



Driving Innovation Through the Information Infrastructure

SPRING 2011











Solid-State Drives with Self-Encryption: An Unbeatable Combination

Dr. Michael Willett
Storage Security Strategist
SAMSUNG



10 Benefits For A Better Work Life

SOLID-STATE DRIVES

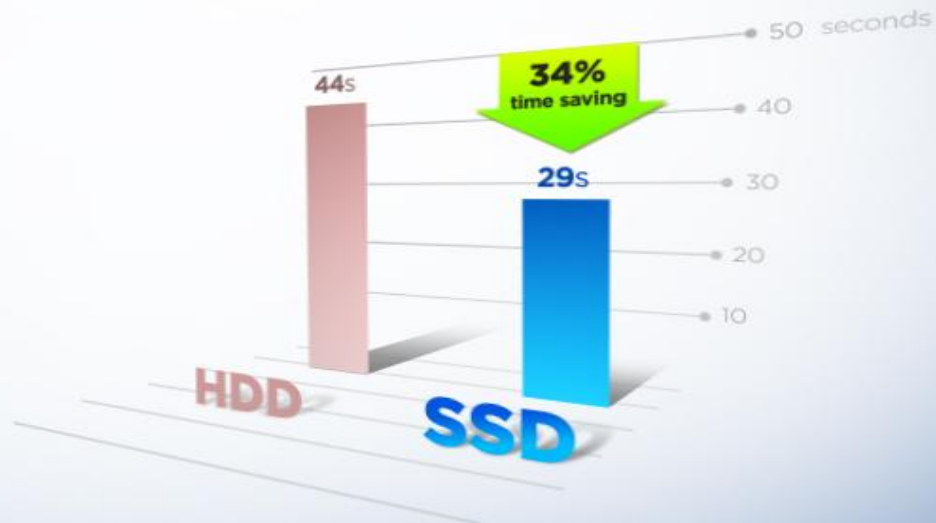
- | | |
|---|---|
|  1. Fast Boot-up |  6. Virus Scan |
|  2. Outlook File Search & Copy |  7. Low Power Consumption |
|  3. Copying Files |  8. Multi-tasking |
|  4. Fast Application Start Up |  9. Video File Editing |
|  5. Program Compilation |  10. Shock & Vibration Resistance |

1. Fast Boot-up



Under 30 seconds.

At nearly half the amount of time it takes to boot to the desktop, compared to conventional HDD drives, SSD gets you ready for the day's work with incredible speed eliminating the need to kill time while waiting for your computer to start.



Test Environment : Windows Vista, Intel Core2Duo 2.4GHz, 2GB DDR2, ICH9M-E

2. Outlook File Search & Copy

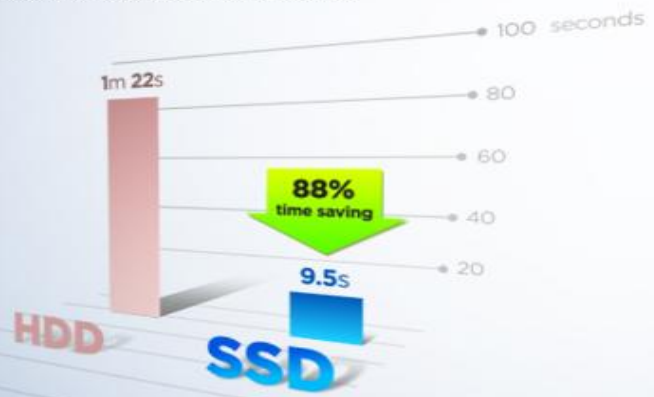
Incredible efficiency.

Save more than 30 minutes when performing a simple E-mail search and copy. SSD is nearly 5x faster than HDD and with the more than 30 minutes being saved from using SSD instead of HDD, imagine what else you could be doing.



Outlook File Search

5.47GB size Mail Box with 55 sub folders



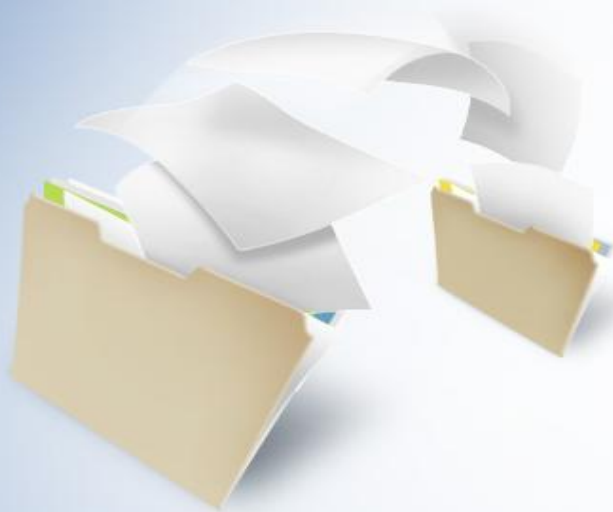
Outlook File Copy

3.5 GB size Mail copy to another folder



Test Environment : Windows Vista, Intel Core2Duo 2.4GHz, 2GB DDR2, ICH9M-E

3. Copying Files



Speed and efficiency.

Thirteen minutes and five seconds is how much faster SSD are at transferring and copying files between hard drive partitions than HDD for speed that you can actually feel.



