DCPMM will result in unused capacity.

RETURN DATA

If successful, the CLI will display the memory allocation goal stored on each DCPMM as documented in the command Section Show Memory Allocation Goal. If a failure occurs, an error code and message will be displayed. If a failure occurs when configuring multiple DCPMMs, the process will exit and remove the memory allocation goal from any DCPMMs that succeeded prior to the failure.

2.2.5. Delete Memory Allocation Goal

NAME

ipmctl-delete-goal - Deletes the memory allocation goal from DCPMMs

SYNOPSIS

```
ipmctl delete [OPTIONS] -goal [TARGETS]
```

DESCRIPTION

Deletes the memory allocation goal from one or more DCPMMs. This command only deletes a memory allocation goal request that has not been processed by BIOS.

OPTIONS

-h

-help

Displays help for the command.

-o (text|nvmxml)

-output (text|nvmxml)

Changes the output format. One of: "text" (default) or "nvmxml".

TARGETS

-dimm [(DimmIDs)]

Deletes the memory allocation goal from specific DCPMMs by optionally supplying one or more comma-separated DCPMM identifiers. The default is to delete the memory allocation goals from all manageable DCPMMs.

-socket (SocketIds)

Deletes the memory allocation goal from the DCPMMs on specific sockets by supplying the socket target and one or more comma-separated socket identifiers.

The default is to delete the memory allocation goals from manageable DCPMMs on all sockets.

EXAMPLES

Deletes the memory allocation goal from all DCPMMs on all sockets.

```
ipmctl delete -goal
```

LIMITATIONS

The appropriate privileges and the specified DCPMM(s) must be manageable by the host software and unlocked if security is enabled. given socket and all specified DCPMMs must contain a memory allocation goal.

RETURN DATA

For each DCPMM, the CLI will indicate the status of the operation. If a failure occurs when deleting the memory allocation goals from multiple DCPMMs, the process will output a failure message for those DCPMMs that did not succeed and a success message for those that did.

SAMPLE OUTPUT

```
Delete memory allocation goal from DIMM (DimmID):
Success
Delete memory allocation goal from DIMM (DimmID):
Error:
(Description) Delete memory allocation goal from
DCPMM
(DimmID): Success
...
```

2.3. Security

DCPMMs support data-at-rest security by encrypting of the data stored in the persistent regions of the DIMM. The CLI only supports transitioning to Disable Security State using the Change Device Security command. Please check with your OSV to determine if they provide native tools that support DCPMM security capabilities.

NOTE	Security commands are subject to OS Vendor (OSV) support and will return "Not Supported." An exception is if the DCPMM is Unlocked Seurity State, then transitioning to Disabled is permitted.

2.3.1. Enable Device Security

NAME

ipmctl-enable-device-security - Enable data-at-rest security on DCPMM on supported OS

SYNOPSIS

```
ipmctl set [OPTIONS] -dimm [TARGETS]
NewPassphrase=(string)
ConfirmPassphrase=(string)
```

DESCRIPTION

Enable data-at-rest security for the persistent memory on one or more DCPMMs by setting a passphrase.

NOTE	This command is subject to OS Vendor (OSV) support. It will return "Not Supported."

OPTIONS

-h

-help

Displays help for the command.

-source (path)

File path to a local file containing the new passphrase (1-32 characters).

NOTE	The file does not need to contain the ConfirmPassphrase property

TARGETS

-dimm (DimmIDs)

Set the passphrase on specific DCPMMs by supplying one or more comma separated DCPMM identifiers. However, this is not recommended as it may put the system in an undesirable state. The default is to set the passphrase on all

manageable DCPMMs.

PROPERTIES

NewPassphrase

The new passphrase (1-32 characters). For better passphrase protection, specify an empty string (e.g., NewPassphrase="") to be prompted for the passphrase or to use a file containing the passphrase with the source option.

ConfirmPassphrase

Confirmation of the new passphrase (1-32 character and must match NewPassphrase). For better passphrase protection, specify an empty string (e.g., ConfirmPassphrase="") to be prompted for the passphrase or to use a file containing the passphrase with the source option.

EXAMPLES

Set a passphrase on DIMM 0x0001.

```
ipmctl set -dimm 0x0001 NewPassphrase=123
ConfirmPassphrase=123
```

Sets a passphrase on DCPMM 0x0001 by supplying the passphrase in the file mypassphrase.file. In this example, the format of the file would be:

#ascii
NewPassphrase=myNewPassphrase

```
ipmctl set -source mypassphrase.file -dimm 0x0001
NewPassphrase="" ConfirmPassphrase=""
```

LIMITATIONS

In order to successfully execute this command:

The caller must have the appropriate privileges. The specified DCPMM must have security disabled and be manageable by the host software.

There must not be any goal creation pending.

Command is subject to OS Vendor (OSV) support. If OSV does not provide support, command will return "Not Supported."

RETURN DATA

If empty strings are provided for the passphrase properties and the source option is not included, the user will be prompted (once for all DCPMMs) to enter the new passphrase and then again to confirm the new passphrase as described below. The passphrase characters will be hidden.

New passphrase: ****
Confirm new passphrase: ****

For each DCPMM, the CLI will indicate the status of the set passphrase operation. If a failure occurs when setting the passphrase on multiple DCPMMs, the process will exit and not continue updating the remaining DCPMMs.

SAMPLE OUTPUT

```
Set passphrase on DIMM (DimmID): Success
…
Set passphrase on DIMM (DimmID): Error (Code) -
(Description)
```

2.3.2. Change Device Passphrase

NAME

ipmctl-change-device-passphrase - Changes the security passphrase on DCPMM on supported OS

SYNOPSIS

```
ipmctl set [OPTIONS] -dimm [TARGETS]
Passphrase=(string) NewPassphrase=(string)
ConfirmPassphrase=(string)
```

DESCRIPTION

Changes the security passphrase on one or more DCPMMs.

NOTE	This command is subject to OS Vendor (OSV) support. It will return "Not Supported."

OPTIONS

-h

-help

Displays help for the command.

-source (path)

File path to a local file containing the new passphrase (1-32 characters).

NOTE	The file does not need to contain the ConfirmPassphrase property

TARGETS

-dimm (DimmIDs)

Changes the passphrase on specific DCPMMs by supplying one or more comma separated DCPMM identifiers. However, this is not recommended as it may put the system in an undesirable state. The default is to change the passphrase on all manageable DCPMMs.

PROPERTIES

Passphrase

The current passphrase (1-32 characters). For better passphrase protection, specify an empty string (e.g., Passphrase="") to be prompted for the current passphrase or to use a file containing the passphrases with the source option.

NewPassphrase

The new passphrase (1-32 characters). For better passphrase protection, specify an empty string (e.g., NewPassphrase="") to be prompted for the passphrase or to use a file containing the passphrase with the source option.

ConfirmPassphrase

Confirmation of the new passphrase (1-32 character and must match NewPassphrase). For better passphrase protection, specify an empty string (e.g., ConfirmPassphrase="") to be prompted for the passphrase or to use a file containing the passphrase with the source option.

EXAMPLES

Changes the passphrase from mypassphrase to mynewpassphrase on all DCPMMs.

```
ipmctl set -dimm Passphrase=mypassphrase
NewPassphrase=mynewpassphrase
 ConfirmPassphrase=mynewpassphrase
```

Changes the passphrase on all DCPMMs by having the CLI prompt for the current and new passphrases.

```
ipmctl set -dimm Passphrase="" NewPassphrase=""
ConfirmPassphrase=""
```

Changes the passphrase on all DCPMMs by supplying the current and new passphrases from the specified file. In this example, the format of the file would be:

#ascii
Passphrase=myOldPassphrase
NewPassphrase=myNewPassphrase

```
ipmctl set -source passphrase.file -dimm
Passphrase="" NewPassphrase=""
ConfirmPassphrase=""
```

LIMITATIONS

The specified DCPMM must be manageable by the host software, have security enabled and not be in the "Unlocked, Frozen", "Disabled, Frozen", or "Exceeded" lock states.

Command is subject to OS Vendor (OSV) support. If OSV does not provide support, command will return "Not Supported."

RETURN DATA

If empty strings are provided for the passphrase properties and the source option is not included, the user will be prompted (once for all DCPMM) to enter the current passphrase, then again for the new passphrase and then again to confirm the new passphrase as described below. The passphrase characters are hidden.

