



**SNIA Solid State Storage Initiative  
PCIe SSD Task Force Meeting No. 7**

Monday 16 July 2012

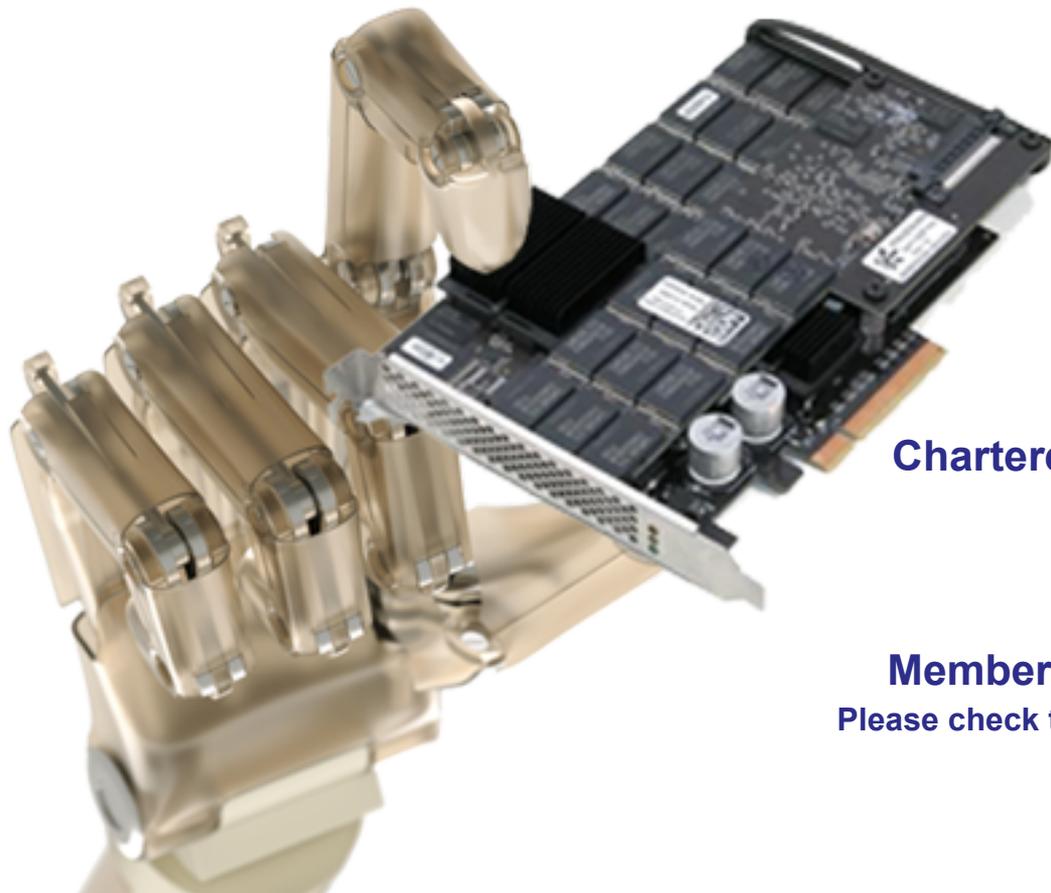


# WELCOME!



Advancing storage & information technology

**Meeting No. 7**  
**Monday 16JUL2012**  
**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](http://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](mailto:pciesd@snia.org)
- Send Questions to  
[pciechair@snia.org](mailto: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 – 16 JULY 12

<b>I.</b>	<b>Administrative</b>	
a.	Roll Call; Call Schedule	<b>4:00 – 4:05</b>
b.	Announcements	<b>4:05 - 4:10</b>
<b>II.</b>	<b>Business</b>	
1.	<b>PCIe Controllers – Narinder Lall, eASIC</b>	<b>4:10 - 4:30</b>
2.	<b>NVM Security – Walt Hubis, SNIA Security TWG</b>	<b>4:30 – 5:00</b>
3.	<b>General Discussion – Final Task Force Survey Questions</b>	<b>5:00 - 5:25</b>
<b>III.</b>	<b>Wrap Up</b>	
a.	Discussion	<b>5:25 – 5:30</b>
b.	Close	

# Attendance

I of 4

Company	No	09APR12	23APR12	07MAY12	21MAY12	04JUN12	18JUN12	16JUL12	30JUL12
Agilent	1	x	x	x	x			x	
Allion	2	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	
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	
Greenliant	18		x	x	x	x	x	x	

Time: 4:00 – 4:05

# Attendance

2 of 4

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Company	No	09APR12	23APR12	07MAY12	21MAY12	04JUN12	18JUN12	16JUL12	30JUL12
HDS	19	x		x	x			x	
HP	20	x	x	x	x	x	x	x	
HGST	21	x	x	x	x	x	x	x	
Huawei	22	x	x	x	x	x	x	x	
Hynix (SK Hynix)	23		x	x	x		x	x	
HyperIO	24	x	x	x		x	x	x	
IBM	25	x		x					
Intel	26	x	x	x	x	x	x	x	
Kingston	27								
Lecroy	28		x	x	x		x		
Lenovo	29	x		x		x			
LiteOnIT	30								
Link-A-Media	31								
Lotes	32								
LSI	33				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	
Microsoft	37	x	x	x					

Time: 4:00 – 4:05

# Attendance

3 of 4



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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	
Objective Analysis	41	x			x	x	x	x	
OCZ	42	x							
Oracle	43	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			
Samsung	48	x	x	x	x	x	x	x	
Sandisk	49	x	x						
Seagate	50	x			x	x	x		
Semtech Snowbush IP	51								
Smart Storage	52		x	x	x	x		x	
SNIA	53	x	x	x	x		x	x	
STEC	54	x	x	x				x	

Time: 4:00 – 4:05

# 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	
Tyco Electronics	59	x	x						
Unigen	60	x	x	x					
Viking	61								
Violin Memory	62						x		
Virident	63	x	x	x	x				
WDC	64	x	x	x					
Paul Mitchell (Ind)	65								
		39	37	34	33	23	28		

# Announcements - Eden Kim

## 1. Announcements / Other

- a. Minutes Meeting No. 5 - next slide
- b. Task Force Charter / Structure - Standing Slides
- c. Announcements: **NO MTG 02JUL12**

### 1. **Meeting No. 7** – Where do we go from Here? – 16JUL12

- a. PCIe Controllers – Narinder Lall, eASIC
- b. NVM Security – Walt Hubis, SNIA Security TWG

### 2. **Meeting No. 8** – SNIA / SSSI presentations to Task Force – 30JUL12

- a. SNIA Board – SNIA Organization – Phil Mills
- b. Initiatives – Paul Wassenberg SSSI
- c. SNIA Tech Council – Arnold Jones SNIA, Don Deel (EMC)
- d. TWGs – Tom West IOTTA, Gilda Foss ABDC, Eden Kim SSS

### 3. **SNIA/SSSI Flash Memory Summit Reception: email to [pciechair@snia.org](mailto: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

# Minutes Meeting No. 6

## 18JUN12

### 1. Attendance:

- a. (28) Companies present of (65)
- b. Presentations / Speakers – Objective Analysis / Coughlin Assoc, Fusion-io

### 2. Administrative:

- a. **Task Force Charter** - General Survey of PCIe SSD issues; Recommendations for SSSI Committee 2d half 2012

- b. **Task Force Structure** -

- 1. (3) Open Mtgs left: 18JUN12, 16JUL12, 30JUL12

- 2. Meeting Topics:

- Meeting No. 6 - Marketing Issues & Deployment Strategies

- Meeting No. 7 - “Where do we go from here?”