Test Environment : Windows Vista, Intel Core2Duo 2.4GHz, 2GB DDR2, ICH9M-E

4. Fast Application Start Up

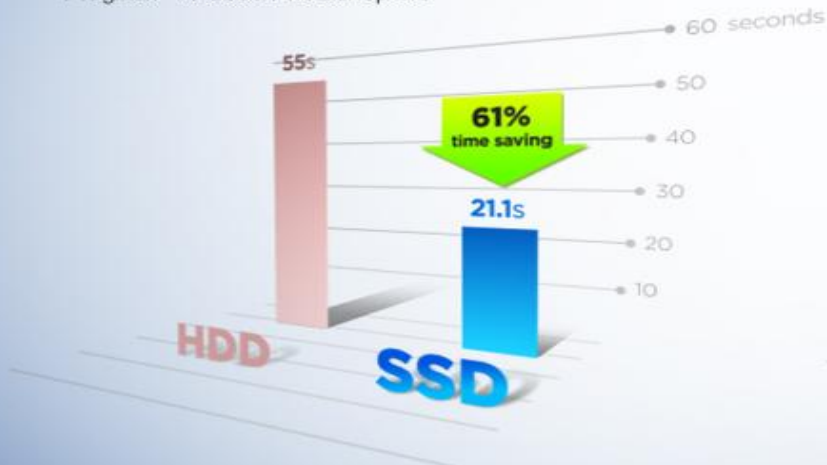
Stop waiting, start doing.

SSDs are more than 2x faster at loading programs and applications than their HDD counterparts. Even for large file sizes, you need only wait seconds, not minutes for programs start and for you to accomplish the day's tasks.



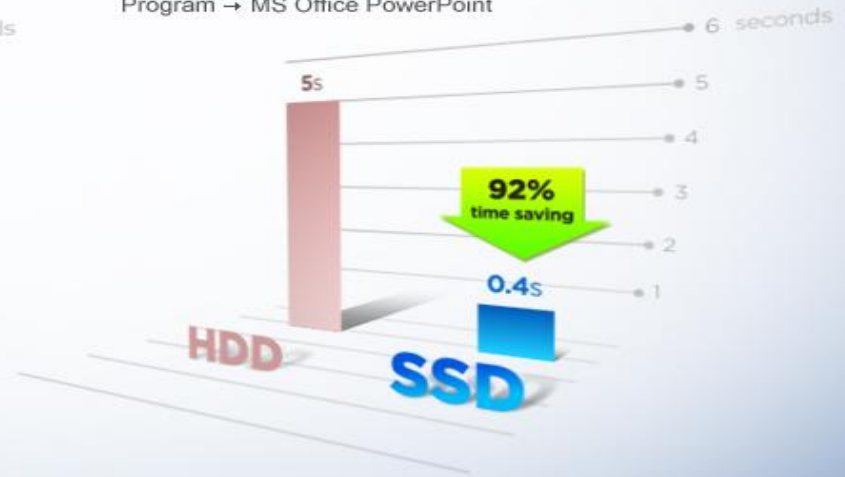
Fast Application

Program → Adobe Photoshop 9.0



Fast Application

Program → MS Office PowerPoint

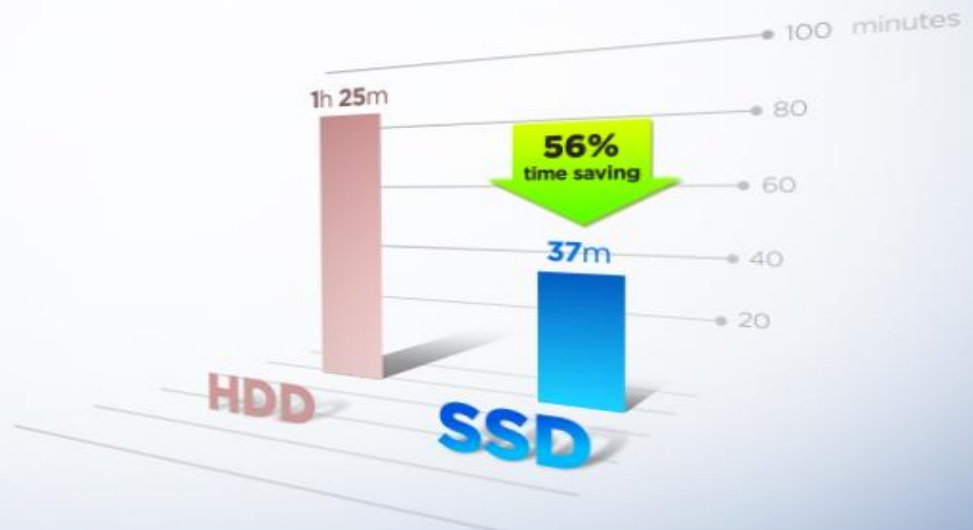


Test Environment : Windows Vista, Intel Core2Duo 2.4GHz, 2GB DDR2, ICH9M-E

5. Program Compilation

2x faster.

Programmers will more than appreciate how SSD can cut the amount of file-compilation time by more than half, giving you more time to complete everything else you need to get done.



Test Environment : Windows Vista, Intel Core2Duo 2.4GHz, 2GB DDR2, ICH9M-E

6. Virus Scan



Prioritize what's important.

Simple tasks such as a virus scan should be as quick as possible. When tested under equal conditions and settings, SSD out-performed HDD by nearly half the time. Let SSD's speed and performance increase your productivity and make sure that the day's work does not hinder on routine maintenance tasks.