Current passphrase: ****

For each DIMM, the CLI will indicate the status of the passphrase change operation. If a failure occurs when updating the passphrase on multiple DCPMMs, the process will exit and not continue updating the remaining DCPMMs.

SAMPLE OUTPUT

```
Change passphrase on DIMM (DimmID): Success
…
Change passphrase on DIMM (DimmID): Error (Code)-
(Description)
```

2.3.3. Change Device Security

NAME

ipmctl-change-device-security - Changes the DCPMM security lock state

SYNOPSIS

```
ipmctl set [OPTIONS] -dimm [TARGETS]
Lockstate=(Unlocked|Disabled|Frozen)
Passphrase=(string)
```

DESCRIPTION

Changes the data-at-rest security lock state for the persistent memory on one or more DCPMMs.

NOTE	This command is subject to OS Vendor (OSV) support. It will return "Not Supported." An exception is if the DCPMM is Unlocked Seurity State, then transitioning to Disabled is permitted.

OPTIONS

-h

-help

Displays help for the command.

-o (text|nvmxml)

-output (text|nvmxml)

Changes the output format. One of: "text" (default) or "nvmxml".

-source (path)

File path to a local file containing the new passphrase (1-32 characters).

TARGETS

-dimm (DimmIDs)

Changes the lock state of a specific DCPMMs by supplying one or more comma separated DCPMM identifiers. However, this is not recommended as it may put the system in an undesirable state. The default is to modify all manageable DCPMMs.

PROPERTIES

LockState

The desired lock state.

- "Disabled": Removes the passphrase on an DCPMM to disable security. Permitted only when LockState is Unlocked.
- "Unlocked": Unlocks the persistent memory on a locked DCPMM.
- "Frozen": Prevents further lock state changes to the DCPMM until the next reboot.

Passphrase

The current passphrase (1-32 characters). For better passphrase protection, specify an empty string (e.g., Passphrase="") to be prompted for the current passphrase or to use a file containing the passphrases with the source option.

EXAMPLES

Unlocks device 0x0001.

```
ipmctl set -dimm 0x0001 LockState=Unlocked
Passphrase=""
```

Unlocks device 0x0001 by supplying the passphrase in the file "mypassphrase.file". In this example, the format of the file would be:

#ascii
Passphrase=myPassphrase

```
ipmctl set -source myfile.file -dimm 0x0001
LockState=Unlocked
Passphrase=""
```

LIMITATIONS

To successfully execute this command, the caller must have the appropriate privileges and the specified DCPMMs must be manageable by the host software, have security

enabled, not be in the "Unlocked, Frozen", "Disabled, Frozen", or "Exceeded" lock states, and not executing a long operation (ARS, Overwrite, FWUpdate).

The command is subject to OS Vendor (OSV) support. If OSV does not provide support, the command may return "Not Supported." An exception is if the DCPMM is Unlocked (via UEFI or OSV tool), then transitioning to Disabled is possible regardless of OSV support.

RETURN DATA

If an empty string is provided for the passphrase property and the source option is not included, the user will be prompted (once for all DCPMMs) to enter the current passphrase. The passphrase characters are hidden.

Current passphrase: **

For each DCPMM, the CLI will indicate the status of the security state change. If a failure occurs when changing multiple DCPMMs, the process will exit and not continue updating the remaining DCPMMs.

SAMPLE OUTPUT

```
Unlock DIMM (DimmID): Success
Unlock DIMM (DimmID): Error (Code) - (Description)
Remove passphrase from DIMM (DimmID): Success
Remove passphrase from DIMM (DimmID): Error (Code)
- (Description)
```

2.3.4. Erase Device Data

NAME

ipmctl-erase-device-data - Erases the persistent data on one or more DCPMMs on supported OS

SYNOPSIS

```
ipmctl delete [OPTIONS] -dimm [TARGETS]
Passphrase=(string)
```

DESCRIPTION

Erases the persistent data on one or more DCPMMs.

NOTE	This command is subject to OS Vendor (OSV) support. It will return "Not Supported."

OPTIONS

-f

-force

Erasing DCPMM data is a destructive operation which requires confirmation from the user for each DCPMM. This option suppresses the confirmation.

-h

-help

Displays help for the command.

-o (text|nvmxml)

-output (text|nvmxml)

Changes the output format. One of: "text" (default) or "nvmxml".

-source (path)

File path to a local file containing the new passphrase (1-32 characters).

TARGETS

-dimm (DimmIDs)

Erases specific specifics by supplying one or more comma-separated specific identifiers. However, this is not recommended as it may put the system in an undesirable state. The default is to erase all manageable DCPMMs.

PROPERTIES

Passphrase

If security state is disabled, then passphrase is not required and will be ignored if supplied.
If security state is enabled, then a passphrase must be supplied.
The current passphrase (1-32 characters). For better passphrase protection, specify an empty string (e.g., Passphrase="") to be prompted for the passphrase or to use a file containing the passphrase with the source option.

EXAMPLES

Security disabled DCPMMs: Erases all the persistent data on all DCPMMs in the system.

```
ipmctl delete -dimm
```

Security enabled specifics: Erases all the persistent data on all DCPMMs in the system.

```
ipmctl delete -dimm Passphrase=123
```

Erases all the persistent data on all DCPMMs by having the CLI prompt for the current passphrase.

```
ipmctl delete -dimm Passphrase=""
```

LIMITATIONS

To successfully execute this command, the caller must have the appropriate privileges and the specified DCPMM(s) must be manageable by the host software, not be in the "Unlocked, Frozen", "Disabled, Frozen", or "Exceeded" lock states and any namespaces associated with the requested DCPMM(s) must be deleted before running this command.

The command is subject to OS Vendor (OSV) support. If OSV does not provide support, the command will return "Not Supported."

RETURN DATA

If an empty string is provided for the passphrase property and the source option is not included, the user will be prompted (once for all DCPMMs) to enter the current passphrase. The passphrase characters are hidden.

Current passphrase: **

For each DCPMM, the CLI will indicate the status of the security state change. If a failure occurs when changing multiple DCPMMs, the process will exit and not continue updating the remaining DCPMMs.

SAMPLE OUTPUT

```
Erase DIMM (DimmID): Success
Erase DIMM (DimmID): Error (Code) - (Description)
```

2.4. Instrumentation

2.4.1. Show Sensor

NAME

ipmctl-show-sensor - Shows health statistics for one or more DCPMMs

SYNOPSIS

```
ipmctl show [OPTIONS] -sensor [SENSORS] [TARGETS]
```

DESCRIPTION

ipmctl-show-device to view more detailed information about a DCPMM.

OPTIONS

-a

-all

Shows all attributes.

NOTE	The all and display options are exclusive and may not be used together.

-d (attributes)

-display (attributes)

Filters the returned attributes by explicitly specifying a comma-separated list of any of the attributes defined in the Return Data section.

NOTE	The all and display options are exclusive and may not be used together.

-h

-help

Displays help for the command.

-o (text|nvmxml)

-output (text|nvmxml)

Changes the output format. One of: "text" (default) or "nvmxml".

SENSORS

Health

(Default) The current DCPMM health as reported in the SMART log

MediaTemperature

(Default) The current DCPMM media temperature in Celsius

ControllerTemperature

(Default) The current DCPMM controller temperature in Celsius

PercentageRemaining

(Default) Remaining DCPMM's life as a percentage value of factory expected life span

LatchedDirtyShutdownCount

(Default) The number of shutdowns without notification over the lifetime of the DCPMM

UnlatchedDirtyShutdownCount

(Default) The number of shutdowns without notification over the lifetime of the DCPMM. This counter is the same as LatchedDirtyShutdownCount except it will always be incremented on a dirty shutdown, even if Latch System Shutdown Status was not enabled

PowerOnTime

(Default) The total power-on time over the lifetime of the DCPMM

UpTime

(Default) The total power-on time since the last power cycle of the DCPMM

PowerCycles

(Default) The number of power cycles over the lifetime of the DCPMM

FwErrorCount

The total number of firmware error log entries

TARGETS

-dimm (DimmIDs)

Restricts output to the sensors on specific DCPMMs by supplying the DIMM target and one or more comma-separated DCPMM identifiers. The default is to display sensors for all manageable DCPMMs.

