

DATA IS IN OUR DNA

Seagate Point of View – Storage Beyond Capacity

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June 2018

Safe Harbor Statement

This document contains forward-looking statements within the meaning of Section 27A of the Securities Act of 1933 and Section 21E of the Securities Exchange Act of 1934, each as amended, including, in particular, statements about the Company's plans, strategies and prospects, estimates of industry growth, market demand, the potential impact of the U.S. Tax Cuts and Jobs Act, and dividend issuance plans for the fiscal quarter ending June 29, 2018 and beyond. These statements identify prospective information and may include words such as "expects," "intends," "plans," "anticipates," "believes," "estimates," "predicts," "projects," "should," "may," "will," or the negative of these words, variations of these words and comparable terminology. These forward-looking statements are based on information available to the Company as of the date of this report and are based on management's current views and assumptions. These forward-looking statements are conditioned upon and also involve a number of known and unknown risks, uncertainties, and other factors that could cause actual results, performance or events to differ materially from those anticipated by these forward-looking statements. Such risks, uncertainties, and other factors may be beyond the Company's control and may pose a risk to the Company's operating and financial condition. Such risks and uncertainties include, but are not limited to: items that may be identified during its financial statement closing process that cause adjustments to the estimates included in this report; the uncertainty in global economic conditions; the impact of the variable demand and adverse pricing environment for disk drives; the Company's ability to successfully qualify, manufacture and sell its disk drive products in increasing volumes on a cost-effective basis and with acceptable quality; the impact of competitive product announcements; the Company's ability to achieve projected cost savings in connection with its restructuring plans; possible excess industry supply with respect to particular disk drive products; disruptions to its supply chain or production capabilities; unexpected advances in competing technologies or changes in market trends; the development and introduction of products based on new technologies and expansion into new data storage markets; the Company's ability to comply with certain covenants in its credit facilities with respect to financial ratios and financial condition tests; currency fluctuations that may impact the Company's margins and international sales; cyber-attacks or other data breaches that disrupt the Company's operations or result in the dissemination of proprietary or confidential information and cause reputational harm; and fluctuations in interest rates. Information concerning risks, uncertainties and other factors that could cause results to differ materially from the expectations described in this press release is contained in the Company's Annual Report on Form 10-K filed with the U.S. Securities and Exchange Commission on August 4, 2017, the "Risk Factors" section of which is incorporated into this press release by reference, and other documents filed with or furnished to the Securities and Exchange Commission. These forward-looking statements should not be relied upon as representing the Company's views as of any subsequent date and the Company undertakes no obligation to update forward-looking statements to reflect events or circumstances after the date they were made.

