



# MSST



## Emerging Data Storage Technologies

### *What's New and What's Next in the Recovery Lab*

Chris Bross  
Chief Technology Officer  
DriveSavers Data Recovery

Presented 2015.06.03 sf

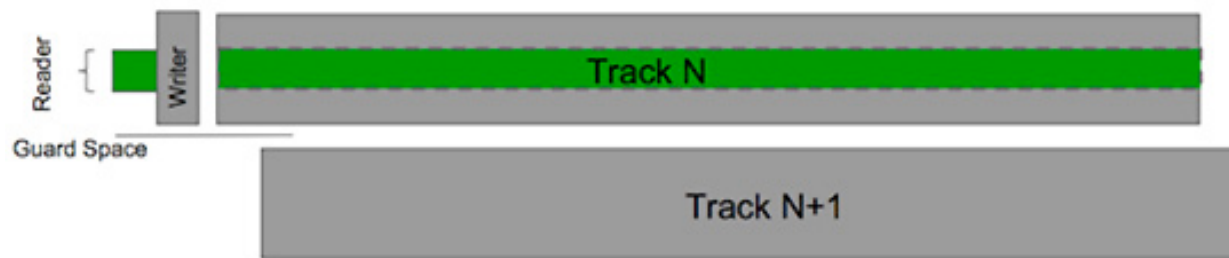


# Hard Disk Drives

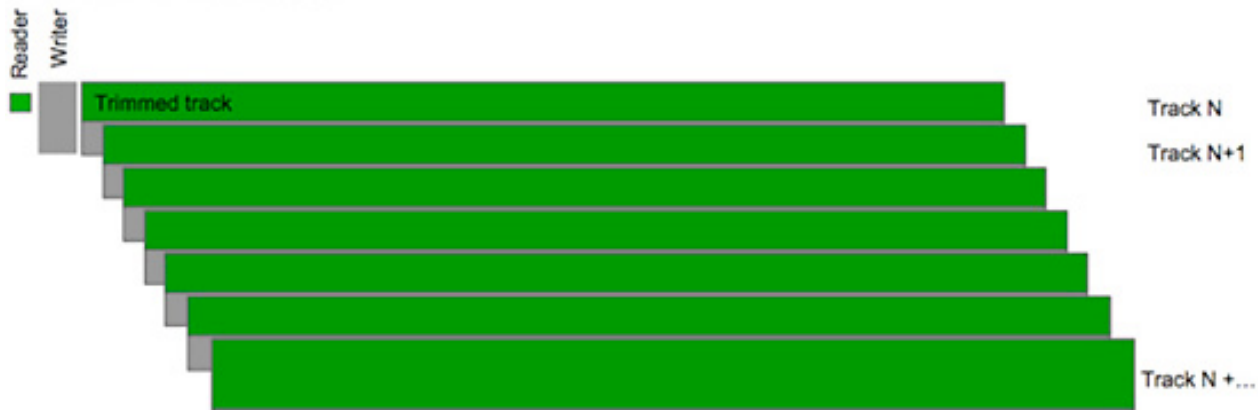


# New HDD Technologies: SMR

## Conventional Writes

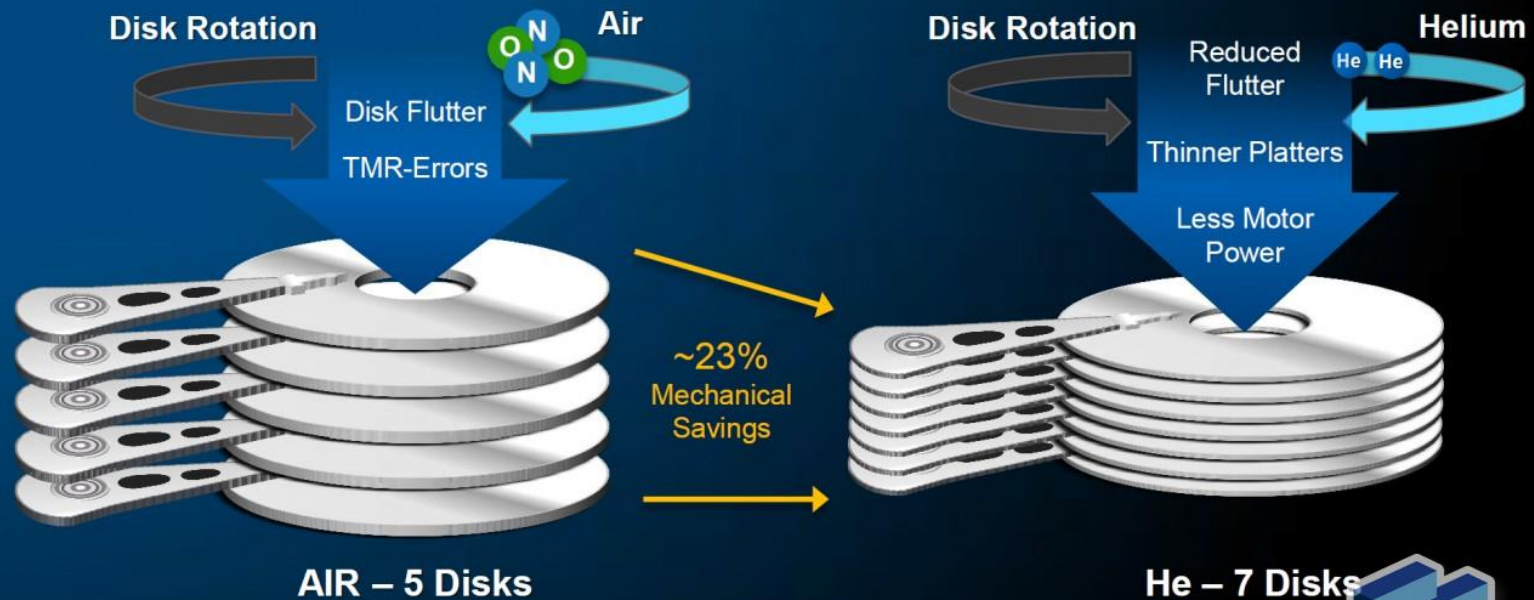


