



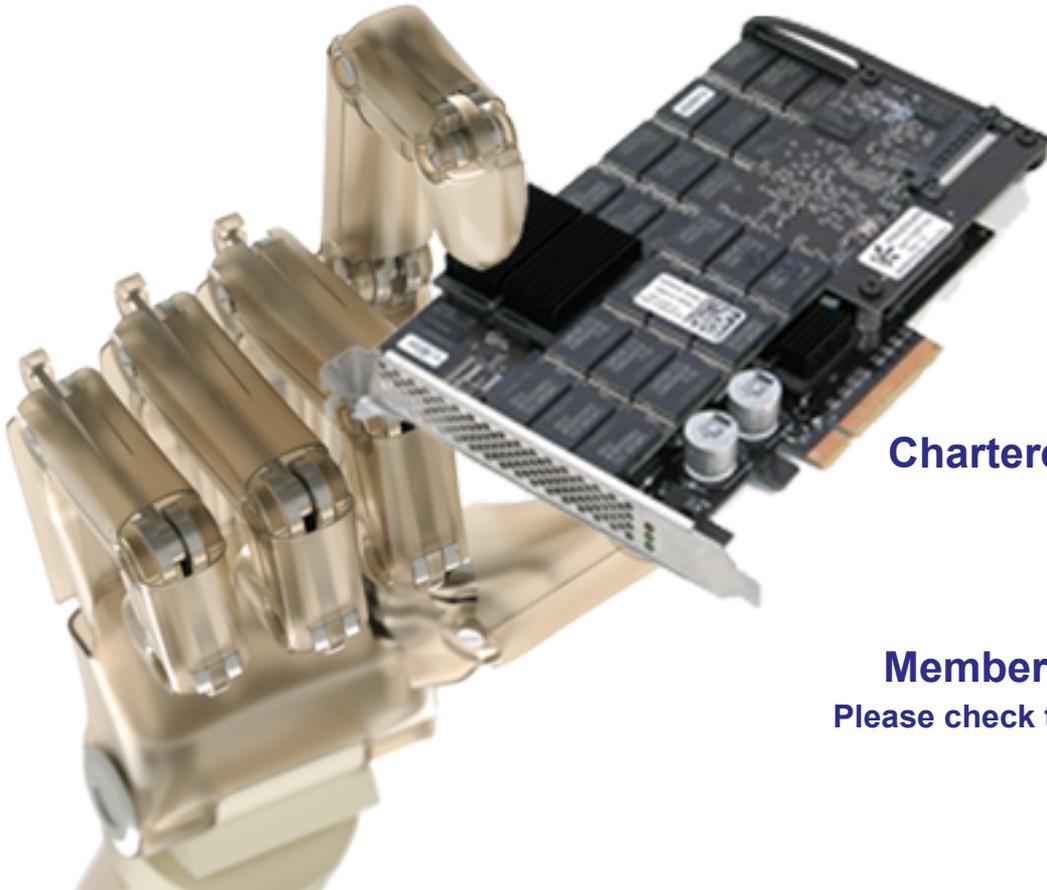
**SNIA Solid State Storage Initiative
PCIe SSD Task Force Meeting No. 8**

Monday 30 July 2012



WELCOME!

Meeting No. 8
Monday 30JUL2012
4:00 PM - 5:30 PM PST



Welcome to the SNIA
Solid State Storage Initiative
PCIe SSD Task Force

This is an Industry Task Force
Chartered to investigate, discuss & educate
All things PCIe SSD

Membership is Complimentary for (90) Days
Please check the homepage at www.snia.org/forums/sssi/pcie

Task Force Participants



Concall Guidelines:

- Use your mute button
- **Sign in webex w/ company name**
john smith (ABC Co.)
- Be on time for roll call
- Un Mute when talking
- Use webex chat to ask questions

- Respond to Feedback Requests
- Email String Topic Discussions
- Email comments to reflector
pciesd@snia.org
- Send Questions to
pciechair@snia.org

(8) OPEN Meetings - Apr - Jul SSSI Committee Aug - Dec 2012

Topics	09APR12 Mtg No. 1	23APR12 Mtg No. 2	07MAY12 Mtg No. 3	21MAY12 Mtg No. 4	04JUN12 Mtg No. 5	18JUN12 Mtg No. 6	16JUL12 Mtg No. 7	30JUL12 Mtg No. 8	20JUL12 SSSI FMS Reception
Kick-Off Mtg Issue Identification	X								
Standards		X							
Test Platforms		X							
Performance			X						
System Integration			X						
System Arch Form Factors				X					

Goals: Issue Identification & Committee 2012 Roadmap

(8) OPEN Meetings - Apr - Jul SSSI Mtg & FMS Round Table

Topics	04JUN12 Mtg No. 5	18JUN12 Mtg No. 6	02JUL12 Holiday	16JUL12 Mtg No. 7	30JUL12 Mtg No. 8	20AUG12 SSSI FMS Reception
Big Picture What's it all Mean	X					
Deployment Strategies Market Development		X				
NAND Flash Controllers; NVM Security			Holiday	X		
SNIA / SSSI Where do we go?					X	X
SSSI Task Force F2F FMS Round Table						X SNIA / SSSI FMS Reception

Tentative Topics for Meetings

Time: 4:00 – 4:05

AGENDA – 30 JULY 12

I.	Administrative	
a.	Roll Call; Call Schedule	4:00 – 4:05
b.	Announcements	4:05 - 4:10
II.	Business	
1.	SNIA – Phil Mills, IBM	4:10 – 4:15
2.	SNIA Tech Council – Arnold Jones, SNIA	4:15 – 4:20
3.	SSSI – Paul Wassenberg, Marvell	4:20 – 4:30
4.	SSS TWG – Eden Kim, Calypso	4:35 – 4:40
5.	NVM Programming TWG- Jim Ryan, Intel	4:40 – 4:50
6.	ABDC – Gilda Foss, NetApp	4:50 – 4:55
7.	Security TWG – Walt Hubis, Fusion-io	4:55 – 5:00
8.	IOTTA TWG – Tom West, HyperIO	5:00 – 5:05
9.	Workload Capture Program – Tom West, HyperIO	5:05 - 5:25
III.	Wrap Up	
a.	Close	5:25 – 5:30

Attendance

I of 4

Company	No	09APR12	23APR12	07MAY12	21MAY12	04JUN12	18JUN12	16JUL12	30JUL12
Agilent	1	x	x	x	x			x	x
Allion	2	x	x		x	x	x	x	x
AMD	3	x	x						
Apacer	4								
BitSprings	5				x	x	x	x	
Cadence	6	x							
Calypso	7	x	x	x	x	x	x	x	x
Cisco	8		x	x	x		x		
CLabs	9								
Corsair	10			x					
Coughlin Associates	11	x	x	x			x		
Dell	12	x							
eAsic	13	x			x			x	
EMC	14	x	x	x	x	x	x	x	
Enmotus	15	x			x	x			
eTron	16		x						
Fusion-io	17	x	x		x	x	x	x	x
Greenliant	18		x	x	x	x	x	x	

Time: 4:00 – 4:05

Attendance

2 of 4

Company	No	09APRI12	23APRI12	07MAY12	21MAY12	04JUN12	18JUN12	16JUL12	30JUL12
HDS	19	x		x	x			x	x
HP	20	x	x	x	x	x	x	x	x
HGST	21	x	x	x	x	x	x	x	x
Huawei	22	x	x	x	x	x	x	x	x
Hynix (SK Hynix)	23		x	x	x		x	x	
HyperIO	24	x	x	x		x	x	x	x
IBM	25	x		x					x
Intel	26	x	x	x	x	x	x	x	x
Kingston	27								
Lecroy	28		x	x	x		x		x
Lenovo	29	x		x		x			
LiteOnIT	30								
Link-A-Media	31								
Lotes	32								
LSI	33				x	x	x	x	x
Lunastar	34	x	x	x	x			x	
Marvell	35		x		x	x	x		
Micron	36	x	x	x	x	x	x	x	x
Microsoft	37	x	x	x					x

