

December 2020

YOU CANNOT CHANGE THE LAWS OF PHYSICS

Why All Roads In The Zettabyte Era Lead To Tape

Hewlett Packard
Enterprise

INCRAM MICRO[®]



WHY ARE WE STILL TALKING ABOUT TAPE?

Total Capacity of LTO Media Shipments By Year thru' Q419* (EB Compressed)

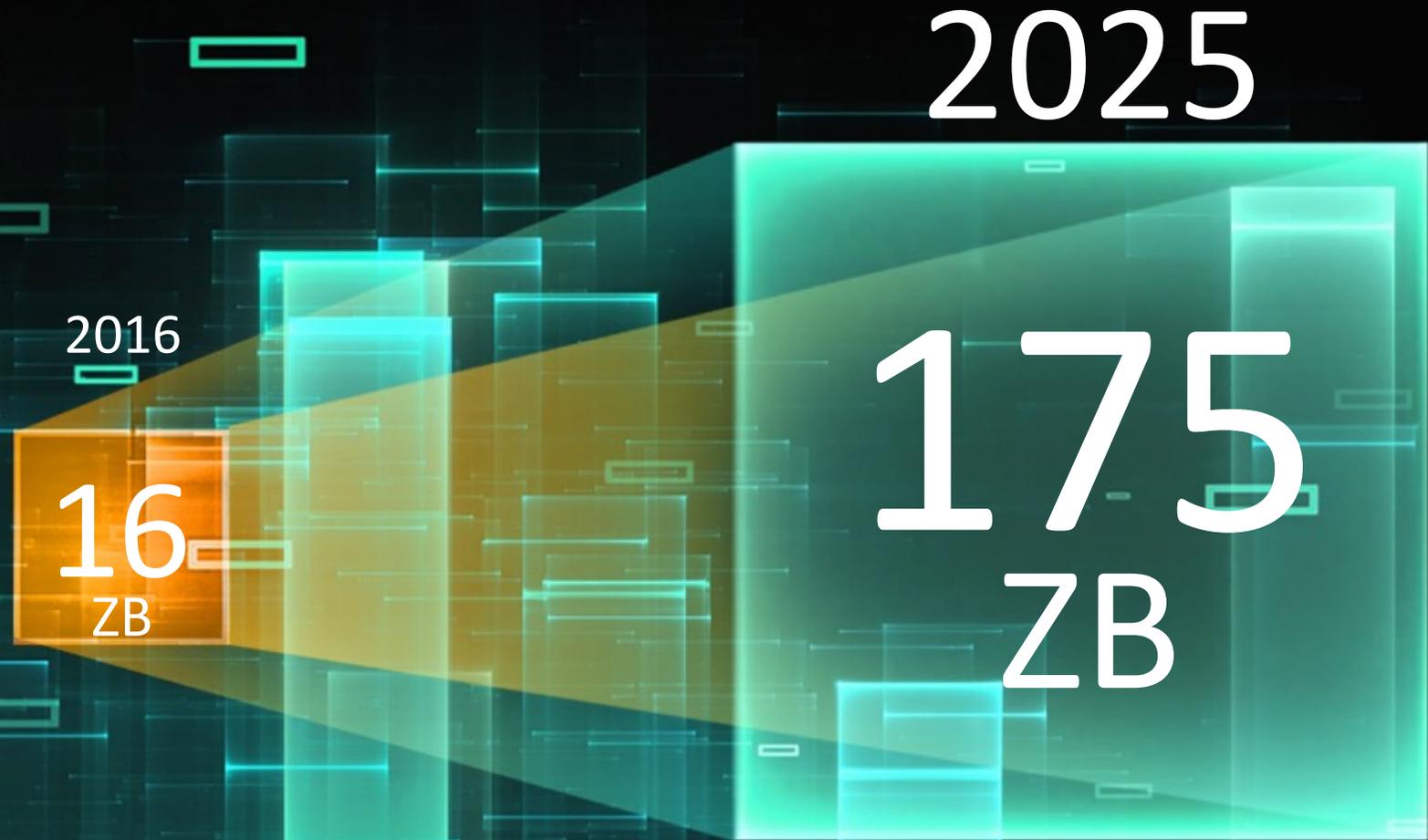


*Aggregate capacities in 2018 and 2019 do not include LTO-7 Type M shipments

Source: LTO Program, August 2020



WE ARE ENTERING THE ZETTABYTE ERA



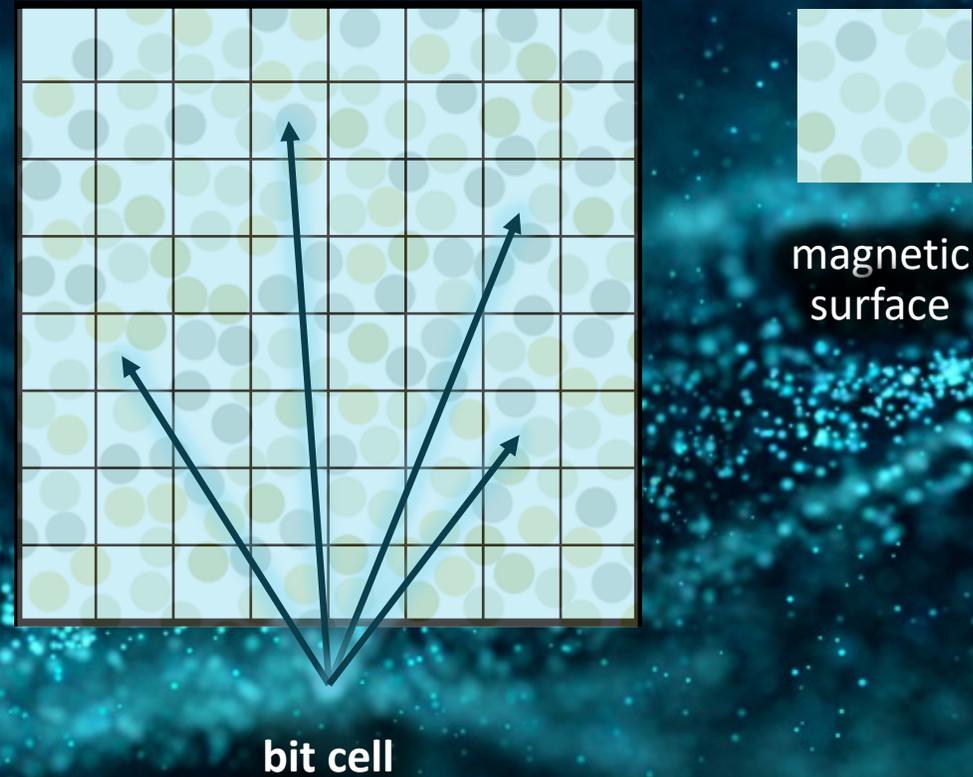
INCREDIBLE INNOVATION

In late 2019, Google announced that Google Books had scanned over 40 million titles. This means that you'd need about 40 TB to store all the books on Google Books, which, of course, will be less than the capacity of a single LTO-9 cartridge.



