Buyer beware—that 2TB-6TB “NAS” drive you’ve been eyeing might be SMR

Enlarge / Shingled Magnetic Recording drives—unlike this *Los Angeles*-class submarine—aren’t on anybody’s list of “Fast Attack” vessels.

reader comments

194 with 118 posters participating, including story author

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Storage vendors, including but reportedly not limited to Western Digital, have quietly begun shipping SMR (Shingled Magnetic Recording) disks in place of earlier CMR (Conventional Magnetic Recording) disks.

SMR is a technology that allows vendors to eke out higher storage densities, netting more TB capacity on the same number of platters—or fewer platters, for the same amount of TB.

Until recently, the technology has only been seen in very large disks, which were typically clearly marked as “archival”. In addition to higher capacities, SMR is associated with much lower random I/O performance than CMR disks offer.

Hey, is that a periscope?

Storage vendors appear to be getting much bolder about deploying the new technology into ever-smaller formats, presumably to save a bit on manufacturing costs. A few weeks

ago, a message popped up on the zfs-discuss mailing list:

> *WD and Seagate are both submarining Drive-managed SMR (DM-SMR) drives into channels, disguised as "normal" drives.*
>
> *For WD REDs this shows as EFRX (standard drive) suffix being changed to EFAX suffix (DM-SMR) […] The only clue you'll get about these drives being SMR is the appalling sequential write speeds (~40MB/s from blank) and the fact that they report a "trim" function.*

The unexpected shift from CMR to SMR in these NAS (Network Attached Storage) drives has caused problems above and beyond simple performance; the user quoted above couldn't get his SMR disks to stay in his ZFS storage array at all.

There has been speculation that the drives got kicked out of the arrays due to long timeouts—SMR disks need to perform garbage-collection routines in the background and store incoming writes in a small CMR-encoded write-cache area of the disk, before moving them to the main SMR encoded storage.

It's possible that long periods of time with no new writes accepted triggered failure-detection routines that marked the disk as bad. We don't know the details for certain, but several users have reported that these disks cannot be successfully used in their NAS systems—despite the fact that the name of the actual product is WD Red NAS Hard Drive.

Western Digital responds

In the weeks since this issue first began cropping up on mailing lists, Western Digital has responded differently in different venues. The same user who reported difficulties in the zfs-discuss list opened a smartmontools ticket and reported an emailed response from Yemi Elegunde, an enterprise and channel sales manager for Western Digital UK:

> *Just a quick note. The only SMR drive that Western Digital will have in production is our 20TB hard enterprise hard drives and even these will not be rolled out into the channel.*
>
> *All of our current range of hard drives are based on CMR Conventional Magnetic Recording.*
>
> *With SMR Western Digital would make it very clear as that format of hard drive requires a lot of technological tweaks in customer systems.*

As several users pointed out in the smartmontools thread, it seems likely that Elegunde was conflating SMR and HAMR technologies. WD Ultrastar 14TB and 20TB drives have been available since 2018 and have SMR written right on the label.

This morning, Elegunde replied with a correction in the form of an official statement from Western Digital. Emphasis below is ours, not Western Digital's:

> *Shingled magnetic recording (SMR) is a hard drive technology that efficiently increases areal density and capacity for users managing increasing amounts of data, thus lowering users' TCO. There are both device-managed and host-managed types, each for different use cases.*
>
> *All our WD Red drives are designed to meet or exceed the performance requirements and specifications for common and intended small business/home NAS workloads.* ***WD Red capacities 2TB-6TB currently employ device-managed shingled magnetic recording (DMSMR) to maximize areal density and capacity.*** *WD Red 8-14TB drives use conventional magnetic recording (CMR).*
>
> *[…]*
>
> *Our customers' experience is important to us. We will continue listening to and collaborating with the broad customer and partner communities to innovate technologies*

> *that enable better experiences with, more efficient management of and faster decisions from data.*

Separately, another Western Digital spokesperson responded to inquiries from blocksandfiles.com:

> *You are correct that we do not specify recording technology in our WD Red HDD documentation.*
>
> *We strive to make the experience for our NAS customers seamless, and recording technology typically does not impact small business/home NAS-based use cases. In device-managed SMR HDDs, the drive does its internal data management during idle times. In a typical small business/home NAS environment, workloads tend to be bursty in nature, leaving sufficient idle time for garbage collection and other maintenance operations.*
>
> *In our testing of WD Red drives, we have not found RAID rebuild issues due to SMR technology.*
>
> *We would be happy to work with customers on experiences they may have, but would need further, detailed information for each individual situation.*

Conclusions

Enlarge / One of these disks is inordinately slower than the other and costs less to manufacture. Can you guess which one?
The writing on the wall here seems clear. Yes, Western Digital slid SMR drives into traditional, non-enterprise channels—and no, the company doesn't feel bad about it, and you shouldn't expect it to stop.

What really grinds our gears about this is that the only conceivable reason to shift to SMR technology in such small disks—lowered manufacturing costs due to fewer platters required—doesn't seem to be being passed down to the consumer. The screenshot above shows the Amazon price of a WD Red 2TB EFRX and WD Red 2TB EFAX—the EFRX is the faster CMR drive, and the EFAX is the much slower SMR drive.

Western Digital doesn't appear to be the only hard drive

manufacturer doing this—blocksandfiles has confirmed quiet, undocumented use of SMR in small retail drives from Seagate and Toshiba as well.

We suspect the greater ire aimed at Western Digital is due both to the prominent NAS branding of the Red line and the general best-in-class reputation it has enjoyed in that role for several years.

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