- Meeting No. 8 - Presentation of SNIA / SSSI to Task Force

- RECEPTION - SNIA / SSSI FMS Reception 20AUG12 at Santa Clara Convention Center

- Links: Email Reflector: [pciessd@snia.org](mailto:pciessd@snia.org) PCIe Task Force Homepage: [www.snia.org/forums/ssi/pts](http://www.snia.org/forums/ssi/pts)

### 3. PCIe – An Analyst’s View – Jim Handy, Objective Analysis, Tom Coughlin, Coughlin Assoc.

### 4. PCI Primitives & Persistent Memory – Walt Hubis, Fusion-io

### 5. Next Actions -

- a. RSVP Flash Memory Summit Reception
- b. Agenda / Topics - Meeting No. 7

*Close 5:30PM*

## **Task Force Charter: GENERAL SURVEY OF PCIE ISSUES**

### **1. Provide Guidance to Marketplace about PCIe SSDs**

1. Educational Materials
2. Best Practices Documents
3. Industry Standards Work

### **2. Coordinate w/ other Industry Organizations**

1. Complement other groups
2. Avoid Overlap
3. Fill Voids

### **3. Open Industry Forum to SSSI Committee**

1. (90) Day Free Trial Membership
2. SNIA SSSI Membership Required Aug 2012
3. No IP/NDA - No Confidential Information may be discussed
4. Identify Issues & Define Roadmap for Committee

### Task Force Structure:

- 1. Webex Meetings - Every other Monday**
  1. Starting Monday 09APR12 and every two weeks thereafter
  2. 4:00 PM - 5:30 PM PST
  3. (8) Open Calls prior to SNIA/SSSI Membership Requirement
  
- 2. Email Reflector - [pciessd@snia.org](mailto:pciessd@snia.org)**
  1. Agenda, Minutes & Discussion via reflector until 30JUL12
  2. Post Meeting Survey's for feedback and agenda preparation
  3. Email reflector becomes SSSI member only starting 30JUL12
  
- 3. Target Objectives for (90) Day Public Forum Period**
  1. Table of Standards Groups
  2. Recommendation on PCIe Hardware Test Platform Standard
  3. Identification of PCIe SSD Performance Issues
  4. Hosting of PCIe Round Table Panel
  5. Other Objectives defined by Task Force
  6. Identity Issues & Recommend SSSI PCIe Committee Roadmap for 2012

## SSSI

- SSSI homepage [www.snia.org/forums/sssi](http://www.snia.org/forums/sssi)
- Understanding SSD Performance Project [www.snia.org/forums/sssi/pts](http://www.snia.org/forums/sssi/pts)
- SSS Performance Test Specification (PTS) [www.snia.org/pts](http://www.snia.org/pts)
- PTS Standard Report Format [www.snia.org/forums/sssi/pts](http://www.snia.org/forums/sssi/pts)
- SSSI Bright Talk Webcasts [www.snia.org/forums/sssi/knowledge/education](http://www.snia.org/forums/sssi/knowledge/education)
- SSSI White Papers [www.snia.org/forums/sssi/knowledge/education](http://www.snia.org/forums/sssi/knowledge/education)

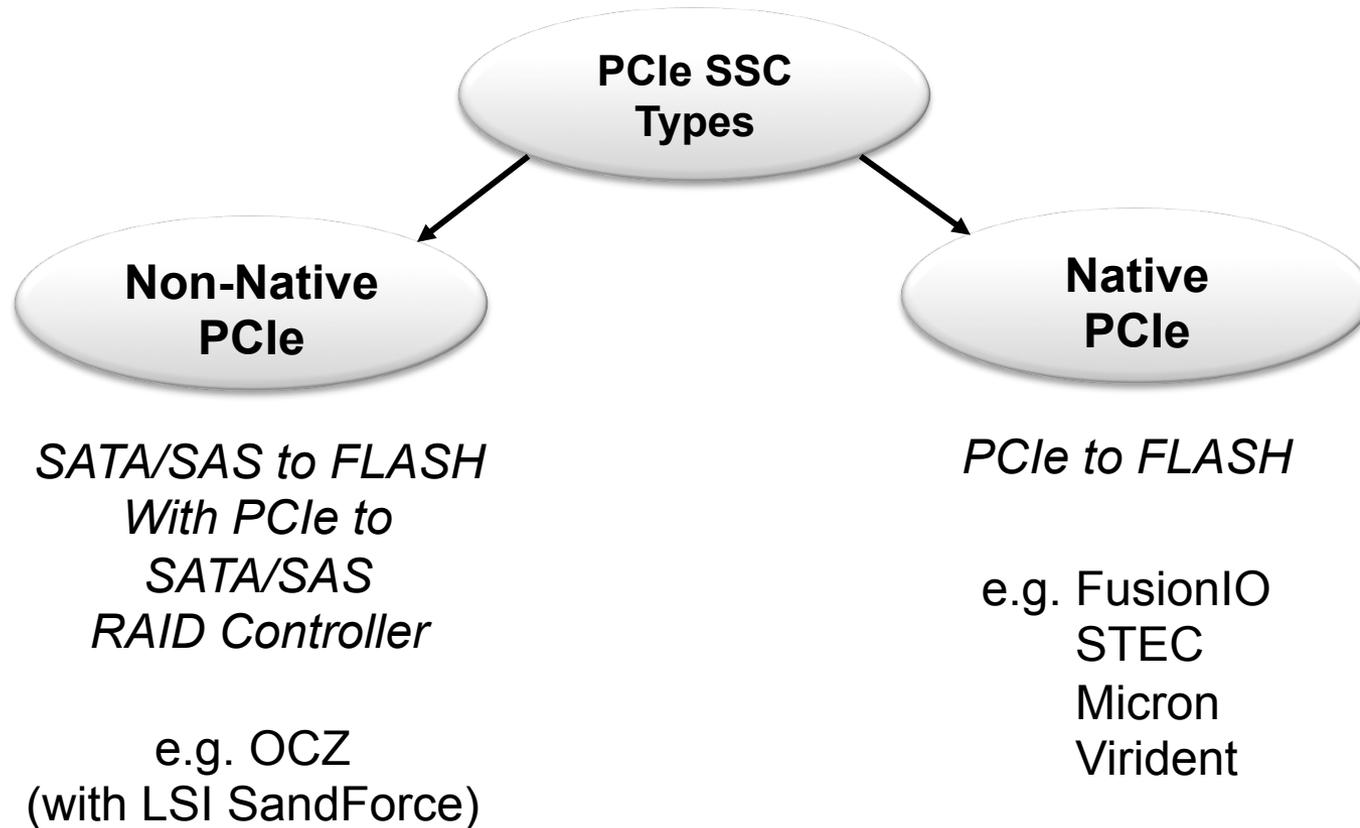
## PCIe Task Force

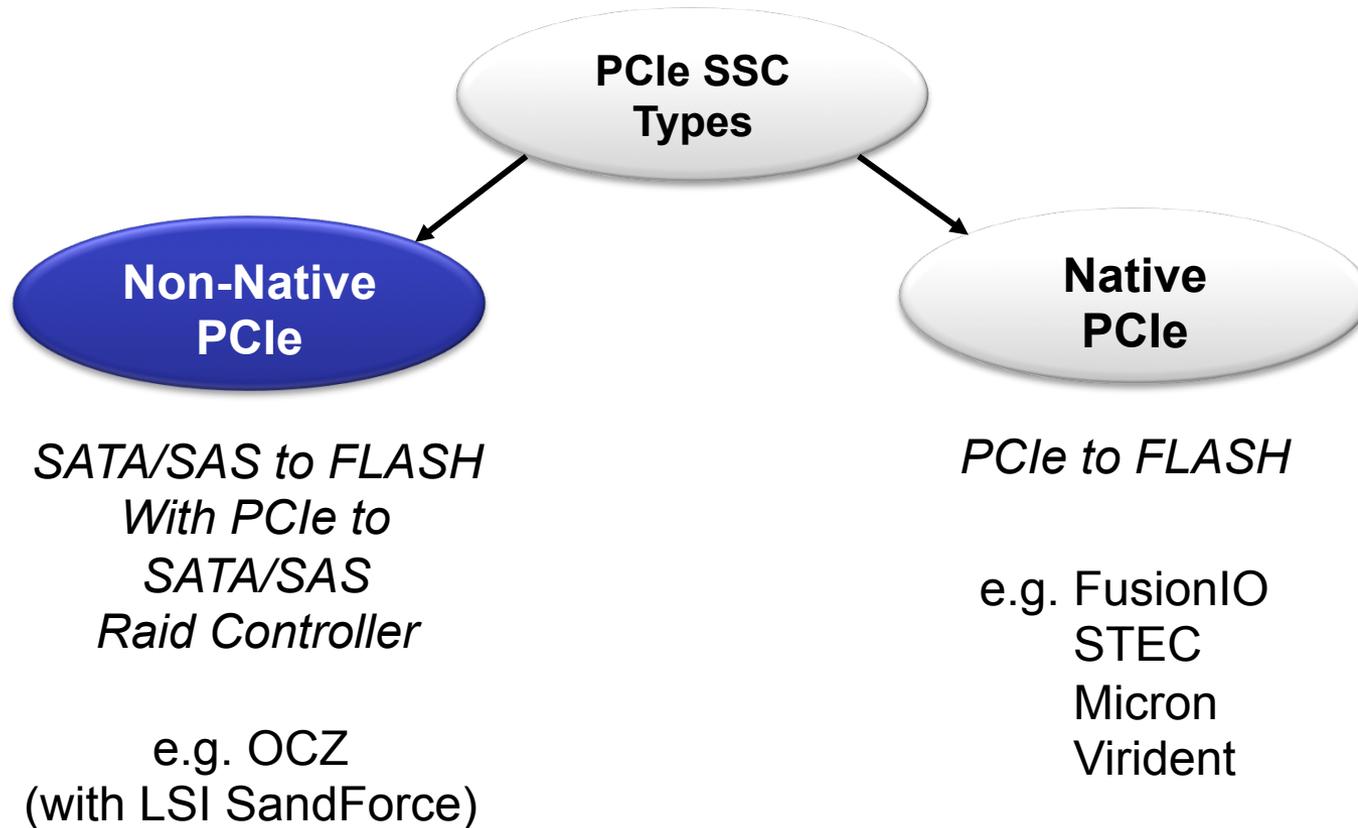
- PCIe SSD Task Force [www.snia.org/forums/sssi/pcie](http://www.snia.org/forums/sssi/pcie)
- PCIe SSD Task Force reflector [pciessd@snia.org](mailto:pciessd@snia.org)
- PCIe SSD Task Force questions [pciechair@snia.org](mailto:pciechair@snia.org)

