



# How Accelerating SSD Capacities will Revolutionize Enterprise Storage

Anders Graham

Product Marketing Manager, Solid State Drives

Samsung Semiconductor, Inc.

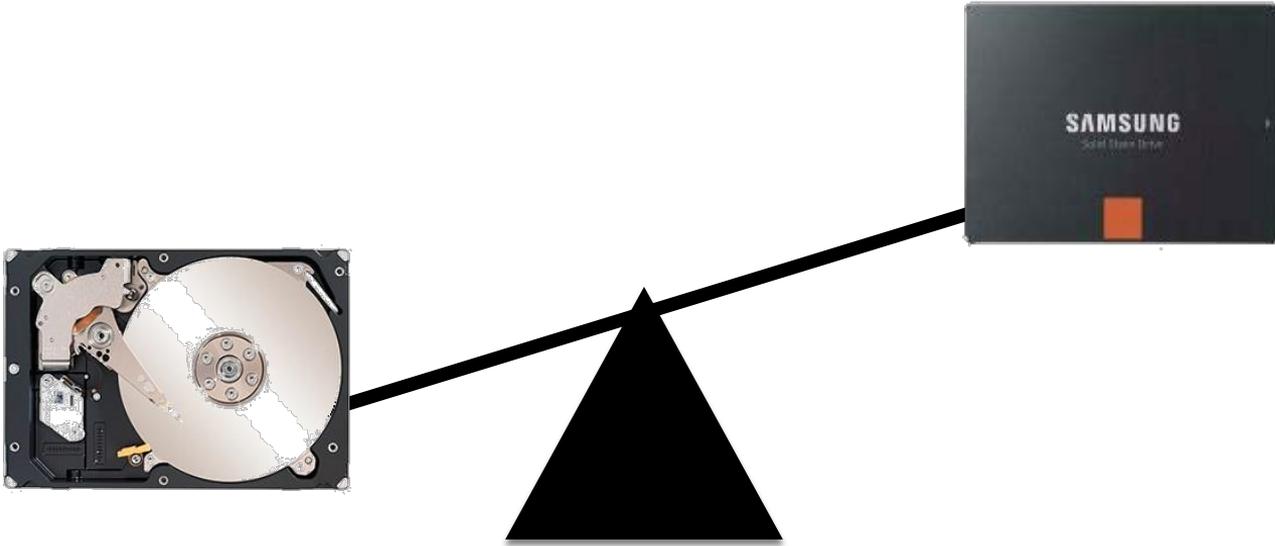


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# HDDs are the Enterprise Incumbent



**Why?**

# SSD Advantages



1 x SAS SSD

Superior Performance

~200,000 IOPS

1000X



1000 x 15K SAS HDD

Superior Reliability

0.26%  
1 in 387 SSDs

12X

3.00%  
1 in 33 HDDs

# It's the Cost vs. Capacity



Low \$ / GB  
High Capacity



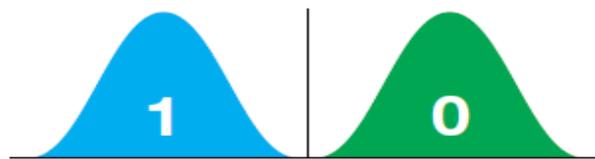
High \$ / GB  
Low Capacity

# Lowering Cost via Multi-bit Cells

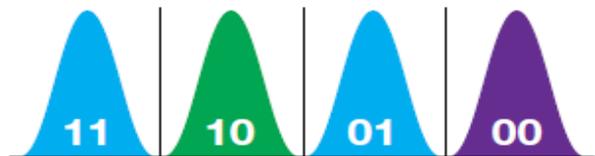
- SLC (Single-Level-Cell)
- MLC (Multi-Level-Cell)
- TLC (Tri-Level-Cell)