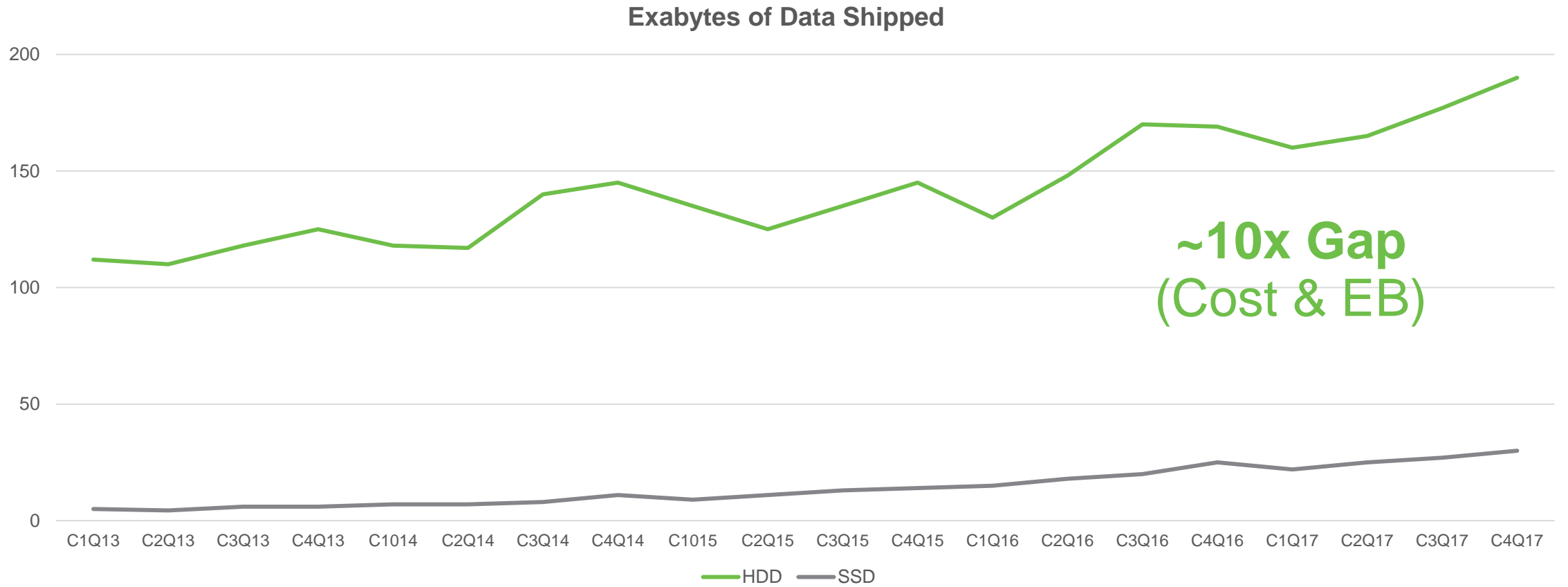


Our Ultimate Goal

At Seagate, we want you to think about what life might be like if we could **remove one thing**



Exabyte Shipment



Hyperscale/Hyperconverged/SDS/Virtualization To Save The Day



Legacy:
The Story of “Or”



Hyperscale/Hyperconverged
The Story of “And”

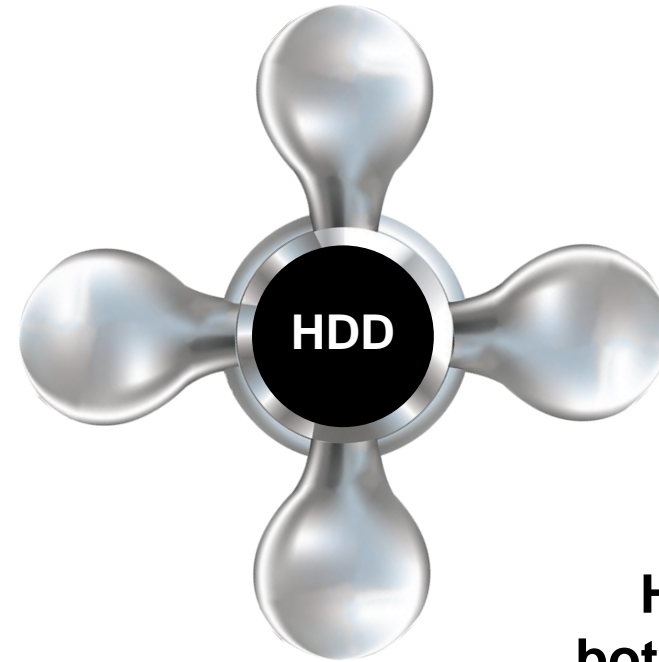
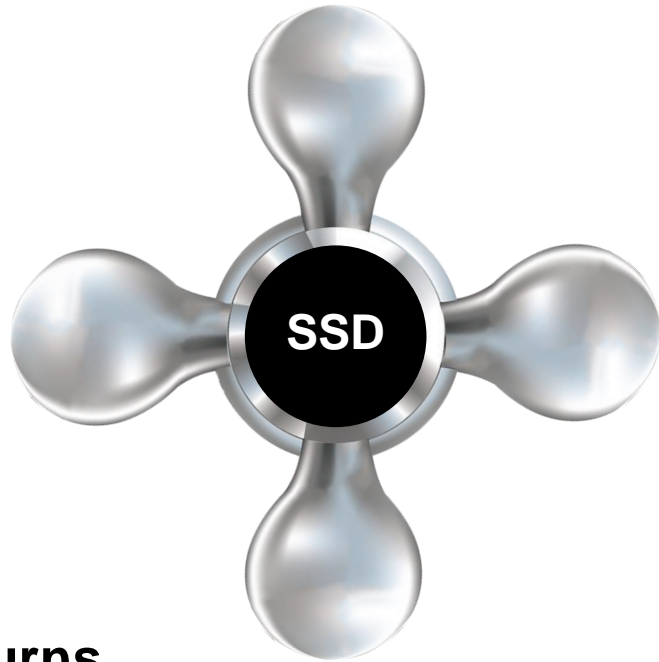