EXAMPLES

Gets all sensor information for all DCPMMs.

```
ipmctl show -sensor
```

Shows the media temperature sensor for the specified DCPMM.

```
ipmctl show -sensor MediaTemperature -dimm 1234
```

LIMITATIONS

The specified DCPMM(s) must be manageable by the host software.

RETURN DATA

This command displays a table with a row for each sensor on each DCPMM. Applying a specific DCPMM or sensor type target limits the number of rows. Applying options can be used to expand or restrict the output.

DimmID

(Default) The DCPMM identifier

Type

(Default) The sensor type. Refer to the sensor table above.

CurrentValue

(Default) The current reading followed by the units of measurement (e.g., 57 °C or 25%)

CurrentState

(Default) The current value in relation to the threshold settings (if supported). One of:

- Unknown: The state cannot be determined.
- Normal: The current reading is within the normal range. This is the default when the sensor does not support thresholds.
- NonCritical: The current reading is within the non-critical range. For example, an alarm threshold has been reached.
- Critical: The current reading is within the critical range. For example, the firmware has begun throttling down traffic to the DCPMM due to the temperature.
- Fatal: The current reading is within the fatal range. For example, the firmware

is shutting down the DCPMM due to the temperature.

LowerThresholdNonCritical

The threshold value below which the state is considered "NonCritical".

UpperThresholdNonCritical

The threshold value at or above which the state is considered "NonCritical".

LowerThresholdCritical

The threshold value below which the state is considered "Critical".

UpperThresholdCritical

The threshold value at or above which the state is considered "Critical".

UpperThresholdFatal

The threshold value at or above which the state is considered "Fatal".

SettableThresholds

A list of user settable thresholds. Zero or more of:

- "LowerThresholdNonCritical"
- "UpperThresholdNonCritical"

SupportedThresholds

A list of supported thresholds. Zero or more of:

- "LowerThresholdNonCritical"
- "UpperThresholdNonCritical"
- "LowerThresholdCritical"
- "UpperThresholdCritical"
- "UpperThresholdFatal"

EnabledState

Whether the critical threshold alarm is enabled, disabled or not applicable. One of:

- 0: Disabled
- 1: Enabled
- N/A

2.4.2. Change Sensor Settings

NAME

ipmctl-change-sensor - Changes the threshold or enabled state for DCPMMs sensors

SYNOPSIS

```
ipmctl set [OPTIONS] -sensor (SENSORS) [TARGETS]
NonCriticalThreshold=(temperature)
EnabledState=(0|1)
```

DESCRIPTION

Changes the non-critical threshold or enabled state for one or more DCPMMs sensors. Use the command Show Sensor to view the current settings.

OPTIONS

-f

-force

Changing the sensor settings is a potentially destructive operation which requires confirmation from the user for each DCPMM. This option suppresses the confirmation.

-h

-help

Displays help for the command.

-o (text|nvmxml)

-output (text|nvmxml)

Changes the output format. One of: "text" (default) or "nvmxml".

SENSORS

MediaTemperature

The current DCPMM media temperature in Celsius.
Valid values: 0-2047

ControllerTemperature

The current DCPMM controller temperature in Celsius.
Valid values 0-2047

PercentageRemaining

Remaining DCPMM's life as a percentage value of factory expected life span. Valid values: 1-99

TARGETS

-dimm [(DimmIDs)]

Restricts output to the sensors on specific DCPMMs by optionally supplying the DIMM target and one or more comma-separated DCPMM identifiers. The default is to display sensors for all manageable DCPMMs.

PROPERTIES

NonCriticalThreshold

The upper (for temperatures) or lower (for spare capacity) non-critical alarm threshold of the sensor. If the current value of the sensor is at or above for thermal, or below for capacity, the theshold value, then the sensor will indicate a "NonCritical" state. Temperatures may be specified in degrees Celsius to a precision of 1/16 a degree.

EnabledState

Enable or disable the non-critical threshold alarm. One of:

- "0": Disable
- "1": Enable

EXAMPLES

Changes the media temperature threshold to 51 on the specified DCPMM and enable the alarm.

```
ipmctl set -sensor MediaTemperature –dimm 0x0001
NonCriticalThreshold=51
EnabledState=1
```

LIMITATIONS

The specified DCPMM(s) must be manageable by the host software.

RETURN DATA

For each DCPMM, the CLI will indicate the status of the operation. If a failure occurs when modifying multiple DCPMMs, the process will exit and not continue modifying the remaining DCPMMs.

SAMPLE OUTPUT

```
Modify (Sensor) settings on DIMM (DimmID): Success
...
Modify (Sensor) settings on DIMM (DimmID): Error
(Code) -
(Description)
```

2.4.3. Show Device Performance

NAME

ipmctl-show-performance - Shows performance metrics for one or more DCPMMs

SYNOPSIS

```
ipmctl show [OPTIONS] -performance [METRICS]
[TARGETS]
```

DESCRIPTION

Shows performance metrics for one or more DCPMMs.

OPTIONS

-h

-help

Displays help for the command.

-o (text|nvmxml)

-output (text|nvmxml)

Changes the output format. One of: "text" (default) or "nvmxml".

METRICS

Restricts output to a specific performance metric by supplying the metric name. See RETURN DATA for more information. One of:

- MediaReads
- MediaWrites
- ReadRequests
- WriteRequests

- TotalMediaReads
- TotalMediaWrites
- TotalReadRequests
- TotalWriteRequests

The default is to display all performance metrics.

TARGETS

-dimm (DimmIDs)

Restricts output to the performance metrics for specific DCPMM by supplying one or more comma separated DCPMM identifiers. The default is to display performance metrics for all manageable DCPMM.

EXAMPLES

Shows all performance metrics for all DCPMMs in the server.

```
ipmctl show -dimm -performance
```

Shows the number of 64 byte reads since last AC cycle for all DCPMMs in the server.

```
ipmctl show -dimm -performance MediaReads
```

RETURN DATA

This command displays a table of the specified metrics for each specified DCPMM. Applying a specific DCPMM target limits the rows in the table. Applying a specific metric name target limits the columns in the table.

DimmID

The DCPMM identifier

MediaReads

Number of 64 byte reads from media on the DCPMM since last AC cycle.

MediaWrites

Number of 64 byte writes to media on the DCPMM since last AC cycle.

ReadRequests

Number of DDRT read transactions the DCPMM has serviced since last AC cycle.

WriteRequests

Number of DDRT write transactions the DCPMM has serviced since last AC cycle.

TotalMediaReads

Number of 64 byte reads from media on the DCPMM over its lifetime.

TotalMediaWrites

Number of 64 byte writes to media on the DCPMM over its lifetime.

TotalReadRequest

Number of DDRT read transactions the DCPMM has serviced over its lifetime.

TotalWriteRequest

Number of DDRT write transactions the DCPMM has serviced over its lifetime.

2.5. Persistent Memory Provisioning

During the initial provisioning of the Section [Memory Subsystem Provisioning] it is possible to allocate some or all of the available DCPMM capacity as persistent memory. If this was done, the result is one or more regions of persistent memory. The number of persistent memory regions depends on the platform configuration (e.g., is it a 2 socket or a 4 socket server) and the type of initial provisioning request.

Persistent memory provisioning is the process by which the capacity in available regions is partitioned and made available as a persistent memory device or "namespace" in the file system. Due to a number of factors there may be restrictions on the type, size and number of namespaces that can be created from a given region. The output of the command Show Persistent Memory includes information on about the persistent memory regions. FreeCapacity indicates the largest that can be created from a given region. A size of zero indicates that it's not possible to create that namespace type from the region whose output is being examined.

NOTE	If DCPMM is locked, then namespaces cannot be detected or displayed.
NOTE	Namespace management is not supported via ipmctl CLI in the Operating System (OS) environment. Native OS utilities must be used for namespace management. See the Intel® Optane™ DC Persistent Memory Help and User's Guide (document number 576369) for additional details on using the native OS utilities.

2.5.1. Show Persistent Memory

NAME

ipmctl-show-region - Retrieves a list of persistent memory regions

SYNOPSIS

```
ipmctl show [OPTIONS] -region [TARGETS]
```

DESCRIPTION

Retrieves a list of persistent memory regions of DCPMM capacity

OPTIONS

-a

-all

Shows all attributes.