Time: 4:00 – 4:05

Attendance

3 of 4

Company	No	09APR12	23APR12	07MAY12	21MAY12	04JUN12	18JUN12	16JUL12	30JUL12
Molex	38	x	x	x	x	x	x		
Mushkin	39								
NetApp	40				x	x	x	x	x
Objective Analysis	41	x			x	x	x	x	
OCZ	42	x							
Oracle	43	x	x	x			x		x
PC Perspectives (Allyn M.)	44								
PLX Technology	45			x	x				
Phison	46	x	x	x	x	x	x	x	
Renesas	47	x	x	x	x	x			x
Samsung	48	x	x	x	x	x	x	x	x
Sandisk	49	x	x						
Seagate	50	x			x	x	x		x
Semtech Snowbush IP	51								
Smart Storage	52		x	x	x	x		x	
SNIA	53	x	x	x	x		x	x	x
STEC	54	x	x	x				x	

Attendance

4 of 4 - TOTAL (65) Companies

Company	No	09APRI12	23APRI12	07MAY12	21MAY12	04JUN12	18JUN12	16JUL12	30JUL12
Taejin	55	x	x	x					
Tektronix	56								
TMS	57	x							
Toshiba	58		x	x	x		x	x	x
Tyco Electronics	59	x	x						
Unigen	60	x	x	x					
Viking	61								
Violin Memory	62						x		
Virident	63	x	x	x	x				x
WDC	64	x	x	x					
Paul Mitchell (Ind)	65								
		39	37	34	33	23	28	26	23

Announcements - Eden Kim

1. Poll – Final Survey, go to Survey Monkey at

<http://www.surveymonkey.com/s/9VS9PQH>

2. Questions for FMS PCIe Panel – submit to chair

3. Ad Slide for FMS Reception –

Company Product or Service ppt

See examples next slides

Slides should be wide format

4. Do you want to sponsor a door prize at FMS Reception?

Contact chair

Appreciation Slide / Poster for Contributors

SNIA/SSSI Flash Memory Summit Reception: email to pciechair@snia.org if you plan to attend

What: Reception : SSSI PCIe Committee - Roadmap 2012

Why: New Member Introduction; SSSI PCIe Committee Inauguration

Who: Invitation only : sponsored by SNIA and the SSSI

When: Monday 20AUG12 5:30 - 7:00 pm

Where: Santa Clara Convention Center 2d floor rm 209 - 210

Sample FMS Reception Ad

Company Product, Technology or Service



www.snia.org/pts
Booth 319

Announcing
the Release of the

Client

**Solid State Storage
Performance Test Specification
(SSS PTS-C)**

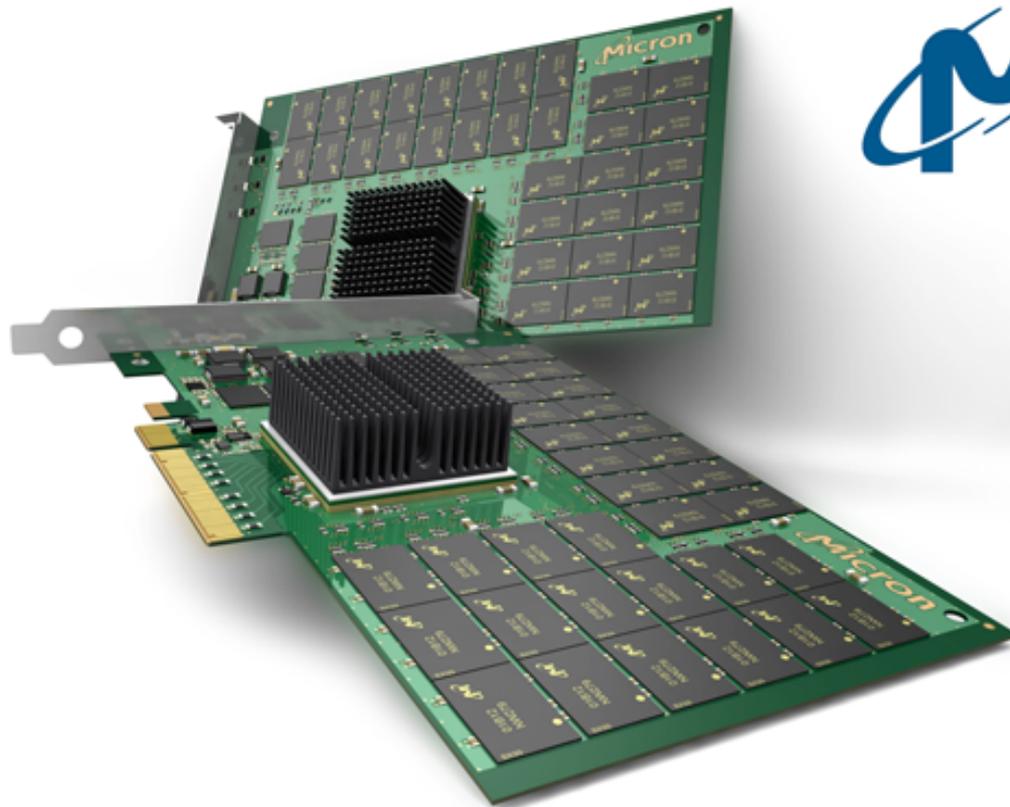
Enables fair comparisons of SSDs from different manufacturers.



Ask SSSI about SSDs!

Sample FMS Reception Ad

Company Product, Technology or Service



Micron®

RealSSD™ P320h
High-performance
Enterprise Storage

NEW PRODUCTS



Sample FMS Reception Ad

Company Product, Technology or Service

SNIA
Advancing storage & information technology

CALYPSO
Systems

- ✓ Turn-key SSD HVM Test System
- ✓ End-to-end Solutions
- ✓ Scales Up Easily

SSD Test Systems

Ask us about PCIe!!