MAGNETIC MEDIA RECORDING: A KIND OF MAGIC

Any magnetic medium – disk or tape - has a magnetic surface divided into **billions** of tiny areas called **'bit cells'**



MAGNETIC MEDIA RECORDING: A KIND OF MAGIC

Each bit cell can be affected by a magnetic field to store a 'bit' of information.

A simplistic way of looking at this, is that during recording a magnetic transition, N to S or S to N is written to store a 1 within each bit cell area.

If no transition is written, this stores a 0 in the bit area.

1	0	0	1	0	1	1	1
0	0	1	0	1	1	0	1
1	1	1	0	0	0	0	1
0	0	1	0	1	0	1	1
1	1	0	0	1	0	0	0
1	0	1	0	1	1	1	0
0	0	1	1	0	1	0	1
1	1	0	1	0	0	1	0

A
= 1000001



TAPE KEEPS REINVENTING

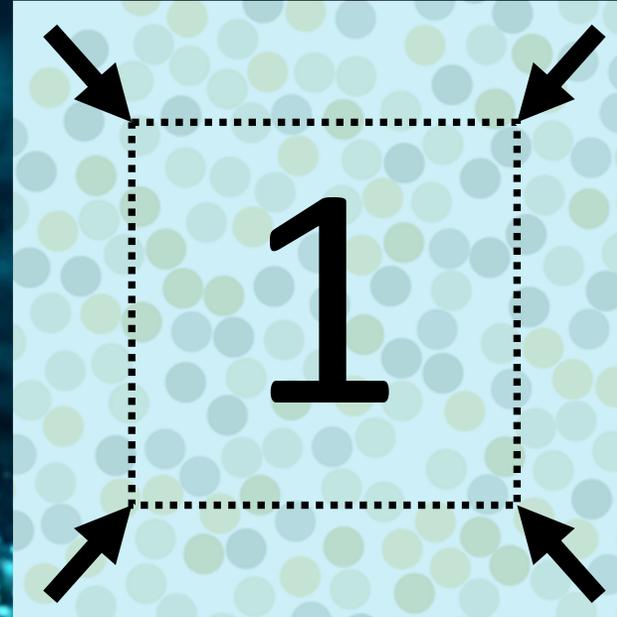


22500% increase in storage capacity!