Today

220°



The Law of Diminishing Returns



32°



HDD performance bottlenecks virtually unchanged for years

70°

Desired Temperature

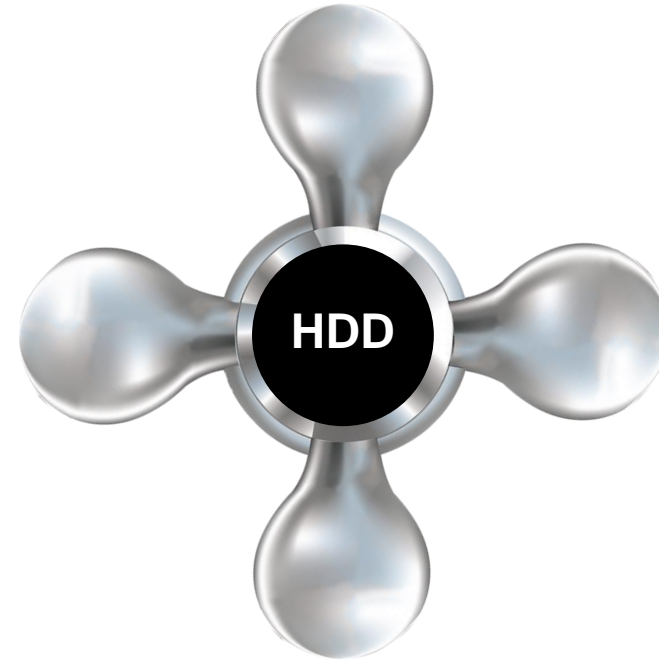
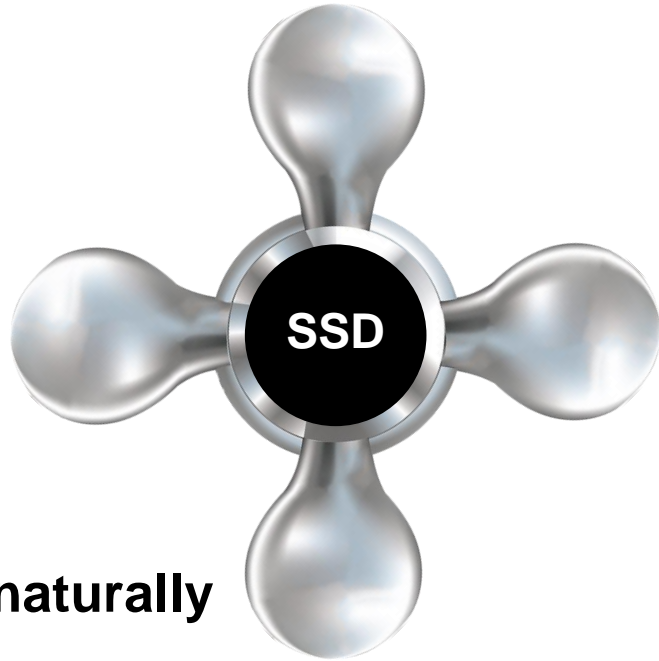


Tomorrow

220°



Let this happen naturally



~~32°~~
2x 64°



Fix the bottleneck

70°

Desired Temperature



What Are Our Challenges to Preserve Our Memories?