More levels → ↓ P/E cycles

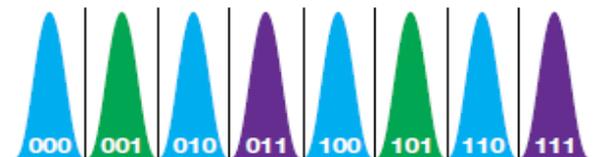
NAND Flash Types



Single Level Cell (SLC) NAND

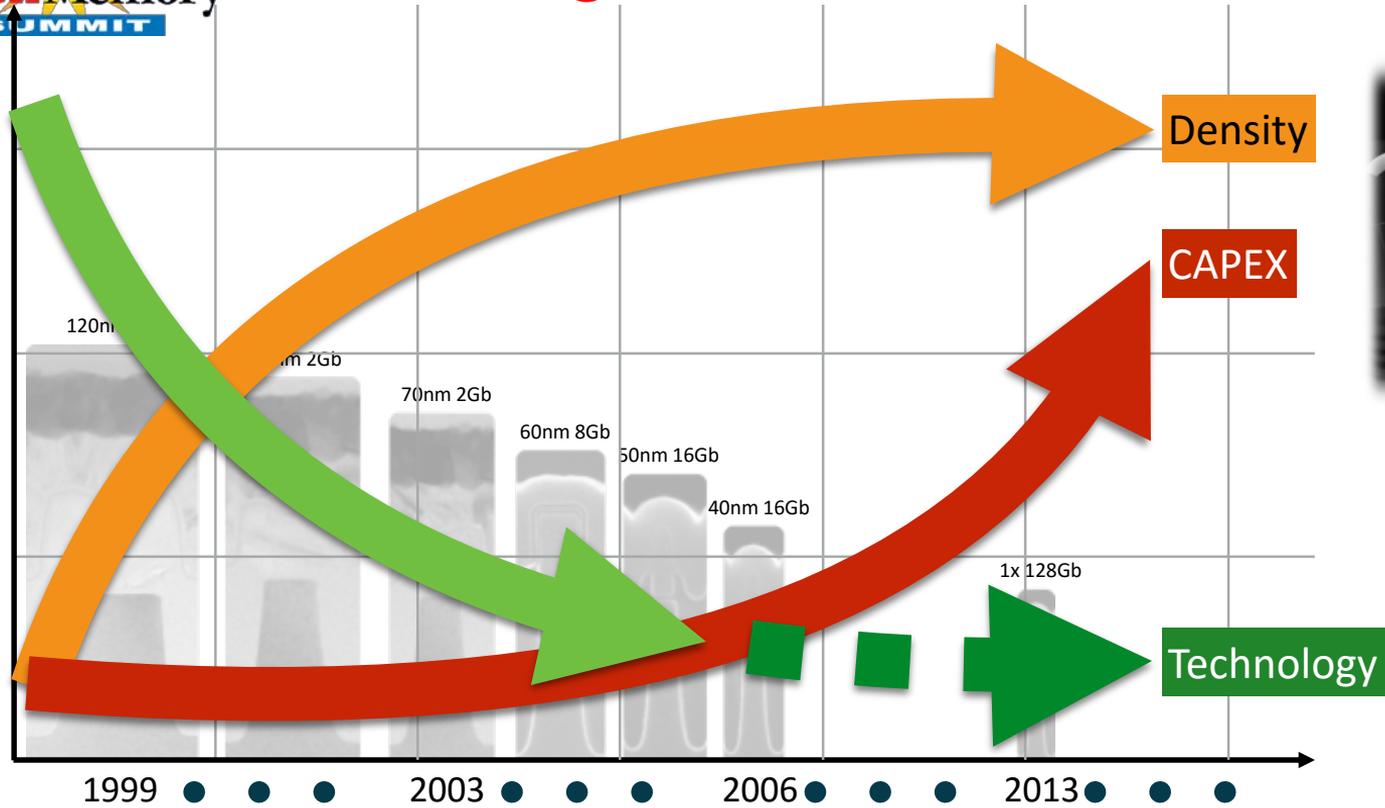


Multi Level Cell (MLC) NAND



Tri Level Cell (TLC) NAND

# Lowering Cost via Process Geometry



**A Disruptive  
Technology  