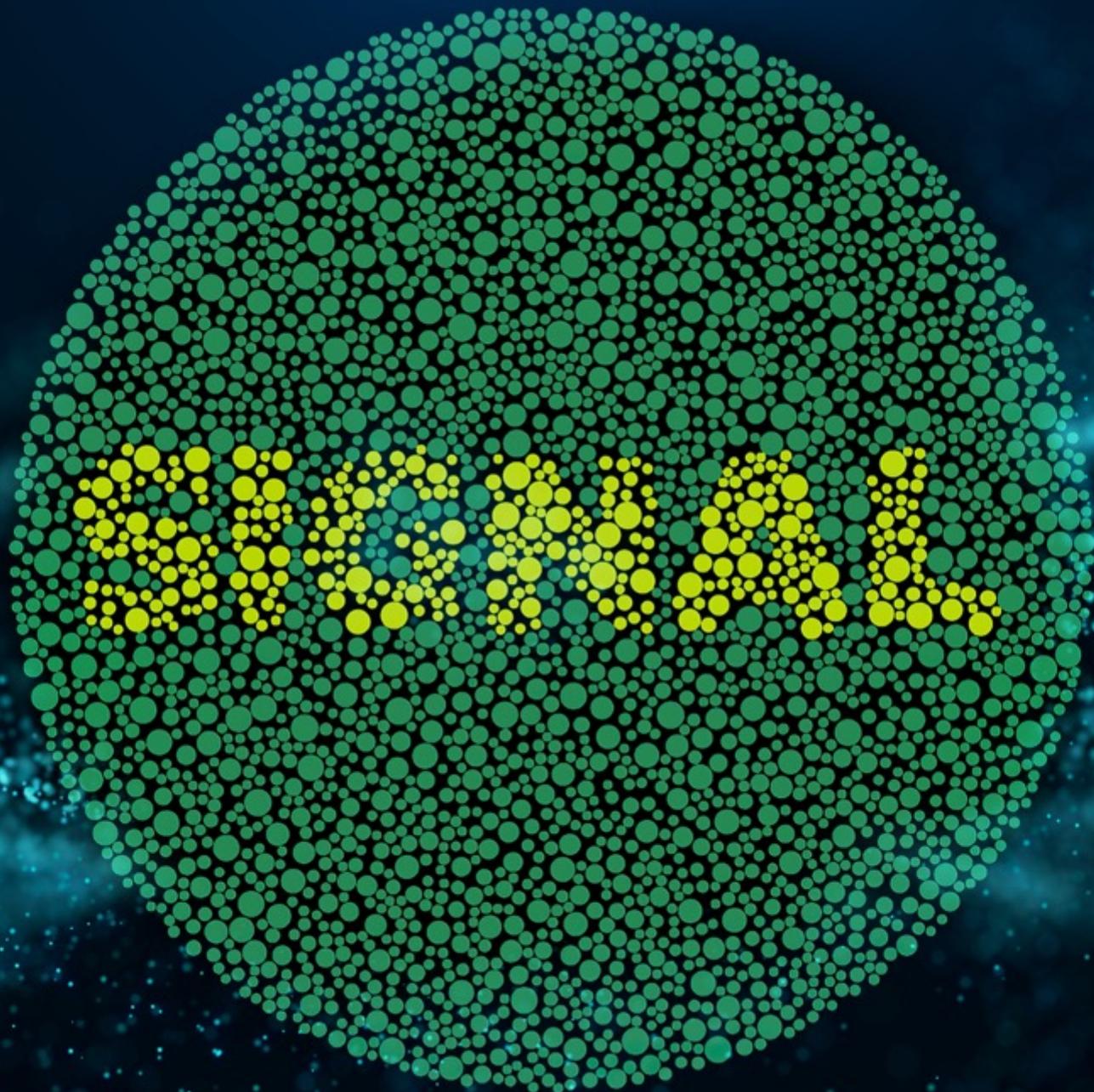


MAGNETIC MEDIA RECORDING: A KIND OF MAGIC

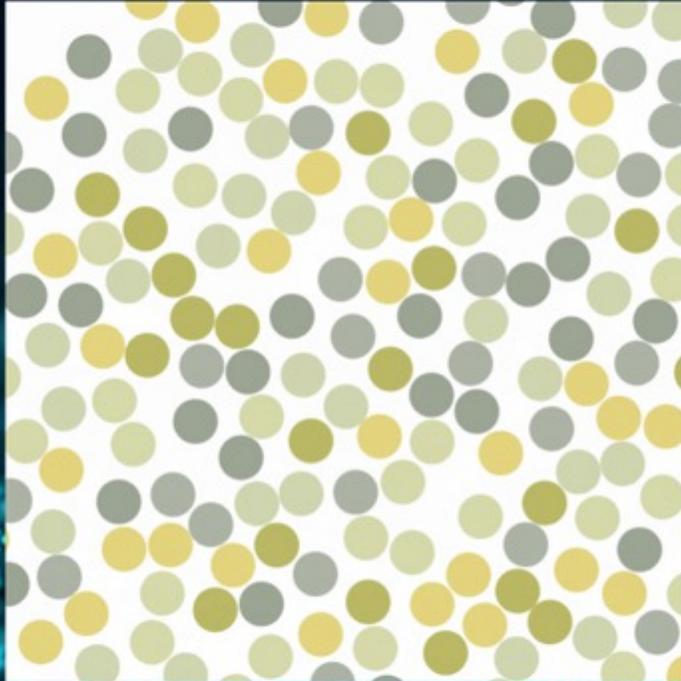
To record more data in a given space, you need to allocate the space occupied by each bit cell smaller.