Booth 812

www.calypsotesters.com

NEW PRODUCTS

FlashMemory
SUMMIT

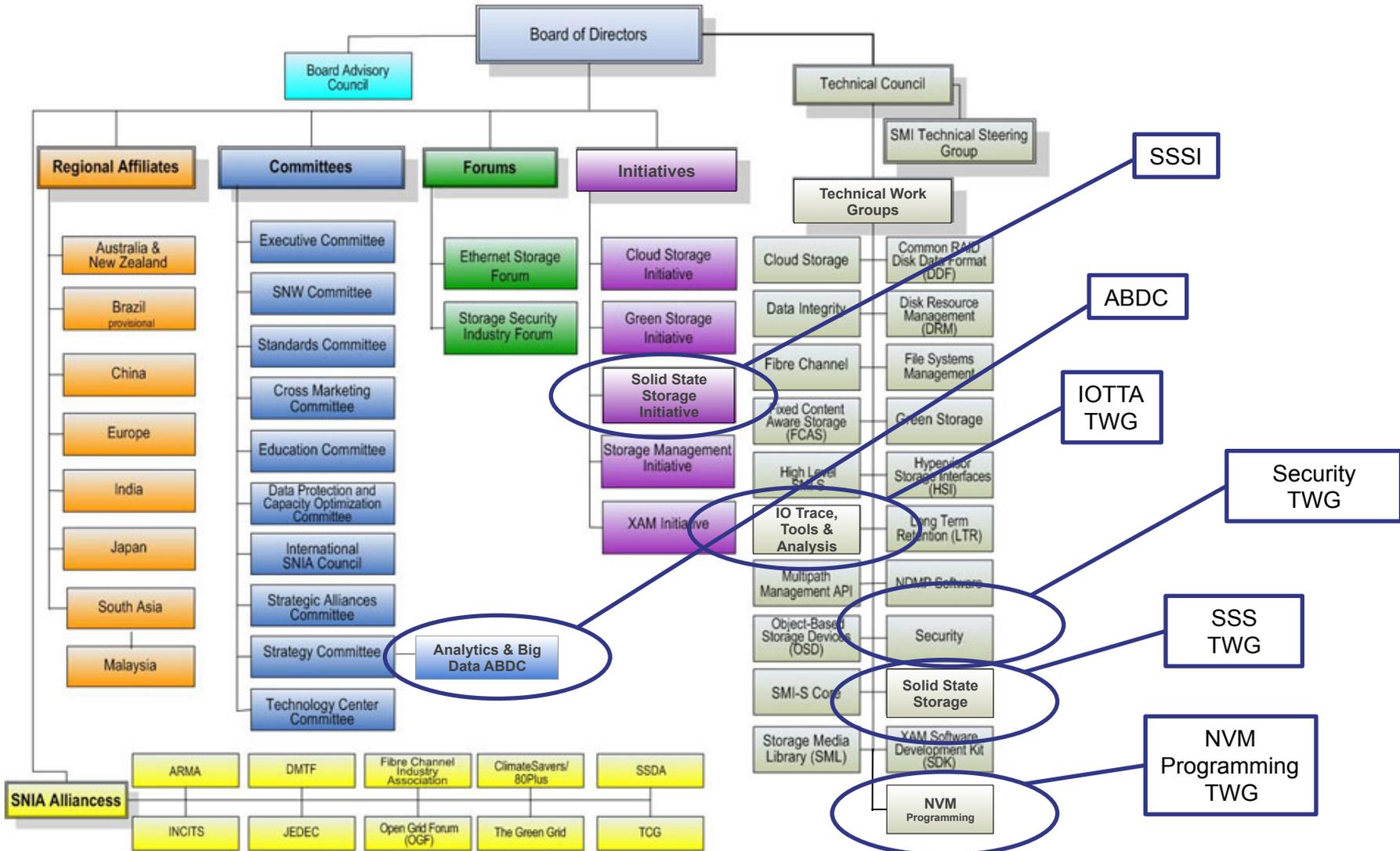


PCIe SSD Task Force Meeting No. 8
SNIA Overview

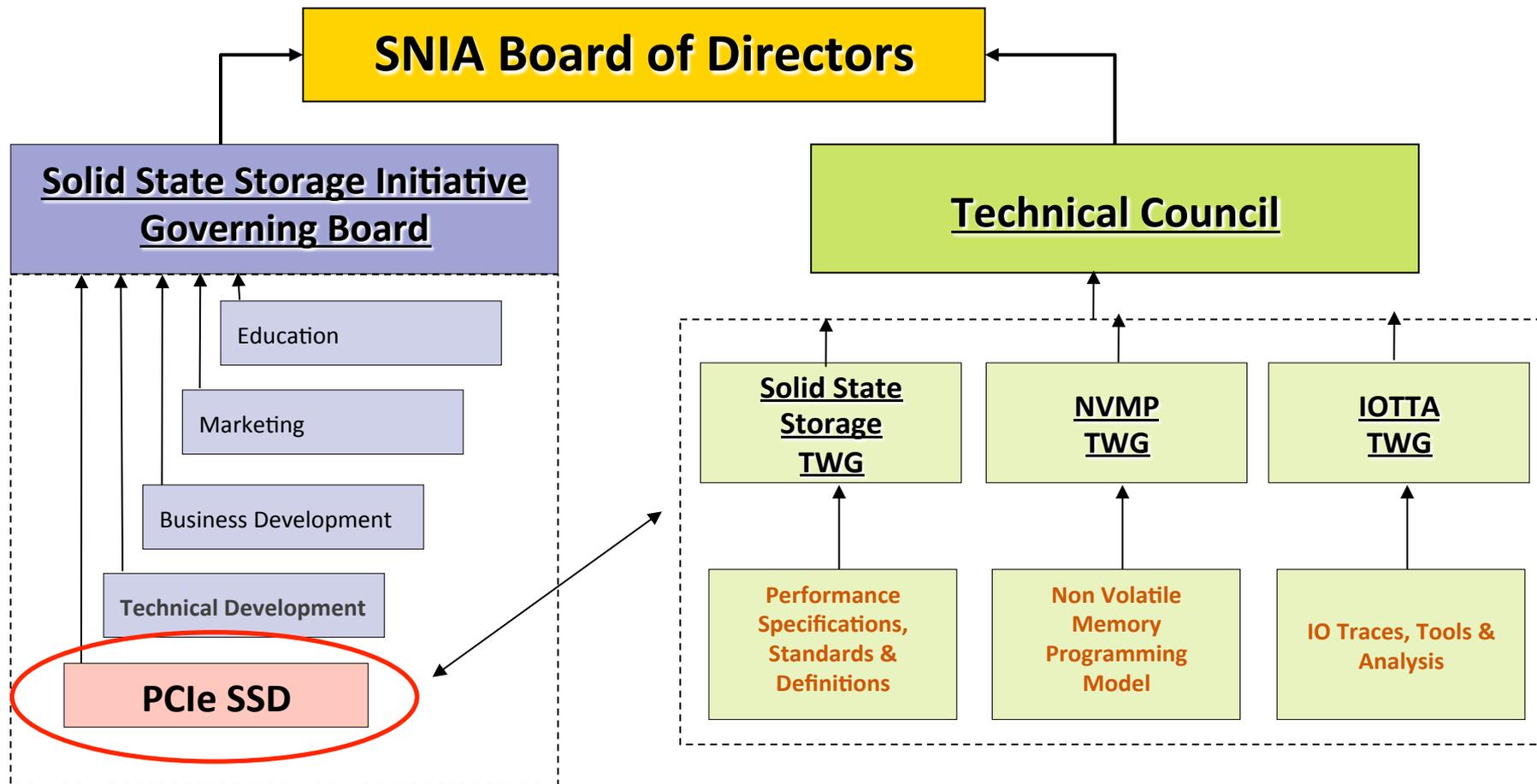


SNIA Overview

Phil Mills, IBM



SSSI / SSS TWG Overview



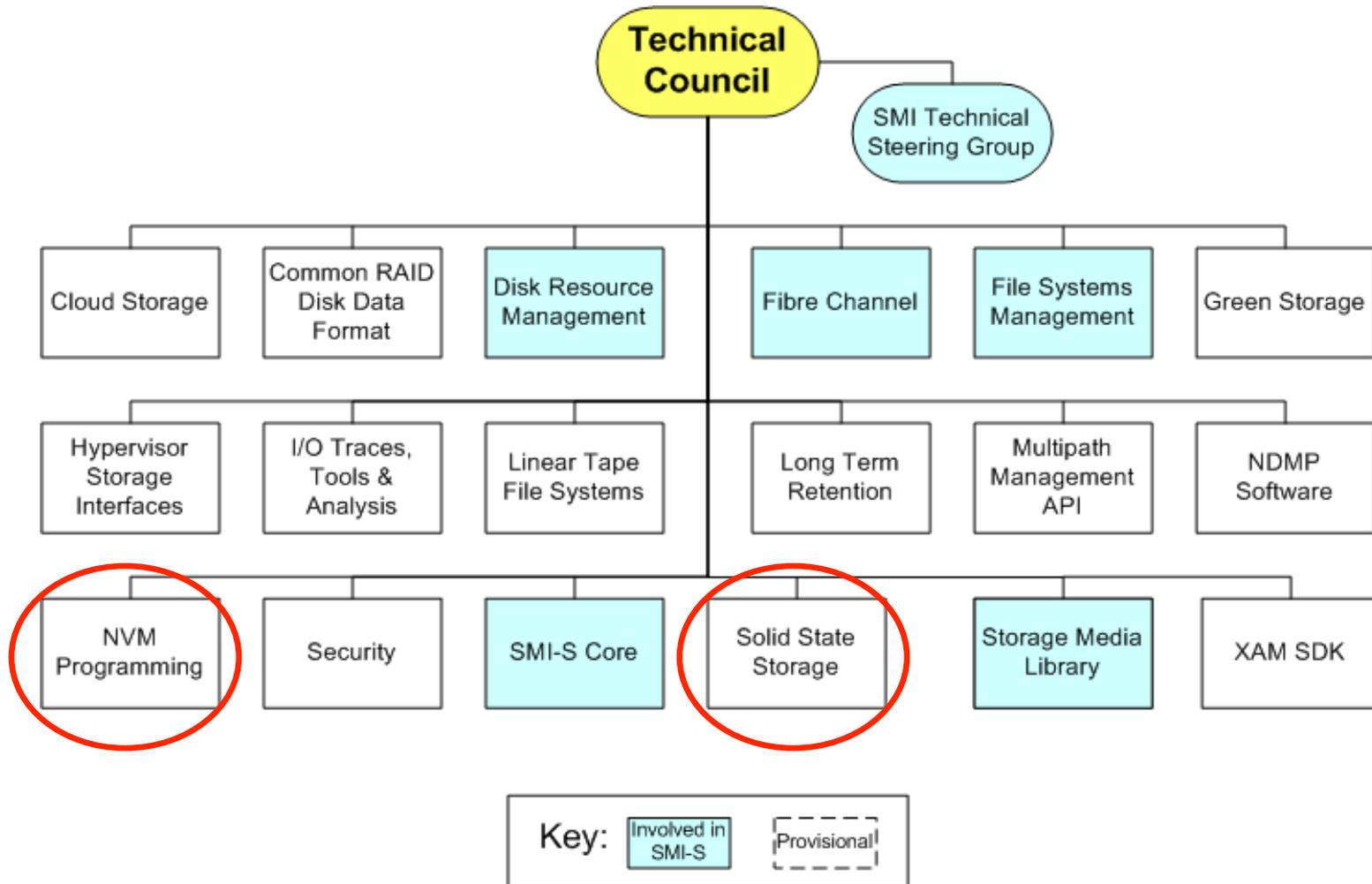


PCIe SSD Task Force Meeting No. 8
Technical Council – Benefits of TWGs



SNIA Technical Organization

Arnold Jones, SNIA



Benefits of SNIA Standards Development Participation

- Make sure the next revision of the standard meets the technical requirements of your company.
- Gain in-depth knowledge of the details in the standard being developed and as a result become an expert on the standard.
 - ◆ Fastest way to become an Expert is through participation, not just reading the standard.
- Work with and get assistance from the other Experts on the standard as you develop your implementation of the standard.
- Participate in the development and become an expert in the Software being developed in support of the standard.
- Ensure your products are current and competitive from a standards perspective

Other SNIA Technical Resources & Benefits

- Ability to propose the development of new Standards
 - ◆ Minimum 3 SNIA Members & a written proposal
- Extensive testing program for certain SNIA Standards
 - ◆ Based on peer reviewed test code



PCIe SSD Task Force Meeting No. 8
Solid State Storage Initiative



Solid State Storage Initiative

Paul Wassenberg, Marvell

➤ Mission

- ◆ Foster the Growth of **SSDs** in both the **Enterprise and Client Markets**

➤ Methods

- ◆ **Educate** the Supplier and User Communities about solid state storage
- ◆ Guide and Pursue **Standards** for solid state storage
- ◆ **Collaborate** with other industry associations for success of solid state storage

➤ SSS Performance Test Specification

- ◆ Establishes a standard for measuring the performance of SSDs
- ◆ Client & Enterprise specs may be downloaded at www.snia.org/pts

➤ Understanding SSD Performance Project

- ◆ To educate users about how to utilize the SSS PTS to make intelligent decisions about SSD performance
- ◆ A webpage (www.snia.org/forums/sssi/pts)