Test Environment : Windows Vista, Intel Core2Duo 2.4GHz, 2GB DDR2, ICH9M-E

7. Low Power Consumption



Extra minutes go a long way.

SSD requires less energy than a conventional HDD. SSD can add an average of 30 minutes to battery life. Extra time that keeps your computer running for longer periods of time and when you need to find a place to recharge. Enjoy SSD's modest need for power without sacrificing performance.



Test Environment : Windows Vista, Intel Core2Duo 2.4GHz, 2GB DDR2, ICH9M-E

8. Multi-tasking



Lag-less multi-tasking.

When it comes to handling multiple programs at the same time, SSD is nearly 3x faster than HDD. Running multiple processor-heavy applications such as Photoshop and game data that were once exhaustively slow to run on a conventional HDD, are no match for SSD, cutting the average amount of time needed to simultaneously and smoothly operate multiple applications.



Test Environment : Windows Vista, Intel Core2Duo 2.4GHz, 2GB DDR2, ICH9M-E

9. Video File Editing



An editor's dream come true.

The time it takes to render three video files into a single two-and-a-half minute clip is incredibly swift and smooth with SSD at just over five minutes compared to 11 minutes on an HDD. It is in this way that you can truly save time by being able to render and compress more and more larger size video files in almost half the time as conventional HDD technology.



Test Environment : Windows Vista, Intel Core2Duo 2.4GHz, 2GB DDR2, ICH9M-E

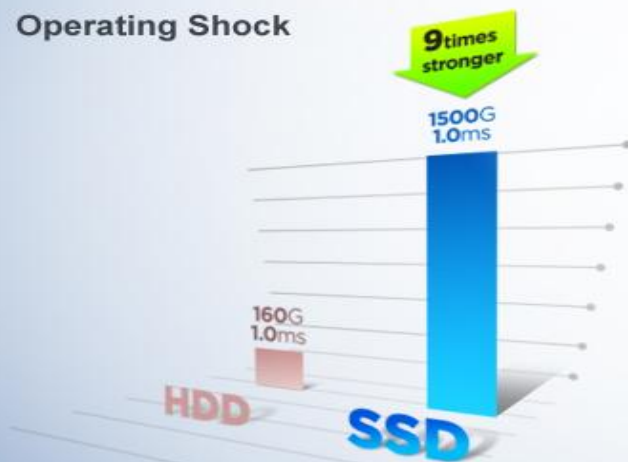
10. Shock & Vibration Resistance

Ready for anything.

SSD far-exceeds the expectations in terms of durability - shock, vibration and temperature. It easily handles some of the most extreme conditions - the hottest of summers, coldest of winters even the most turbulent of car rides. Being able to handle situations assures that important files will be kept safe.



Operating Shock



Operating Vibration



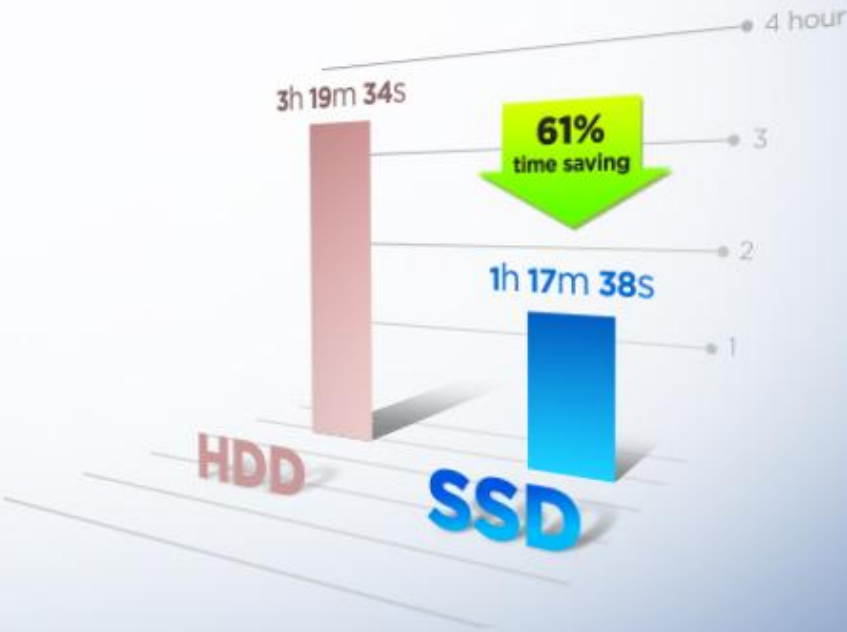
Test Environment : Windows Vista, Intel Core2Duo 2.4GHz, 2GB DDR2, ICH9M-E

For a Better Work Life

SSD can save up to 61% of your work hour.