is required!**

**NAND Flash Challenges**



# Why Samsung for SSD?

## #1 Supplier

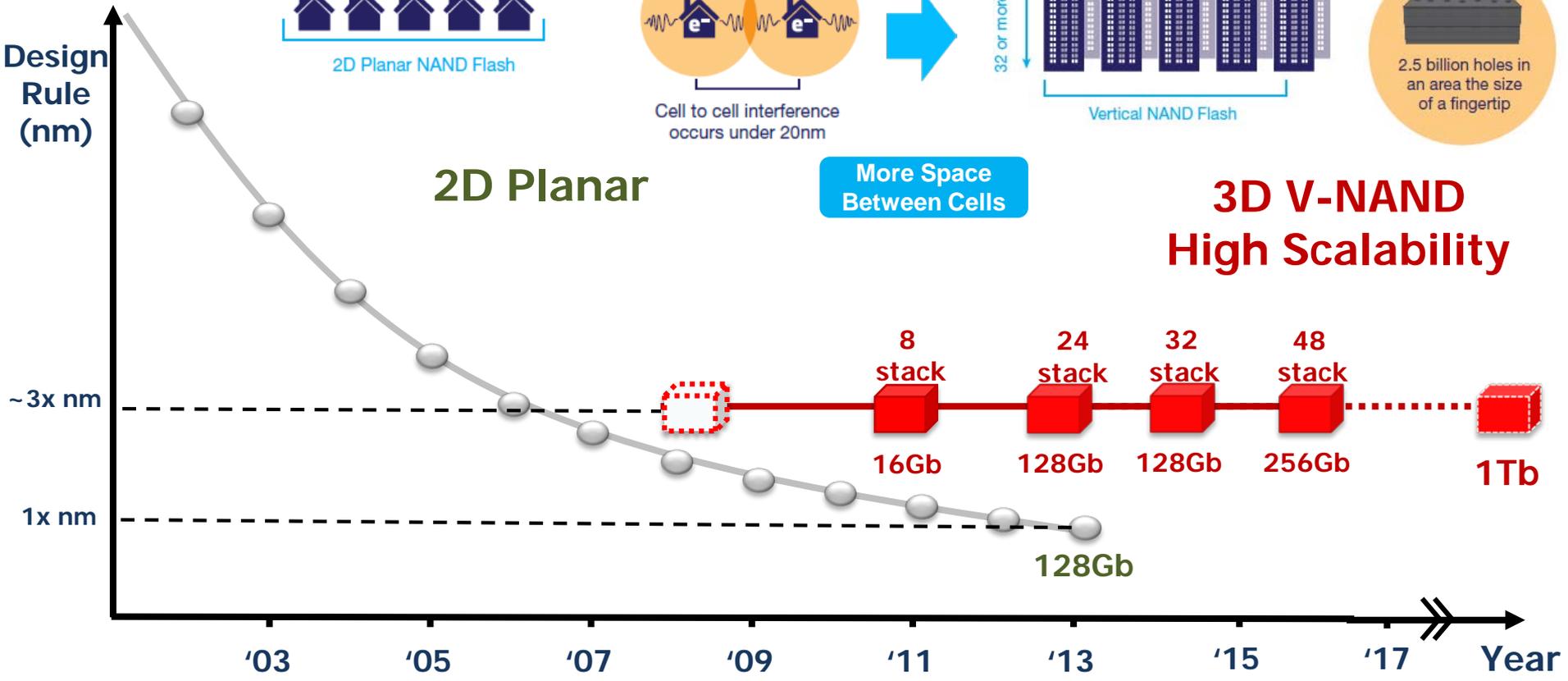
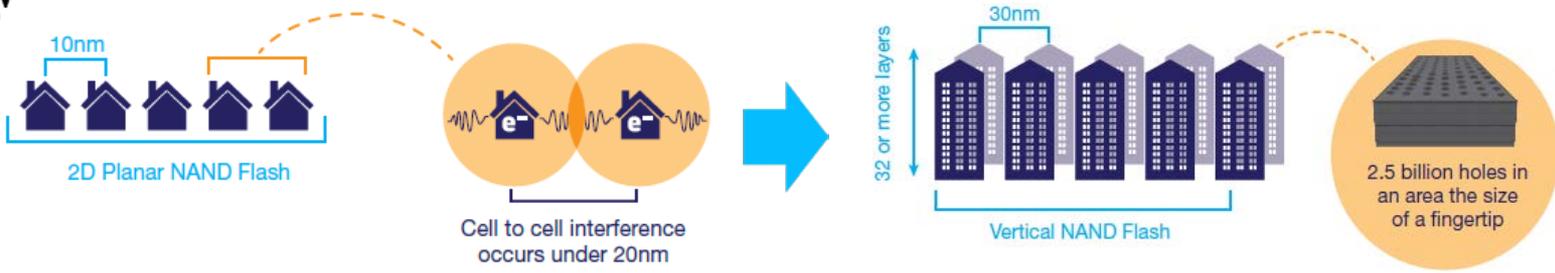
- World's #1 SSD Supplier
- World's #1 NAND Producer
- World's #1 DRAM Producer