➤ PCIe SSD Taskforce

- ◆ Provides guidance to the marketplace on PCIe SSDs
- ◆ Webpage at www.snia.org/forums/sssi/pcie

- Solid State Storage Standards Explained
 - ◆ All the standards that are involved in the design and testing of SSDs
 - ◆ www.snia.org/forums/ssi/knowledge/standards
- Solid State Storage Form Factors
 - ◆ Details on SSD form factors on the market today
 - ◆ www.snia.org/forums/ssi/knowledge/formfactors
- SSSI Blogroll
 - ◆ List of blogs that are dedicated to, or at least occasionally mention SSDs
 - ◆ www.snia.org/forums/ssi/knowledge/education/blogroll
- SSS Glossary
 - ◆ SSD technology and test terminology
 - ◆ www.snia.org/sites/default/files/SSSIGLOSSARYofTerms%20Sept2011.pdf
- We can do more, but we need your help!

SSSI Membership Benefits

➤ Visibility

- ◆ Participating in SSSI tradeshow booths
- ◆ Speaking on SSSI panels
- ◆ Authoring white papers & presentations / tutorials
- ◆ Hosting webcasts

➤ Access

- ◆ Collaborating with industry leaders to guide the direction of SSDs
- ◆ Taking advantage of SNIA & SSSI relationships with industry analysts
- ◆ Understanding the status of other SSD-related industry & standards groups
 - > Regular updates and guest speakers
 - > To the extent permitted by other groups' membership agreements
- ◆ Utilizing the reach of SNIA's WW network of affiliates

➤ All available at no additional cost beyond the annual membership fee

SSSI Membership Benefits

Voting Members

- Voting members are eligible for leadership positions on the SSSI Governing Board

- Voting members may also chair SSSI committees
 - ◆ Technical Development, Business Development, Marketing, Education
 - ◆ Special-purpose committees, e.g. PCIe SSD Taskforce

- Also may vote on SSSI ballots

How to Sign Up

- SNIA membership is required to join SSSI
- SNIA: www.snia.org/member_com/join
- SSSI: www.snia.org/forums/ssi/about/join
- Questions: askssi@snia.org



PCIe SSD Task Force Meeting No. 8
Solid State Storage TWG



SSS TWG

Eden Kim, Calypso

- 53 Member Companies
- PTS Spec
 - ◆ Client PTS-C 1.1 June 2012
 - ◆ Enterprise PTS-E 1.1 August 2012
- Meets Every other Monday at 4 PM