NOTE	The all and display options are exclusive and may not be used together.

-d (attributes)

-display (attributes)

Filters the returned attributes by explicitly specifying a comma-separated list of any of the attributes defined in the Return Data section.

NOTE	The all and display options are exclusive and may not be used together.

-h

-help

Displays help for the command.

-o (text|nvmxml)

-output (text|nvmxml)

Changes the output format. One of: "text" (default) or "nvmxml".

-u (B|MB|MiB|GB|GiB|TB| TiB)

-units (B|MB|MiB|GB|GiB|TB| TiB)

Changes the units that capacities are displayed in for this command. One of: bytes (B), megabytes (MB), mebibytes (MiB), gigabytes (GB), gibibytes (GiB), terabytes (TB) or tebibytes (TiB).

TARGETS

-region (RegionIDs)

Restricts output to specific persistent memory regions by providing one or more comma separated region identifiers. The default is to display the persistent memory regions across all manageable DCPMMs.

-socket (SocketIDs)

Restricts output to the persistent memory regions on specific sockets by supplying the socket target and one or more comma-separated socket identifiers. The default is to display all sockets.

EXAMPLES

Shows all attributes of all persistent memory regions in the server.

```
ipmctl show -a -region
```

Shows all attributes for the specified persistent memory region.

```
ipmctl show -a -region 1
```

LIMITATIONS

All the underlying DCPMMs should be unlocked to accurately reflect the available capacities. The specified DCPMM(s) must be manageable by the host software.

RETURN DATA

The default behavior is to display a table with the default attributes listed below; applying options changes the output to a more detailed format.

ISetID

(Default) The region unique identifier. Also known as interleave set cookie.

PersistentMemoryType

(Default) A comma-separated list of the underlying type(s) of persistent memory capacity in the region. One or more of:

- AppDirect: App Direct capacity interleaved across two or more DCPMMs that is

fully mapped into the system physical address space.

- AppDirectNotInterleaved: App Direct capacity wholly contained on a single DCPMMs that is fully mapped into the system physical address space.

Capacity

(Default) Total usable capacity, both allocated and unallocated

FreeCapacity

(Default) Remaining usable capacity

SocketID

(Default) Socket ID to which the region belongs

HealthState

The rolled up health of the underlying DCPMMs. One of:

- Unknown: The region health cannot be determined.
- Healthy: All underlying DCPMM persistent memory capacity is available.
- Pending: A new memory allocation goal has been created but not applied. Reboot or delete any existing memory allocation goals before creating namespaces on the region.
- Error: There is an issue with some or all of the underlying DCPMM capacity because the interleave set has failed.
- Locked: One or more of the of the underlying DCPMMs are locked.

DimmID

A list of all the DIMMs that are part of this reg.

2.6. Support and Maintenance

2.6.1. Help

NAME

ipmctl-help - Shows help for the supported commands

SYNOPSIS

```
ipmctl help [OPTIONS]
```

DESCRIPTION

Shows help for the supported commands.

OPTIONS

-h

-help

Displays help for the command.

-o (text|nvmxml)

-output (text|nvmxml)

Changes the output format. One of: "text" (default) or "nvmxml".

EXAMPLES

Lists all supported commands

```
ipmctl help
```

RETURN DATA

The default behavior is to display an introduction to CLI followed by a list of the supported commands. To display detailed help for a specific command, use the help option with that specific command.

SAMPLE OUTPUT

```
ipmctl help
Commands:
(name)
(synopsis)
(name)
(synopsis)
(name)
(synopsis)
(name)
(synopsis)
...
```

2.6.2. Version

NAME

ipmctl-version - Shows the DCPMM host software versions

SYNOPSIS

```
ipmctl version [OPTIONS]
```

DESCRIPTION

Shows the DCPMM host software versions.

OPTIONS

-h

-help

Displays help for the command.

-o (text|nvmxml)

-output (text|nvmxml)

Changes the output format. One of: "text" (default) or "nvmxml".

EXAMPLES

Displays the available version information for the DCPMM software components.

```
ipmctl version
```

RETURN DATA

By default returns the following inventory information.

Component

The name of the software component. One of:

- [Product Name] Software Version: The DCPMM management software version
- [Product Name] Driver Version: The vendor specific DCPMM driver version

Version

The current version of the software component if found or an error if not.

NOTE	If the software version is incompatible, the version will be followed by an error message indicating such. If DCPMMs are found with a FIS implementation higher than supported by the SW version, this command will print a warning.

2.6.3. Show Device Firmware

NAME

ipmctl-show-firmware - Shows detailed information about the firmware

SYNOPSIS

```
ipmctl show [OPTIONS] -firmware [TARGETS]
```

DESCRIPTION

Shows detailed information about the firmware on one or more DCPMMs.

OPTIONS

-a

-all

Shows all attributes.

NOTE	The all and display options are exclusive and may not be used together.

-d (attributes)

-display (attributes)

Filters the returned attributes by explicitly specifying a comma-separated list of any of the attributes defined in the Return Data section.

NOTE	The all and display options are exclusive and may not be used together.

-h

-help

Displays help for the command.

-o (text|nvmxml)

-output (text|nvmxml)

Changes the output format. One of: "text" (default) or "nvmxml".

TARGETS

-dimm (DimmIDs)

Restricts output to the firmware information for specific DCPMMs by supplying one or more comma-separated DCPMM identifiers. The default is to display the firmware information for all manageable DCPMMs.

EXAMPLES

Shows the firmware information for all DCPMMs in the server.

```
ipmctl show -dimm -firmware
```

LIMITATIONS

The specified DCPMM(s) must be manageable by the host software.

RETURN DATA

The default behavior is to display a table with the default attributes listed below; the options can be used to expand or restrict the output.

DimmID

(Default) The DCPMM identifier

ActiveFWVersion

(Default) The BCD-formatted revision of the active firmware in the format PN.RN.SV.bbbb where:

- PN = 2-digit product number
- RN = 2-digit revision number
- SV = 2-digit security version number
- bbbb = 4-digit build version

StagedFWVersion

(Default) The BCD-formatted revision of the firmware staged for execution on the next power cycle in the format PN.RN.SV.bbbb where:

- PN = 2-digit product number

- RN = 2-digit revision number
- SV = 2-digit security version number
- bbbb = 4-digit build version

FWUpdateStatus

The status of the last firmware update operation. One of:

- Unknown
- Staged successfully
- Update loaded successfully
- Update failed to load, fell back to previous firmware

FWImageMaxSize

The maximum size of a firmware image

2.6.4. Update Firmware

NAME

ipmctl-update-firmware - Updates the firmware on one or more DCPMMs

SYNOPSIS

```
ipmctl load [OPTIONS] -source (path) -dimm
(DimmIds) [TARGETS]
```

DESCRIPTION

Updates the firmware on one or more DCPMMs. On the next power cycle, the firmware will become active.

NOTE	If Address Range Scrub (ARS) is in progress on any target DIMM, an attempt will be made to abort ARS and the proceed with the firmware update.

NOTE	A reboot is required to activate the updated firmware image and is recommended to ensure ARS runs to completion.

OPTIONS

-x

-examine

Verifies the target DIMM is compatible with and ready to receive the recovery firmware image specified in the source option. Return the recovery firmware image version.

-f

-force

Downgrading the firmware to an older version is a potentially destructive operation which requires confirmation from the user for each DCPMM. This option suppresses the confirmation when attempting to downgrade.

-h

-help

Displays help for the command.

-o (text|nvmxml)

-output (text|nvmxml)

Changes the output format. One of: "text" (default) or "nvmxml".

TARGETS

-dimm (DimmIDs)

Updates the firmware on specific DCPMMs by supplying one or more comma-separated DCPMM identifiers. However, this is not recommended as it may put the system in an undesirable state. The default is to update all manageable DCPMMs.

EXAMPLES

Updates the firmware on all DCPMMs in the system to the image in sourcefile.pkg on the next power cycle.

```
ipmctl load -source sourcefile.pkg -dimm
```

Checks the firmware image in c:\sourcefile.pkg and retrieve the version.

```
ipmctl load -examine -source sourcefile.pkg -dimm
```

LIMITATIONS

The specified DCPMM(s) must be manageable by the host software.