# PCIe Controllers

Narinder Lall, eASIC

## PCIe Controllers





# ASSP Controllers for Non-Native PCIe SSCs

## ➤ Advantages

- ◆ Fastest time to production
- ◆ No chip design NRE needed

## ➤ Disadvantages

- ◆ Many controllers needed
- ◆ Limitations on how PCIe SSC vendors can differentiate & adapt
- ◆ New SSC introduction somewhat restricted by availability of ASSP
- ◆ Higher latency than native PCIe

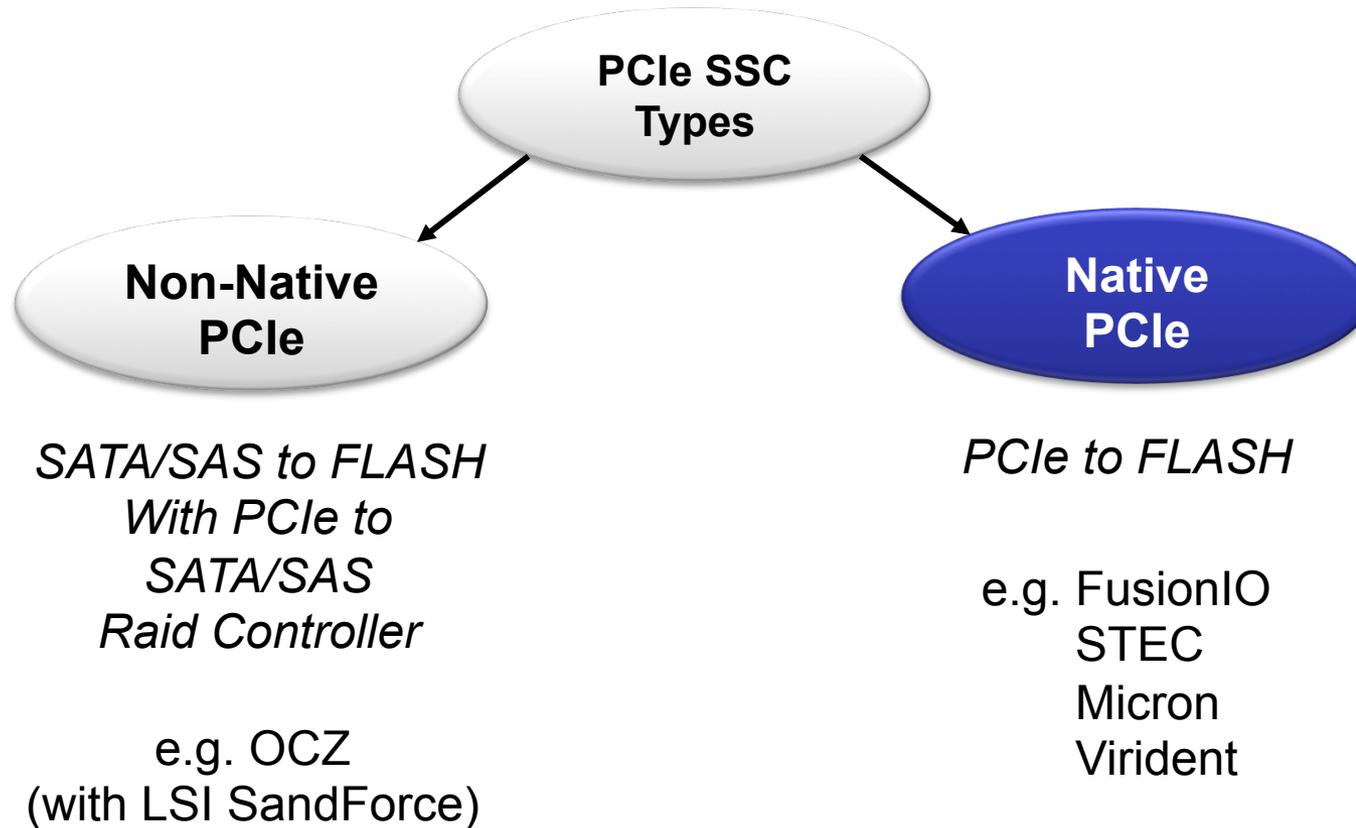
### Example Implementation: **LSI SandForce® ASSP-based OCZ RM88 Z drive**



