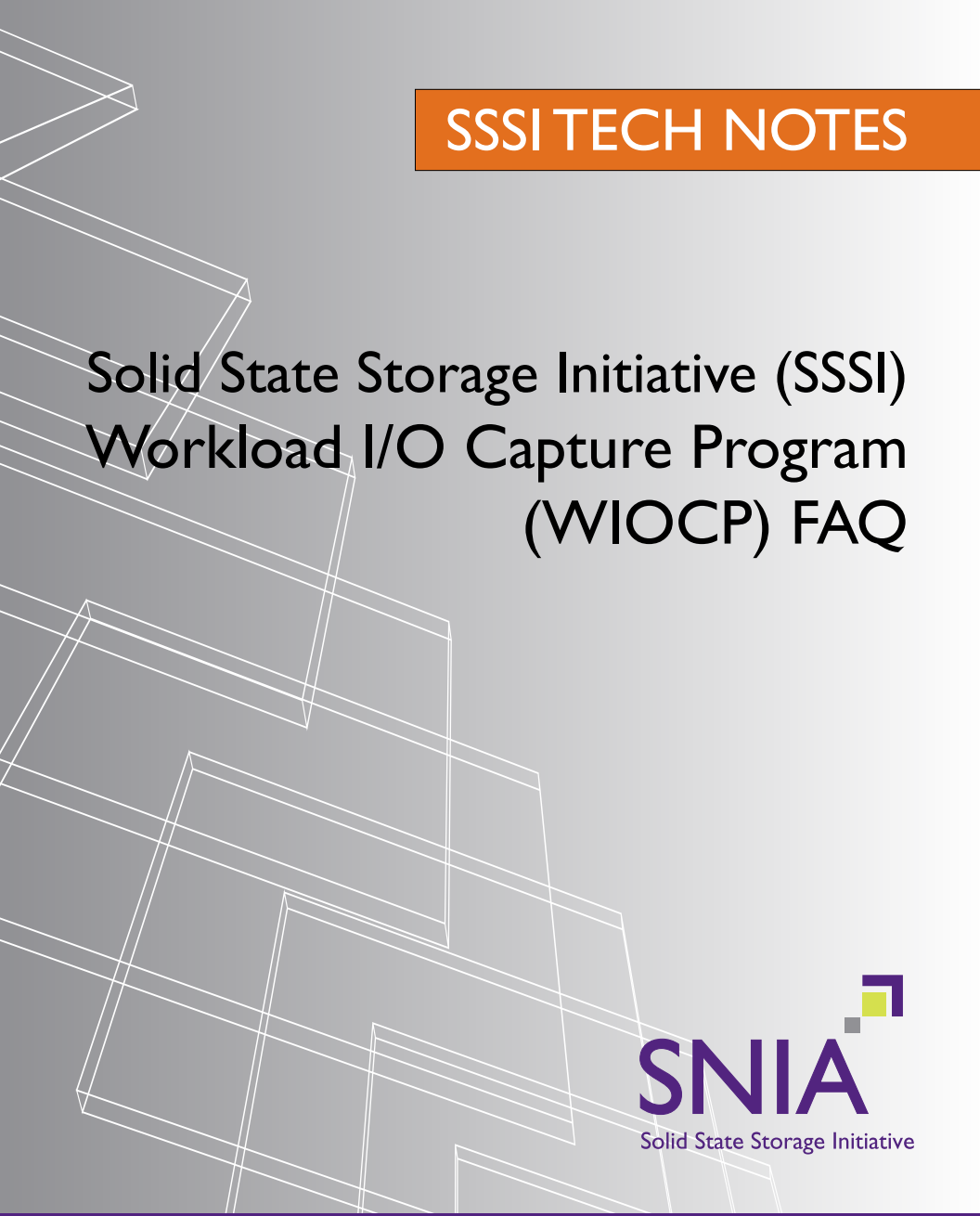
SSSI TECH NOTES

Solid State Storage Initiative (SSSI) Workload I/O Capture Program (WIOCP) FAQ



SNIA
Solid State Storage Initiative

by SNIA SSSI Member:

Tom West

hyperI/O LLC

www.snia.org

About the Solid State Storage Initiative

The SNIA Solid State Storage Initiative (SSSI) fosters the growth and success of the market for solid state storage in both enterprise and client environments. Members of the SSSI work together to promote the development of technical standards and tools, educate the IT communities about solid state storage, perform market outreach that highlights the virtues of solid state storage, and collaborate with other industry associations on solid state storage technical work.