SIGNAL TO NOISE



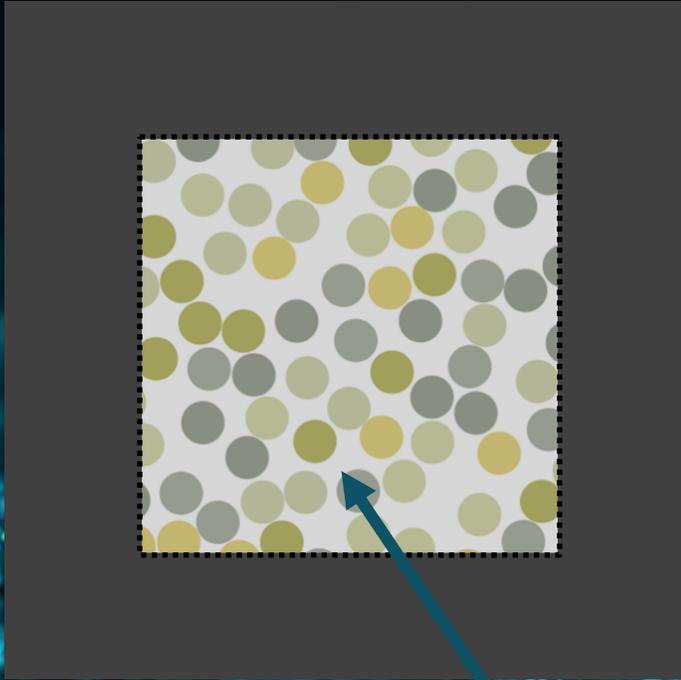
MAGNETIC MEDIA RECORDING: A KIND OF MAGIC



The transition inside the bit cell occurs because magnetic particles are affected by the magnetic field.