## SMR Writes



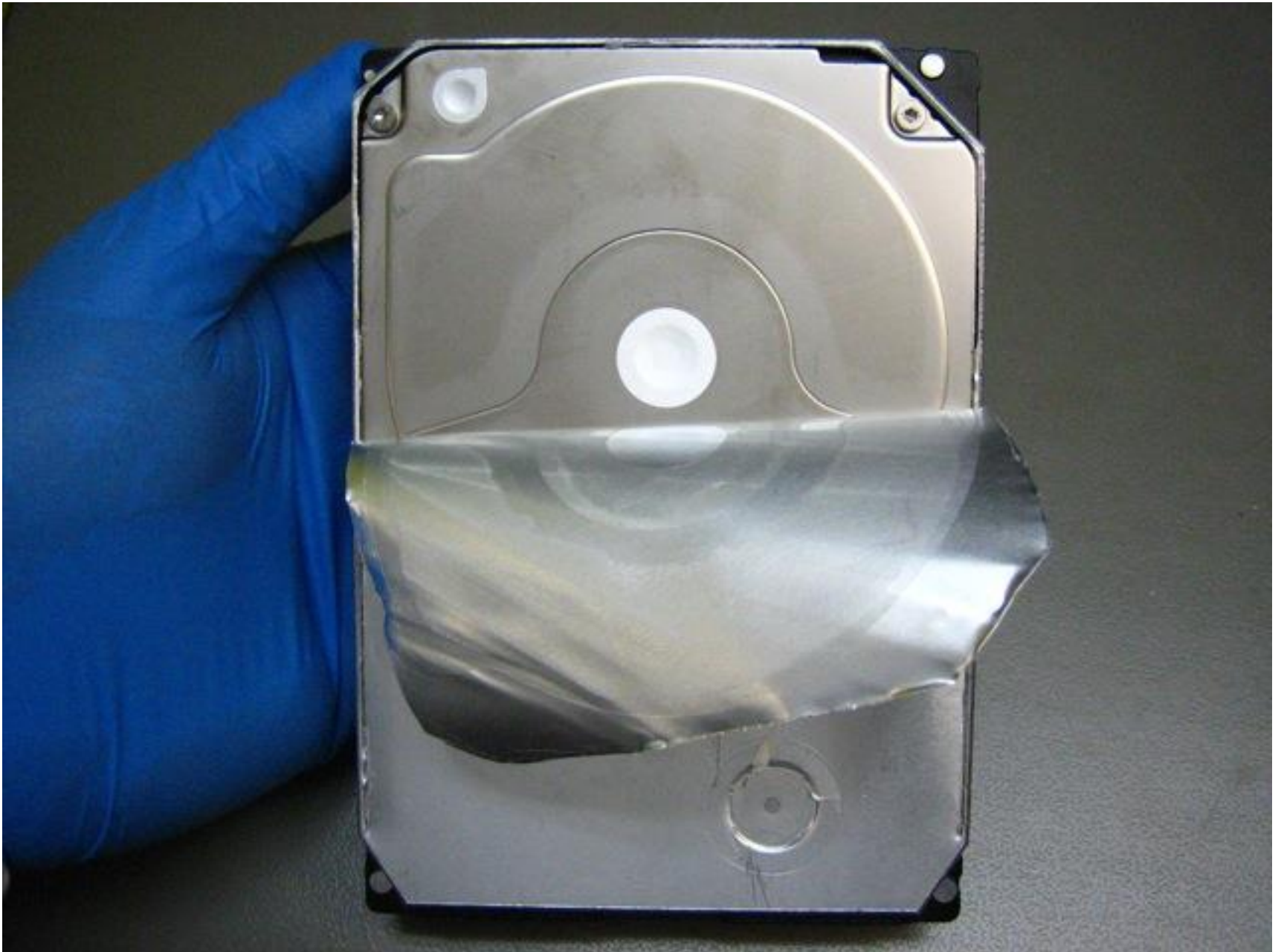
# New HDD Technologies: Helium

- Reduces mechanical power dissipated in air shear
- Allows platters to be placed closer together enabling more capacity