Keep the gap of cost, and therefore EB growth at 10x (or greater)



Look to challenge a long established bottleneck on the HDD, and innovate to preserve the most retention of our memories at the greatest efficiency.



Innovation: Density

Capacity Growth:

Step 1:

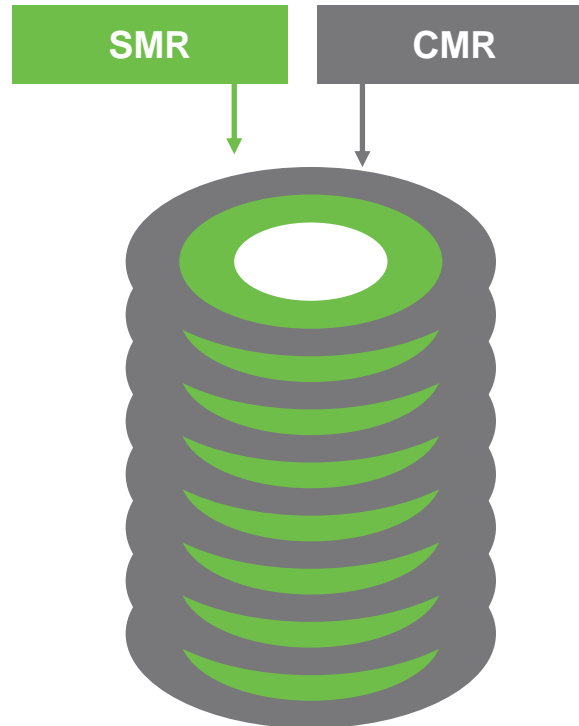
Zone Block Devices

Software development at OCP underway to control dataflow and data warmth

Step 2:

HAMR

Core technological achievement to keep pace with Industry Exabyte demand



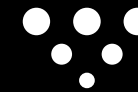
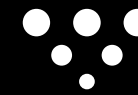
MARKET DYNAMICS