SSSI member companies come from a wide variety of segments in the SSD industry **www.snia.org/forums/sssi/about/members**.

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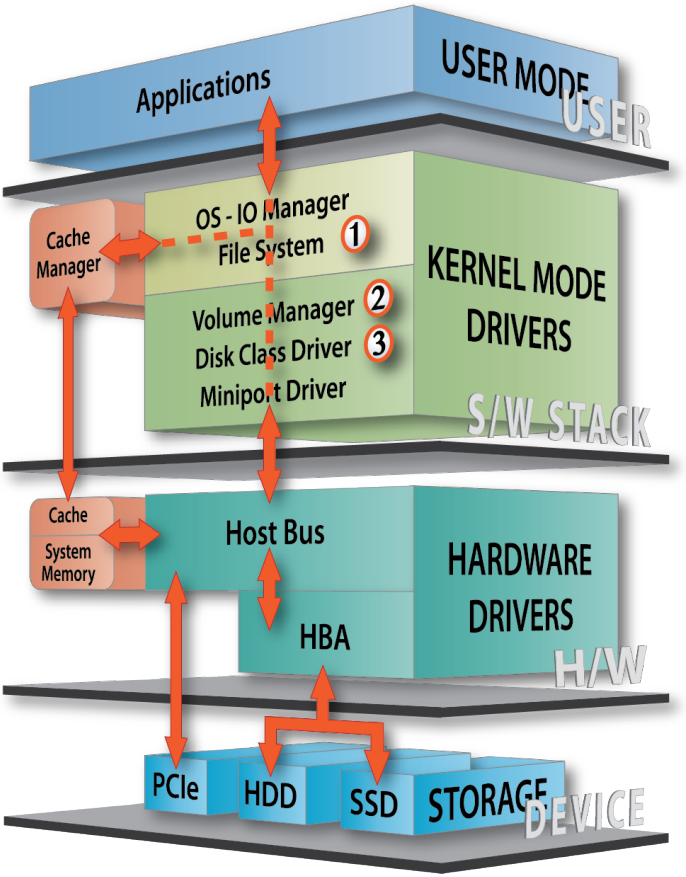
1. What is Workload I/O Capture Program (WIOCP)?

The "Workload I/O Capture Program (WIOCP)" is a project undertaken by the SNIA SSSI to collect I/O operation performance metrics. These empirical metrics reflect the actual I/O operation activity performed during normal, everyday application/workload usage spanning both consumer/client and enterprise systems.

Moreover, the I/O metrics are collected concurrently at three distinct levels within the I/O software stack as numbered within the diagram below.



2. What does it do?

The WIOCP utilizes a commercial software tool that runs unobtrusively in the background with negligible if any impact upon system performance. This I/O operation monitoring tool collects summarized (i.e., automatically-aggregated) I/O operation performance metrics based upon the individually-observed I/O operations.

The I/O metrics include I/O operations per second (IOPS), megabytes-per-second data transfer rates (MB/s), queue depths, response times (latency), and more. These metrics are collected separately for the monitored individual devices as well as the particular applications used.

Table 1 – I/O Metric Types and Observed Values.

I/O Metric	C:	\Device\HarddiskVolume2:	\Device\Harddisk0\DR0:
Read Total I/O Operation Count	33 275 759	11 759 656	11 759 816
Read Maximum IOPS	72 973	10 195	10 195
Read Total Data Transferred (bytes)	773 153 218 377	449 063 986 176	449 064 162 304
Read Maximum MB/s (bytes in 1 second)	475 543 793	237 845 504	237 845 504
Read Maximum I/O Queue Depth	16	34	34
Write Total I/O Operation Count	7 833 749	891 654	892 180
Write Maximum IOPS	45 010	11 473	11 473
Write Total Data Transferred (bytes)	39 523 059 603	23 033 721 856	23 035 724 800
Write Maximum MB/s (bytes in 1 second)	174 164 811	87 864 320	87 864 320
Write Maximum I/O Queue Depth	99	55	55

Table 1 above shows an excerpt of the I/O metric types that are captured by the WIOCP. The "I/O Metric" column lists some of the specific metric types, such as the highlighted read and write maximum IOPS and the read and write maximum data transfer rate (which refers to what is generally called throughput).

Column "C:" refers to the metrics observed at the highest level within the I/O software stack (application/file level #1 in the diagram above) and includes reads and write I/O operations involving the system file cache. Thus, these metrics will tend to show a higher transfer rate and IOPS than at the device levels.