## Customer Benefits

- Vertical Integration Leads To Superior Product Capabilities
- V-NAND Technology



# Transition to 3D NAND

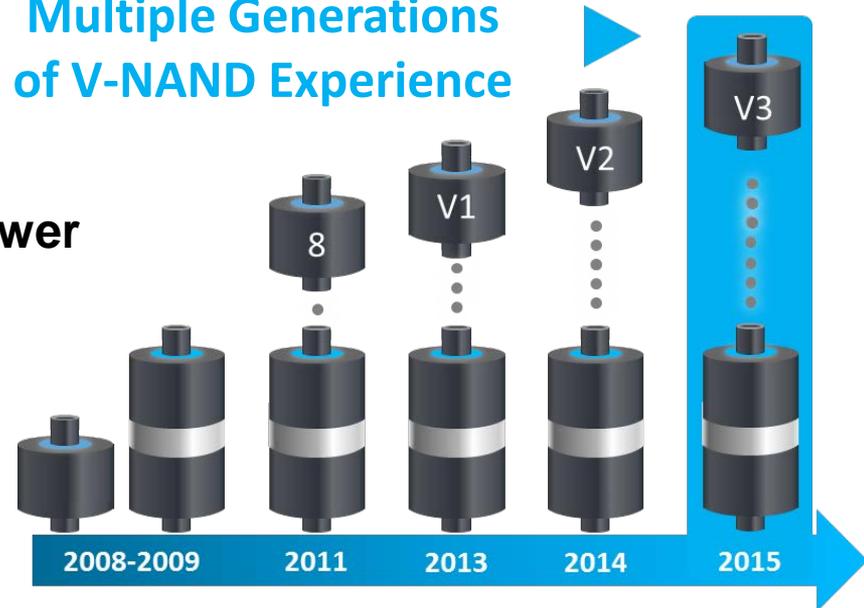


# Samsung's V-NAND Advantage



- **No Process Shrink Penalty**
  - V-NAND Scales By Building Up, Rather Than Shrinking Cells
- **Superior Endurance, Performance & Power**
  - ✓ 2x Write Endurance
  - ✓ 2x Write Performance
  - ✓ 40% Lower Read Power
- **Enables Enterprise TLC**
- **Enables Huge Capacities**

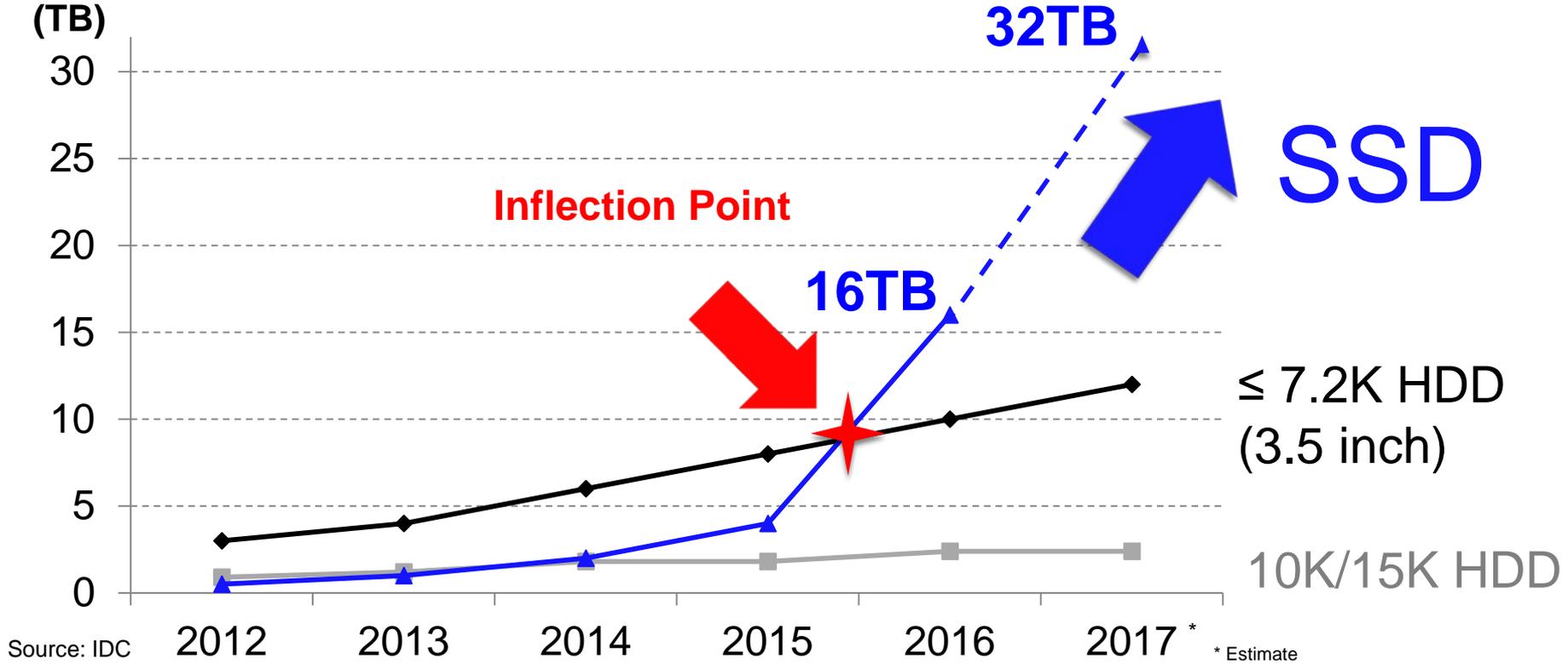
Multiple Generations  
of V-NAND Experience