MAGNETIC MEDIA RECORDING: A KIND OF MAGIC

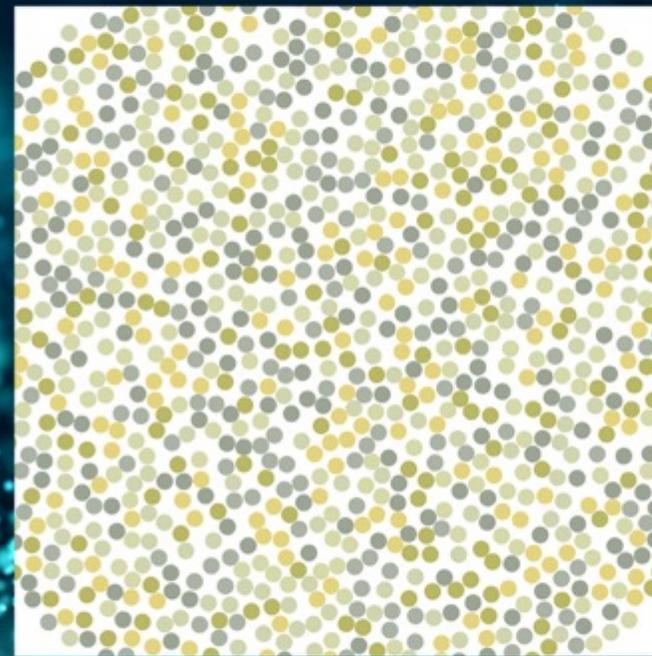
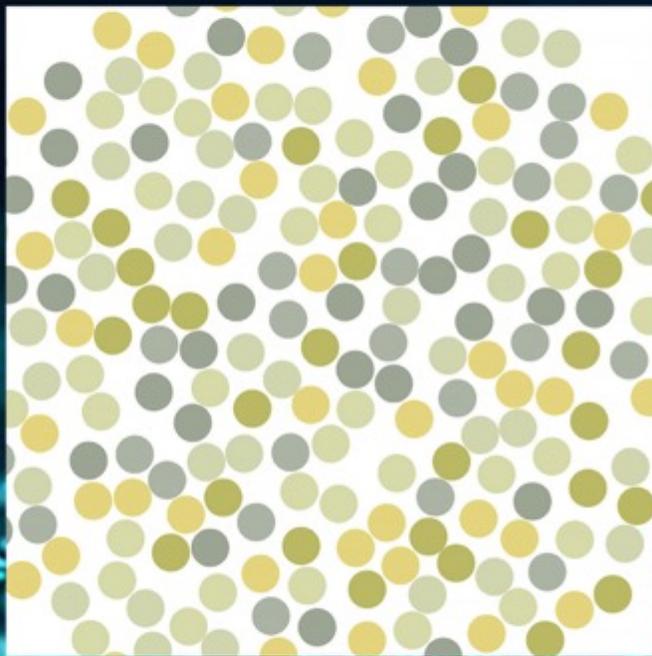


But if you make the bit cell smaller, you have fewer particles inside the allotted area that can generate the signal for that bit.

fewer particles / smaller area



HIGHER CAPACITY TAPES NEED SMALLER PARTICLES



HIGHER CAPACITY TAPES NEED SMALLER PARTICLES

But the superparamagnetic limit affects how small the particles can become



COERCIVITY MATTERS



Coercivity is the ability of magnetic material to resist having its magnetic state changed