Firmware version (PN.RN.SV.bbbb) updates are supported as follows:

- The product number (PN) cannot be changed.
- The revision number (RN) can be upgraded when PN is the same.
- The security revision number (SV) can be upgraded when PN.RN is the same. In some configurations it can also be downgraded when PN.RN is the same; use the examine option to determine if the security revision number can be downgraded.
- The build number (bbbb) can be upgraded or downgraded. However, if the firmware API version in the firmware image is lower than is supported by the host software and would make the DCPMM become unmanageable, the downgrade is not supported.

NOTE	Once a firmware image is staged for execution, a power cycle is required before another firmware image of the same type (production or debug) can be staged for execution using this command.

RETURN DATA

When the examine option is provided, the firmware image is checked and the version number and firmware type is provided. The firmware will either be valid for the DCPMM, a downgrade or invalid meaning it cannot be used for that DCPMM.

SAMPLE OUTPUT

```
(file path): MM.mm.hh.bbbb
Load FW on DIMM (DimmID): (Valid|Downgrade) [(with
confirmation or the force option)]
```

If the firmware is being downgraded and the force option is not provided, the user will be prompted to confirm the downgrade for each DCPMM. Otherwise, for each DCPMM, the CLI will indicate the status of the operation.

```
Downgrade firmware on DIMM (DimmID)? (y or [n])
Downgrade firmware
on DIMM (DimmID)? (y or [n])
...
```

If a failure occurs when updating multiple DCPMMs, the process will continue attempting to update the remaining DCPMMs requested. The firmware will not become active until the next power cycle. Use the command Section Show Device Firmware to view more detailed information about the active and staged firmware.

```
Load FW on DIMM (DimmID): Success, a power cycle is
required to
activate the FW.
Load FW on DIMM (DimmID): Success, a power cycle is
required to
activate the FW.
…
Load FW on DIMM (DimmID): Error (Code) -
(Description)
```

2.6.5. Show Preferences

NAME

ipmctl-show-preferences - Displays a list of the DCPMM software user preferences

SYNOPSIS

```
ipmctl show [OPTIONS] -preferences
```

DESCRIPTION

Displays a list of the DCPMM software user preferences and their current values.

OPTIONS

-h

-help

Displays help for the command.

-o (text|nvmxml)

-output (text|nvmxml)

Changes the output format. One of: "text" (default) or "nvmxml".

EXAMPLES

Displays the current values for all the user preferences

```
ipmctl show -preferences
```

RETURN DATA

CLI_DEFAULT_DIMM_ID

The default display of DCPMM identifiers. One of:

- UID: Use the DimmUID attribute as defined in the command Show Device.
- HANDLE: Use the DimmHandle attribute as defined in the command Show Device. This is the default.

CLI_DEFAULT_SIZE

The default display of capacities in the CLI. One of:

- AUTO: Automatically choose the best format for each capacity in binary multiples of bytes (i.e., B, MiB, GiB or TiB). This is the default.
- AUTO_10: AUTO_10: Automatically choose the best format for each capacity in decimal multiples of bytes (i.e., B, MB, GB or TB).
- B: Displays all capacities in bytes.
- MB: Displays all capacities in megabytes.
- MiB: Displays all capacities in mebibytes.
- GB: Displays all capacities in gigabytes.
- GiB: Displays all capacities in gibibytes.
- TB: Displays all capacities in terabytes.
- TiB: Displays all capacities in tebibytes.

PERFORMANCE_MONITOR_ENABLED

Whether or not the monitor is periodically storing performance metrics for the DCPMMs in the host server. One of:

- 0: Disabled
- 1: Enabled. This is the default.

PERFORMANCE_MONITOR_INTERVAL_MINUTES

The interval in minutes that the monitor is retrieving and storing performance metrics (if enabled). The default value is 180 minutes.

EVENT_MONITOR_ENABLED

Whether or not the monitor is periodically checking for DCPMM events. One of:

- 0: Disabled
- 1: Enabled. This is the default.

EVENT_MONITOR_INTERVAL_MINUTES

The interval in minutes that the monitor is checking for and storing DCPMM events (if enabled). The default value is 1 minute.

EVENT_LOG_MAX

The maximum number of events to keep in the management software. The default value is 0, which indicates no limit.

DBG_LOG_MAX

The maximum number of debug log entries to keep in the management software. The default value is 0, which indicates no limit.

APPDIRECT_SETTINGS

The interleave settings to use when creating App Direct capacity in the format: (IMCSize_ChannelSize). The default is "RECOMMENDED" which uses the BIOS recommended App Direct settings returned by the command Show System Capabilities.

APPDIRECT_GRANULARITY

The minimum App Direct granularity per DCPMM supported by the command Create Memory Allocation Goal. One of:

- RECOMMENDED: Use the recommended App Direct granularity of 32 GiB.
- 1: Allows 1 GiB App Direct granularity which may result in App Direct region sizes that are not recommended.

DBG_LOG_LEVEL

Whether debug logging is enabled in the DCPMM host software. These logs pertain to the operation of the command-line tool only and do not reflect any logging functionality of the DCPMM. One of:

- 0: Logging is disabled. This is the default.
- 1: Log Errors.
- 2: Log Warnings, Errors.
- 3: Log Informational, Warnings, Errors.
- 4: Log Verbose, Informational, Warnings, Errors.

2.6.6. Change Preferences

NAME

ipmctl-change-preferences - Modifies one or more user preferences

SYNOPSIS

```
ipmctl set [OPTIONS] -preferences [PROPERTIES]
```

DESCRIPTION

Modifies one or more user preferences in the DCPMM software.

OPTIONS

-h

-help

Displays help for the command.

-o (text|nvmxml)

-output (text|nvmxml)

Changes the output format. One of: "text" (default) or "nvmxml".

PROPERTIES

CLI_DEFAULT_DIMM_ID

The default display of DCPMM identifiers. One of:

- "UID": Use the DimmUID attribute as defined in the section ***Show Device***.
- "HANDLE": Use the DimmHandle attribute as defined in section ***Show Device***. This is the default

CLI_DEFAULT_SIZE

The default display of capacities in the CLI. One of:

- "AUTO": Automatically choose the best format for each capacity in binary multiples of bytes (i.e., B, MiB, GiB or TiB). This is the default.
- "AUTO_10": Automatically choose the best format for each capacity in decimal multiples of bytes (i.e., B, MB, GB or TB).
- "B": Displays all capacities in bytes.
- "MB": Displays all capacities in megabytes.
- "MiB": Displays all capacities in mebibytes.
- "GB": Displays all capacities in gigabytes.

- "GiB": Displays all capacities in gibibytes.
- "TB": Displays all capacities in terabytes.
- "TiB": Displays all capacities in tebibytes.

APPDIRECT_SETTINGS

The interleave settings to use when creating App Direct capacity in the format: (IMCSize_ChannelSize). Must be one of the BIOS supported App Direct settings returned by the command ***Show System Capabilities***.

NOTE	ByOne is not a valid setting for this preference. The default is "RECOMMENDED" which uses the BIOS recommended App Direct settings.

NOTE	The same interleave settings are used for all the App Direct capacity in the system. Therefore, if any App Direct capacity already exists, this preference cannot be changed.

APPDIRECT_GRANULARITY

The minimum App Direct granularity per DCPMM supported by the command ***Create Memory Allocation Goal***. One of:

- "RECOMMENDED": Use the recommended App Direct granularity of 32 GiB.
- "1": Allows 1 GiB App Direct granularity which may result in App Direct region sizes that are not recommended.

PERFORMANCE_MONITOR_ENABLED

Whether or not the monitor is periodically storing performance metrics for the DCPMMs in the host server. One of:

- "0": Disable performance monitoring.
- "1": Enable performance monitoring. This is the default.

PERFORMANCE_MONITOR_INTERVAL_MINUTES

The interval in minutes that the monitor is storing performance metrics (if enabled). The default value is 180 minutes and must be >= 1.

EVENT_MONITOR_ENABLED

Whether or not the monitor is periodically checking for DCPMM events.

- "0": Disable event monitoring.
- "1": Enable event monitoring. This is the default.

EVENT_MONITOR_INTERVAL_MINUTES

The interval in minutes that the monitor is checking for DCPMM events (if enabled). The default value is 1 minutes and must be >= 1.