PCIe SSD Task Force Meeting No. 8
NVM Programming TWG





Introduction to the SNIA NVM Programming TWG

Jim Ryan, Intel
SNIA NVM Programming TWG
July 30, 2012

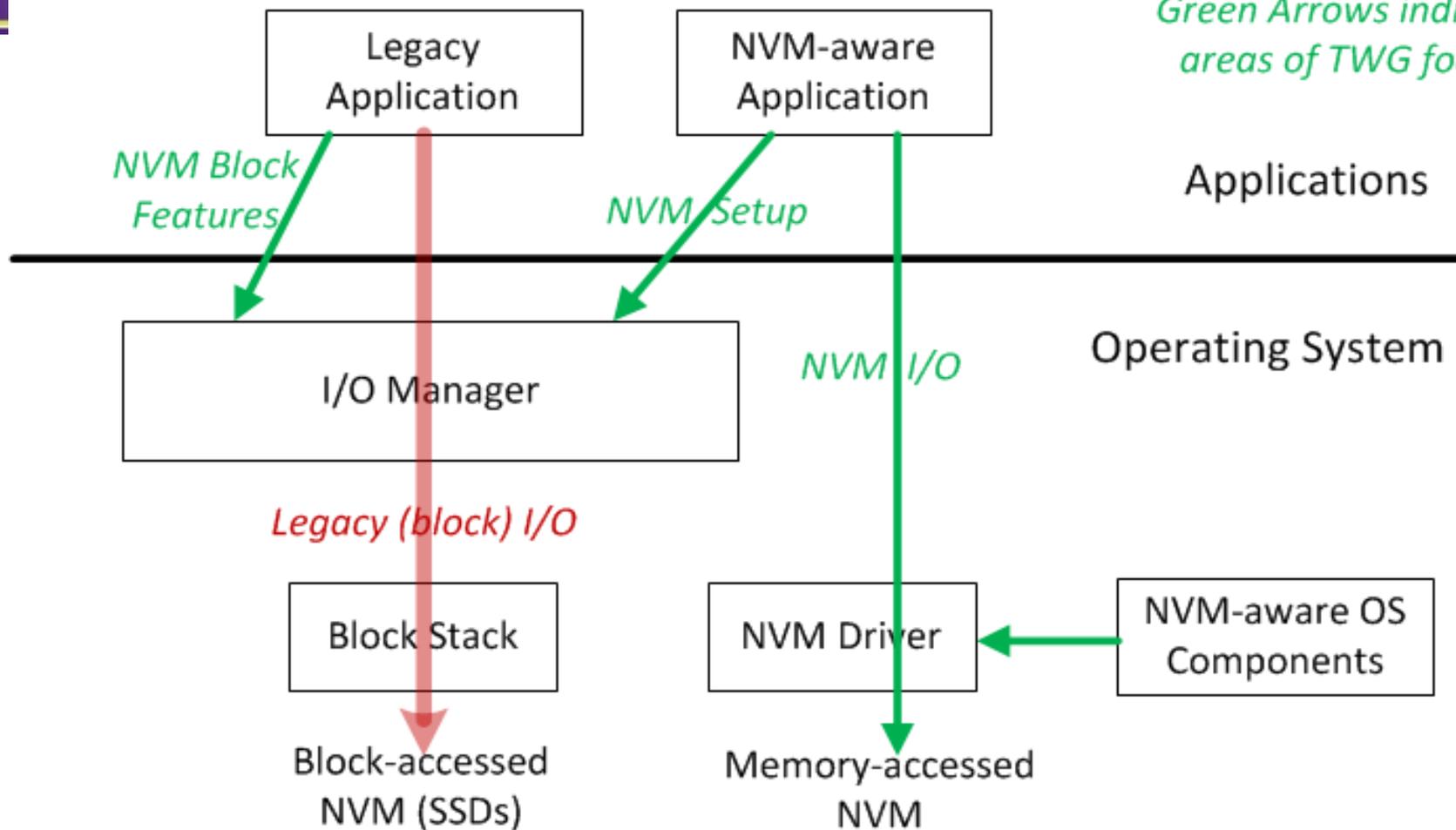
Description of the NVM Programming TWG

The NVM Programming TWG is specifying OS extensions to support NVM hardware. The OS extensions enable applications and OS components to access and utilize features of NVM that is accessed as a disk or, emerging NVM products accessed as memory. The functionality described in the TWG's specifications enable OSes to enable development of NVM-aware SW across a board range of NVM hardware.

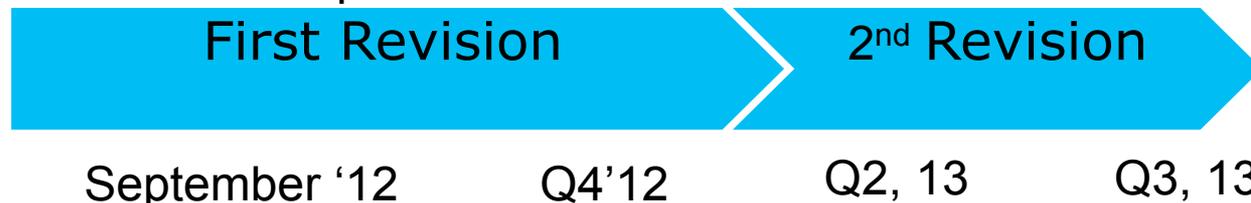
The specifications describe the relationships between OS extensions to underlying standards (such as those from T10 and NVM Express) as well as functionality common to NVM vendors. Participants in this group include architects and developers for NVM aware OS components and applications.

TWG Activities in the SW stack

Green Arrows indicate areas of TWG focus



Specs for NVM Extensions between OS Components



Specs for NVM Application Extensions





Analytics & Big Data Committee **Overview**

Gilda Foss
Industry Evangelist, Office of the CTO
NetApp



► Mission

The SNIA ABDC is dedicated to fostering the growth and success of the market for what is generally referred as Analytics and Big Data and more generally the use of data storage resources and services by analytics and big data applications and toolsets.

➤ Goals

- ◆ Become the recognized authority regarding the use of storage and storage networking for Analytics and Big Data
 - › Determine and document the characteristics of Analytics and Big Data offerings
 - › Determine and document the impact of Analytics and Big Data on enterprises and analytics and big data computing
 - › Collect requirements from Analytics and Big Data vendors and document best practices in this area
 - › Collaborate with academia and the research labs of member companies to understand how advances in storage, storage networking, and other technologies will affect Analytics and Big Data
- ◆ Educate the vendor and user communities on the use of storage and storage networking for Analytics and Big Data
 - › Coordinate education activities with the Education Committee
 - › Create peer reviewed vendor-neutral SNIA Tutorials
 - › Create vendor-neutral demonstrations
 - › Leverage SNW and other SNIA and partner conferences
 - › Collaborate with industry analysts

➤ Goals

- ◆ Perform market outreach that highlights the virtues of storage and storage networking for Analytics and Big Data
 - › Articles in trade magazines
 - › White papers
 - › Press releases
 - › Collaborative published articles with academia and research institutions
- ◆ Collaborate with other industry associations via SNIA's various strategic alliance partners on analytics and big data related technical work in which they are involved
- ◆ Coordinate with SNIA Regional Affiliates to ensure that the impact of the Analytics and Big Data Committee is felt worldwide
- ◆ Coordinate with the Cloud Storage Initiative to jointly message the Analytics and Big Data cloud-oriented market and offerings

- Will not distinguish types of members beyond SNIA membership
- Standard SNIA membership rights
- There are no fees beyond SNIA membership fees
 - ◆ SNIA members may donate funds for exclusive use by the ABDC
- Fiscal year will be the same as the SNIA fiscal year, which is December 1st through November 30th
- Funding comes from SNIA and/or member donations
 - ◆ Member donations/sponsorships can be dedicated to ABDC
 - ◆ Currently 3 member companies are donors

ABDC Event Planning

- 2012 April - Request Committee formation of the board
- 2012 April - Establish ABDC Members Portal (SNIA website)
 - ◆ 'Incubator' members (pledged) begin effort
- 2012 April - First Announcement of ABDC formation and solicit participation from all SNIA Members
- 2012 May - Second Announcement
- 2012 June (begin) - Notification of election/nomination period
- 2012 June (end) - Chairpersons selected
 - ◆ All the above is complete – Gilda Foss & Rob Peglar, co-chairs
- 2012 September - Hold *ABD Summit* at *SDC*
 - ◆ Featured & session speaker recruitment underway
- 2012 October - Deliver Tutorials at *SNW Fall 2012*
 - ◆ Tutorials chosen, in development, for Big Data track



Q&A





PCIe SSD Task Force Meeting No. 8
SECURITY TWG





**SNIA Solid State Storage Initiative
PCIe SSD Task Force Meeting No. 8**

**SNIA Security
Technical Work Group**

Walt Hubis, Fusion-io, SNIA Security Technical Work Group



Security TWG Goals

- Assist the SNIA membership in better understanding Information Assurance and how it applies to the storage ecosystem.
- Identify and incorporate prudent security mechanisms in all SNIA technical specifications.
- Continue striving to become a recognized expert/authority in data/information security.