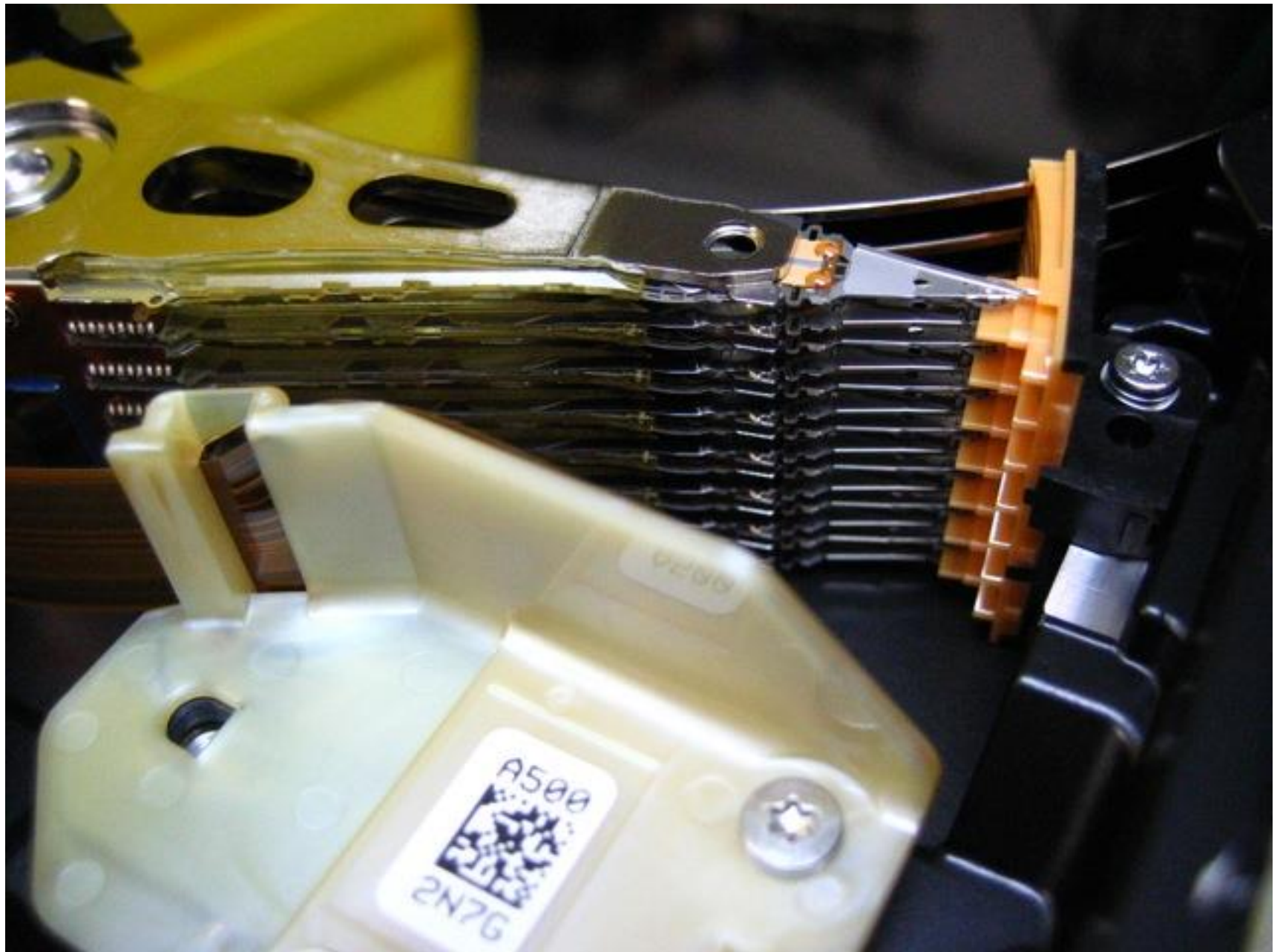


N Nitrogen  
O Oxygen  
He Helium

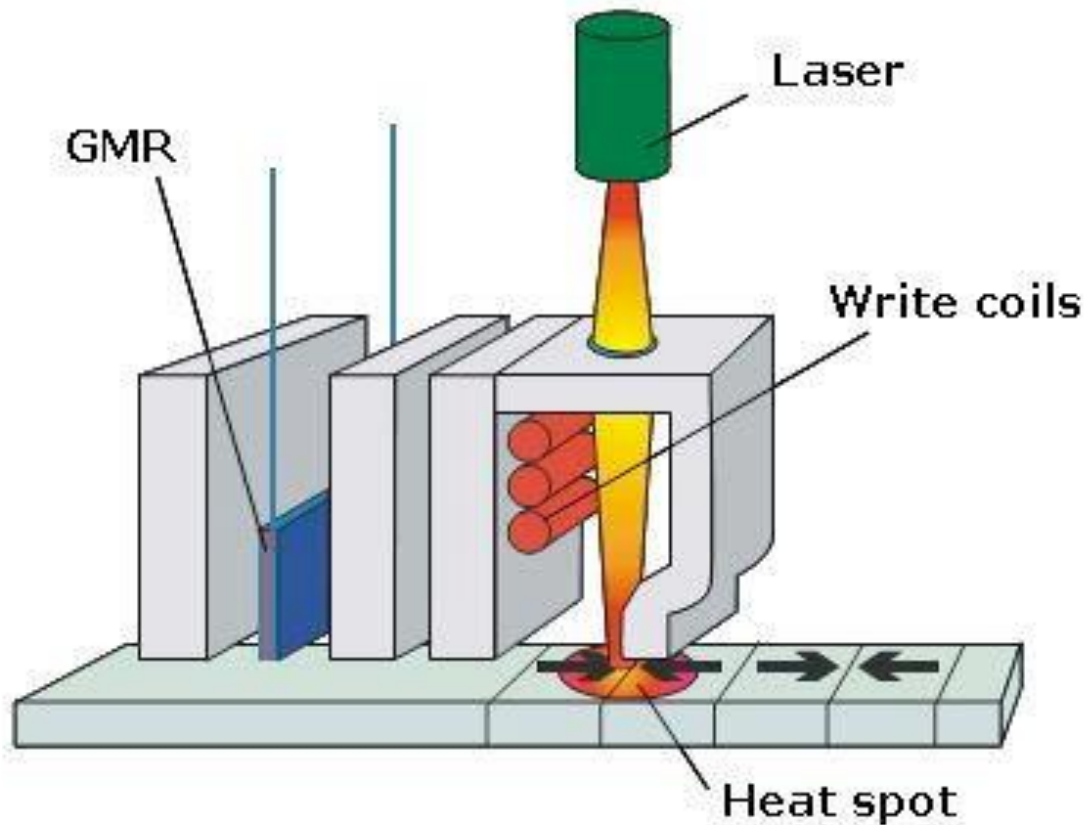
- 4 C cooler
- 49% reduction in Watts/TB







# New HDD Technologies: HAMR



# Why Data Recovery from HDD?

## ❑ **Electro-Mechanical Failures**

- ❑ Laws of physics: heat, friction, speed, vibration
- ❑ Component Failure: head or motor
- ❑ HDI (head-to-disk interface contact) media damage

## ❑ **Firmware Corruption**

- ❑ Translator module corruption
- ❑ P-list or G-list inaccessible
- ❑ Manufacturer bugs

## ❑ **User Error**

- ❑ Deletion, accidental format, PEBKAC
- ❑ Incorrect application of HDD type
- ❑ Humans are capable (unfortunately) of anything!

