SOLUTION BRIEF

Scalable SMR Data Center Storage Solutions with Western Digital and Broadcom

Highlights

- By 2025, 163 zettabytes of data will be created per year, says IDC. Big data, video, IoT/IIoT AI/ML, consumer-created content and more drive efforts to rationalize workloads.
- The Zoned Storage initiative is a campaign designed to build awareness about the advantages of zoned block devices for architecting robust, efficient, and purpose-built storage tiers to achieve competitive TCO now and into the future.
- ZonedStorage.io, a new website hosted by Western Digital, includes documentation for getting started with SMR and ZNS technologies, along with links to open-source libraries, tools, and resources.

Components

- Western Digital Ultrastar® DC HC620 SMR HDD
- Broadcom 9400 Series Tri-Mode Storage Host Bus Adapters

With a focus on enabling purpose-built, open and scalable data center architectures, Western Digital is working with partners to bring together new innovations and industry standards for cloud data center architects. Western Digital collaborates with Broadcom on solutions to reduce TCO and achieve greater economies of scale as industry approaches the zettabyte-scale era. We have expanded our product offerings to help prepare cloud and hyperscale customers for the zettabyte-scale era by testing, validating, and delivering host-managed SMR HDD ecosystems.

Cloud and hyperscale data center architects manage hundreds of exabytes to zettabytes of data. Their data centers must adapt to IT infrastructures to keep pace and scale appropriately, along with optimizing time for a diverse set of workloads for greater efficiencies. Plus, they need to store more and more sequential data, such as video, IoT sensor data, surveillance, and data that needs to be "zoned" into larger datasets like Artifical Intelligence or Machine Learning. This proliferation of sequential data brings opportunities to rationalize workloads and accelerate the adoption of zoned block devices for zettabyte scale data centers.

Zoned Storage is designed for applications where host and storage are orchestrated to help workloads take full advantage of the highest available storage capacities typically with SMR HDDs and the emerging ZNS standard for NVMe™ SSDs. NVMe Zoned Storage incorporates intelligent zoned namespaces (ZNS) management to deliver QoS, predictable latency, high performance, and better endurance regardless of the media type. This ZNS SSD approach is similar to the technology already used by cloud service providers to write overlapping tracks on SMR HDDs to benefit from greater areal density.

Current SAS Controller Product Support

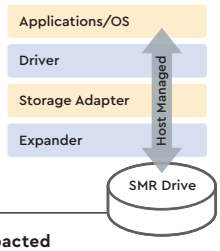
Feature	Description	9300 Family of HBAs	9305 Family of HBAs	9400 Family of HBAs	9500 Family of HBAs
Basic SMR Support	Support for SATA HM SMR; Support for the following SCSI/SATL commands: SAT-4: ZBC and ZAC. See separate supported commands list.	Supported	Supported	Supported	Supported
Extended Sense Code Support for SMR and DePoP	Support for Extended Sense Codes for SMR and Repurposing Depopulation.	Not Supported	Supported	Supported	Supported
Repurposing Depopulation	T10 (SCSI) and T13 (ATA) standards for Offline Logical Depop. Capacity backed by a failed head or bad platter can be removed from the namespace.	Not Supported	Supported	Supported	Suppported

Implementing for Host-managed SMR Drives

Host-managed SMR is an implementation where the host is responsible for everything ranging from sequential write data streams to zone state management. Host-managed SMR requires host-software modification so that the host system has knowledge of the underlying media zone organization and can control all elements by employing a new set of commands.

Depending on the system architecture, implementing these modifications may seem like an onerous task, yet once developers gain SMR familiarity and optimize their applications for sequential writing, they can take advantage of unsurpassed levels of reliability and quality. With the ability to deliver predictable, consistent performance comparable to what users expect from traditional CMR drives, host-managed SMR is emerging as the preferred option for implementing shingled magnetic recording.

Implementing for host-managed SMR enables total control of how data is placed on the disk, along with how and when the necessary "housekeeping" tasks are managed.



Host-managed SMR Stack

Storage Stack Component	SATA SMR Drives	SAS SMR Drives	How Impacted
Applications / OS	Yes	Yes	App and OS must adhere to SMR sequential write rules
Driver	No	No	No Driver changes for SMR
SAS Storage Controller	Yes	Yes	SAS Controller must translate SCSI commands to ATA; per zone write command order must be preserved for SAS and SATA SMR
Expander	No	Not	Expander is pass-thru for SMR

Solution Description

Western Digital and Broadcom have collaborated to promote host-managed SMR and the open-source community to help customers to better store, manage, and deliver data. The foundational open-source work leveraging ZNS and SMR technologies is documented on the site http://ZonedStorage.io and creates more options for SDS infrastructures as a way to both manage current complex storage challenges and lay a foundation to more intelligently manage and scale workloads for the Cloud and Hyperscalers.

Ultrastar® DC HC620 SMR HDD

The Ultrastar DC HC620 delivers an unprecedented capacity point with a time-to-market advantage for customers who have invested in and continue to take advantage of the benefits of SMR. The Ultrastar DC HC620 is built on the proven and mature HelioSeal® platform to deliver an unmatched Watts/TB power footprint for online storage. Built for enterprise workloads up to 550TB/year, DC HC620 is ideal for ultra-dense scale-out storage systems, providing the uncompromising product reliability necessary for private and public cloud enterprise applications. Industry-standard SATA 6Gb/s or SAS 12Gb/s interface options support a variety of data center configurations.

Broadcom 9400 and 9500 Series HBAs

Designed for large-scale external storage enclosures or high-end servers utilizing internal storage, the Broadcom family of SAS/SATA and NVMe HBAs and storage adapters are ideal for increased connectivity and maximum performance for data center flexibility.

The Broadcom HBAs and storage adapters can enable an easy, long-term storage growth strategy in practically any direct-attached storage scenario. Whether solutions use SAS or SATA or NVMe, hard disk or flash, or even internal or external storage elements, these HBAs and adapters can create the fabric tying any or all of those components together into a unified storage effort.

Learn more at http://www.wdc.com/dc-hc620 and https://www.broadcom.com/products/storage/host-bus-adapters#overview

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