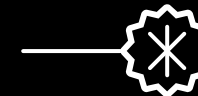
Growing Exabyte Demand

Enable Storage Density

Store Multiple Copies



HDD TECHNOLOGIES



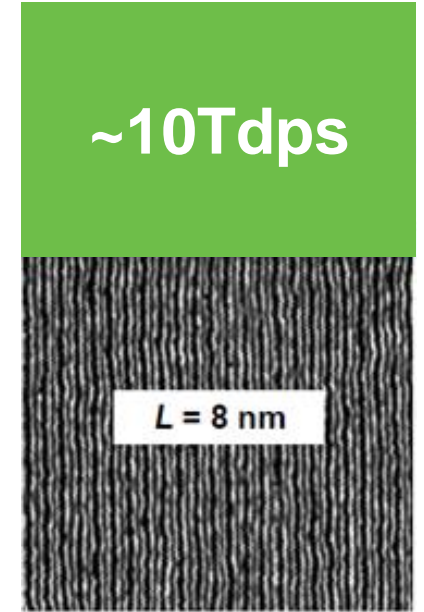
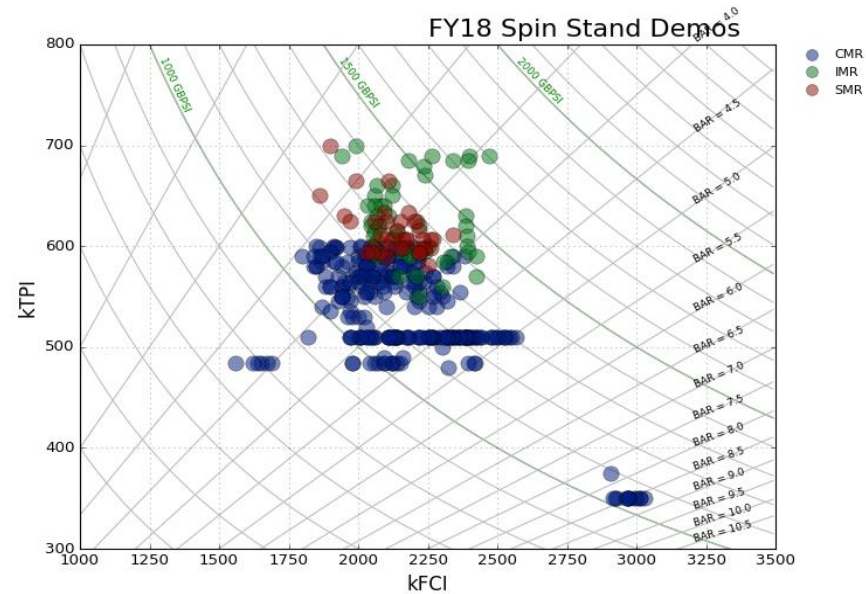
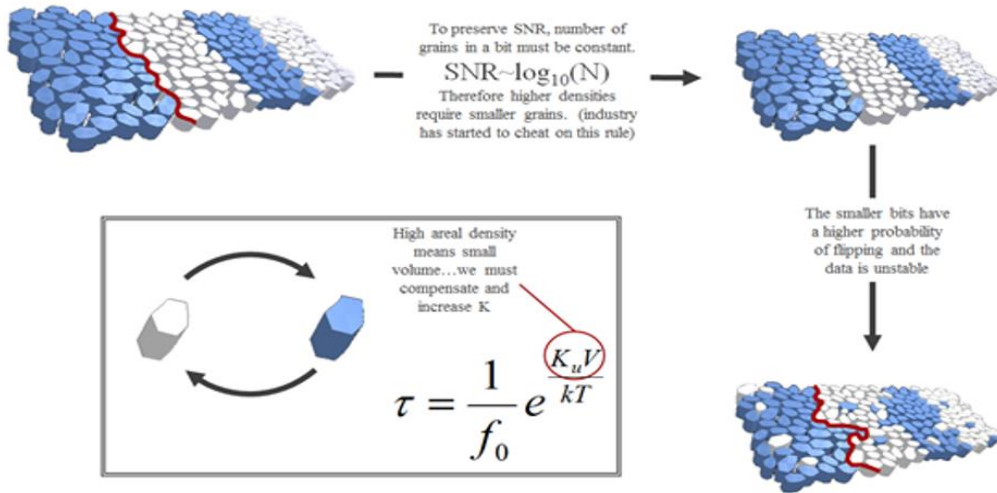
Areal Density

