SEAGATE | Dropbox

Case Study

Dropbox

Seagate areal density enhancements
produce TCO savings and other benefits.

Conclusion: Real Mass-Capacity Benefits

Dropbox moved Seagate® mass-capacity shingled magnetic recording (SMR) technology out of testing and into production in the fourth quarter of 2021. As of early January 2022, Dropbox had Seagate SMR drives running with live customer data and were already realizing the following key benefits from the transition:

- **TCO savings.** Mass-capacity SMR drives deliver lower cost per gigabyte, both at the drive and rack levels.

- **Energy efficiency.** Higher storage density translates into less storage infrastructure and fewer deployed racks pulling energy from the grid.

- **Better roadmap positioning.** With SMR qualification done, Dropbox can more readily pass higher-capacity Seagate drives through testing and into production.

- **Innovation Benefits.** We can apply SMR development methods to new technology, including Seagate's HAMR, which enables higher in-track areal density.

These benefits directly contribute to Dropbox's ability to provide more value to users, which in turn helps drive subscription conversions. Customers see the value of exceptional capacity, security, and service resiliency. As Seagate's and Dropbox's shared roadmaps lead to a future filled with 30TB and 50TB drives, these benefits will only magnify.

"It's critical to have the right partners with the right products," says Dropbox's Ali Zafar.

Meeting the Demand for Growing Capacity

Data volumes are growing even faster than predicted. According to revised guidance from IDC, worldwide storage capacity will compound by nearly 20% annually through 2025. IDC notes that storing more data is crucial for digital resiliency, using data for innovation, and regularly monitoring the satisfaction of customers, partners, and employees. Those who want ongoing success are more likely to find it with expanding data use.

Few companies have done a better job of unlocking the economic and functional benefits of cloud-based storage than Dropbox. The company makes easy and affordable unlimited cloud-based storage accessible to everyone from single-person operations to multinational enterprises. As of early 2022, Dropbox had over 700 million registered users, and nearly 16.79 million of them pay for a subscription.

To help further the company's goals, Dropbox deployed mass-capacity hard disk drives (HDDs) with Seagate's SMR technology which increased data density per drive to meet the demand for growing capacity. This case study talks about why and how this implementation happened—and about the tangible business benefits that resulted.

On Track to Top Density

Performance is always relevant in storage, and drive reliability must meet application-specific requirements, but there is no escaping that capacity is king for Dropbox. The company's early growth came from leveraging Amazon's AWS infrastructure, but rising and broadening customer needs pushed Dropbox to see that a hybrid cloud approach would be most advantageous for the long term.

Starting in 2013, Dropbox designed its Magic Pocket private infrastructure from scratch, since it knew the solution would require exabyte-scale storage. Magic Pocket is ravenous for storage capacity, and so HDD technology, with its lowest cost per gigabyte for non-archival applications, was the most practical, economical path to maximum capacity. "Seagate's hard drives were instrumental in building out Dropbox's infrastructure even from the earliest deployment days," says Dropbox Head of Supply Chain Refugio Fernandez. "Seagate had a wide portfolio of large capacity nearline HDDs to support our growing data center needs." Collaboration between the two companies has deep roots. Dropbox's adoption of the Seagate solution began with 1TB drives and continued through 4TB, 6TB, 8TB, 16TB, and as of early 2022, 18TB models. However, the 18TB unit represents the first use of SMR HDD technology from Seagate in Dropbox storage for live customer data.

Conventional magnetic recording (CMR) correlates on-platter track width with the size of the write head. It's like correlating the exposed width of a siding plank with the size of a paint brush. Shrinking head sizes to increase areal density is difficult and costly. However, most data writes to the track's center region, with little written near the edges. SMR enables higher data densities by writing new data on tracks that overlap part of the previously written magnetic track, leaving the previous track narrower and allowing for the writing of higher track density in a shingle-like overlaying pattern. Error correction catches any overwritten edge data and rewrites it. SMR is better suited for bulk storage applications, which put less emphasis on performance, but delivers about 20% increase in storage density.

Deep Cooperation Pays Off

Dropbox views Seagate as a top infrastructure provider, with strong cross-company relationships at the executive and engineering levels. Both organizations share semi-annual account reviews to align strategic directions and analysis of overlapping roadmaps.

Perhaps no other effort has shown this symbiotic relationship better than the latest 18TB implementation, which took advanced development and testing at Dropbox before reaching firm traction. In that time, Dropbox refined many testing procedures and evolved its storage requirements. Both companies emerged with stronger processes and product lines, the value of which will ripple outward to their respective ecosystems and client bases.

Ultimately, bringing Seagate's mass-capacity SMR technology into production at Dropbox was a three-year journey. SMR was originally introduced in the consumer market in 2013 but implementing the technology into

Dropbox's application required a new level of qualification and validation that took longer than preceding segment introductions. For example, nearline storage in data centers require around-the-clock duty cycles and higher vibration tolerances because of dense deployments in rackmount systems potentially containing scores of drives running (and vibrating) in close proximity. Such conditions never exist in consumer applications. Similarly, consumer and hyperscale workloads exhibit different characteristics, requiring new waves of R&D and refinement.