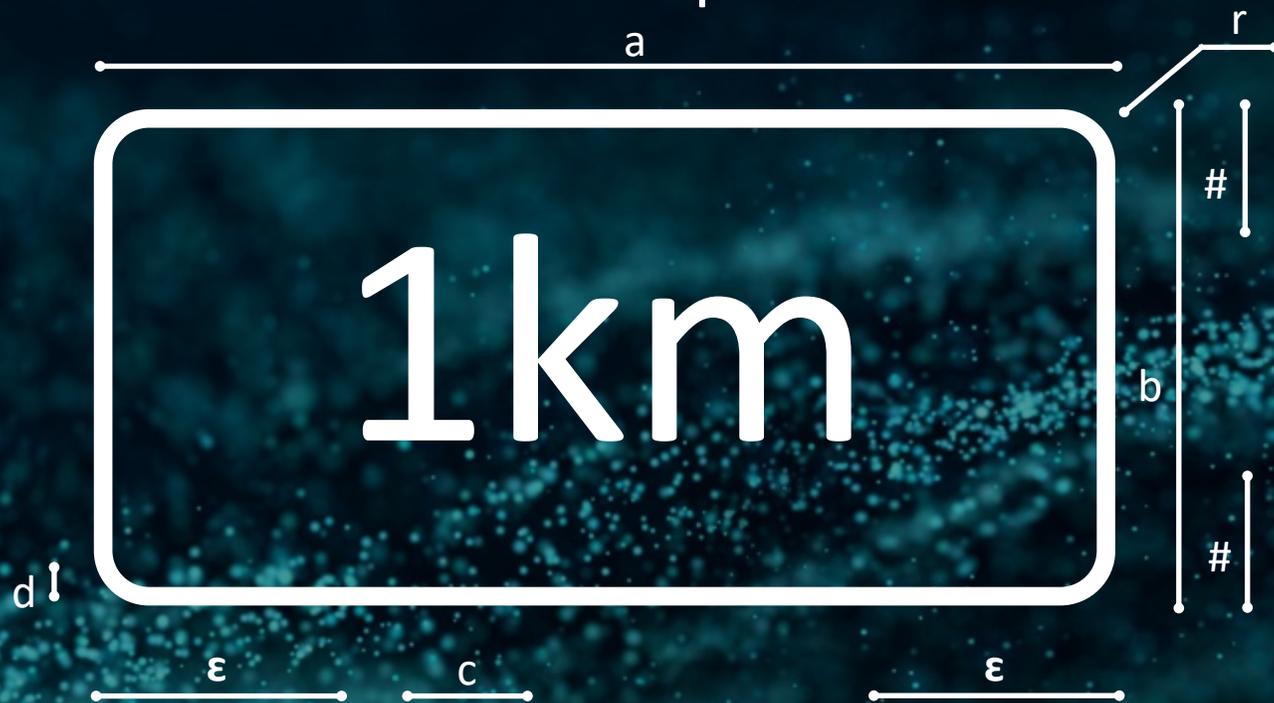


MAGNETIC MEDIA RECORDING: A KIND OF MAGIC

Hard disk platter 3.5" diameter



LTO-9 tape



On such a small recording surface, the magnetic particles on a hard disk drive have to be much smaller!



SMALL BUT MIGHTY

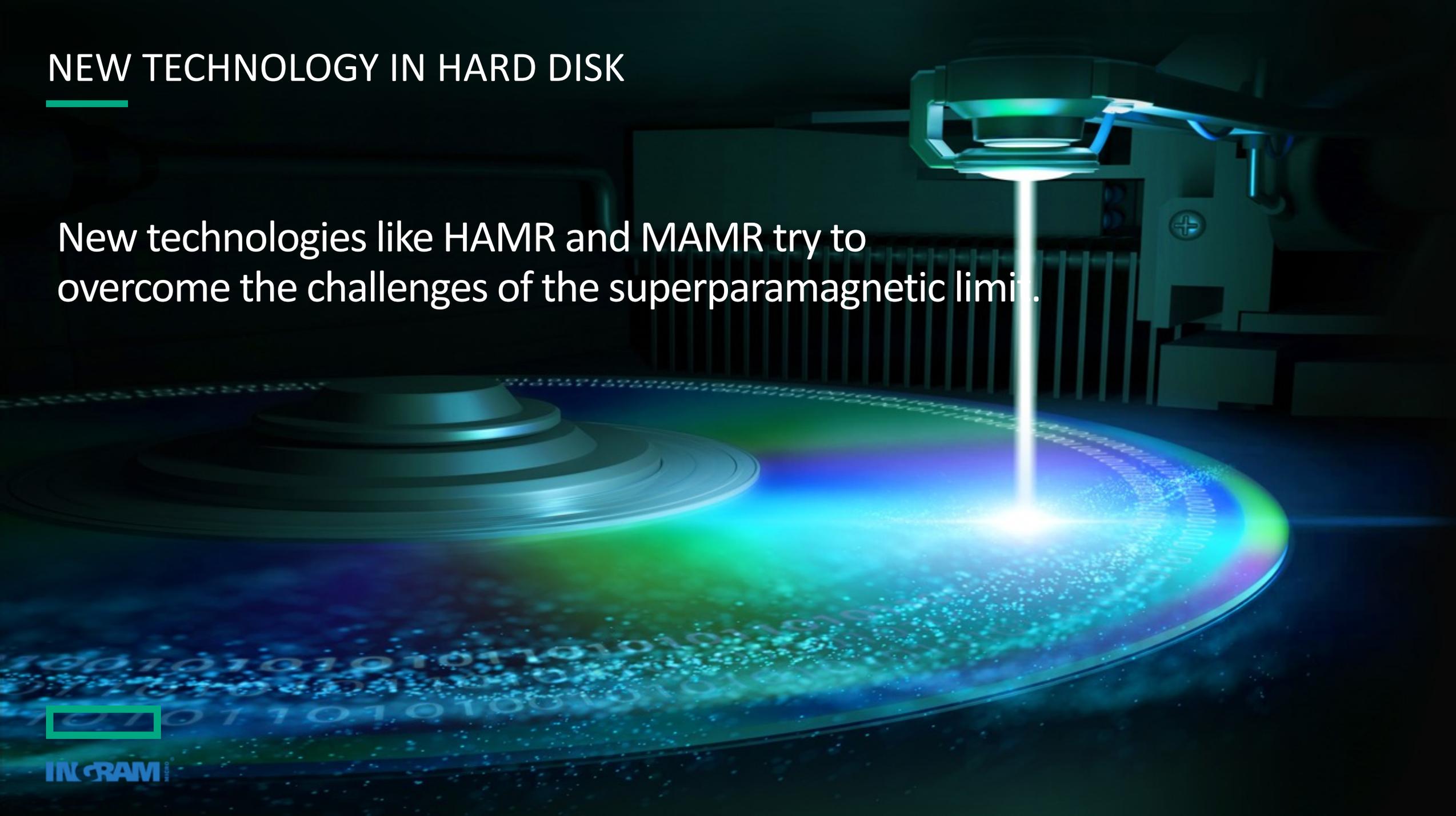
To go beyond current areal densities and increase capacity, the magnetic particles deposited on the surface of hard disks need to be so small that they become unstable unless they have extremely high coercivity- which is then very difficult to write data to.