Security TWG Charter Summary

Advancing storage & information technology



- Define requirements for storage network security in collaboration with other interested parties
- Define storage network security terminology for use throughout SNIA
- Support other SNIA groups in creating educational materials covering security in storage networks;
- Define architectures, interfaces, and practices that leverage existing security technologies in a storage network;
- Create, or stimulate creation of, new information security technologies where nothing exists that meets the requirements for use in a storage network.

- Storage Security Industry Forum (SSIF)
- Data Protection & Capacity Optimization Committee (DPCO)
- Storage Management Initiative (SMI)
- SMI Technical Steering Group (TSG)
- Education Committee
- Cloud Storage
- Long-term Retention (LTR) TWG

- ◆ American Bar Association (ABA)
- ◆ ANSI INCITS
- ◆ ISO/IEC JTC1 (SC27& SC38)
- ◆ Trusted Computing Group (TCG)
- ◆ IEEE Information Assurance Standards Committee (IASC)
- ◆ Cloud Security Alliance (CSA)
- ◆ Distributed Management Task Force (DMTF)
- ◆ Internet Engineering Task Force (IETF)
- ◆ Organization for the Advancement of Structured Information Standards (OASIS)
- ◆ Information Systems Audit and Control Association (ISACA)
- ◆ Other Security Organizations

➤ SNIA Security Technical Work Group (TWG)

- ◆ Focus: Requirements, architectures, interfaces, practices, technology, educational materials, and terminology for storage networking.
- ◆ Best Practices for Storage Security
- ◆ http://www.snia.org/tech_activities/workgroups/security/

➤ Storage Security Industry Forum (SSIF)

- ◆ Focus: Educational materials, customer needs, whitepapers, and best practices for storage security.
- ◆ <http://www.snia.org/ssif>

- SNIA: Introduction to Storage Security
(http://www.snia.org/forums/ssif/knowledge_center/white_papers/Storage-Security-Intro-2.0.090909.pdf)
- SNIA: Audit Logging for Storage
(http://www.snia.org/forums/ssif/knowledge_center/white_papers/forums/ssif/knowledge_center/white_papers/SNIA-Logging-WP.050921.pdf)
- Encryption of Data at Rest: A Step by Step Checklist
(http://www.snia.org/forums/ssif/knowledge_center/white_papers/Encryption-Checklist-2.0.090909.pdf)
- SNIA: Best Practices for Deploying a Storage Security Solution
(http://www.snia-europe.org/news_events/e_news/)

Questions



PCIe SSD Task Force Meeting No. 8
IOTTA TWG



- **I/O Traces, Tools, and Analysis TWG – Charter:**
 - Create/maintain a ***worldwide repository*** for storage-related I/O trace collection and analysis tools, application workloads, and I/O traces
 - Define common, recommended ***semantics*** and ***formats*** for I/O traces
- **Brief background info:**
 - Originally formed in 2003; restarted and has remained active since 2005
 - Over 60 members upon the roster
 - Conference calls on alternate Fridays at 11:00 AM Pacific time
 - Longtime co-chairs:
 - ✓ Geoff Kuenning, Professor and Clinic Director, Harvey Mudd College (HMC)
 - ✓ Tom West, President, hyperI/O LLC.

- **Deployed and live since 2007**
 - Announced at “Files and Storage Technologies (FAST)” Conference, Feb 2007
- **Dedicated website server**
 - Located in the SNIA Technology Center in Colorado Springs, Colorado
- **Gracious support from:**
 - Harvey Mudd College (Geoff with student team to maintain repository web site)
 - NSF (National Science Foundation, some grant funding)
 - NetApp (web site disk storage for all I/O traces)
 - HP Laboratories (active participants; HP DataSeries - set of tools for storing and analyzing structured serial data in a common format; contributed a set of large NFS traces)

- **Types of I/O traces available for download include:**
 - System call traces (OS calls to the file system)
 - Network File System (NFS) traces (including HP animation traces)
 - Block I/O traces (including 2008 Microsoft storage workload traces from Windows production servers)
 - Static Snapshots (e.g., Microsoft FAST '07 static study of file systems)
 - ✓ Above include both historical and current I/O traces
- **Free public download**
 - Do need to accept liberal SNIA download license terms
 - Often two (or more) downloads per day (academia and industry worldwide)
 - SNIA IOTTA Repository URL: <http://iotta.snia.org/>



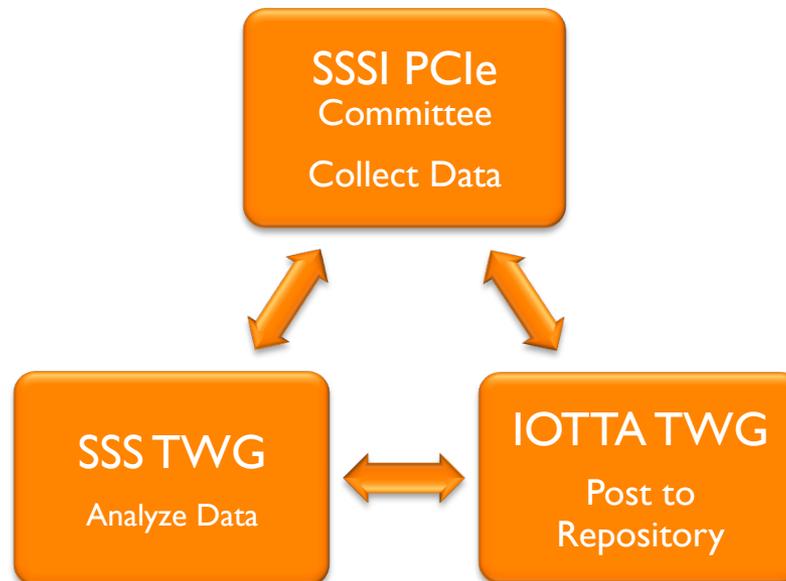
PCIe SSD Task Force Meeting No. 8
Workload Capture Program



An SSSI PCIe Committee Workload I/O Capture Program

Goals:

- *Collect Contemporary Empirical Workload I/O Performance Metrics*
- *Actual, Everyday Application I/O Activity on Windows OS Systems*
- *Collected Workload I/O Metrics Posted to SNIA IOTTA Repository*
- *Support Analysis and Activities by SSS TWG*



The Need for a Workload I/O Capture Program

The Need: “What is *MY* Particular IO Traffic?”

- Understanding Actual User IO Traffic
- What IOs are Generated by Applications/Systems
- IO Access Patterns from the Host/App Perspective