"We needed SMR to handle sequential writes for Dropbox in very specific ways," says Dropbox storage engineer Jared Mednick. "Seagate worked with us to implement specific firmware tuning and optimize the servo processor, things that applied to SMR that didn't apply with CMR. It was a journey that took many months, but now the results speak for themselves."
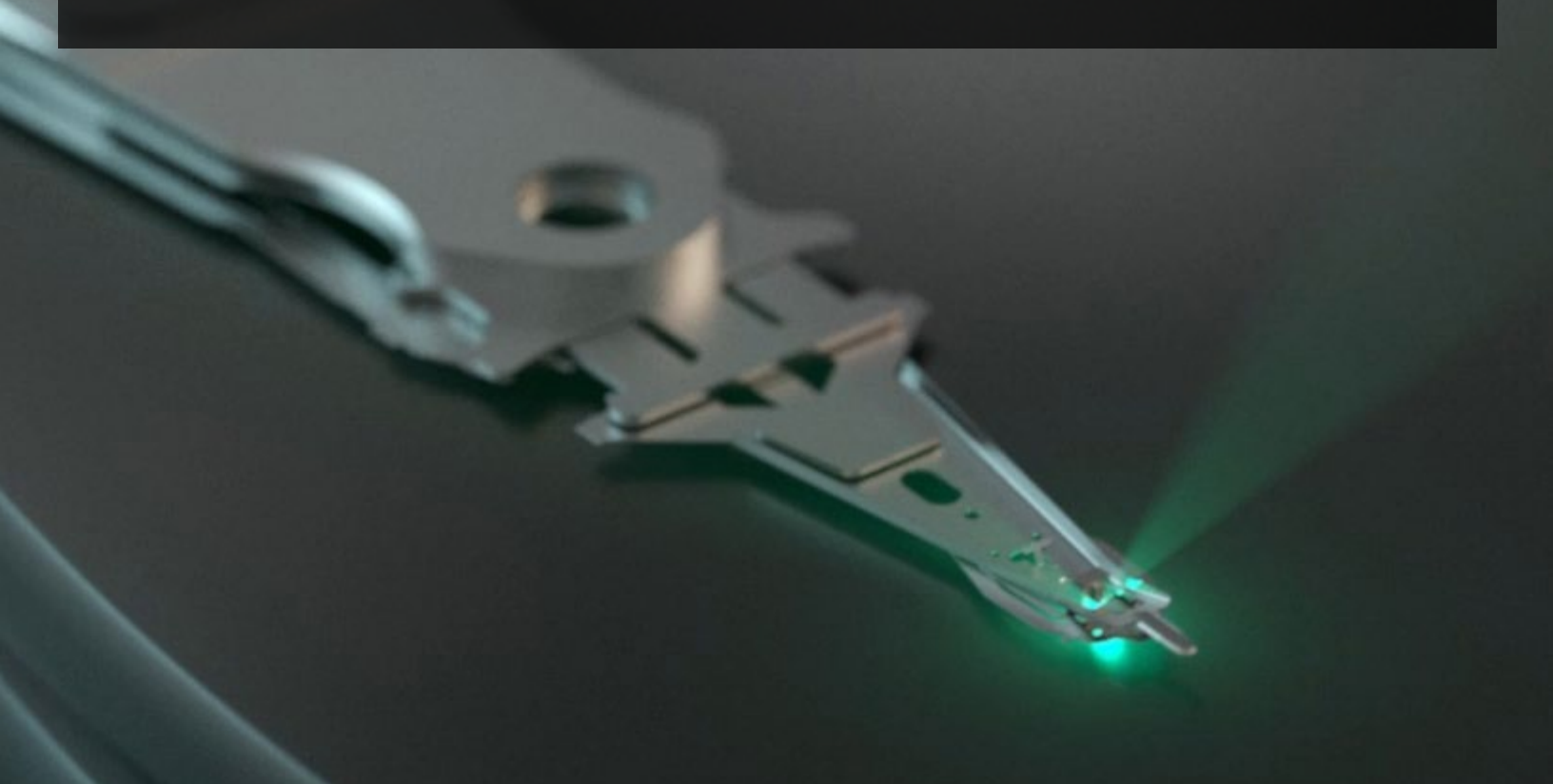
Their Success

SMR's Impact on Dropbox Business

Understanding the business advantages of SMR requires looking beyond the headlines describing higher capacities. As Dropbox commodity manager Jesse Lee describes it, SMR conveys economic benefits relative to both operational and capital expenditures.

"With OpEx, think of power, cooling, and hard drive maintenance expenses," says Lee. "With CapEx, consider how more capacity per drive can allow more total capacity per rack and so fewer racks are needed to reach the same capacity target, which also reduces networking and server equipment. Combine those two things, and you have lower TCO with decreasing data center footprints."

The nature and variety of Dropbox workloads continues to evolve. Dropbox's earlier years were predominantly filled with music, photos, and text. More recently, the company has seen its user content shift toward richer media, especially larger video files and PDF documents. This shift fuels much of the present need for top-capacity storage, which mass-capacity HDDs using SMR now helps to fulfill.

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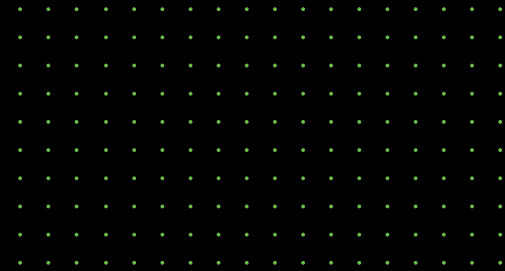
At Dropbox, we need to deploy the most cost-efficient storage without sacrificing reliability, security, and performance. That's why we've continually partnered with Seagate. Their collaboration is critical in helping Dropbox define our future storage architecture.

ALI ZAFAR – DROPBOX SENIOR DIRECTOR OF PLATFORM STRATEGY AND OPERATIONS

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