Flash Memory Summit

The Use Of Encryption For Sanitization: A Case Study

Robin England

Research & Development Team Lead

Flash Memory Summit

Why Sanitize?

- Protect Sensitive Data
  - Government, Military secrets, Corporate IP, Client database
- Avoid Data Breach
  - Medical records / social security numbers / financial records
- Citizens' Right To Be Forgotten
  - Social media posts, chat-rooms, photos
- General Data Protection Regulation (GDPR)
  - Know exactly where specific data is located
  - ..and be able to securely and **demonstrably** eradicate all copies of that data **on demand**

Sanitization (NIST Purge) & Erasure Verification

NIST = National Institute of Standards and Technology

- NIST 800-88 r1
  - Replaced DoD standard
  - Defines 3 sanitization levels: Clear, **Purge**, Destroy
  - **Purge:**
    - Hinder subsequent attempts to recover purged data
    - Be media-agnostic
    - Allow re-use of the media

- Erasure Verification:
  - Can any purged user data be recovered – even at the deepest "bit-level" of the physical media?

Includes reading ALL blocks, processing the physical data against controller-specific elements (e.g. ECC, XOR, bit / byte-striping) and searching for test byte patterns

Purge Sanitization Methods (closed-source 3rd party SSD design)

Flash Block Erase – all NAND cells programmed to set level

- Not optimal for Flash -
  - drives which store firmware metadata
  - Some areas of NAND may not be completely erased (e.g. if defective)
  - Can only be done by controller (we do not have direct access to Flash)

CryptoErase – utilizes hardware encryption (shred DEK (Data Encryption Key))

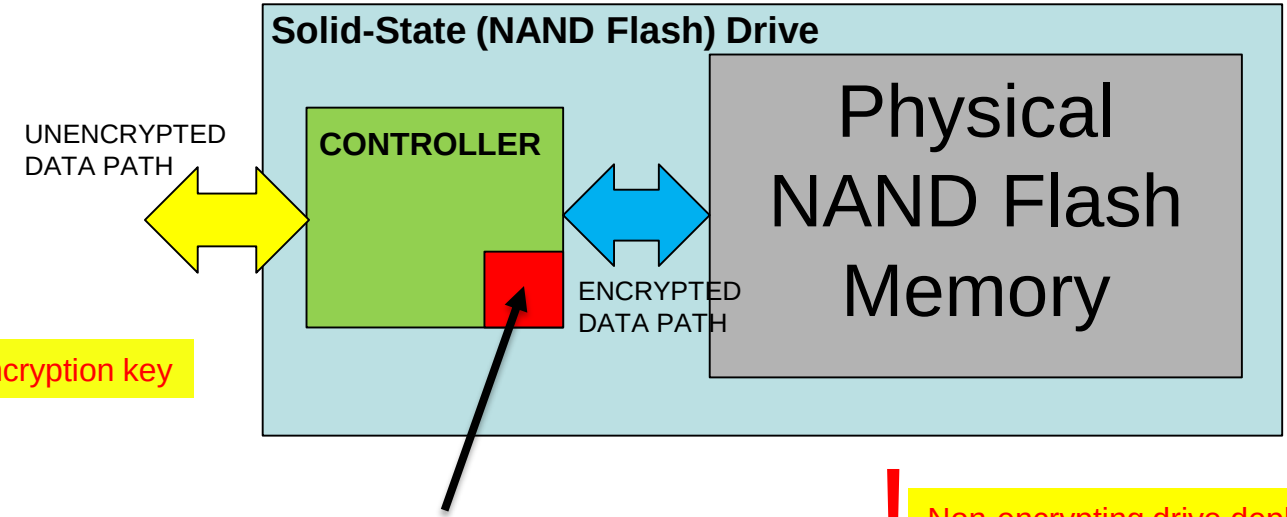
- Thorough, includes hidden, active and blocks marked “bad”, defective blocks
- Very fast – no need to update every NAND block
- Can be done both outside and inside the drive..

Q: What are the potential drawbacks of using SSD hardware encryption inside the drive alone?