Coercivity means the particles will resist being changed.



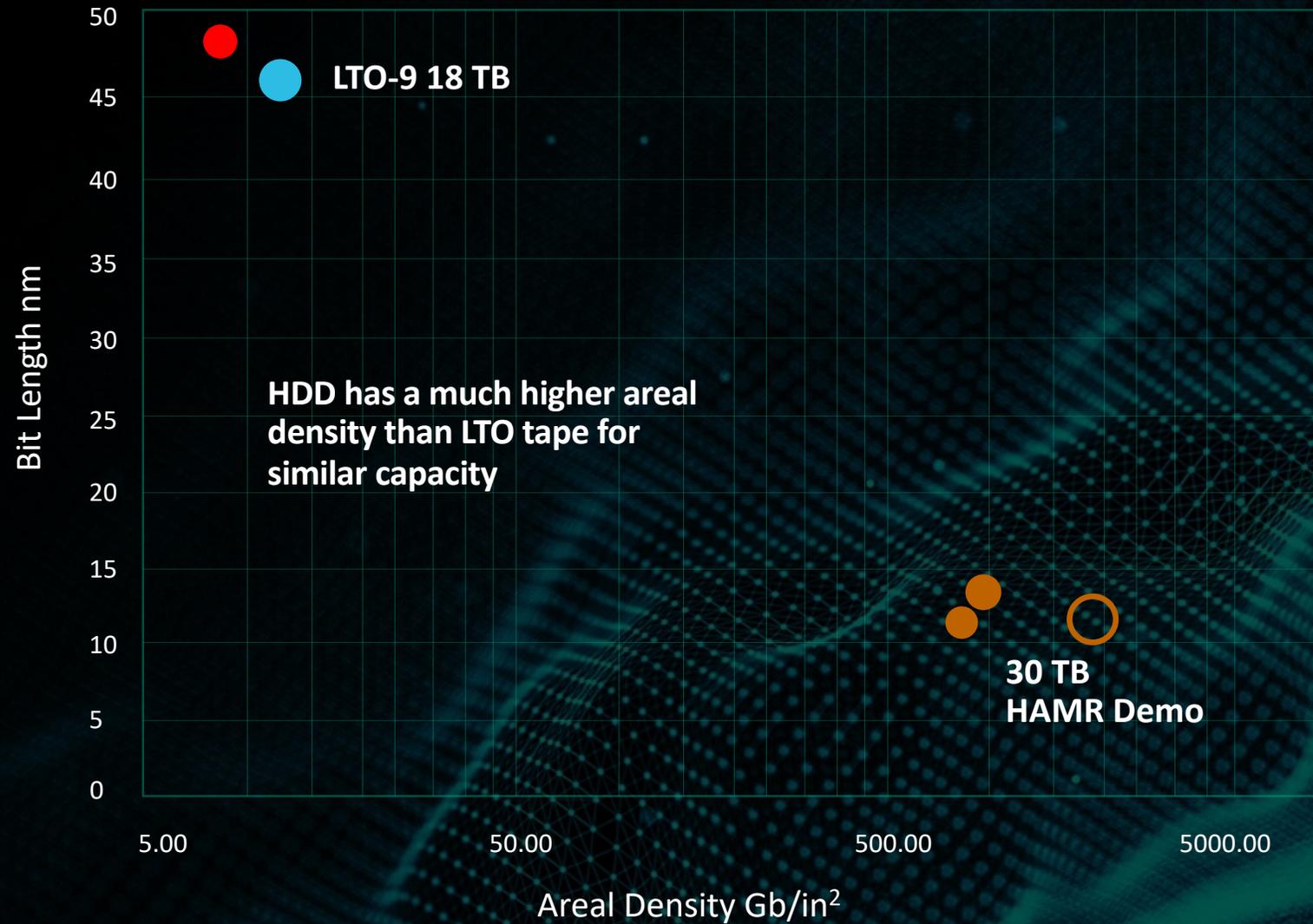
NEW TECHNOLOGY IN HARD DISK

New technologies like HAMR and MAMR try to overcome the challenges of the superparamagnetic limit.