	HDD	SSD
Boot up	44s	29s
Outlook File Search	1m22s	9.5s
Outlook File Copy	39m22s	6m38s
Copying Files	21m15s	8m10s
Photoshop Start Up	55s	21.1s
PowerPoint Start Up	5s	0.4s
Multi-tasking	25m	9m50s
Video File Editing	14m16s	8m56s
Virus Scan	11m35s	6m4s
Program Compilation	1h25m	37m



Test Environment : Windows Vista, Intel Core2Duo 2.4GHz, 2GB DDR2, ICH9M-E

SOLID-STATE DRIVES

SSD ADVANTAGES



Reduced maintenance time and costs¹



35% better performance²



9 times more shock resistance³



67% more reliability (MTBF)⁴



80% less power consumption⁵

Save \$\$ on IT cost (TCO)



Faster booting and application launching



Shock proof



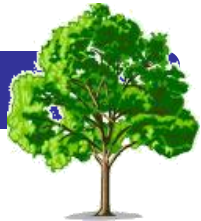
Fewer drive crashes



Energy efficient and Green



Right Solution



1) IDC white paper, Nov. 2007 2) SysMark 2007 Benchmark
3) 1500 G/0.5 ms SSD vs. 170 G/0.5 ms HDD
4) Reliability Demonstration Tests 5) 0.4 watts SSD vs. 2.0 watts HDD

IDC Study: The Cost of Owning a PC **or** **Reduced Cost of an SSD-based PC**

True cost of an IT asset = direct + indirect costs over the life span

Cost factors:

- Acquisition
- Deployment
- Performance
- Support and maintenance
- Retirement



Example savings: SSD-based notebook PC: **improved reliability** = 35%, or **\$30 per user per year**, reduction in lost productivity. Improved reliability **reduces the annual IT labor costs** to evaluate, fix, and/or replace failed or improperly working disks. The cost savings over HDD-based PCs is estimated to be 80%, or **\$16 per user per year**.

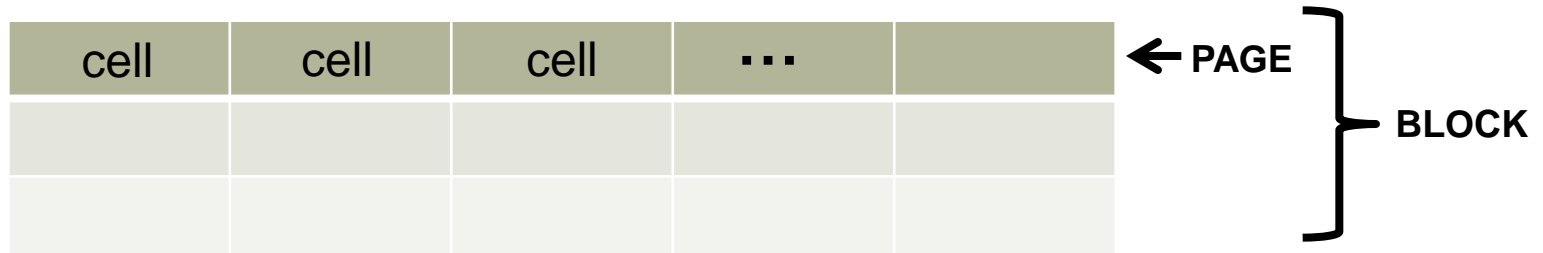
Cost savings result from:

- increased user productivity
- higher reliability
- reduction of costs associated with support
- maintenance and retirement
- power savings

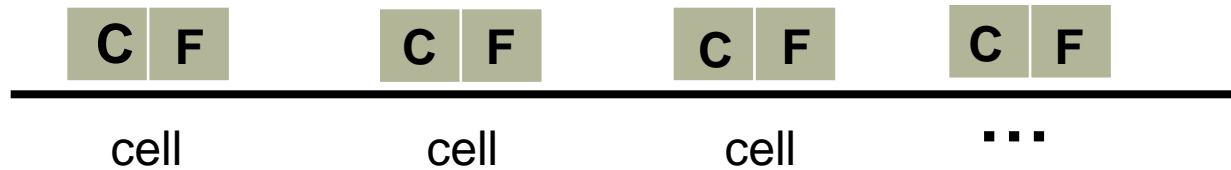
**Annual cost reduction
up to \$176/user annually**

adding all of these cost benefits together....

NAND (Not-AND) Flash: How it works



Cell = SLC (single-level cell) or MLC (multi-level cell) = bit(s) per cell



C = Control Gate

F = Floating Gate: hold/release ELECTRICAL charge

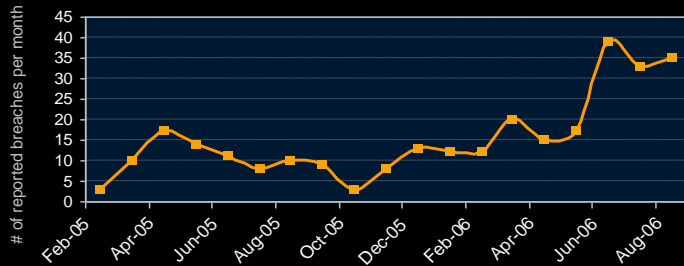
- Vary voltage on C; detects charge on F (or not): Read
- Read/Write a PAGE
- But, Erase only a BLOCK
- Can (over)write a cell only after an Erase
- TRIM command: “garbage collection” = Erase designated BLOCKs

WHY ENCRYPT STORED DATA?