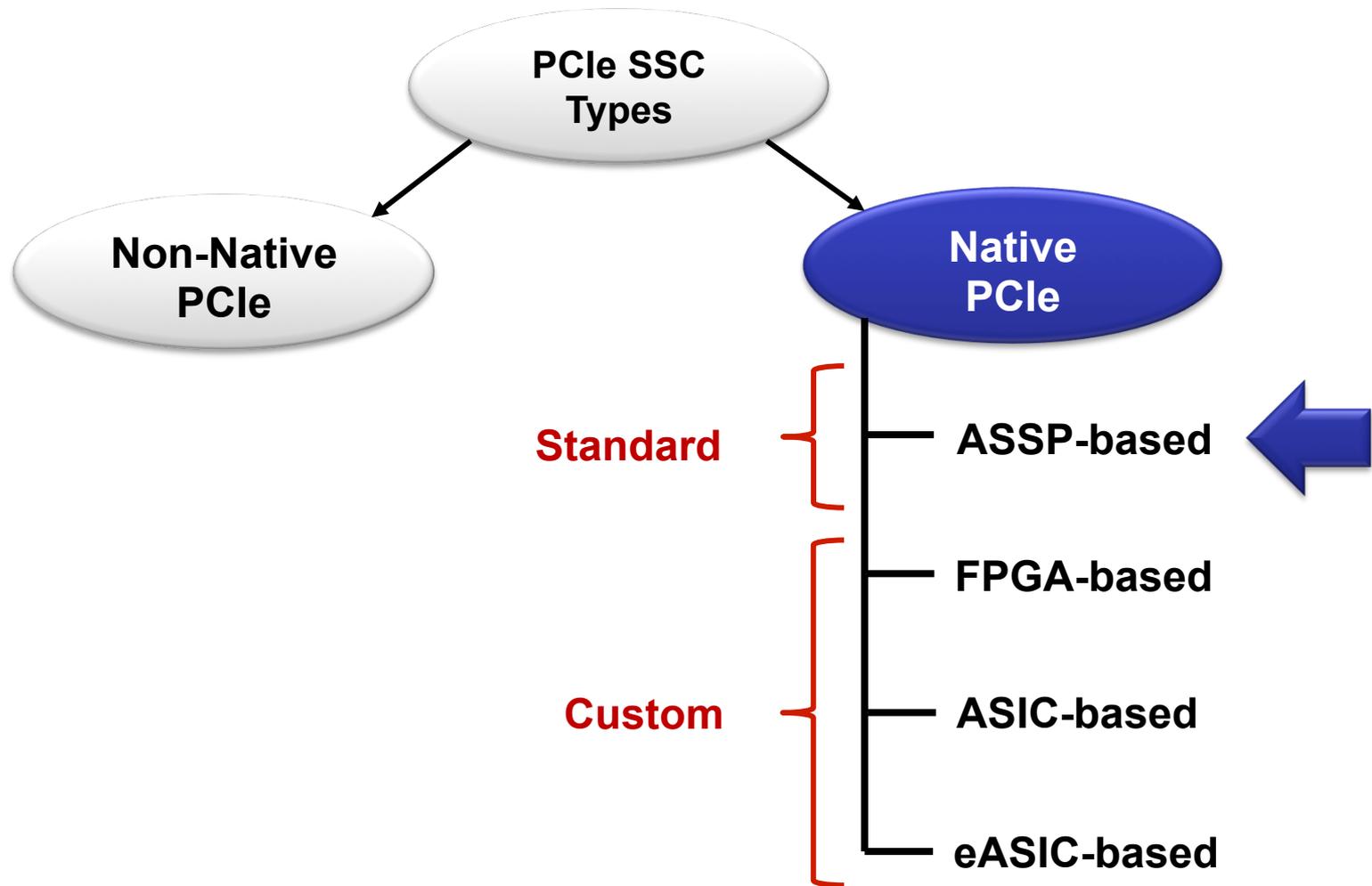
#### 8 SandForce Controllers

- 410,000 IOPs (4KB, MLC)
- 26W (active)
- 800GB-3.2TB

Higher power/IOPs options available



# Native PCIe SSC Controllers



# ASSP-based Controllers for Native PCIe SSCs

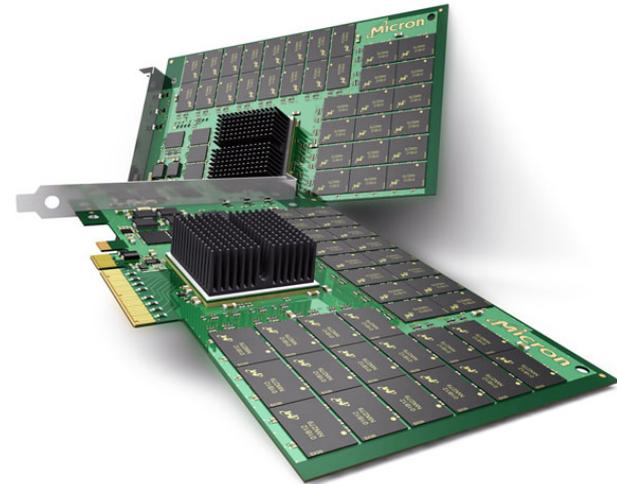
## ➤ Advantages

- ◆ Fastest time to production
- ◆ Low power consumption
- ◆ No design NRE needed

## ➤ Disadvantages

- ◆ Limitations on how PCIe SSC vendors can differentiate & adapt
- ◆ New SSC introduction somewhat restricted by availability of ASSP

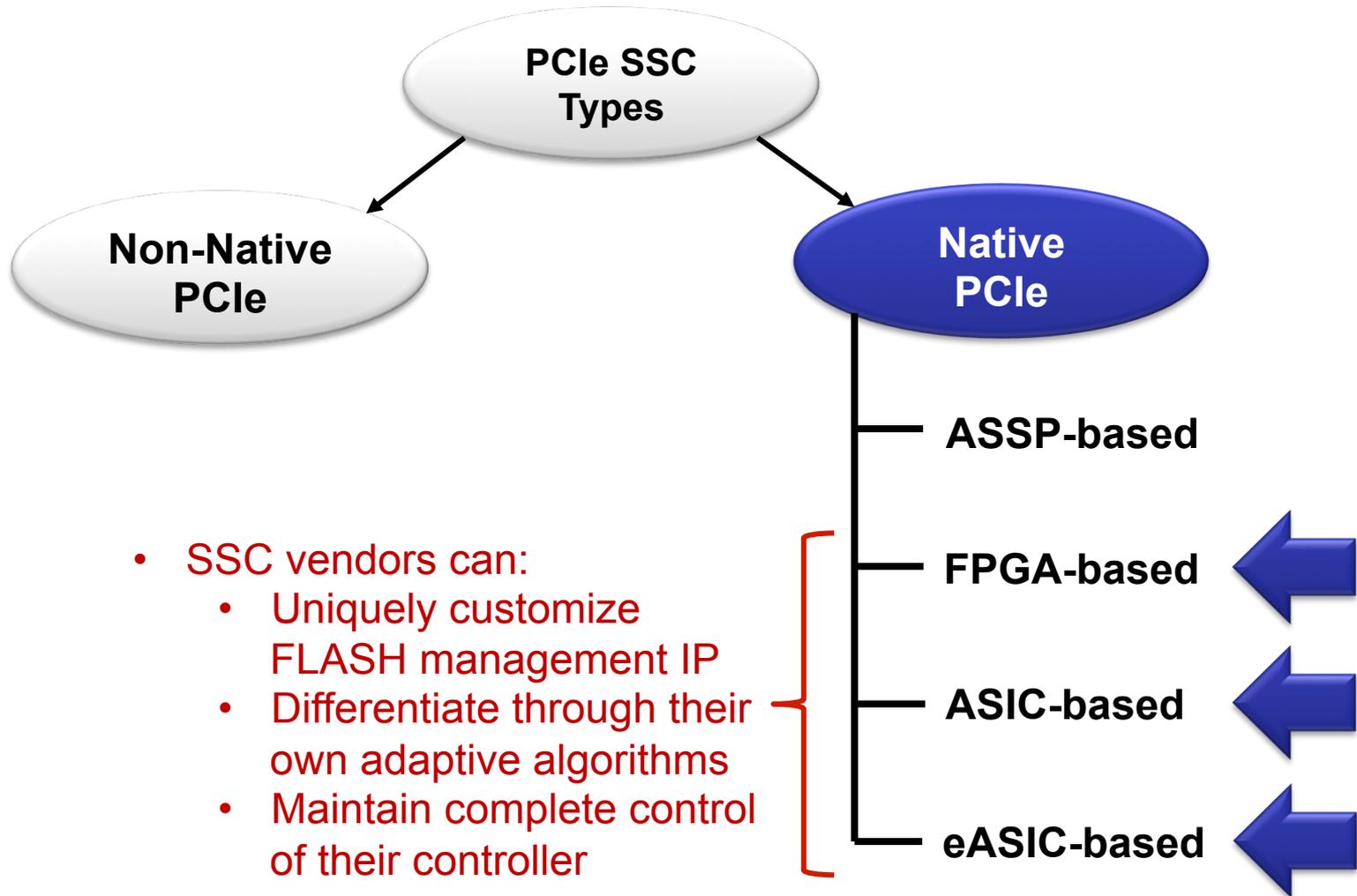
### Example Implementation: IDT ASSP-based Micron p320h PCIe SSC



- One Integrated HBA + Controller
- Up to 785,000 IOPs (4KB, SLC)
  - 25W (active)
  - 300-700GB

Note: Data taken from Micron website

# Native PCIe SSC Controllers



# Custom Controller Platform Architectures

## Cell-based ASIC

## FPGA

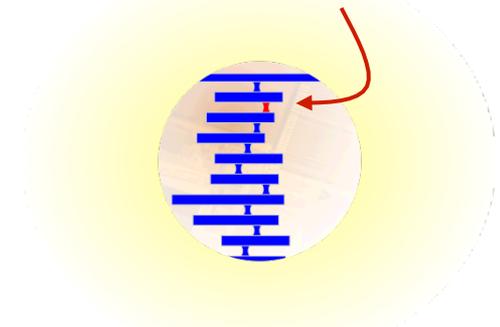
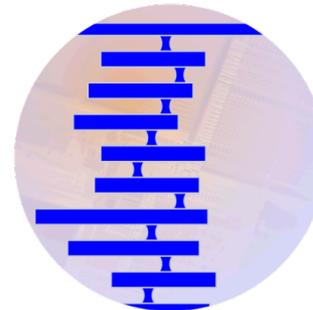
## eASIC<sup>®</sup>

### Customization

Every layer is uniquely customized in the fab for each design

The user programs SRAM cells to customize FPGA

Fab customizes entire chip using a Single Via Layer



### Design Structures

Design structures are created, connected & verified for every design

- Design/Test structures are **already in-built** e.g. Logic, Test
- The user configures/connects these structures & verifies design

