Managing the FTL for reliability, security… & recovery?

Flash Memory Summit

Balancing Openness & IP to benefit the Customer

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DEPRESSION AWARENESS

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SSDs: Order(s) of Magnitude Better Reliability

When you're one of the 0.5%, statistics don't matter!!

- Root cause analysis of returned drives:
  - *No Trouble Found!*
  - Power Interrupt/Brownout (Data Corruption)
  - Power Interrupt (NOR Flash – Empty Sector)
  - Firmware Bug
  - Discrete Component Failure

SSDs: Managing Priority

SSD Manufacturers have definite priorities.

1. Cost
2. Cost
3. Quality and Reliability
4. Time to Market
5. Performance
6. *Disaster Recovery*
7. Cost

How SSDs Work

- ## Flash Translation Layer: FTL
  - FTL is the SSD manufacturer's "secret sauce."
  - FTL and NAND architecture are key differentiators
    - SSD manufacturers won't give up their FTL secrets easily!
  - Secrecy is also important for Security.

SSDs: When Disaster Strikes

- ## The Manufacturer can help!!
  - Micron is a founding member of "DR/E SIG" at www.snia.org
  - Micron has NDAs with major recovery firms
    - https://www.micron.com/about/blogs/2015/october/unlikely-pair-disaster-recovery-and-secure-erase
  - Data sheet sharing can be critical

- ## What about FTL Design??
  - FTL has redundancies for product reliability
  - FTL not dependent on controller hardware… can change controller during troubleshooting!!
  - Even encrypted SSDs can be saved. Just don't lose your password!

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SANITIZATION and the FTL

- FTL Manipulation
  - Delete "page table" – Not secure under "elite" attack; maybe "good enough."

- *If you are not using SEDs, why not?!?!?*
  - Sanitize Crypto Scramble is the fastest, very secure method!

- Sanitize Block Erase
  - Complete data wipe through NAND Block Erase
  - Takes a couple minutes for a very large drive.

- [Third-party Sanitize Validation](#)

- Individual File Sanitize – The biggest challenge for SSD security

A word about DATA SANITIZATION

Fast, Easy and Inexpensive method for
SSD repurpose/retirement

SATA, SAS & NVMe SANITIZE commands

- **SED: SANITIZE CRYPTO SCRAMBLE ***
  - "Instant Scramble Erase" for rapid data destruction by deleting and generating a new encryption key

- **SANITIZE BLOCK ERASE**
  - All NAND blocks containing user data will be erased
  - Includes Over-provision & bad blocks

Sanitize supported by:

✓ **STORAGE EXECUTIVE** Micron

* CRYPTO SCRAMBLE now accepted as a data "purge" method under NIST Special Publication 800-88 – Revision 1

Your Presenter

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Jon is a Sr. SSD Product Engineer in Micron's *Consumer Products Group*, better known as www.crucial.com. Jon is responsible for new product development for client SSDs, ensuring that SSD products meet the needs of a demanding market, while leading product launch and sustaining activities. Jon provides the technical interface to various internal and external groups, including data recovery and data security partners.

Jon has more than 25 years of experience in the data storage industry, working with both magnetic media and solid state technologies.

Jon earned his Bachelor of Science degree in Electrical and Computer Engineering from the University of Colorado at Boulder.