Since 2005, over 345,124,400 records containing sensitive personal information have been involved in security breaches

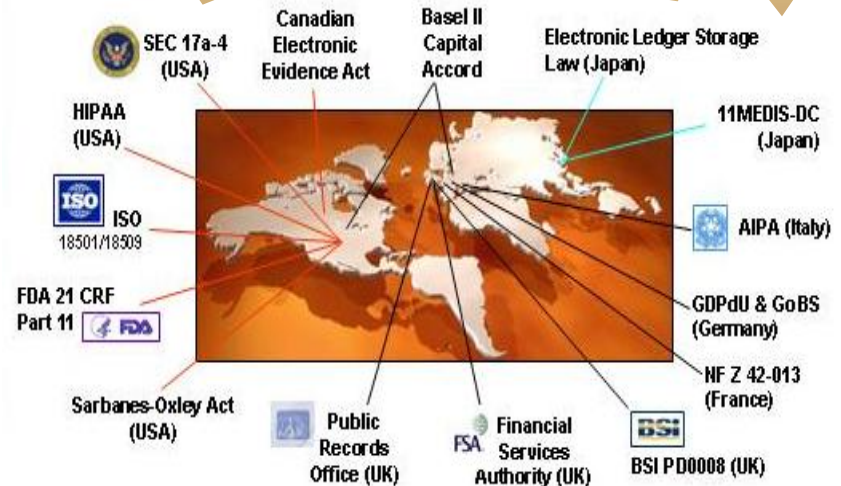
The Problem...

Reported Data Breaches Since February 2005 to Now



In 2008, the average cost of a data breach was \$6.65 million per affected corporation (\$202 per record)

\$6.65 Million Per Incident



WHY ENCRYPT STORED DATA?

The Problem...

Since 2005, over 345,124,400 records containing sensitive personal information have been involved in security breaches

Legal

breach was \$6.65 million per affected corporation (\$202 per record)

Financial

Incident

Reputation



WHY ENCRYPT STORED DATA?



- **Compliance**
 - 46+ states have data privacy laws with encryption “safe harbors”, which exempt encrypted data from breach notification
 - New federal data breach bills have explicit encryption safe harbors
 - European Commission mandating breach laws for member countries
- Data center and laptop drives are portable (HDD, SSD)
- Exposure of data loss is expensive (\$6.65 Million on average per incident¹)
- Obsolete, Failed, Stolen, Misplaced, Re-purposed...
 - Nearly ALL drives leave the security of the data center
 - The vast majority of decommissioned drives are still readable

Threat scenario: stored data leaves the owner's control – lost, stolen, re-purposed, repaired, end-of-life, ...

1. Ponemon Institute, Fourth Annual US Cost of Data Breach Study – Jan 2009 www.ponemon.org

Self-Encrypting Drives (SED)

- Simplified Management
- Robust Security
- Compliance “Safe Harbor”
- Cuts Disposal Costs
- Scalable
- Interoperable
- Integrated
- Transparent

“Many organizations are considering **drive-level security for its simplicity** in helping secure sensitive data through the hardware lifecycle from initial setup, to upgrade transitions and disposal”

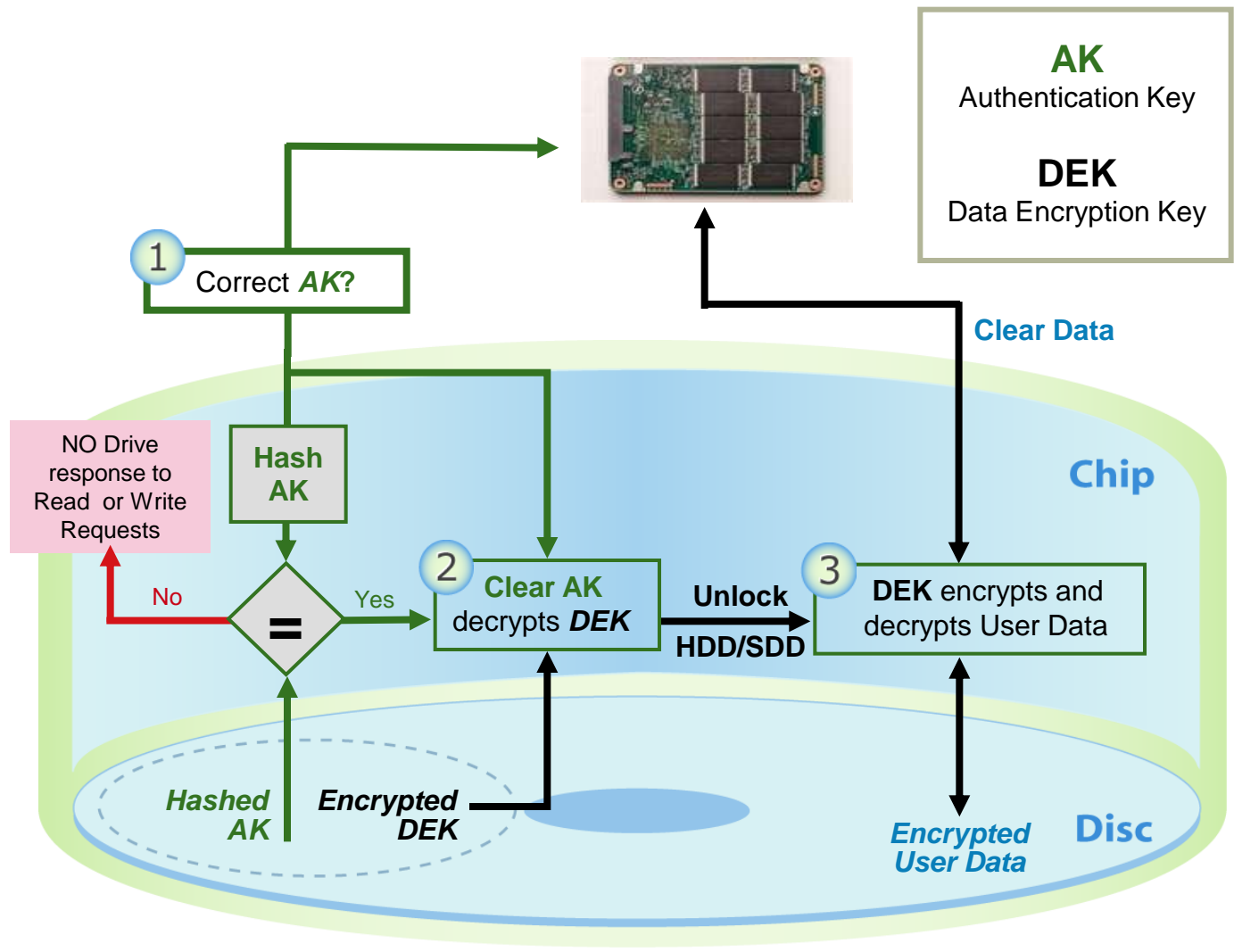
Eric Ouellet
Research Vice President
Gartner