The last two columns show metrics observed further down at the physical volume level and the physical device level (#2 and #3 respectively within the I/O stack diagram) for the associated C: Logical Drive. The actual storage device in this case is a single SSD.

Performance can be much higher at the file system level than at the device level. This is due, in part, to the interaction of the system file cache (which is very fast and can bypass the physical SSD entirely), thus showing much faster IOPS than what actually occurs at the drive.

The full set of the collected WIOCP I/O metrics provides read and write mixes of I/O operations and other details necessary to help characterize the access patterns that specific workloads generate.

3. Why do I care?

The I/O metrics collected by the WIOCP can help identify the access patterns of real-life workloads. This information in turn can be used to help the SSSI better understand how SSDs perform under particular workloads. This information will also aid in choosing the best SSD for a specific application.

4. How does it work?

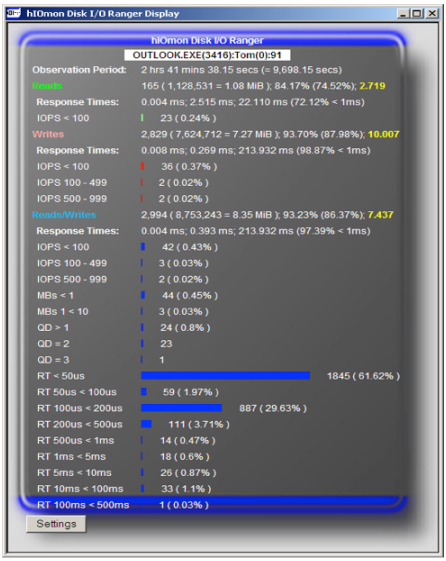
After being downloaded to your computer, the WIOCP tool runs in the background for a seven-day collection period. It automatically collects the summary I/O operation performance metrics, which are periodically saved by the tool to export files that can be readily and directly imported into spreadsheets and other tools. Then you simply e-mail these small export files to the SSSI at the completion of the collection period as instructed by the software.

5. What does the SSSI do with the WIOCP I/O Metrics?

The collected WIOCP I/O metrics are analyzed by the SSSI Technical Development Committee and the SNIA SSS Technical Work Group. In addition, a "SSSI WIOCP Metrics" download package will be generated from your WIOCP export files; several ancillary files will also be included to help further expedite a "top-down" analysis of the collected WIOCP I/O metrics. The resulting package can be downloaded from the public SNIA IOTTA Repository (http://iotta.snia.org) by WIOCP participants, end-users, academia, industry, and other interested parties.

6. Will the WIOCP tool run on my computer?

The WIOCP I/O operation monitoring tool with run on any computer using Microsoft® Windows® XP or later (or Windows Server 2003 or later). As the tool runs in the background, you can optionally view the currently-collected I/O metrics in real-time using the included "hIOmon™ Disk I/O Ranger Display" application as shown in the example below.



7. Do I have to worry about anything?

No. The WIOCP software tool does not require any application, file, file system, device, or operating system code changes. It also does not collect any individual I/O operation trace data, file names, or binary data. No Personally Identifiable Information is collected – and the WIOCP software tool download package is digitally-signed to ensure its authenticity and to protect it from being altered.

8. How do I get started?

Simply download/install the WIOCP I/O operation monitoring software tool, use your computer as you normally do, and then e-mail the WIOCP export files to the SSSI at the completion of the seven-day collection period.

Go to the following URL to download the WIOCP software tool. You can also download a SSSI white paper that provides additional details about the WIOCP I/O metrics.

www.snia.org/forums/sssi/wiocp

Thank you very much for your interest and participation in the SNIA SSSI WIOCP.

The Solid State Storage Initiative

About SNIA

The Storage Networking Industry Association (SNIA) is a not-for-profit global organization made up of some 400-member companies and 7,000 individuals spanning virtually the entire storage industry. SNIA's mission is to lead the storage industry worldwide in developing and promoting standards, technologies, and educational services to empower organizations in the management of information. To this end, SNIA is uniquely committed to delivering standards, education, and services that will propel open storage networking solutions into the broader market. For additional information, visit the SNIA web site at **www.snia.org**.

SSSI TECH NOTES

About this Book

How do applications really access your SSD?

What is the best SSD for your work environment?

The goal of the SSSI Workload I/O Capture Program is to get answers to those questions.

About the Author

Tom West is President of hyperI/O LLC and Co-Chair of the I/O Traces, Tools and Analysis (IOTTA) Technical Work Group.

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