Technology: HAMR

Focus: 20TB by 2020

Innovation: The Technology

Capacity growth starts at the media



SEAGATE has created production media up to **2Tbpsi**

SEAGATE has created media in research up to **10Tbpsi**

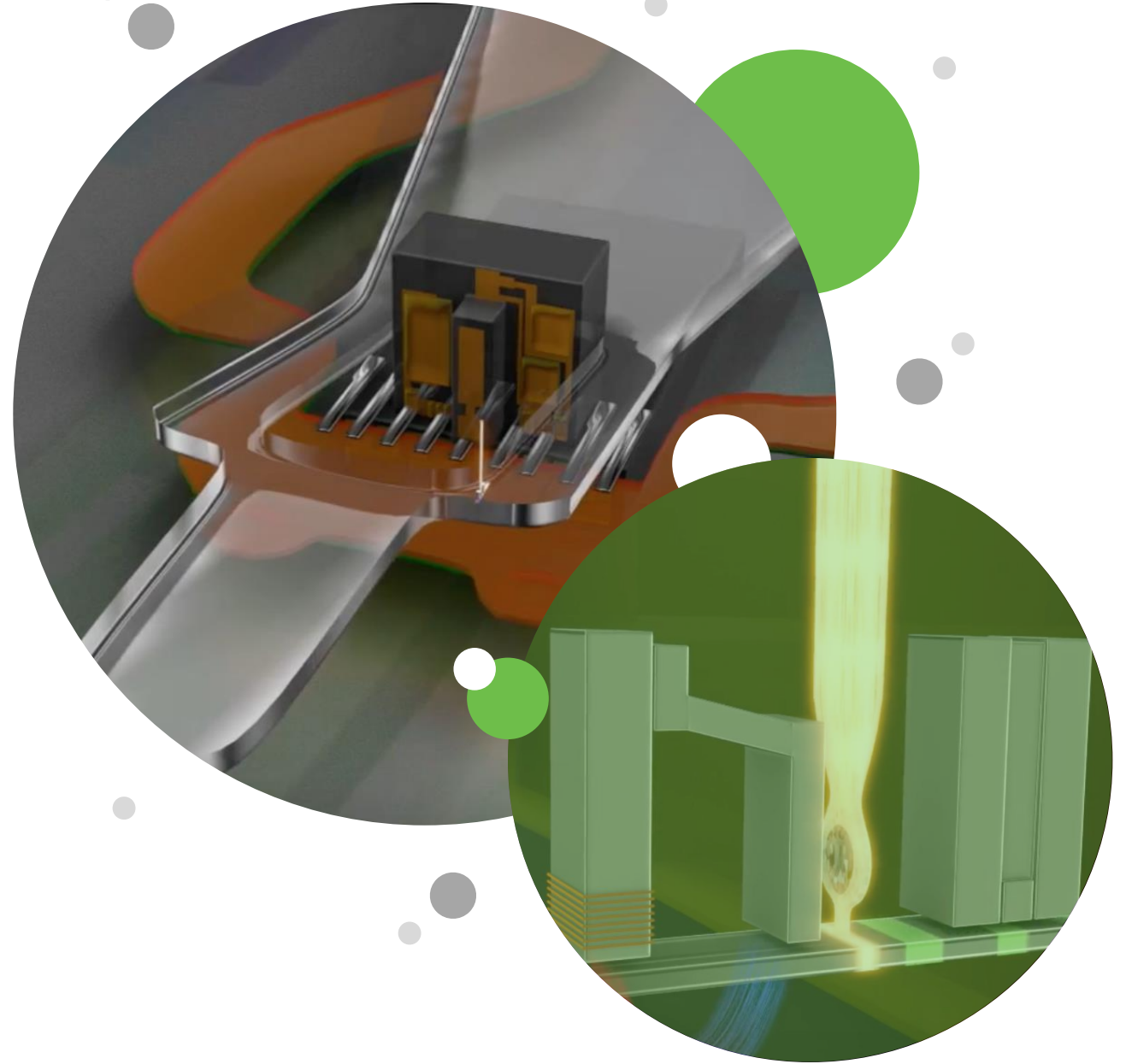
9 YEARS of 30% CAGR demonstrated with HAMR



Innovation: The Technology

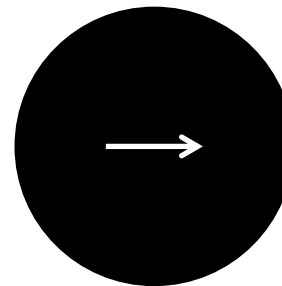
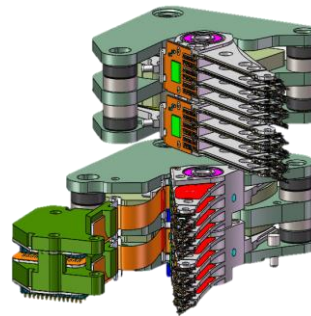
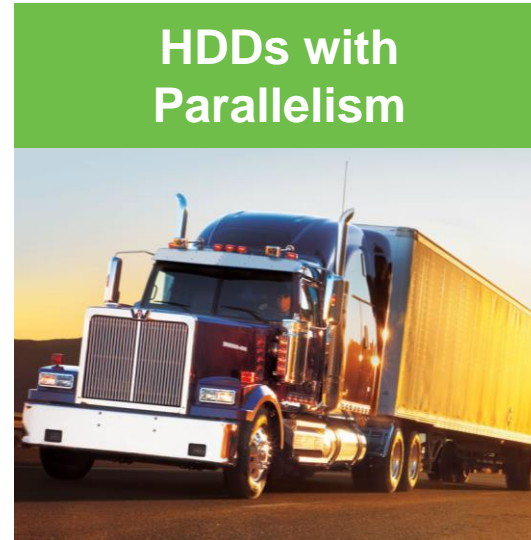
Investment in precision manufacturing, optics, mechanical/electrical/chemical engineering

Energy assisted technology is needed to continue this amazing growth in the Hyperscale world.