Trusted Storage Standardization



Published Storage Specifications

Authentication/Encryption in the Drive: How it works



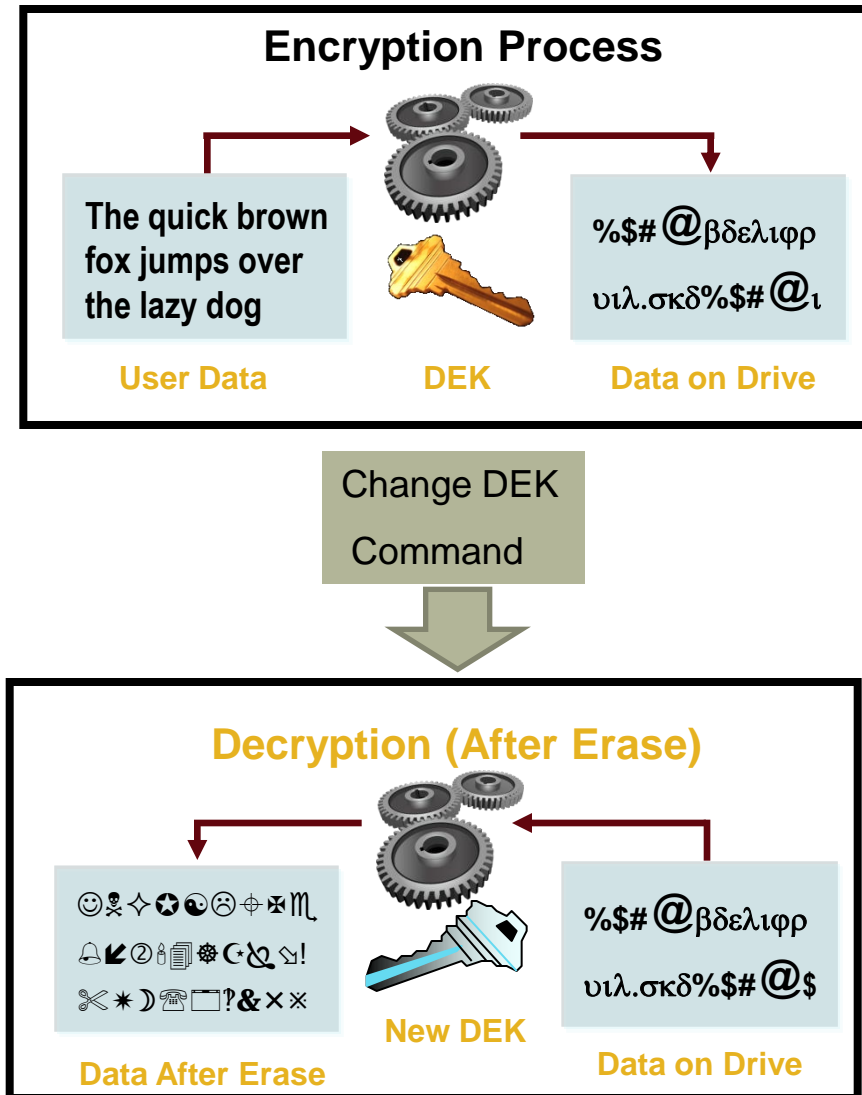
Cryptographic Erase

■ Description

- Cryptographic erase changes the drive encryption key
- Data encrypted with previous key: unintelligible when **DEcrypted** with new key

