**Intel® PMWatch**

**User Guide**

Contents

[Introduction 3](#_Toc20245868)

[Tool Usage 3](#_Toc20245869)

[Collecting Data 3](#_Toc20245870)

[Overview 3](#_Toc20245871)

[Options 3](#_Toc20245872)

[Explanation of metrics 4](#_Toc20245873)

[Memory Performance 4](#_Toc20245874)

[Health Information 6](#_Toc20245875)

# Introduction

Intel® PMWatch (PersistentMemoryWatch) is a tool that monitors and reports the behavior of the Intel® Optane™ DC persistent memory.

# Tool Usage

## Collecting Data

### Overview

pmwatch "<sampling interval>" "<number of samples>" [-hi] -f outputfile.csv

Example: "pmwatch 1 100 [-hi]" reads the counters every 1 second (provides the delta) 100 times. If -hi is given, it will collect health information.

The default metrics provided are memory performance metrics.

### Options

This section explains options provided by the tool.

##### DCPMM DIMM Topology

Use the following command to obtain the version information and DCPMM DIMM memory topology.

pmwatch -a

##### Indefinite Run

###### Default Duration

Use the following command to run indefinitely with a default collection time of 1 second.

pmwatch 1

Use the following command to stop the collection: pmwatch-stop

###### User Defined Duration

pmwatch “<sampling interval>” 0

Example: “pmwatch 1 0” reads the counters every 1 second indefinitely

##### Lifetime Count Snapshot

Use the “-l” option to view the lifetime count snapshot of memory performance metrics.

pmwatch -l

#### Additional Options

##### Health Information

Use the option “-hi/--health-info” to collect health information instead of memory performance. The explanation of the health information are available [here](#_Health_Information).

##### Output Format

There are 2 output formats available with PMWatch, the default format and metric grouping format.

In default format, the grouping is based on DIMMs. The metrics associated with a DIMM are grouped together.

In metric grouping format, the metrics are grouped based on the hardware topology.

Use the option “-g/--group-metrics-format” to obtain the output in metric grouping format.

-g option is available is only available with memory performance metrics.

##### Output File

Use the option “-f <output.csv>” to save the output to the file <output.csv>.

Use the option “-F <output.csv>” to append the output to the file <output.csv>.

##### Delimiter

The default delimiter in the output data is “;”.

Use the option “-td/--tab-delimited” to use tab as delimiter.

# Explanation of metrics

## Memory Performance

bytes\_read (derived) :

bytes\_written (derived):

Number of bytes transacted by the read and write operations.

Note: The total number of bytes transacted in any sample is computed as bytes\_read (derived) + 2 \* bytes\_written (derived).

Formula:

bytes\_read : (read\_64B\_ops\_received - write\_64B\_ops\_received) \* 64

bytes\_written: write\_64B\_ops\_received \* 64

read\_hit\_ratio (derived) : measures the efficiency of the buffer in the read path. Range of 0.0 - 0.75.

write\_hit\_ratio (derived): measures the efficiency of the buffer in the write path. Range of 0.0 - 1.0.

0.75 : indicates 100% sequential read or write traffic

> 0.75 : indicates writing to 64B addresses that are still in the WDB (never had to go to media)

1 or ~1 : likely writing to a specific address or small range of addresses (fitting in write buffer) for long periods of time.

Formula:

read\_hit\_ratio : (cpu\_read\_ops - media\_read\_ops) / cpu\_read\_ops

write\_hit\_ratio: (cpu\_write\_ops - media\_write\_ops) / cpu\_write\_ops

media\_read\_ops (derived) :

media\_write\_ops (derived):

Number of read and write operations performed to the physical media. Each operation transacts a 256 bytes operation.

Formula:

media\_read\_ops : (read\_64B\_ops\_received - write\_64B\_ops\_received) / 4

media\_write\_ops: write\_64B\_ops\_received / 4

read\_64B\_ops\_received :

write\_64B\_ops\_received:

Number of read and write operations performed to the physical media. Each operation transacts a 64 bytes operation. These operations includes commands transacted for maintenance as well as the commands transacted by the CPU.

cpu\_read\_ops :

cpu\_write\_ops:

Number of read and write operations received from the CPU (memory controller), for the Memory Mode and App Direct Mode partitions.

## Health Information

health\_status:

Overall health summary.

|  |  |
| --- | --- |
| Value | Health Status |
| 0 | Normal |
| 1 | Non-critical |
| 2 | Critical |
| 3 | Fatal |

lifespan\_used:

The module’s used life as a percentage value of factory expected like span.

lifespan\_remaining:

The module’s remaining life as a percentage value of factory expected like span.

power\_on\_time:

The lifetime the DIMM has been powered on in seconds.

uptime:

The current uptime of the DIMM for the current power cycle in seconds.

last\_shutdown\_time:

The time the system was last shutdown. The time is represented in epoch (seconds).

media\_temp :

The media’s current temperature in degrees Celsius.

controller\_temp :

The controller’s current temperature in degrees Celsius.

max\_media\_temp :

The media’s the highest temperature reported in degrees Celsius.

max\_controller\_temp :

The controller’s highest temperature reported in degrees Celsius.