Over 30 million V-NAND SSDs shipped!

V3 256Gb Density Enables 15.36TB Capacity

# SSDs Now Larger Than HDDs



TLC V-NAND fueling SSD Capacity Growth



# HPE 3PAR Announces 15.36TB SSD

## HPE 3PAR



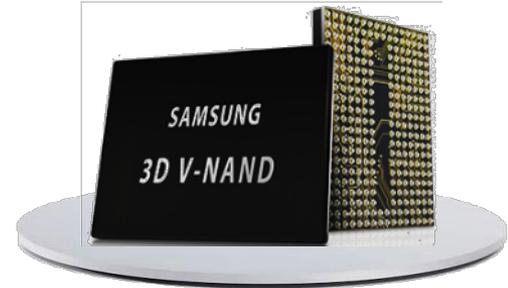
*Leader in  
All-Flash Arrays*

### PM1633a SAS SSD



**7.68TB  
and 15.36TB**

## SAMSUNG



*Leader in  
Solid State Drives*

# 15.36TB - What Does it Really Mean?



2.5 in

1.8TB x 24 HDDs per 2U chassis = **43TB**



3.5 in

10.0TB x 12 HDDs per 2U chassis = **120TB**



2.5 in

15.36TB x 24 SSDs per 2U chassis = **369TB**



HDD 2.5"

43TB

HDD 3.5"

120TB

SSD 2.5"