### Test Structures

Test structures are created, connected & verified for every design

# FPGA-based Controllers for Native PCIe SSCs

## ➤ Advantages

- ◆ Fast time to market and production
- ◆ Little chip design NRE needed
- ◆ Field upgradeable
- ◆ Custom algorithms (H/W optimized)

## ➤ Disadvantages

- ◆ High FPGA power consumption limits IOPS
- ◆ Likely to be highest device cost (FPGA)

## Example Implementation: FPGA-based FUSION-io ioDrive2 SSC



### FPGA based HBA + Controller

- Up to 535,000 IOPs (512b, MLC)
- 24W
- 1.28TB

Higher IOPS/power SSCs also available

Note: Data taken from Fusion-io website

# Cell-based ASIC Controllers for Native PCIe SSCs

## ➤ Key Advantages

- ◆ High performance
  - › Often multi-CPU based
- ◆ Lowest device cost
- ◆ Lowest power consumption
- ◆ Custom algorithms e.g. adaptive DSP

## ➤ Key Disadvantages

- ◆ Highest NRE/Risk (\$Millions)
- ◆ Longest development time
  - › 12-18 months after FPGA finalized
  - › Cannot always use latest FLASH

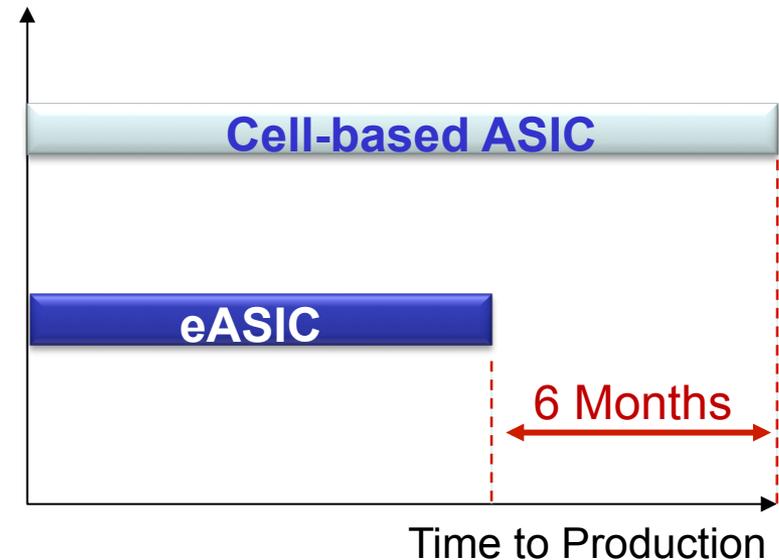
*\*"Adaptive SSDs have smarter technologies which can each dynamically interact and learn from the chips they're connected to."*

*Source: [StorageSearch.com](http://StorageSearch.com)*

# eASIC-based Controllers for Native PCIe SSCs

## ➤ Key Advantages

- ◆ High performance
  - › Hardware optimized
- ◆ Short time to production
  - › 6 months earlier than cell-based ASIC
  - › Can leverage latest FLASH
- ◆ Low power consumption
  - › High IOPS at 25W
- ◆ Low design risk
- ◆ Custom algorithms e.g. adaptive DSP



## ➤ Key Disadvantages

- ◆ NRE required (albeit '00s \$K)

## ➤ Typical Volumes for ROI

- ◆ FPGA: Low 10's KU
- ◆ eASIC: Low 10's KU to 1MU
- ◆ Cell-based ASIC: > 1MU

## ➤ PCIe SSC Market\*

- ◆ 2011 – Low '00s KU
- ◆ 2015 – 2MU



## ➤ Can cell-based ASIC provide adequate ROI for all controller suppliers? (12+ months from final FPGA to ASIC production)

\* Source: FLASH Memory Summit 2011

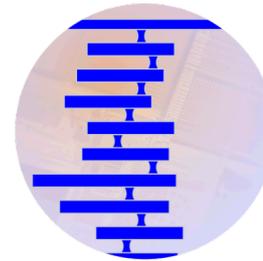
[http://www.flashmemorysummit.com/English/Collaterals/Proceedings/2011/20110809\\_F1C\\_Collins.pdf](http://www.flashmemorysummit.com/English/Collaterals/Proceedings/2011/20110809_F1C_Collins.pdf)

# Custom Architecture Summary

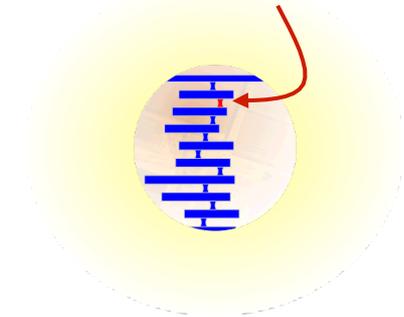
Every layer is uniquely customized in the fab for each design



The user programs SRAM cells to customize FPGA



Fab customizes entire chip using a Single Via Layer



	Cell-based ASIC	FPGA	eASIC
Performance (at 25W)	Fastest	Slowest (Programmable)	Fast
Time to Production	12+ months after FPGA production	Immediately after FPGA prototype is finalized	6 months earlier than cell-based ASIC
Development Cost (Risk etc.)	\$Millions (ROI?)	Low Tens \$K	Hundreds of \$K

- Native PCIe SSC Controllers gaining momentum
- Many choices for controllers
  - ◆ ASSP, FPGA, Cell-based ASIC, eASIC
- eASIC
  - ◆ Emerging as a high IOPs, fast time to production solution
  - ◆ ROI at much lower volumes than cell-based ASIC

Thank You

Narinder Lall, eASIC Corporation  
([narinder@easic.com](mailto:narinder@easic.com))

# PCIe Controllers, Narinder Lall, eASIC

- **Discussion / Questions & Answers**

# **Security Topics for PCIe and Non-Volatile Memory**

- **New Class of Portable Storage**
- **SCSI Express**
  - ◆ SOP/PQI Interface
  - ◆ PCIe Hot Pull+Plug
  - ◆ Standard Form Factor
- **Removable Memory**
  - ◆ Non Volatile Memory Modules
  - ◆ PCIe Cards

# Why Security?

## ➤ Portability

- ◆ HDD, SSD
- ◆ Now PCIe NVM devices

## ➤ Compliance

- ◆ At least 46 States have data privacy laws
- ◆ All have encryption *safe harbors*
  - › Exempts lost encrypted data from public disclosure

## ➤ Protect Data

- ◆ Obsolete
- ◆ Failed
- ◆ Stolen
- ◆ Misplaced
- ◆ Decommissioned
- ◆ Reprovisioned

# Compliance Requirements

Sector	Requirements
<b>Public</b>	Encryption requirements for FISMA, DoD, and DCID 6/3
<b>Health</b>	HiTECH + HIPAA fines and prosecution
<b>E-Commerce</b>	PCI-DSS Requirement 3 for handlers of credit card information
<b>Retail</b>	PCI-DSS mandates encryption for data at rest
<b>Service Providers</b>	Service level support for HiTECH, PCI-DSS, GLBA, FFIEC
<b>Financial</b>	Basel II, FFIEC, and GLBA requirements for encryption
<b>Other</b>	Various state mandating encryption for companies doing business in those states (e.g., MA and NV).

- Court Orders,
- Contractual Obligations
- Due Care
- Trade Secrets
- Competitively Sensitive Information
- National Security
- Intellectual Property

## ➤ Management Concerns

- ◆ Public Image
- ◆ Thwarting/Detecting Criminal Activity
- ◆ Protecting Intellectual Property
- ◆ Traceability to Quantifiable Obligations and Requirements