Performance Enablement

- Cost, Size, Performance matter in the data center!
- Logistics has known this model for years
- All are required for customer experience



Innovation: Performance

IOPS Growth:

Step 1:

Latency Bounded IO – ICC – Banding

- Command priority, queues, locality optimization
- Unfortunately latency boundaries become encountered

Step 2:

Dual Actuator

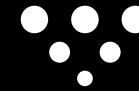
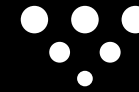
- Enable 1 drive slot to perform like 2 drives
- Significantly less power than 2 drives, avoid slot tax!



Maintain SLAs with High Performance

High Availability

Low Response Time



Scale IOPS with Capacity

Technology: Multi Actuator, Parallelism

Focus: Random Read IOPS, Latency



Innovation: Performance

1 Slot in the Datacenter → Performance of 2X → Enable TCO

Up to 2018

3.5" NL Performance History

- Spindle Speed
- Disk Size
- Actuator Mass

Random Read performance has been flat

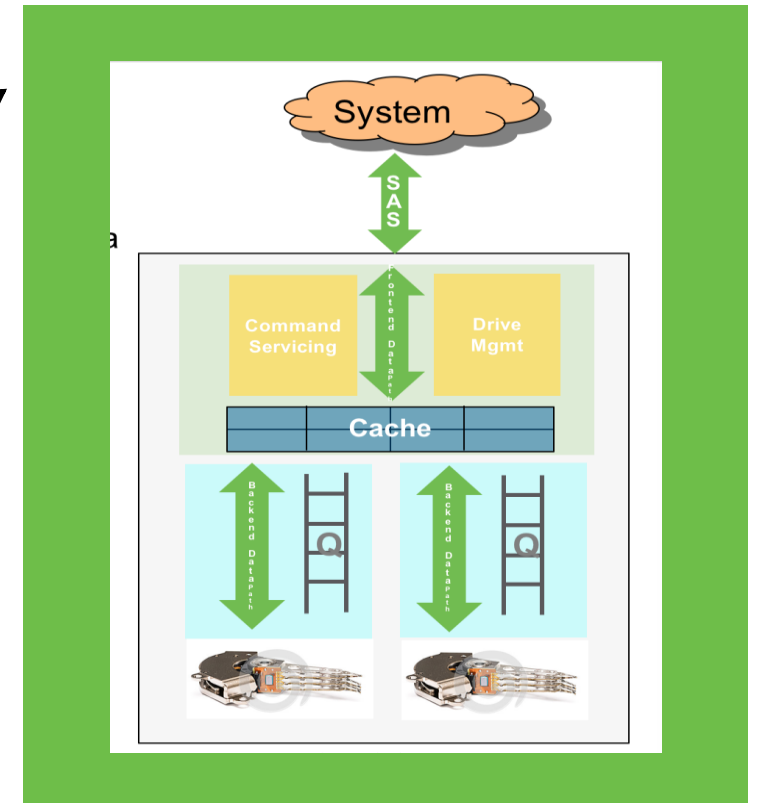
Ingest:

Open the pipe from the SSDs to allow software defined storage to scale

Read IOPS:

- We can't predict what users will read...yet ;)
- Need to give analytics access to the data lakes with efficient model

2019 and beyond

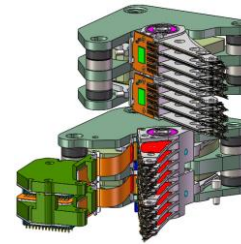


Beyond Capacity:

Latency is critical to data center growth

Software solutions to keep IO/TB sufficient in the short term (1-2 years).