EVENT_LOG_MAX

The maximum number of events to keep in the management software. The default value is 0 (no limit). The valid range is 0 - 2,147,483,647.

DBG_LOG_MAX

The maximum number of debug log entries to keep in the management software. The default value is 0 (no limit). The valid range is 0 - 2,147,483,647.

DBG_LOG_LEVEL

Whether debug logging is enabled in the DCPMM host software. These logs pertain to the operation of the command-line tool only and do not reflect any logging functionality of the DCPMM. One of:

- "0": Logging is disabled. This is the default.
- "1": Log Errors.
- "2": Log Warnings, Errors.
- "3": Log Informational, Warnings, Errors.
- "4": Log Verbose, Informational, Warnings, Errors.

EXAMPLES

Use DimmUID as the default DCPMM identifier, and display all capacities in bytes.

```
ipmctl set -preferences CLI_DEFAULT_DIMM_ID=UID
CLI_DEFAULT_SIZE=B
```

RETURN DATA

Returns the status of the operation.

SAMPLE OUTPUT

```
Set (Property)=(Value): Success|Error (Code)-
(Description)
...
```

2.6.7. Show Host Server

NAME

ipmctl-show-host - Shows basic information about the host server

SYNOPSIS

```
ipmctl show [OPTIONS] -system -host
```

DESCRIPTION

Shows basic information about the host server.

OPTIONS

-a

-all

Shows all attributes.

NOTE	The all and display options are exclusive and may not be used together.

-d (attributes)

-display (attributes)

Filters the returned attributes by explicitly specifying a comma-separated list of any of the attributes defined in the Return Data section.

NOTE	The all and display options are exclusive and may not be used together.

-h

-help

Displays help for the command.

-o (text|nvmxml)

-output (text|nvmxml)

Changes the output format. One of: "text" (default) or "nvmxml".

EXAMPLES

Lists a few key fields for the server.

```
ipmctl show -system -host
```

Displays the host server operating system name.

```
ipmctl show -d osname -system -host
```

RETURN DATA

The default behavior is to return the default attributes listed below; the options can be used to expand or restrict the output.

Name

(Default) The server name

OsName

(Default) The operating system

OsVersion

(Default) The operating system version

MixedSKU

(Default) One or more DCPMMs in the system have different SKUs. One of:

- 0: False
- 1: True - In this case, the host software operates in a read-only mode and does not allow changes to the DCPMMs and their associated capacity.

SKUViolation

(Default) One or more DCPMMs in the system has an unsupported configuration due to a license issue. One of:

- 0: False
- 1: True - In this case, the host software operates in a read-only mode and does not allow changes to the DCPMMs and their associated capacity.

2.6.8. Dump Support Data

NAME

ipmctl-dump-support-data - Dumps a support snapshot to a file

SYNOPSIS

```
ipmctl dump [OPTIONS] -destination (file_prefix) [-
dict (file)] -support
```

DESCRIPTION

Creates a support snapshot and dump support data to a file for off-line analysis by support personnel. Support data may include system log(s), error log(s), trace log(s), platform configuration, sensor information, events and diagnostic results.

Commands executed: * version * show -memoryresources * show -a -system -capabilities * show -a -topology * start -diagnostic * show -event * show -system

Commands executed per DCPMM: * show -a -dimm * show -a -sensor -dimm * show -pcd -dimm * show -error media -dimm * show -error thermal -dimm

OPTIONS

-h

-help

Displays help for the command.

-o (text|nvmxml)

-output (text|nvmxml)

Changes the output format. One of: "text" (default) or "nvmxml".

TARGET

-destination (file_prefix)

This command creates a text file with a name starting with the given file_prefix option and dumps the platform support information into it. In addition, this command also outputs the debug log information in separate files. Refer to ***Dump Debug Log*** for more details.

-dict (path)

Optional file path to the dictionary file. If supplied, the command will create both the binary debug log and a text file with decoded log data with the file prefix specified by -destination. This option is used only to dump the debug log information.

EXAMPLES

Creates a text file named dumpfile_platform_support_info.txt and stores the platform

supported data in that file. Also, dumps the debug log info in the related files that start with the file name dumpfile_*. Refer to ***Dump Debug Log*** for more info on the output files.

```
ipmctl dump -destination dumpfile_ -dict
nlog_dict.1.1.0.0000.txt -support
```

RETURN DATA

Simply returns the status of the operation.

SAMPLE OUTPUT

Dump support data succesfully written to dumpfile_platform_support_info.txt

2.6.9. Show Events

NAME

ipmctl-show-events - Shows DCPMM related events

SYNOPSIS

```
ipmctl show [OPTIONS] -event [TARGETS] [PROPERTIES]
```

DESCRIPTION

Shows DCPMM related events. The options, targets, and properties can be used to filter the events. If no filters are provided, the default is to display up to 50 events. Refer to the Event Log Specification for detailed information about events.

OPTIONS

-h

-help

Displays help for the command.

-o (text|nvmxml)

-output (text|nvmxml)

Changes the output format. One of: "text" (default) or "nvmxml".

TARGETS

-dimm [(DimmID)]

Filter output to events on a specific DCPMM by optionally supplying the dimm target and one DCPMM identifier.

PROPERTIES

Category

Filters output to events of a specific category. One of:

- "Diag": Filters output to diagnostic events.
- "FW": Filters output to FW consistency diagnostic test events.
- "Config": Filters output to platform config diagnostic test events.
- "PM": Filters output to PM meta data diagnostic test events.
- "Quick": Filters output to quick diagnostic test events.
- "Security": Filters output to security diagnostic test events.
- "Health": Filters output to device health events.
- "Mgmt": Filters output to management software generated events.

Severity

Filters output of events based on the severity of the event. One of:

- "Info": (Default) Shows informational, warning, and error severity events.
- "Warning": Shows warning and error events.
- "Error": Shows error events.

ActionRequired

Filters output to events that require corrective action or acknowledgment.

- "0": Filters output to only show non-ActionRequired events.
- "1": Filters output to only show ActionRequired events.

Count

Filters output of events limited to the specified count, starting with the most recent. Count may be a value from 1 to 2,147,483,647. Default = 50.

EXAMPLES

Displays the 50 most recent events.

```
ipmctl show -event
```

Shows the 10 most recent error events.

```
ipmctl show -event count=10 severity=error
```

RETURN DATA

This command displays a table with a row for each event matching the provided filters, showing most recent first.

Time

Time of the event in the format MM:dd:yyyy:hh:mm:ss.

EventID

The event identifier

Severity

The severity of the event

ActionRequired

A flag indicating that the event requires corrective action or acknowledgment. One of:

- 0: A action is not required.
- 1: An action is required.

Code

The event code defined by the SW Event Log specification

Message

The event message

2.6.10. Acknowledge Event

NAME

ipmctl-acknowledge-event - Turns off the flag that signals a corrective action on an event SYNOPSIS

```
[verse]
ipmctl set [OPTIONS] -event (EventID) ActionRequired=(0)

DESCRIPTION
-----------
Turns off the flag that signals a corrective action on an event. Refer to
the
Event Log Specification for detailed information about individual events.

OPTIONS
-------
-h::
-help::
  Displays help for the command.

-o (text|nvmxml)::
-output (text|nvmxml)::
  Changes the output format. One of: "text" (default) or "nvmxml".

TARGETS
-------
-event::
  The identifier of the event to be acknowledged

PROPERTIES
----------
ActionRequired::
  A flag indicating whether the event needs a corrective action or
  acknowledgment. One of:
  - "0": Disable the action required flag.

EXAMPLES
```

ipmctl set -event 1 ActionRequired=0

LIMITATIONS

An event can be acknowledged only if the action required flag is currently set.

RETURN DATA

Simply returns the status of the operation. Sample output:

```
Acknowledge Event: Success|Error (Code) -
(Description)
```

2.7. Debug

2.7.1. Run Diagnostic

NAME

ipmctl-run-diagnostic - Runs a diagnostic test

SYNOPSIS

```
ipmctl start [OPTIONS] -diagnostic
(Quick|Config|Security|FW) -dimm(DIMMIDs)
```

DESCRIPTION

Runs a diagnostic test.

OPTIONS

-h

-help

Displays help for the command.

-o (text|nvmxml)

-output (text|nvmxml)

Changes the output format. One of: "text" (default) or "nvmxml".