## ➤ Organizational Policies

- ◆ Retention
- ◆ Destruction
- ◆ Privacy/Confidentiality

## ➤ IS/IT

- ◆ Compliance with Strategic Plan
- ◆ Desired Future States
- ◆ Audit Results

## ➤ Monitoring

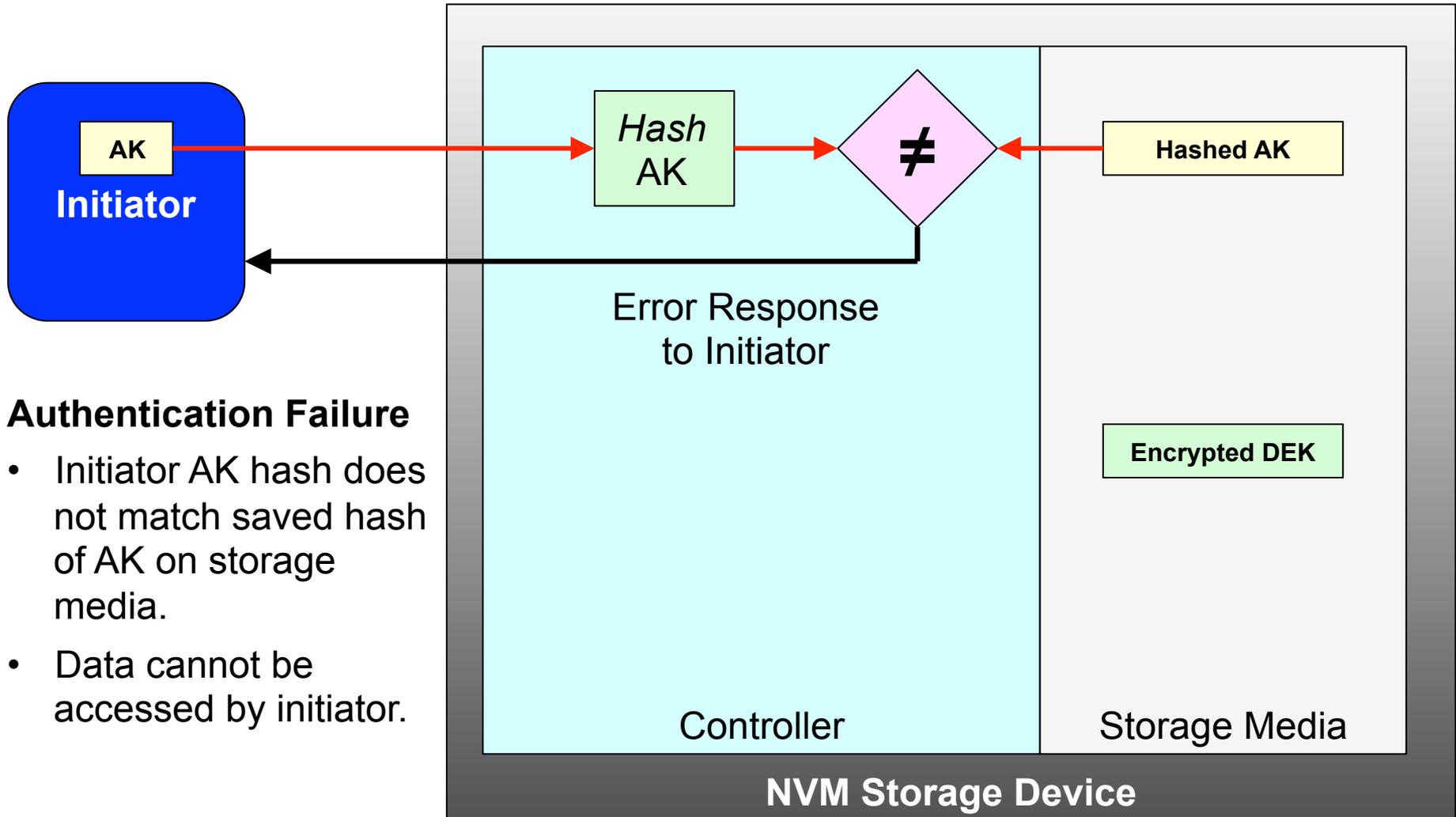
- ◆ Track Access to Sensitive Data
- ◆ Monitor Intrusion

## ➤ Audits

- ◆ May be an Additional Legal or Corporate Obligation

- All data on the media is encrypted
  - ◆ Encryption occurs with all writes
  - ◆ Decryption occurs with all reads
- Two types of keys needed
  - ◆ Authentication Key (AK)
    - › Used to allow an initiator to access the storage device
    - › Kept on storage media in hashed form
    - › Known by initiator
  - ◆ Data Encryption Key (DEK)
    - › Used by the device to encrypt and decrypt data
    - › Encrypted on the storage device media
    - › Cannot be read or written directly
      - Controlled by storage device
      - Can only be set to a random value