■ Benefits

- Instantaneous “rapid” erase for secure disposal or re-purposing



No Performance Degradation



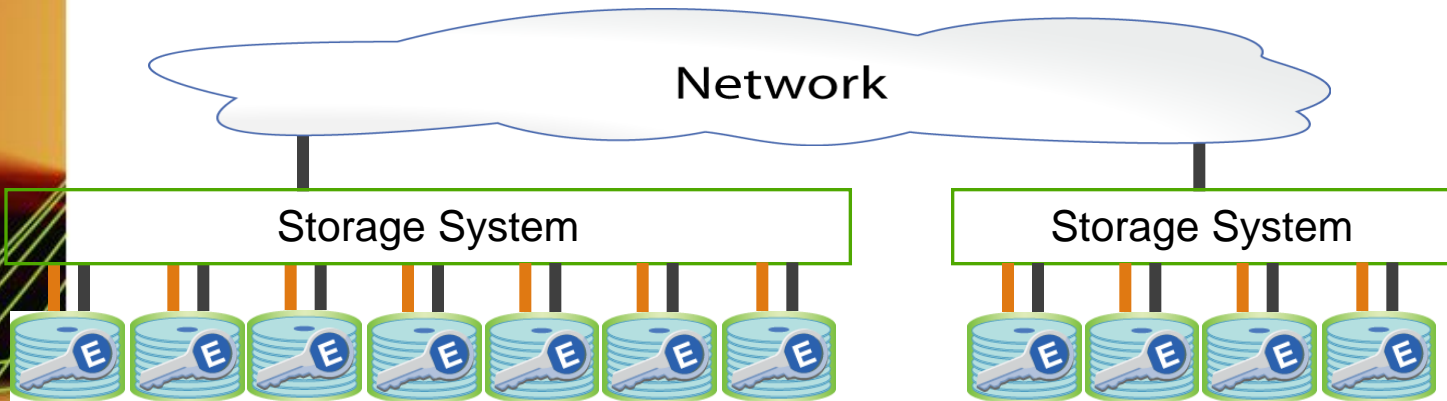
Encryption engine speed

Matches

Port's max speed

The encryption engine is in the drive electronics

Scales Linearly, Automatically



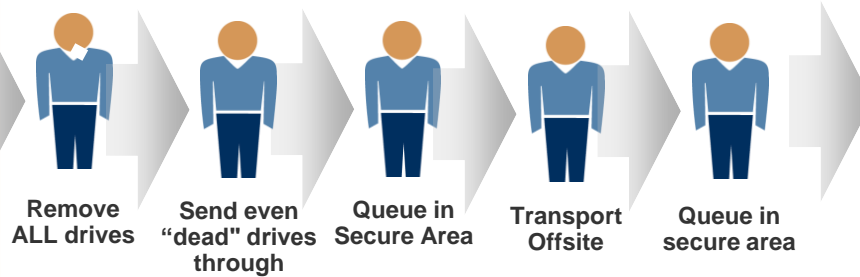
All data will be encrypted, with no performance degradation

How the Drive Retirement Process Works



Retire Drive

- Replace
- Repair
- Repurpose



Retirement Options



Overwriting takes days and there is no notification of completion from drive



Hard to ensure degauss strength matched drive type



Shredding is environmentally hazardous



Not always as secure as shredding, but more fun

SECURE?

People make mistakes

Because of the volume of information we handle and **the fact people are involved, we have occasionally made mistakes.**"



which lost a tape with 150,000 Social Security numbers stored at an Iron Mountain warehouse, October 2007¹

99% of Shuttle Columbia's hard drive data recovered from crash site

Data recovery specialists at Kroll Ontrack Inc. retrieved 99% of the information stored on the charred Seagate hard drive's platters over a two day period.

- May 7, 2008 (Computerworld)

1. <http://www.usatoday.com/tech/news/computersecurity/2008-01-18-penney-data-breach>

How the Drive Retirement Process Works

Retirement Options

Drive Retirement is:

Expensive

Time-consuming

Error-prone

SECURE?



Retire Drive

- Replace
- Repair
- Repurpose

Overwriting takes
is no
in drive

length
type

y

adding,

**Columbia's
hard drive data recovered
from crash site**

Data recovery specialists at Kroll Ontrack Inc. retrieved 99% of the information stored on the charred Seagate hard drive's platters over a two day period.

- May 7, 2008 (Computerworld)



which lost a tape with 150,000 Social Security numbers stored at an Iron Mountain warehouse, October 2007¹

1. <http://www.usatoday.com/tech/news/computersecurity/2008-01-18-penney-data-breach>

Drive Retirement: Self-Encrypting Drives



Retire Drive

Remove
ALL drives

Send even
"dead" drives
through

Queue in
secure area

Transport
Offsite

Queue in
secure area

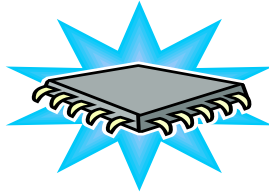
SECURE

- Replace
- Repair
- Repurpose

Powered Off = Locked, Encrypted

- Reduces IT operating expense
 - Eliminates the need to overwrite or destroy drive
 - Secures warranty and expired lease returns
 - Enables drives to be repurposed securely
- Provides safe harbor for most data breach notification laws

Hardware-Based Self-Encryption versus Software Encryption



- **Transparency:** SEDs come from factory with encryption key already generated
- **Ease of management:** No encrypting key to manage
- **Life-cycle costs:** The cost of an SED is pro-rated into the initial drive cost; software has continuing life cycle costs
- **Disposal or re-purposing cost:** SED: erase on-board encryption key
- **Re-encryption:** With SED, there is no need to ever re-encrypt the data
- **Performance:** No degradation in SED performance
- **Standardization:** Whole drive industry is building to the TCG/SED Specs
- **No interference** with upstream processes

ISSUE: Hardware acquisition (part of normal replacement cycle)

The Future: Self-Encrypting Drives

➤ Encryption everywhere!