TARGETS

-diagnostic (Quick|Config|Security|FW)

Run a specific test by supplying its name. By default all tests are run. One of:

- "Quick" - This test verifies that the DCPMM host mailbox is accessible and that basic health indicators can be read and are currently reporting acceptable values.
- "Config" - This test verifies that the BIOS platform configuration matches the installed hardware and the platform configuration conforms to best known practices.

- "Security" - This test verifies that all DCPMMs have a consistent security state. It's a best practice to enable security on all DCPMMs rather than just some.
- "FW" - This test verifies that all DCPMMs of a given model have consistent FW installed and other FW modifiable attributes are set in accordance with best practices.
  Note that the test does not have a means of verifying that the installed FW is the optimal version for a given DCPMM model just that it's been consistently applied across the system.

-dimm [(DimmIDS)]

Runs a diagnostic test on specific DCPMMs by optionally supplying one or more comma-separated DCPMM identifiers. The default is to run the specified tests on all manageable DCPMMs. Only valid for the Quick diagnostic test.

EXAMPLES

Runs all diagnostics.

```
ipmctl start -diagnostic
```

Runs the quick check diagnostic on DCPMM 0x0001

```
ipmctl start -diagnostic Quick -dimm 0x0001
```

LIMITATIONS

If a DCPMM is unmanageable, then Quick test will report the reason, while Config, Security and FW tests will skip unmanageable DCPMMs.

RETURN DATA

Each diagnostic generates one or more log messages. A successful test generates a single log message per DCPMM indicating that no errors were found. A failed test might generate multiple log messages each highlighting a specific error with all the relevant details. Each log contains the following information.

TestName

The test name. One of:

- "Quick"
- "Config"
- "Security"
- "FW"

State

The severity of the error. One of:

- "Ok"
- "Warning"
- "Failed"
- "Aborted"

```
NOTE: State is promoted to the highest severity result from the test
group.
```

Message

A free form textual description of the error.

2.7.2. Show Error Log

NAME

ipmctl-show-error-log - Shows thermal or media errors on the specified DCPMMs

SYNOPSIS

```
ipmctl show [OPTIONS] -error (Thermal|Media)
[TARGETS] [PROPERTIES]
```

DESCRIPTION

Shows thermal or media errors on the specified DCPMMs.

OPTIONS

-h

-help

Displays help for the command.

-o (text|nvmxml)

-output (text|nvmxml)

Changes the output format. One of: "text" (default) or "nvmxml".

TARGETS

-dimm (DimmIDs)

Filter output to events on a specific DCPMM by supplying the dimm target and one DCPMM identifier.

PROPERTIES

SequenceNumber

Error log entries are stored with a sequence number starting with 1 and rolling over back to 1 after 65535. Limit the error log entries returned by providing a sequence number. Only errors with a sequence number equal to or higher than provided will be returned. The default is 1.

Level

Severity level of errors to be fetched. One of:

- "High": High severity errors (Default)
- "Low": Low severity errors

Count

Max number of error entries to be fetched and printed. The default is 8 for media errors and 16 for thermal errors.

EXAMPLES

Show all high thermal error log entries

```
ipmctl show -error Thermal Level=High
```

Show all low media error log entries

```
ipmctl show -error Thermal Level=High
```

LIMITATIONS

To successfully execute this command, the specified DCPMM(s) must be manageable by the host software.

RETURN DATA

Prints errors of the specified type for the specified DCPMMs. If no errors are found, the following message will be printed:

```
No errors found on DIMM (DimmID)
```

SAMPLE OUTPUT

```
Thermal Error occurred on Dimm (DimmID):
System Timestamp : 1527273299
Temperature : 88C
Reported : 4 - Critical
Temperature Type : 0 - Media Temperature
Sequence Number : 1
```

```
Media Error occurred on Dimm (DimmID):
System Timestamp : 1527266471
DPA : 0x000014c0
PDA : 0x00000600
Range : 4B
Error Type : 4 - Locked/Illegal Access
Error Flags : DPA Valid
Transaction Type : 11 - CSR Write
Sequence Number : 2
```

2.7.3. Dump Debug Log

NAME

ipmctl-dump-debug-log - Dumps encoded firmware debug logs from specified DCPMMs and optionally decodes to human readable text.

SYNOPSIS

```
ipmctl dump [OPTIONS] -destination (file_prefix) [-
dict (file)] -debug -dimm (DimmIDs) [PROPERTIES]
```

DESCRIPTION

Dumps encoded firmware debug logs from specified DCPMMs and optionally decodes to human readable text.

OPTIONS

-h

-help

Displays help for the command.

TARGET

-destination (file_prefix)

The command will create files that use the given filename as a prefix and append the DCPMM UID, DCPMM handle, debug log source, and the appropriate file type (.bin for encoded logs, .txt for decoded logs) onto the end.

```
file_prefix_Uid_Handle_logsource.[bin,txt]
```

-dict (path)

Optional file path to the dictionary file. If supplied, the command will create both the binary debug log and a text file with decoded log data with the file prefix specified by -destination.

-dimm (DimmIDs)

Dumps the debug logs from the specified DCPMMs.

EXAMPLES

Dumps and decodes the debug log from DCPMM 0x0001 and 0x0011 using the dictionary file.

```
ipmctl dump -destination file_prefix -dict
nlog_dict.txt -debug -dimm 0x0001,0x0011
```

LIMITATIONS

To successfully execute this command, the specified DCPMM(s) must be manageable by the host software.

RETURN DATA

Dumps the encoded and optionally decoded contents of all 3 firmware debug log sources for the specified DCPMMs. Output file names are generated based on the -destination parameter above.

SAMPLE OUTPUT

```
Dumped media FW debug logs to file
(file_prefix_8089-A1-1816-
00000016_0x0001_media.bin)
Decoded 456 records to file (file_prefix_8089-A1-
1816-00000016_0x0001_media.txt)
No spi FW debug logs found
```

2.7.4. Show ACPI Tables

NAME

ipmctl-show-acpi - Shows the system ACPI tables related to the DCPMMs

SYNOPSIS

```
ipmctl show [OPTIONS] -system (NFIT|PCAT|PMTT)
```

DESCRIPTION

Shows the system ACPI tables related to the DCPMMs in the system.

OPTIONS

-h

-help

Displays help for the command.

TARGETS

-system (NFIT|PCAT|PMTT)

The system ACPI table(s) to display. By default both the NFIT and PCAT tables are displayed. One of:

- "NFIT" - The NVDIMM Firmware Interface Table
- "PCAT" - The Platform Capabilities Table
- "PMTT" - The Platform Memory Topology Table

Refer to the ACPI specification for detailed information about the ACPI tables.

EXAMPLES

Show the ACPI NFIT

```
ipmctl show -system NFIT
```

RETURN DATA

Returns the formatted data from the requested ACPI tables and their sub-tables. Refer to the ACPI specification for detailed information about the format of the ACPI tables.

NOTE All data is presented in ACPI little endian format.

2.7.5. Show Device Platform Configuration Data

NAME

ipmctl-show-pcd - Shows the platform configuration data for one or more DCPMMs

SYNOPSIS

```
ipmctl show [OPTIONS] -dimm (DimmIds) -pcd
(Config|LSA)
```

DESCRIPTION

Shows the platform configuration data for one or more DCPMMs.

OPTIONS

-h

-help

Displays help for the command.

TARGETS

-dimm (DimmIDs)

Restricts output to the platform configuration data on specific DCPMMs by supplying one or more comma-separated DCPMM identifiers. The default is to display the platform configuration data for all manageable DCPMMs.

-pcd (Config|LSA)

Restricts output to a specific partition of the platform configuration data. The default is to display both. One of:

- Config - Configuration management information
- LSA - Namespace label storage area

EXAMPLES

Shows the configuration information from the platform configuration data for all

manageable DCPMMs.

```
ipmctl show -dimm -pcd
```

Shows the configuration information from the platform configuration data for DCPMM 0x1.

```
ipmctl show -dimm -pcd Config
```

LIMITATIONS

The specified DCPMM(s) must be manageable by the host software.

RETURN DATA

Returns the formatted data from the requested platform configuration data for the specified DCPMMs for debugging and troubleshooting purposes.