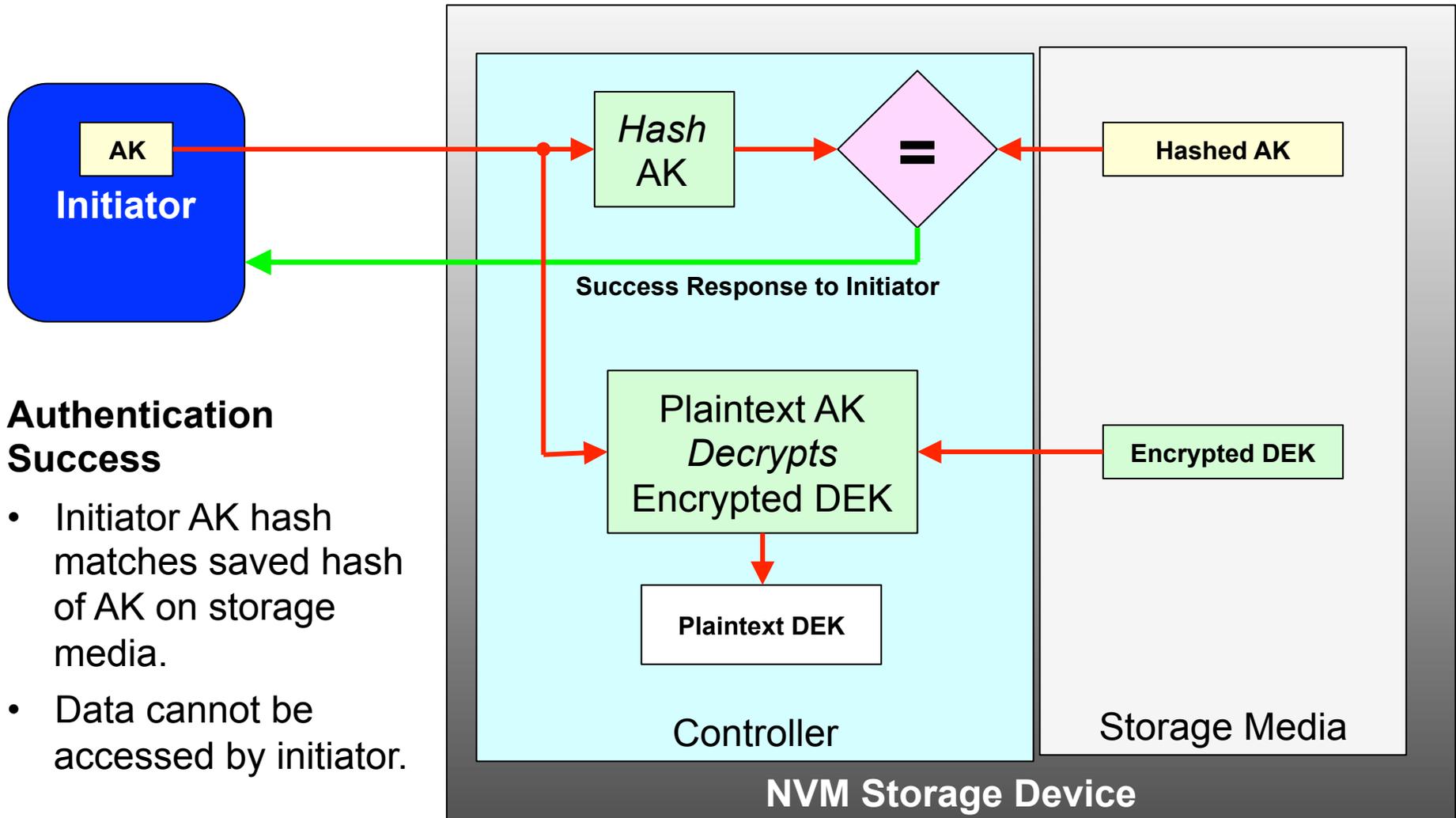
# Authentication Failure



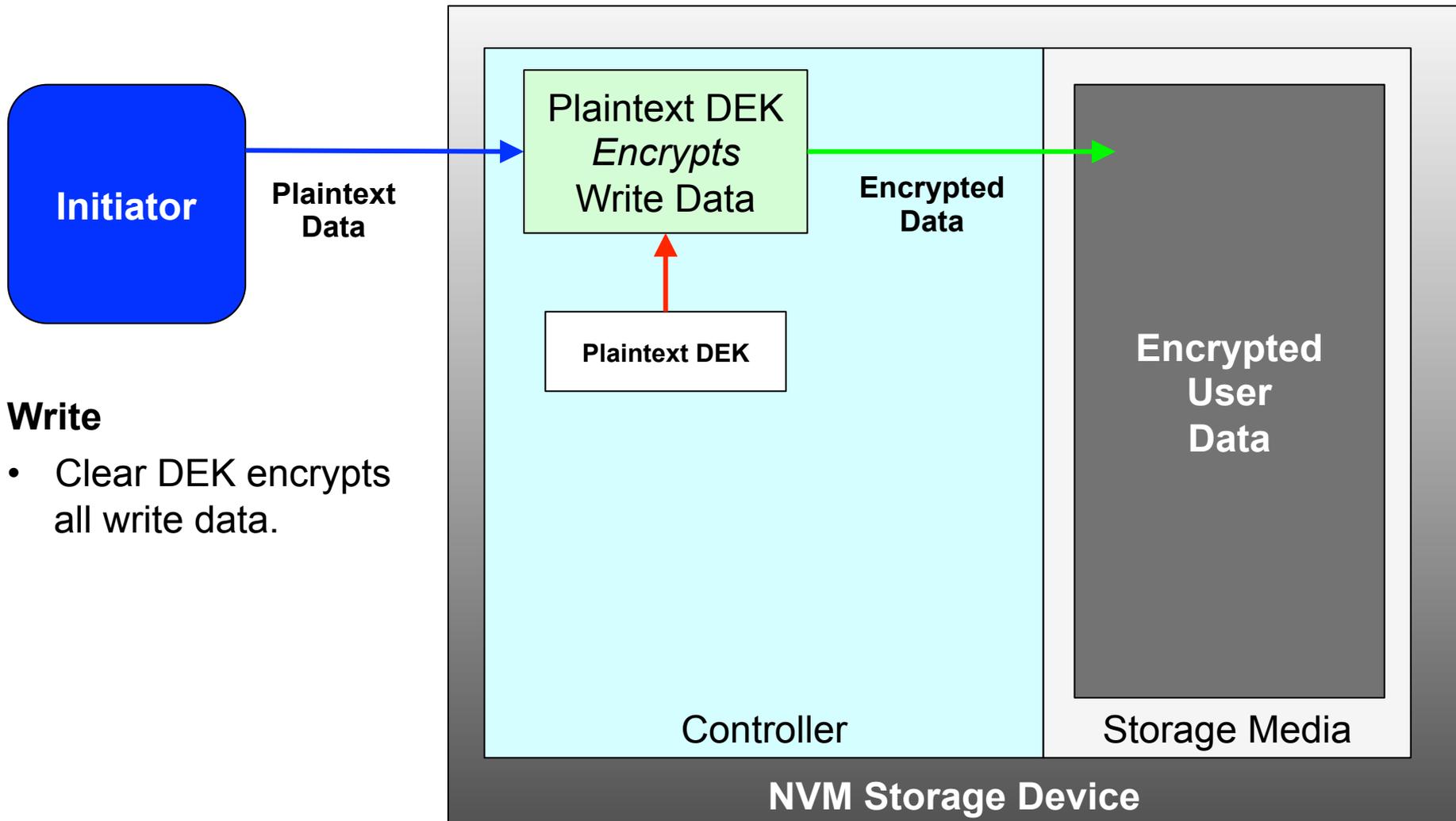
## Authentication Failure

- Initiator AK hash does not match saved hash of AK on storage media.
- Data cannot be accessed by initiator.

# Authentication Success



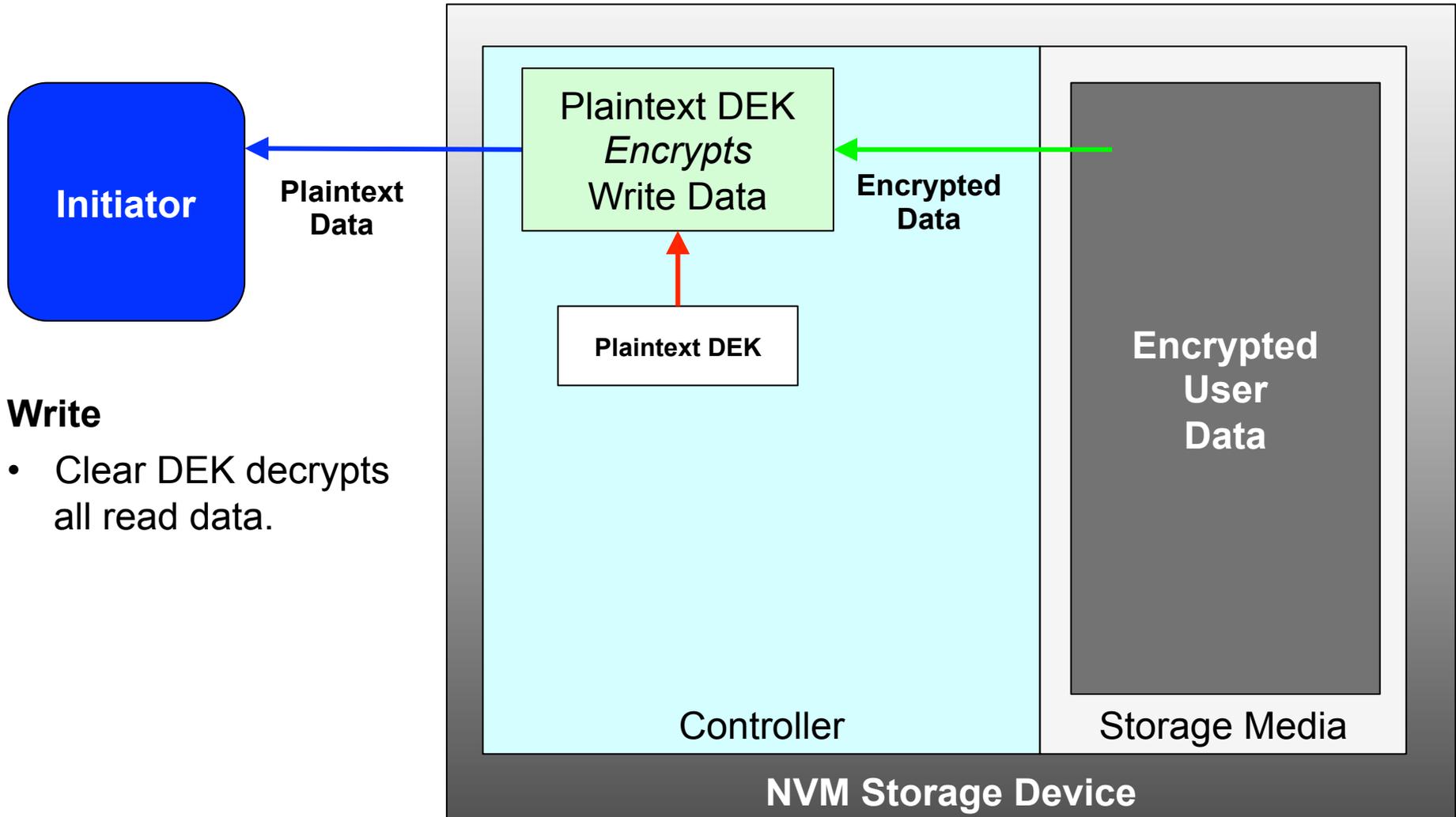
# Write



## Write

- Clear DEK encrypts all write data.