- ◆ Data center/branch office to the USB drive

➤ Standards-based

- ◆ Multiple vendors; interoperability

➤ Unified key management

- ◆ Authentication key management handles all forms of storage

➤ Simplified key management

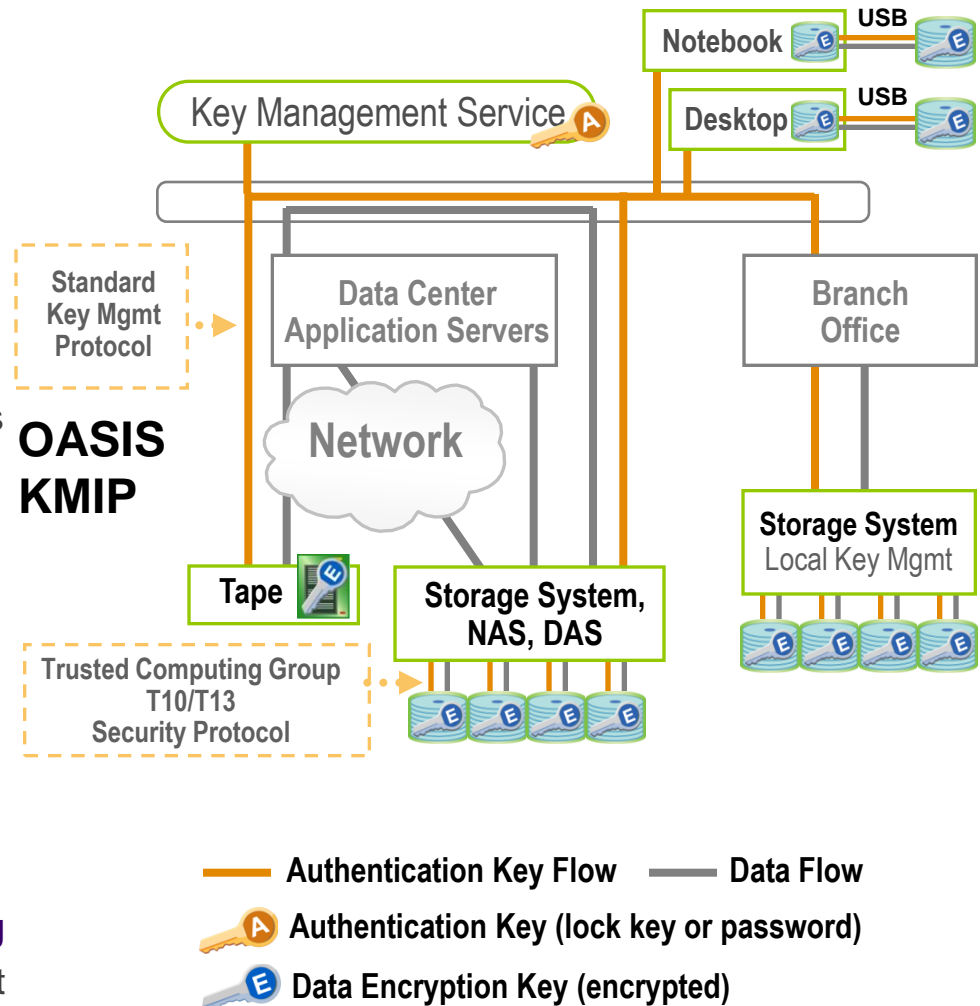
- ◆ Encryption keys never leave the drive. No need to track or manage.

➤ Transparent

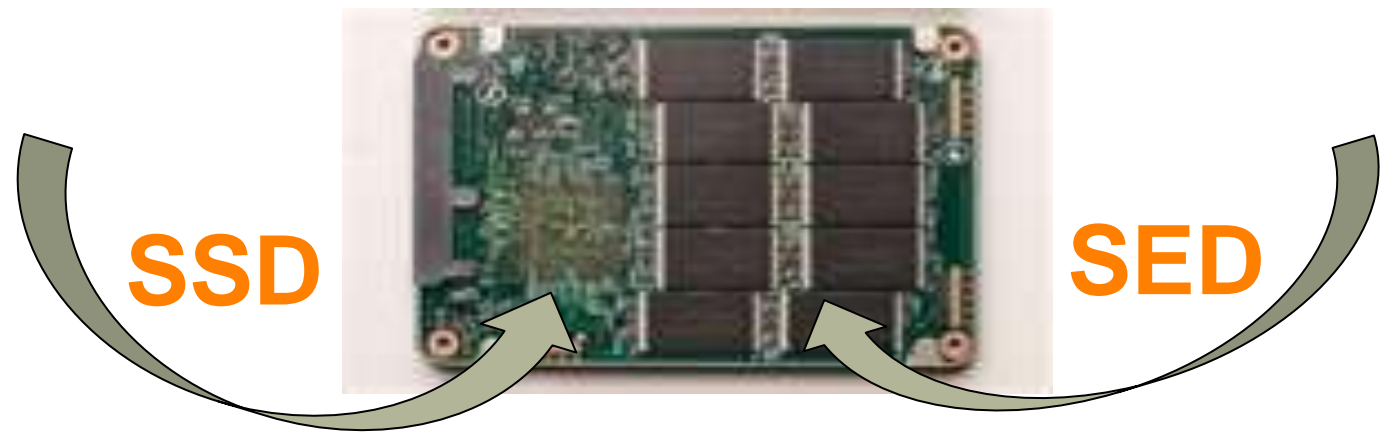
- ◆ Transparent to OS, applications, application developers, databases, database administrators

➤ Automatic performance scaling

- ◆ Granular data classification not needed



Solid-State Drive + Self-Encrypting Drive



SIMPLE SOLUTION

- Reduced TCO
- Increased productivity
- Better Performance
- More shock resistance
- Better reliability
- Less power use
- Cost reduction up to \$176
(per user, annually)

- Simplified Management
- Robust Security
- Compliance “Safe Harbor”
- Cut Disposal Costs
- Scalable
- Interoperable
- Integrated
- Transparent