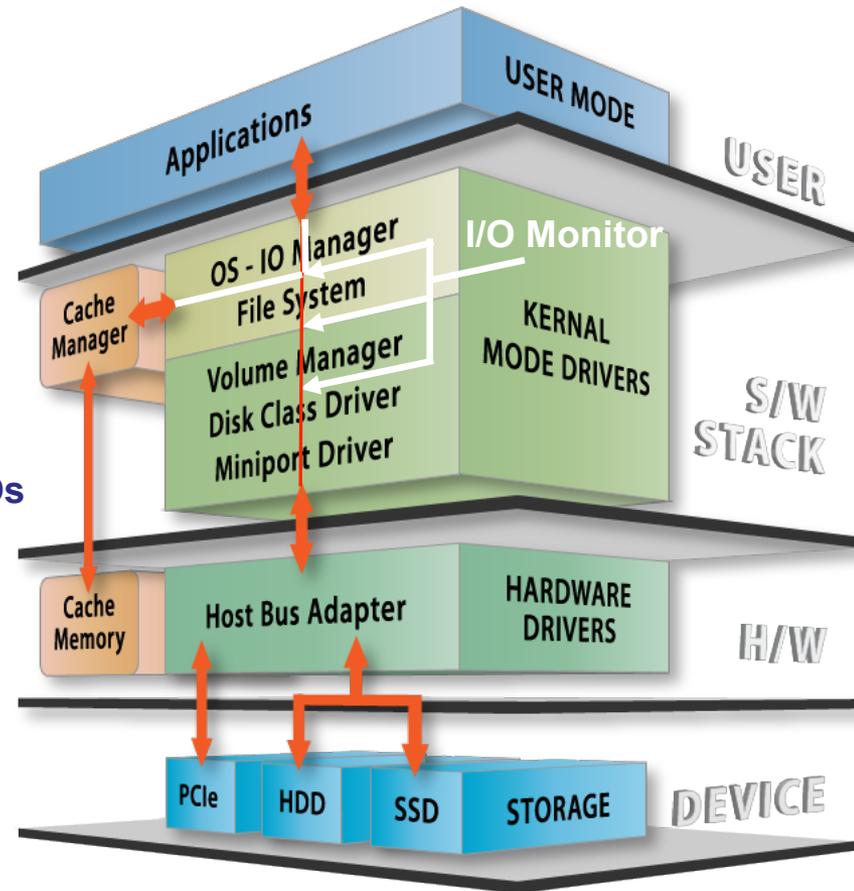
The Issues: “How to Capture IO Traffic”

- IOs Affected by OS I/O SW/HW Stack
- System Cache and File System Affect IOs
- Device Level IOs can be very Different from App IOs

The Solution: “Collect Empirical IO Metrics”

- Phase I: Capture User I/O Metrics
- Phase II: Analyze/Characterize Workload I/O

“Get Contemporary Real-Life SSD I/O Metrics, not outdated, sketchy HDD-based data”



The Workload I/O Capture Program

Phase I: Empirical Workload I/O Capture

- **Easy to use Download Tool**
 - ✓ Download software tool, install (5 minutes or less), auto-configured, reboot
 - ✓ Automatically-summarized metrics (upon a cumulative 10-minute periodic basis) are directly exported to CSV files (no I/O operation trace files required/used)
 - ✓ Collect metrics in background for 7 days, then e-mail CSV files to project coordinator
- **Capture Client and Enterprise I/O Workloads (Windows OS Only)**
 - ✓ Ultrabook and laptop/notebook
 - ✓ Desktop and Server
- **Collect Workload I/O Metrics for PCIe Committee**
 - ✓ The actual “speeds and feeds” from a workload/application/system perspective upon an individual device and process/application basis
 - ✓ What host I/O activity actually looks like during normal, everyday usage

Phase II: Workload I/O Analysis

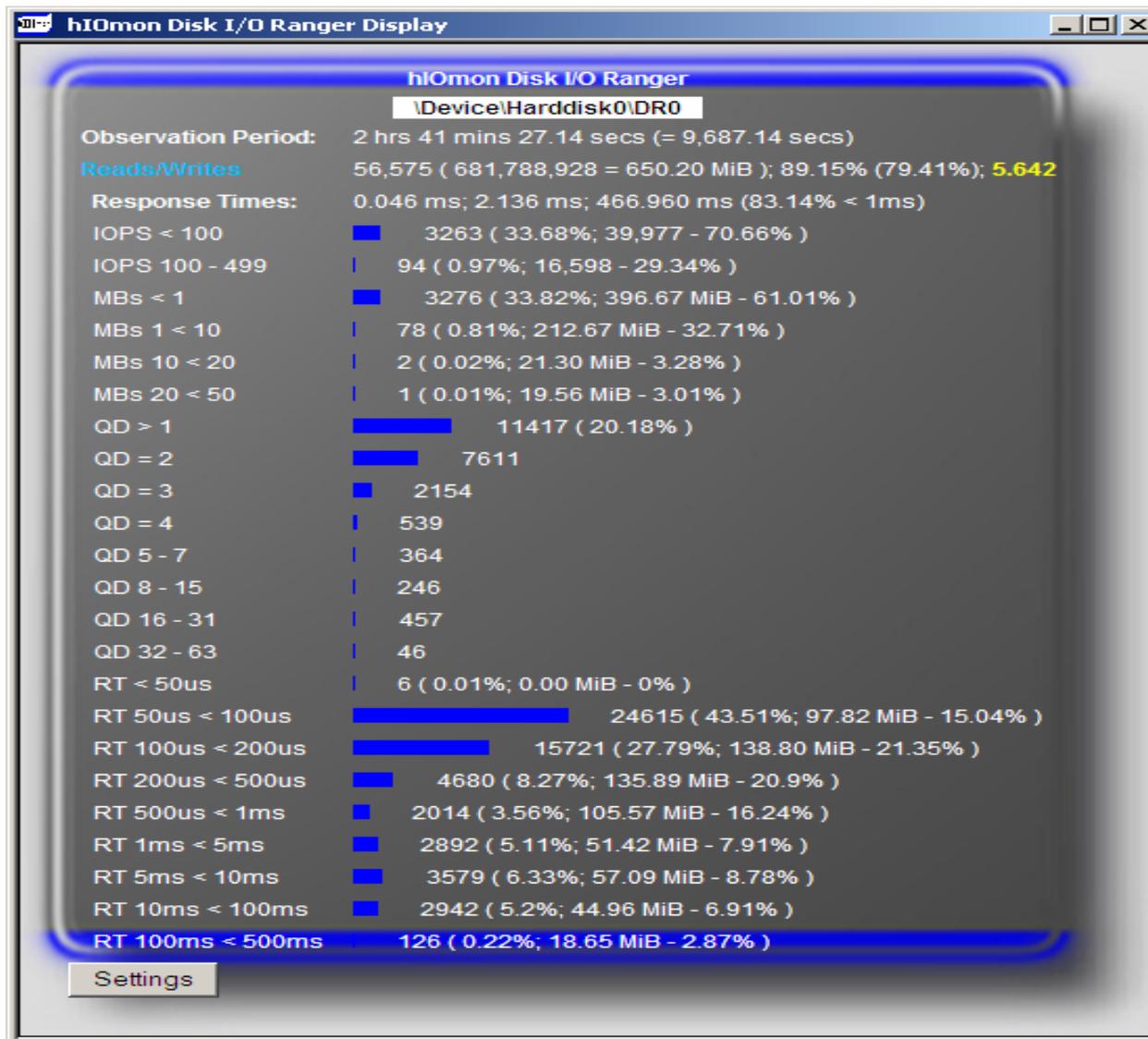
- **SSS TWG Analysis of Captured I/O Performance Metrics**
- **Summary of IOPS, Throughput, Latencies, Queue Depth, Random/Sequential, etc.**
- **Posting of Results to the SNIA IOTTA Repository**