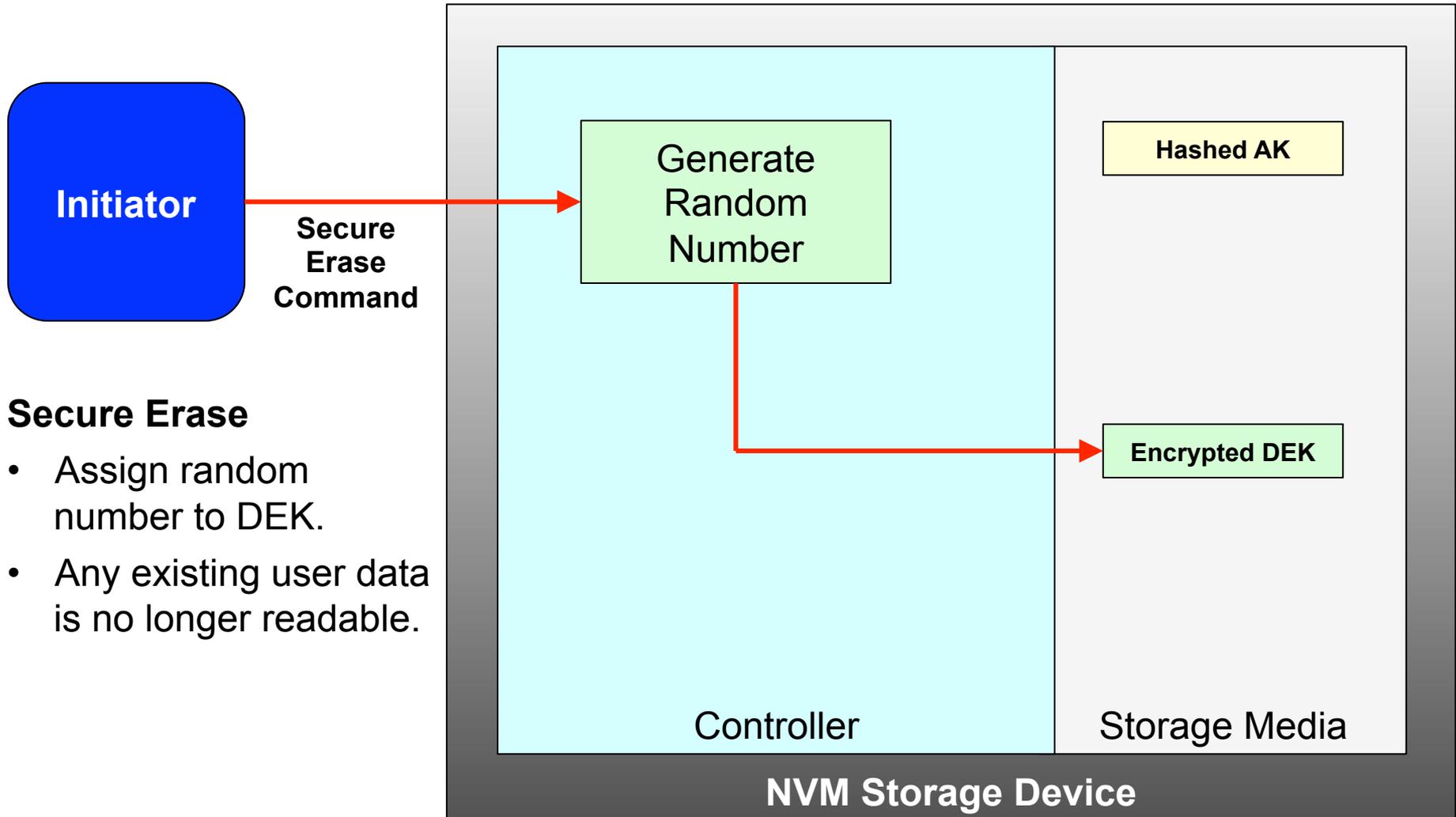
# Read



# Why Self Encryption?

- Simplified Management
- Robust Security
  - ◆ FIPs I40-2 Capable
- Safe Harbor Compliance
- Lowered Disposal Costs
  - ◆ Secure Erase
- Scalable
- Interoperable
  - ◆ TCG Enterprise and Opal
  - ◆ Supported in T10 and T13
- Transparent

# Secure Erase



## Secure Erase

- Assign random number to DEK.
- Any existing user data is no longer readable.

## ➤ Secure Erase

- ◆ Log-Append mechanism requires attention
  - All un-erased data must be cleared
  - Unmapped data must be cleared
  - Areas scheduled for garbage collections must be cleared
- ◆ Any area that may have contained user data must be cleared

## ➤ Accessibility

- ◆ Current NVM technologies easier to examine
  - No spin stand required
  - Common (and inexpensive) mechanisms available

- **Best security practices for NVM**
  - ◆ Encryption
  - ◆ Key Management
- **Manufacturing**
  - ◆ Requirements and best practices
- **Speed**
  - ◆ Cryptographic module suitability for NVM speeds
- **Applicability of requirements**
  - ◆ FIPs
  - ◆ Common Criteria
  - ◆ Others?

## ➤ SNIA Security Technical Work Group (TWG)

- ◆ Focus: Requirements, architectures, interfaces, practices, technology, educational materials, and terminology for storage networking.
- ◆ [http://www.snia.org/tech\\_activities/workgroups/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](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](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](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/](http://www.snia-europe.org/news_events/e_news/))

- NIST Special Publication 800-57: Recommendation for Key Management ([http://csrc.nist.gov/publications/nistpubs/800-57/sp800-57-Part1-revised2\\_Mar08-2007.pdf](http://csrc.nist.gov/publications/nistpubs/800-57/sp800-57-Part1-revised2_Mar08-2007.pdf))
- ISO/IEC 11770 Parts 1-3: Information technology - Security techniques - Key management (<http://webstore.ansi.org/> )
- FIPS 140-2: SECURITY REQUIREMENTS MODULES (<http://csrc.nist.gov/publications/fips/fips140-2/fips1402.pdf>)
- Trusted Computing Group (<https://www.trustedcomputinggroup.org/home>)
- IEEE P1619.3: Security in Storage Workgroup (SISWG) Key Management Subcommittee (<http://siswg.net/>)
- OASIS Enterprise Key Management Infrastructure (EKMI) Technical Committee ([http://www.oasis-open.org/committees/tc\\_home.php?wg\\_abbrev=ekmi](http://www.oasis-open.org/committees/tc_home.php?wg_abbrev=ekmi))
- IETF: Provisioning of Symmetric Keys (KEYPROV) (<http://www.ietf.org/html.charters/keyprov-charter.html>)

# Questions

# NVM Security

## Walt Hubis, SNIA Security TWG



- **Discussion / Questions & Answers**

# Open Discussion

## Final Doodle Poll of Task Force

Opportunity to pose questions to the group.

Send suggestions to [pciechair@snia.org](mailto:pciechair@snia.org)

Sample Questions on following page(s)

# PCIe Task Force Survey Questions

## Sample Questions:

1. What is the topic area that has been the most value to you?
  - a. Standards & Technical Working Groups
  - b. Education & Market Development
  - c. Specifications & Product Architectures
  - d. Workloads, Testing & Certification
2. What would you most want to have as a work item in the PCIe Committee?
  - a. Standards & Technical Working Groups
  - b. Education & Market Development
  - c. Specifications & Product Architectures
  - d. Workloads, Testing & Certification
3. What is the most important activity you want the PCIe Committee to perform?
  - a. Continuing Education & Presentations on PCIe Specs & Trade Groups
  - b. Discussion of Product Architectures
  - c. Industry Round Tables & Trade show Events
  - d. Other

# PCIe Task Force Survey Questions

## Sample Questions:

4. What is the technical area of most interest to you?
  - a. Client v Enterprise Workloads
  - b. PCIe Testing
  - c. PCIe Test Platform Specifications
  - d. Driver Architectures
  - e. PCIe Standards – interaction & execution
5. In which of the following would you want to participate?
  - a. White Paper – PCIe 101: An introduction and overview of PCIe SSDs
  - b. Best Practices – Test & Instrumentation; Driver implementation; Cabling & Connectors; Security
  - c. PCIe Performance – Performance metrics & methodologies: recommendations to SSS TWG
  - d. Workloads definition – Client & Enterprise workloads for PCIe SSDs
6. Question ?
  - a. item
  - b. item
  - c. item
  - d. Other

# PCIe Task Force Survey Questions

## Sample Questions:

7. Question ?

- a. item
- b. item
- c. item
- d. Other

8. Question ?

- a. item
- b. item
- c. item
- d. Other

9. Question ?

- a. item
- b. item
- c. item
- d. Other

# Open Discussion Next Actions

## Open Discussion:

## Next Actions:

- **Meeting No. 8 – SNIA / SSSI Presentation to Task Force 30JUL12**
  - a. **SNIA Organization – Phil Mills**
  - b. **Solid State Storage Initiative – Paul Wassenberg**
  - c. **SNIA Technical Council – Arnold Jones**
  - d. **SNIA Technical Working Groups & Committees**
    - 1. **IOTTA – Tom West**
    - 2. **ABDC – Gilda Foss**
    - 3. **Security – Walt Hubis**
    - 4. **NVMP – Paul von Berhan**
    - 5. **Solid State Storage – Eden Kim**
  
- **FMS Reception – 20AUG12**
  - **5:30 – 7:00 PM**
  - **Santa Clara Convention Center rm 209-210**

# Supplemental Slides