**369TB**



TCO Savings: 8 racks  $\rightarrow$  1 rack



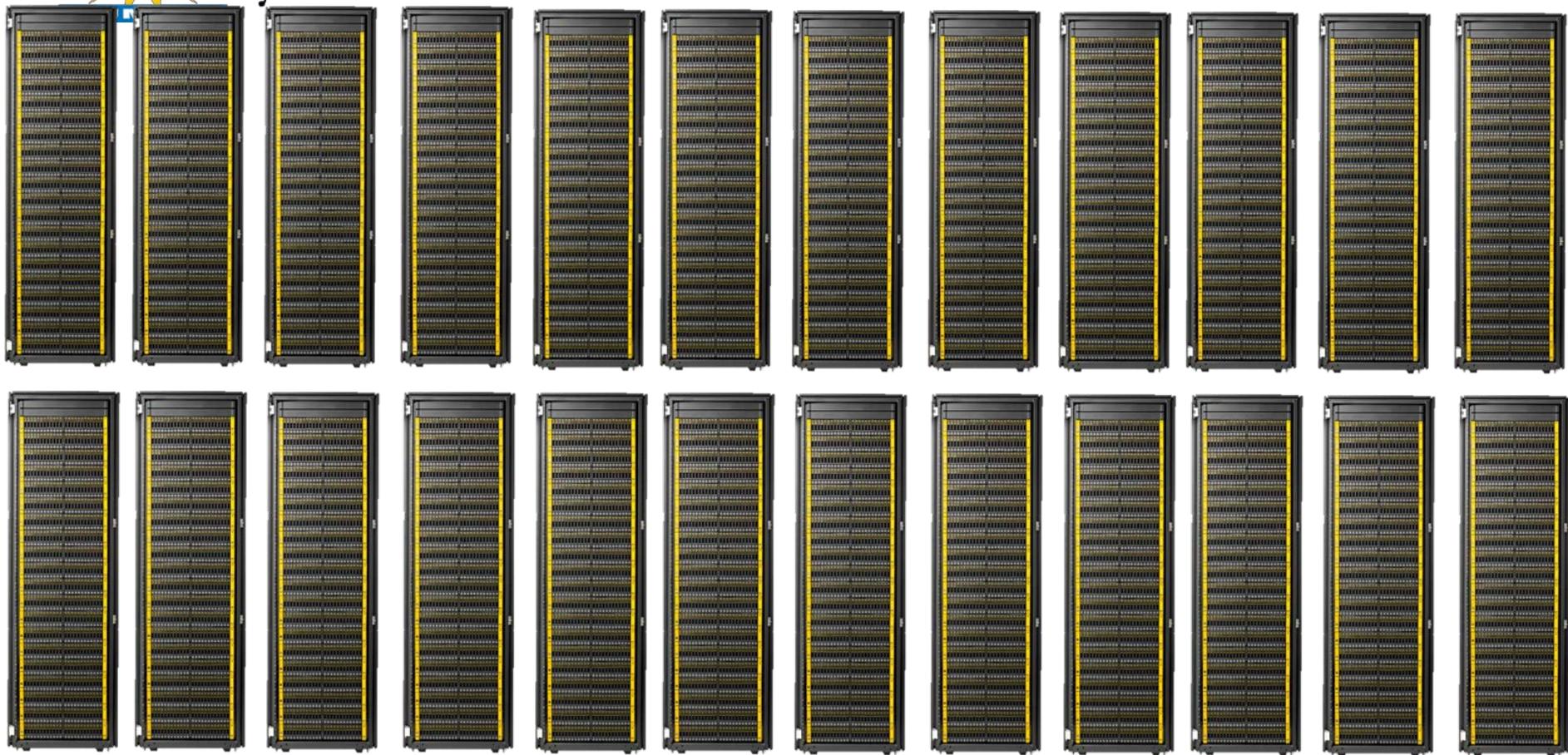
7.3PB Performance HDD (10K/15K)

7.7PB SSD

What if we include 3:1 data reduction?



24 racks HDD → 1 rack SSD



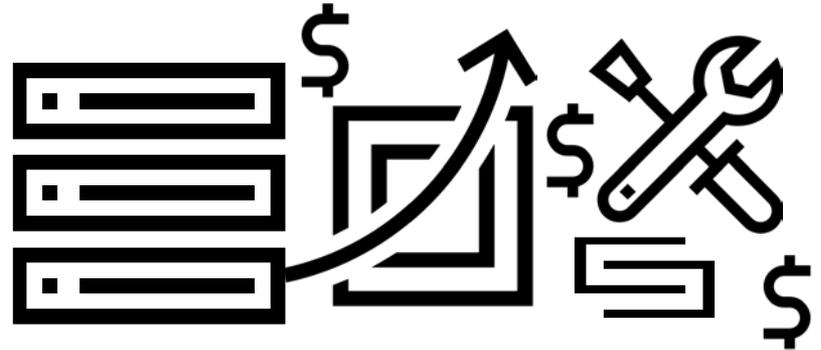


# 15.36TB is the HDD Killer

**HPE 3PAR  
15.36TB SSD**

**Highest density available in any AFA**  
**563TB** usable capacity  
per 1U (4:1 ratio)

Less Management  
More Performance  
Better Overall TCO  
**HDD Killer**





# 15.36TB is the HDD Killer

## 10K HDDs



EMC VMAX-3 with 3 engines, 900 x 1.2TB SAS  
Base Suite and Remote Replication  
3 racks, 13.71KVA

**1PB**

## 15.36TB SSDs



3PAR 20450, 4 nodes, 32 x 15.36TB SSD  
Dynamic Optimization Suite v2, Replication Suite  
1 rack, 2.3KVA

**1PB (2:1 data reduction)**

**26%**  
lower acquisition cost

**56%**  
lower support cost

**31%**  
lower overall cost  
In 3 years

Scale to 12 PB in a single rack (36X density)