Hardware solutions to enable storage economics for the data center longer term



Dual Actuator

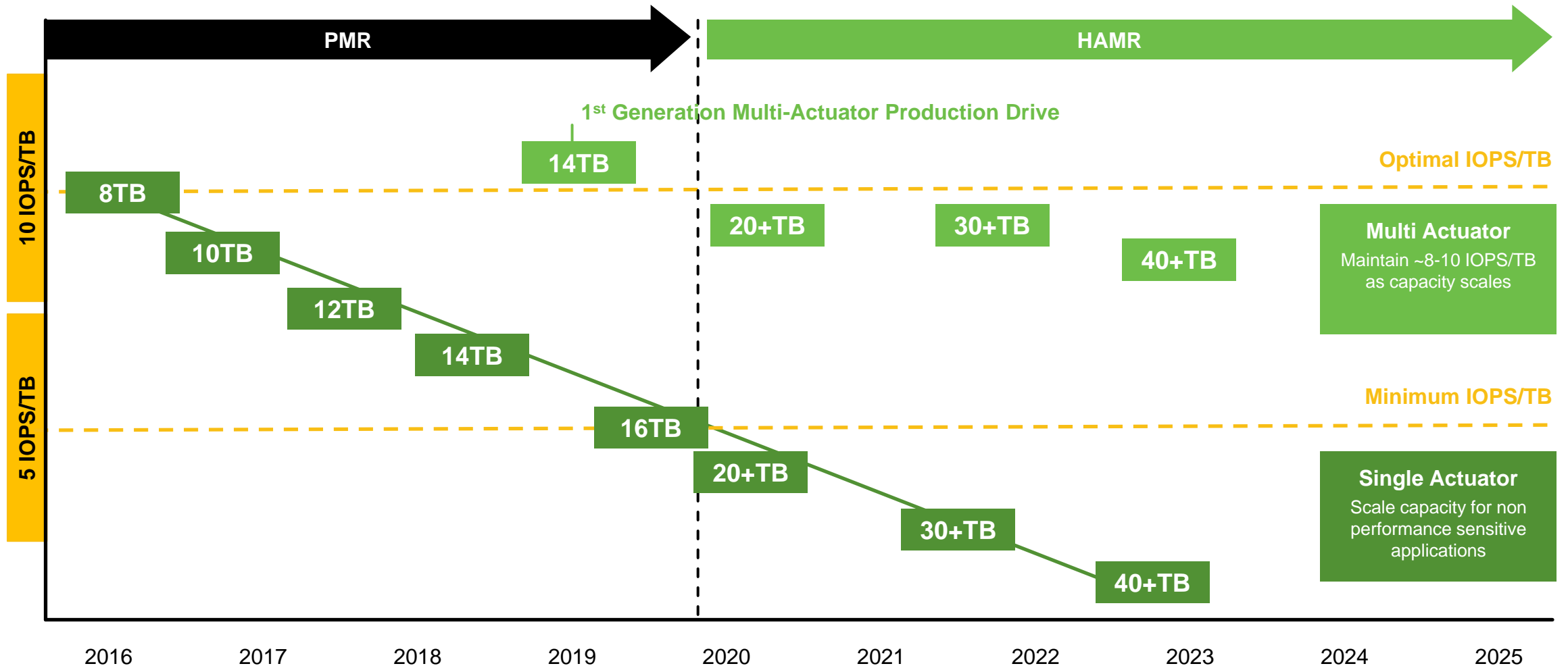
LBIO



Random Read IOPS	160 IOPS in 1 st half of 2019	10 IOPS/TB achieved on 10-12-14TB
Power	Significantly less than 2 drives	Optimized for customer use case
TCO	Significantly less than 2 drives	
Sequential Fill	~500MB/Sec!	No change to traditional NL Allows writes/reads prioritization
Compatibility	Seamless integration to all future capacity growth recording techniques. (HAMR)	Works with both SAS & SATA devices



Ensuring Hard Drives Can Meet Hyperscale Workload Requirements



The Bottom Line:

1.

Capacity

Improve the Density of the Data Center

2.

Performance

Enable the users to access the data to continue achieving service level agreements

3.

Collaboration

Work closely to ensure software genius fully optimize hardware capability