Typical Hardware Encryption Implementation (closed-source 3rd party SSD design)

! Encryption may get switched off or fails

! Not possible to CryptoErase individual files



! Exposed encryption key

! Non-encrypting drive deployed in error

! Weak key

! Key NOT changed by CryptoErase

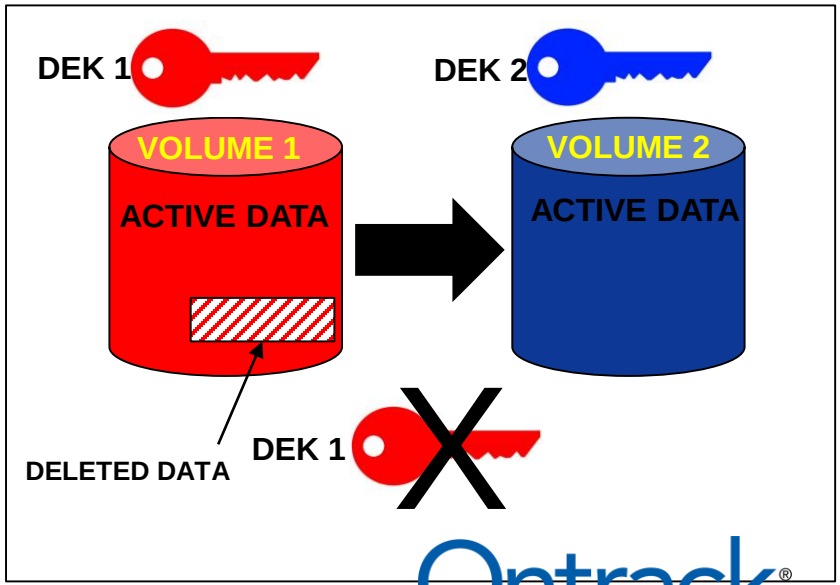
Case Study – Fabric-Attached Storage (FAS) ONTAP Secure-Purge

- ONTAP Secure-Purge function:-
  - Meets 800-88 r1 purge sanitization guidelines
  - Non-disruptive
  - Ensures that “scrubbed” deleted data will not be recoverable at physical level
  - Allows scrubbing of individual deleted files
  - Remediates data “spillage” / data contamination
  - Utilizes cryptographic erase
    - Encryption managed outside the drive and optionally enabled inside FIPS-140 certified encrypting drive hardware
    - Key-management and block-level encryption

Case Study - NetApp FAS ONTAP Secure-Purge

NetApp AFF-A300 FAS
12 x 960GB SSD

- Scenario:-
  - Need to selectively delete and purge a specific data set / file from an encrypted volume on a Flash array…
- ONTAP Secure Purge overview:-
  1. Delete the target data / set file from volume encrypted with DEK 1
  2. Create a new encrypted volume with new encryption DEK 2
  3. Copy only blocks belonging to **active** files / data sets to new volume
  4. Destroy DEK 1



Case Study - NetApp FAS ONTAP Secure-Purge

Scrub Selected Data

Ensure Compliance with NIST.SP.800-88r1

Create Test Data Sets

Modify Existing Ontrack WAFL Tools

Challenges

Search For Scrubbed Data In All Regions of Media

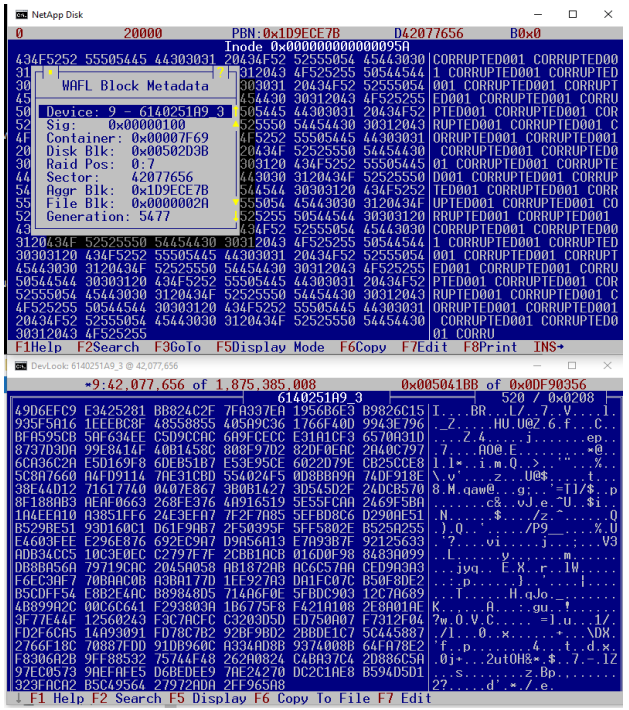
Apply Encryption Keys To Data Blocks

Validate Integrity Of Active Data

Encryption Key Verification

Case Study - NetApp FAS ONTAP Secure-Purge

- Conclusions
  - Use of 3rd party closed-source SSD hardware encryption carries with it some risks - external encryption is better
  - NetApp's secure-purge process had wiped the encryption key from the system and the scrubbed data was not recoverable
  - The data sanitization process used was effective; NetApp's software was functioning properly, and Ontrack was able to verify the results independently
  - The Secure-Purge function meets the needs of those who require secure non-disruptive deletion of individual files



Flash Memory Summit

Thank You!

Please visit us at booth #126