# 15.36TB Enables AFA Density Leadership

## 2 x 6-Brick XtremIO

2.4PB Usable  
64U

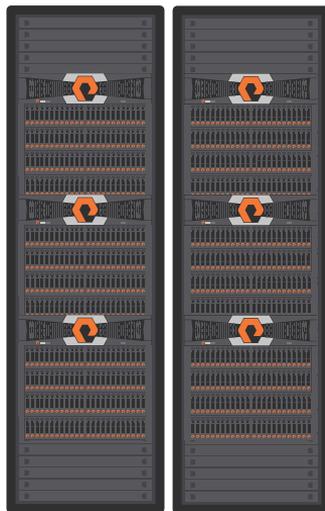


**8.7 W/TB**

5x power/cooling  
16x Sprawl

## 6 x Pure //m70

2.4PB usable  
66U



**13.9 W/TB**

8x Power/Cooling  
16x Sprawl

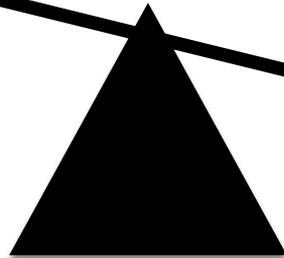
## 3PAR 8450 (4N)

2.3 PBs Usable  
4U



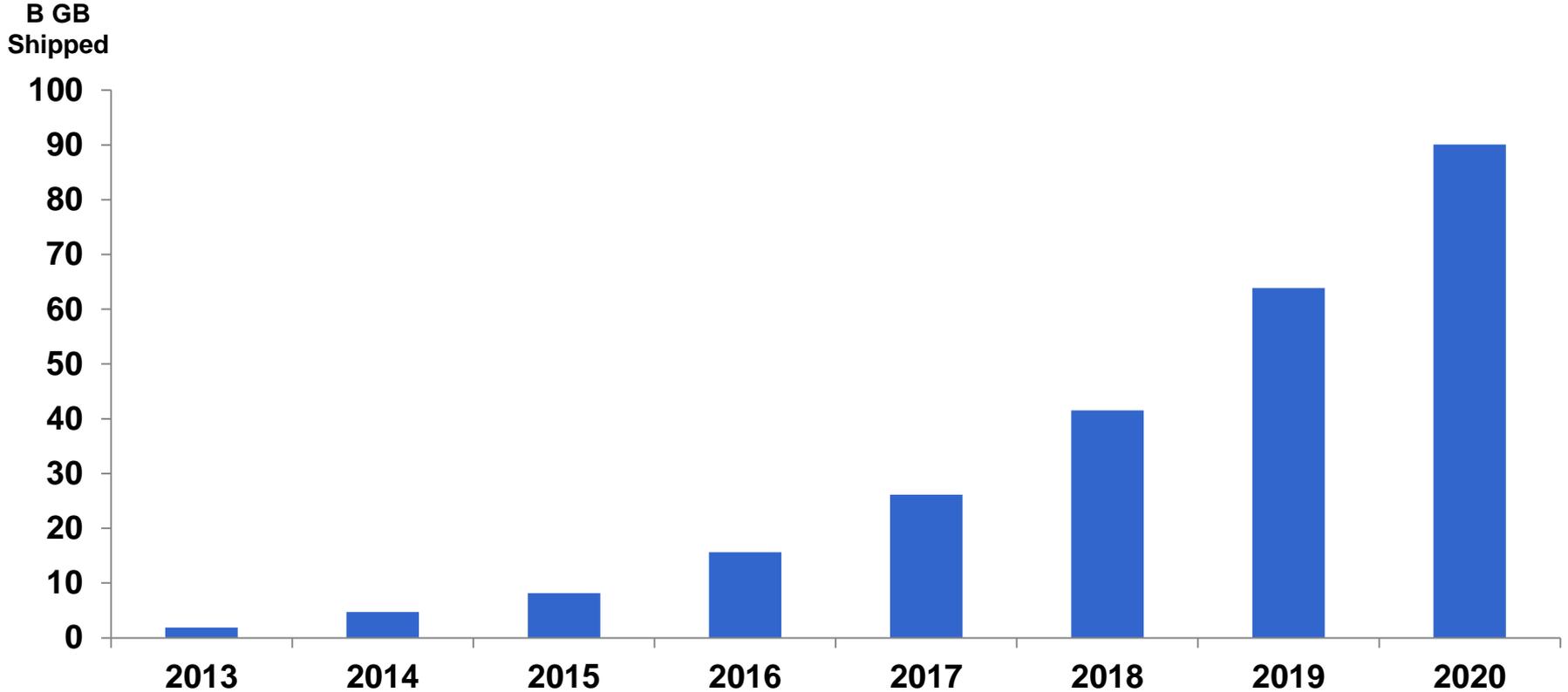
**0.8 W/TB**

**Tipping**  **Point** 





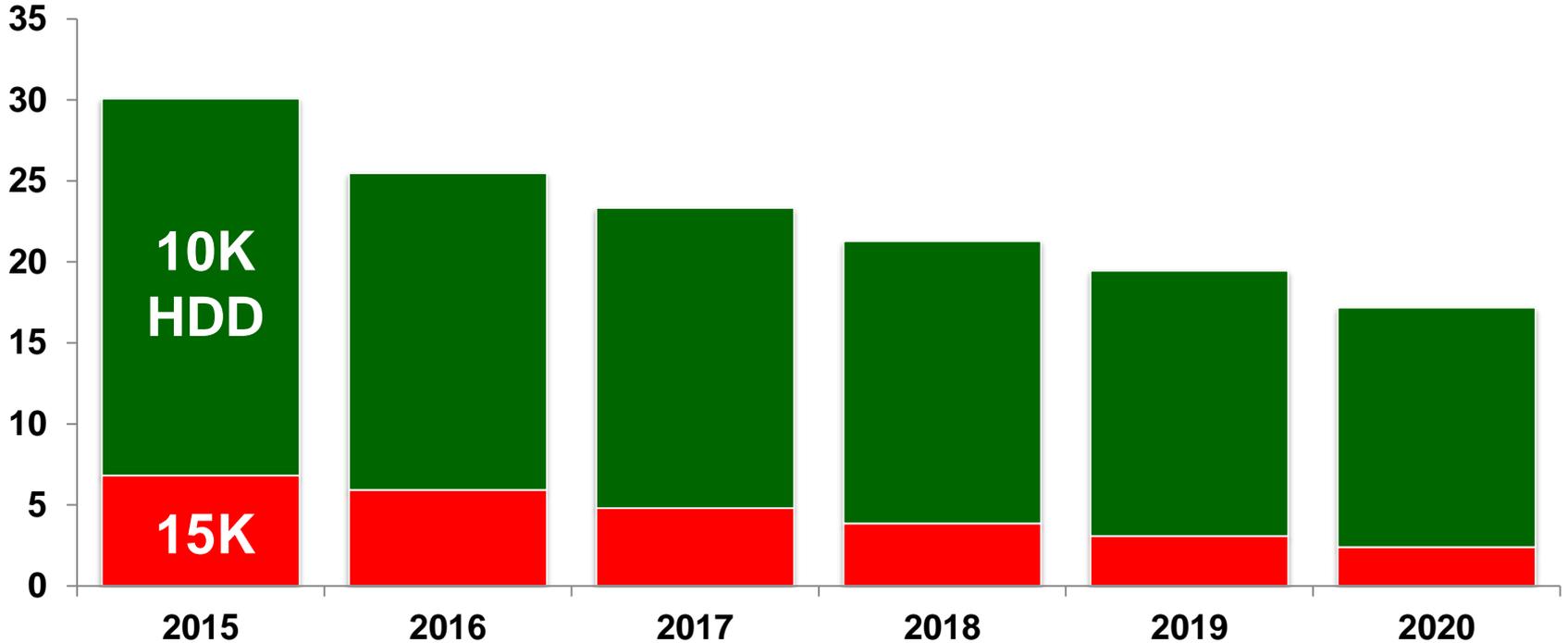
# The Acceleration of Enterprise SSD



Source: Forward Insights

# The Demise of Performance HDD

M Units  
Shipped



Source: IDC



What do the hard drive guys  
think about this?

# Steve Luczo – Seagate Chairman & CEO



...the **incursion of flash**...it's **not going to reverse** itself, so we are preparing for the **continued decline of the 15K segment**.

- Q3 2016 Earnings Call



SEAGATE



We are now seeing some **more trending down happening in the 10,000 RPM market** quarter-over-quarter.

I think that's reflected in what we see people doing with **all-flash arrays and what not.**



# Takeaways

1. 3D V-NAND is a BIG deal in the Enterprise
2. Performance HDDs are in BIG trouble
3. Why even worry about spinning disks?

**Check out our demos in the Samsung & HPE Booths**

**SAMSUNG**



HPE 3PAR StoreServ

Leading the next wave of solid state storage



**Thank you!**