2.7.6. Delete Device Platform Configuration Data

NAME

ipmctl-delete-pcd - Clears select partition data from the PCD

SYNOPSIS

```
ipmctl delete [OPTIONS] -dimm (DimmIds) -pcd
(Config)
```

DESCRIPTION

When Config is specified, the Current, Input, and Output Data Size and Start Offset values in the Configuration header are set to zero, making those tables invalid.

NOTE	When Config is specified, only PCD partition 1 is modified. If the platform is rebooted prior to creating a new goal on any targeted DCPMMs, UEFI platform firmware will detect the missing tables and, if possible, restore previous config using the PCD partition 0 tables.

NOTE	This action can be useful when moving DCPMMs from one system to another, as goal creation rules may restrict provisioning dimms with an existing configuration. Deleting the PCD can be used as a way to prepare a DCPMM for provisioning with the create -goal or load -goal commands by clearing existing configuration metadata. This allows the DCPMM to be provisioned in isolation using the create-goal command with the -dimm option. Once the PCD has been deleted a new goal should be created before rebooting.
WARNING	**This command may result in data loss. Data should be backed up to other storage before executing this command. Because of data dependencies, other commands may be affected until the system has been rebooted**.

OPTIONS

-f

-force

Deleting the PCD data is a destructive operation which requires confirmation from the user for each DCPMM. This option suppresses the confirmation.

-h

-help

Displays help for the command.

TARGETS

-dimm (DimmIDs)

Deletes the PCD data on specific DCPMMs by supplying one or more comma-separated DCPMM identifiers. The default is to delete the PCD data for all manageable DCPMMs.

-pcd Config

Clears the configuration management information

EXAMPLES

Clears the Cin, Cout, Ccur tables from all manageable DCPMMs

```
delete -dimm -pcd Config
```

LIMITATIONS

The specified DCPMM(s) must be manageable by the host software, and if data-at-rest security is enabled, the DCPMMs must be unlocked. Any existing namespaces associated with the requested DCPMM(s) should be deleted before running this command.

RETURN DATA

For each DCPMM, the CLI will indicate the status of the operation. If a failure occurs when deleting the platform configuration data from multiple DCPMMs, the process will continue deleting the remaining DCPMMs.

2.7.7. Inject Error

NAME

ipmctl-inject-error - Injects an error or clears a previously injected error

SYNOPSIS

```
ipmctl set [OPTIONS] -dimm (DimmIDs) [PROPERTIES]
```

DESCRIPTION

Injects an error or clears a previously injected error on one or more DCPMM for testing purposes.

OPTIONS

-h

-help

Displays help for the command.

-o (text|nvmxml)

-output (text|nvmxml)

Changes the output format. One of: "text" (default) or "nvmxml".

TARGETS

-dimm (DimmIDS)

Injects or clears an error on specific DCPMMs by supplying one or more comma separated DCPMM identifiers. The default is to inject the error on all manageable

DCPMMs.

PROPERTIES

This command only supports setting or clearing one type of error at a time.

Clear

- "1": Clears a previously injected error. This property must be combined with one of the other properties indicating the previously injected error to clear.

Temperature

Injects an artificial media temperature in degrees Celsius into the DCPMM. The firmware that is monitoring the temperature of the DCPMM will then be alerted and take necessary precautions to preserve the DCPMM. The value is injected immediately and will override the firmware from reading the actual media temperature of the device and use this value instead which may cause adverse reactions by the firmware and result in an alert or log.
Note: The injected temperature value will remain until the next reboot or it is cleared. The media temperature is an artificial temperature and will not cause harm to the part. Although firmware actions due to improper temperature injections may cause adverse effects on the DCPMM. If the Critical Shutdown Temperature, or higher, is passed in, this may cause the DCPMM firmware to perform a shutdown in order to preserve the part and data. The temperature value will be ignored on clear.

Poison

The physical address to poison.
Note: The address must be 256 byte aligned (e.g., 0x10000000, 0x10000100, 0x10000200...).
Poison is not possible for any address in the PM region if the PM region is locked. Injected poison errors are only triggered on a subsequent read of the poisoned address in which case an error log will be generated by the firmware, but no alerts will be sent.
This command can be used to clear non-injected poison errors. The data will be zero'd after clearing. There is no requirement to enable error injection prior to request to clear poison errors.
The caller is responsible for keeping a list of injected poison errors, in order to properly clear the injected errors afterwards. Simply disabling injection does not clear injected poison errors. Injected poison errors are persistent across power cycles and system resets.

PoisonType

The type of memory to poison. One of:

- "PatrolScrub": Injects a poison error at the specified address simulating an error found during a patrol scrub operation indifferent to how the memory is currently allocated, This is the default.
- "MemoryMode": Injects a poison error at the specified address currently allocated in Memory Mode.
- "AppDirect": Injects a poison error at the specified address currently allocated as App Direct.
  Note: If the address to poison is not currently allocated as the specified memory type, an error is returned.

PackageSparing

- "1": Triggers an artificial package sparing. If package sparing is enabled and the DCPMM still has spares remaining, this will cause the firmware to report that there are no spares remaining.

PercentageRemaining

Injects an artificial module life remaining percentage into the DCPMM. This will cause the firmware to take appropriate action based on the value and if necessary generate an error log and an alert and update the health status.

FatalMediaError

- "1": Injects a fake media fatal error which will cause the firmware to generate an error log and an alert.

```
NOTE: When media fatal error is injected, BSR Media Disabled status
bit will be set indicating media error, until the fatal error is
cleared using disable trigger input parameter to clear this injected
fatal error.
```

```
NOTE: Injecting a Fatal Media error is unsupported on Windows.
Please
contact Microsoft for assistance in performing this action.
```

DirtyShutdown

- "1": Injects an ADR failure resulting in dirty shutdown upon reboot.

EXAMPLES

Sets the media temperature on all manageable DCPMMs to 100 degrees Celsius.

```
ipmctl set -dimm Temperature=100
```

Clears the injected media temperature on all manageable DCPMMs.

```
ipmctl set -dimm Clear=1 Temperature=1
```

Poison address 0x10000200 on DCPMM 1234.

```
ipmctl set -dimm 1234 Poison=0x10000200
```

Clears the injected poison of address 0x10000200 on DCPMM 1234.

```
ipmctl set -dimm 1234 Poison=0x10000200 Clear=1
```

Triggers an artificial package sparing on all manageable DCPMMs.

```
ipmctl set -dimm PackageSparing=1
```

Sets the life remaining percentage on all manageable DCPMMs to 10%.

```
ipmctl set -dimm PercentageRemaining=10
```

Clears the injected remaining life percentage on all manageable DCPMMs. The value of PercentageRemaining is irrelevant.

```
ipmctl set -dimm PercentageRemaining=10 Clear=1
```

Triggers an artificial ADR failure on all manageable DCPMM s resulting in a dirty shutdown on each DCPMM on the next reboot.

```
ipmctl set -dimm DirtyShutdown=1
```

LIMITATIONS

This command is available only when error injection is enabled on the DCPMM(s) in the BIOS. To successfully execute this command, the specified DCPMM(s) must be manageable by the host software.

RETURN DATA

For each DCPMM, the CLI will indicate the status of the operation. If a failure occurs when injecting an error on multiple DCPMMs, the process will continue with the remaining DCPMMs.

SAMPLE OUTPUT

```
Set temperature on DCPMM (DimmID): Success|Error
(Code) -
(Description)
Clear injected temperature on DCPMM (DimmID):
Success|Error
(Code) - (Description)
…
Poison address (Address) on DCPMM (DimmID):
Success|Error
(Code) - (Description)
Clear injected poison of address (Address) on DCPMM
(DimmID): Success|Error (Code) - (Description)
…
Trigger package sparing on DCPMM (DimmID):
Success|Error
(Code) - (Description)
Clear injected package sparing on DCPMM (DimmID):
Success|Error (Code) - (Description)
…
Trigger a spare capacity alarm on DCPMM (DimmID):
Success|Error (Code) - (Description)
Clear injected spare capacity alarm on DCPMM
(DimmID):
Success|Error (Code) - (Description)
…
Create a media fatal error on DCPMM (DimmID):
Success|Error
(Code) - (Description)
Clear injected media fatal error on DCPMM (DimmID):
Success|Error (Code) - (Description)
```