SSSI PCIe Committee Member Participation

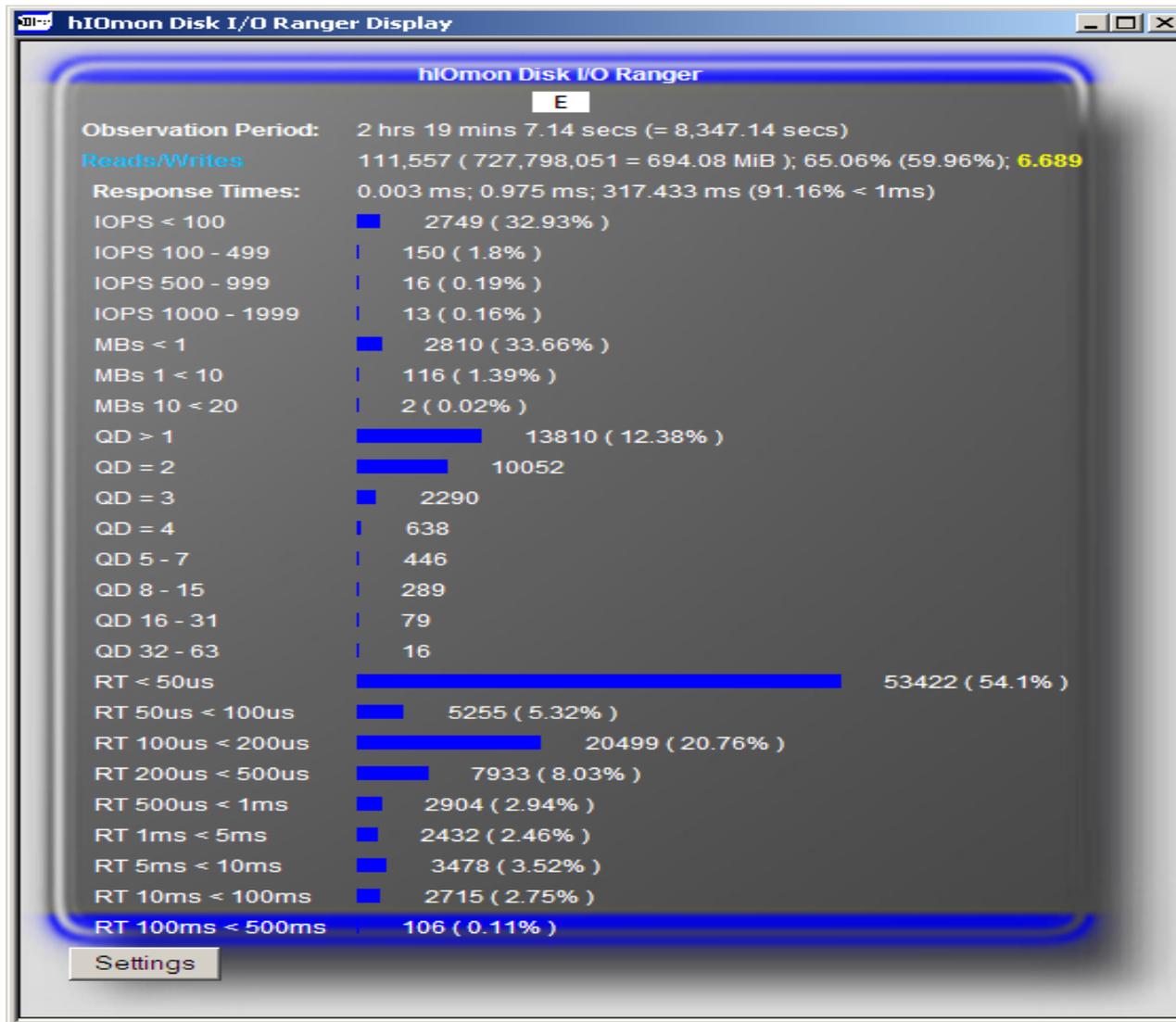
PCIe Committee Workload I/O Capture Program:

- **Volunteer to Download the Workload I/O Capture Tool**
 - ✓ Special free download tool (hIOMon Disk I/O Ranger) provided by hyperI/O
 - ✓ Simple to install; runs automatically in background
 - ✓ Records system configuration data, applications run, workload I/O per application
 - ✓ Summary metrics saved to CSV files (no I/O Trace collected); email to Committee
- **hIOMon IO Capture Tool Distributed to Interested Committee Members**
 - ✓ Client or Enterprise Applications
 - ✓ Single user or Company
- **Data Collected by PCIe Committee**
 - ✓ Top-level metrics published
 - ✓ Underlying data sent to SSS TWG for analysis
 - ✓ Workload I/O Captures posted to IOTTA Repository (<http://iotta.snia.org/>)

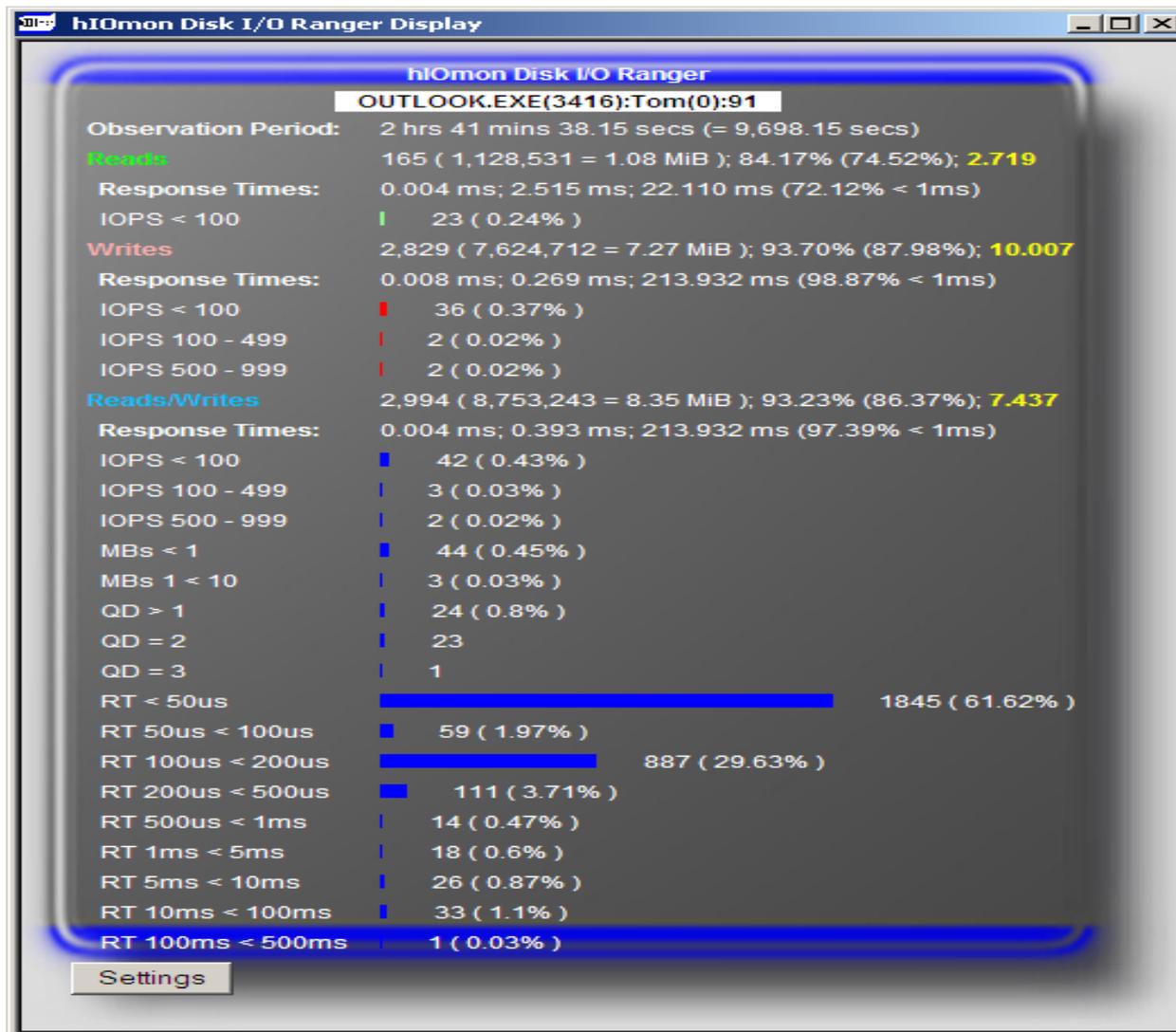
hIOMon Disk I/O Ranger: Physical Device



hIOmon Disk I/O Ranger: Logical Device



hIOmon Disk I/O Ranger: Application/Process



**Thank You for Participating in the
Open Industry PCIe SSD Task Force!!**