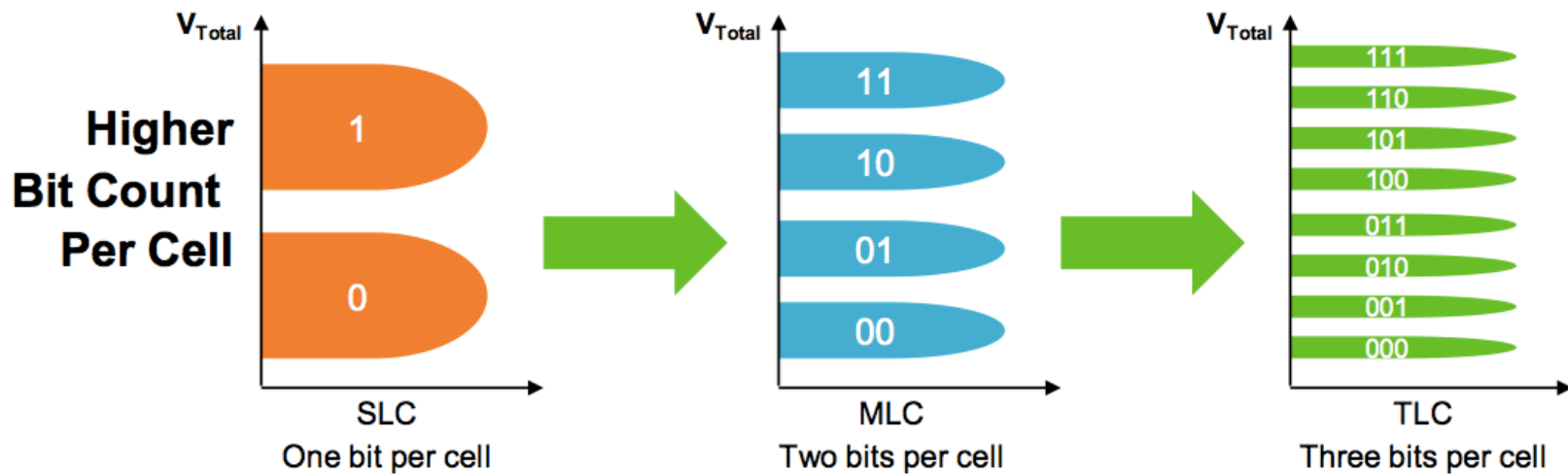




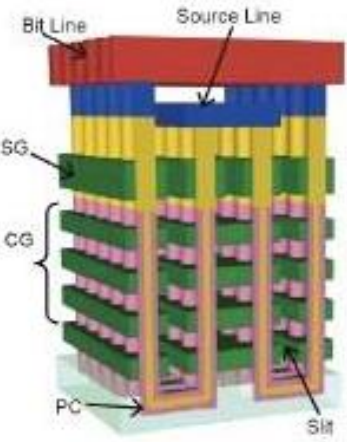
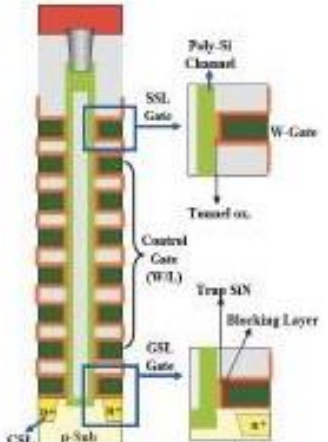
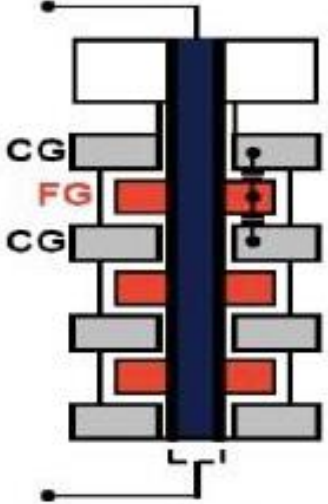
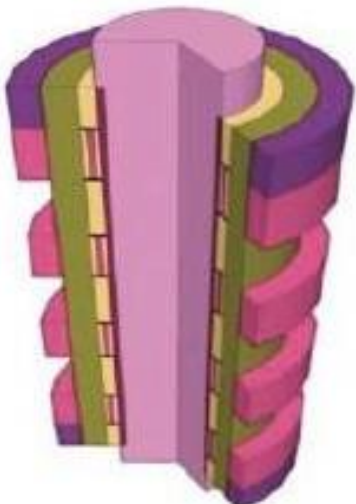
# Solid State Storage



# New SSD Technologies: TLC NAND



# New SSD Technologies: 3D NAND

p-BiCS (Toshiba)	TCAT (Samsung)	3D FG (Hynix)	Micron
			

# New SSD Technologies: eMMC



# New SSD Technologies: M.2





# New SSD Technologies: NVMe/PCIe



# New SSD Technologies: NVDIMM



# Why Data Recovery from SSD?

## ❑ **Electro-logical Failures**

- ❑ Complex controller architecture that with encryption, compression, de-dup
- ❑ Corrupt FTL (flash translation layer)
- ❑ Power related events

## ❑ **NAND flash issues**

- ❑ Program & read disturb errors
- ❑ Data Retention
- ❑ Data Endurance

## ❑ **Firmware issues**

- ❑ Corruption and inability to reload without erasing device
- ❑ Manufacturer bugs

## ❑ **Self Maintenance Routines**

- ❑ TRIM & garbage collection

## ❑ **User Error**

- ❑ Data loss happens just that much faster!



# Q&A





# MSST



## Thank You!

Chris Bross  
chris.bross@drivesavers.com