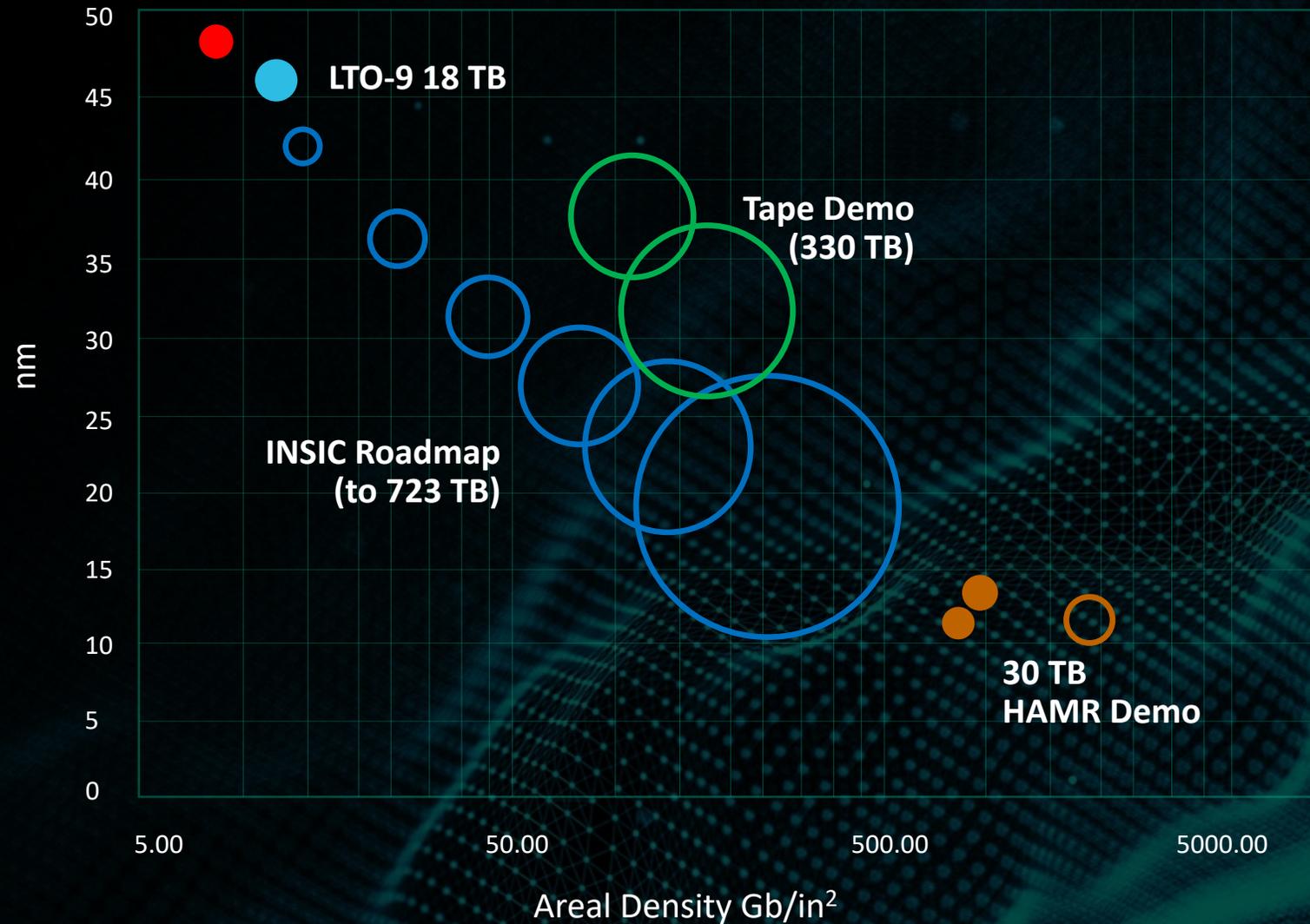
TAPE HAS PLENTY OF HEADROOM

Recorded Bit Length
vs. Areal Density and
Capacity (Bubble Size)



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A MISMATCH BETWEEN SUPPLY AND DEMAND

Hyperscale data centres bring other challenges relating to energy use and sustainability, some of which we're already seeing today.



THE FUTURE OF TAPE

Everything may be “moving to the cloud”, but behind the metaphor, the cloud will probably still be a tape library – just much bigger!



SOCIAL ACCOUNTS AND WRAPUP



twitter.com/tapevine



linkedin.com/in/andrew-dodd/
linkedin.com/in/nassrin-schott-40129675/

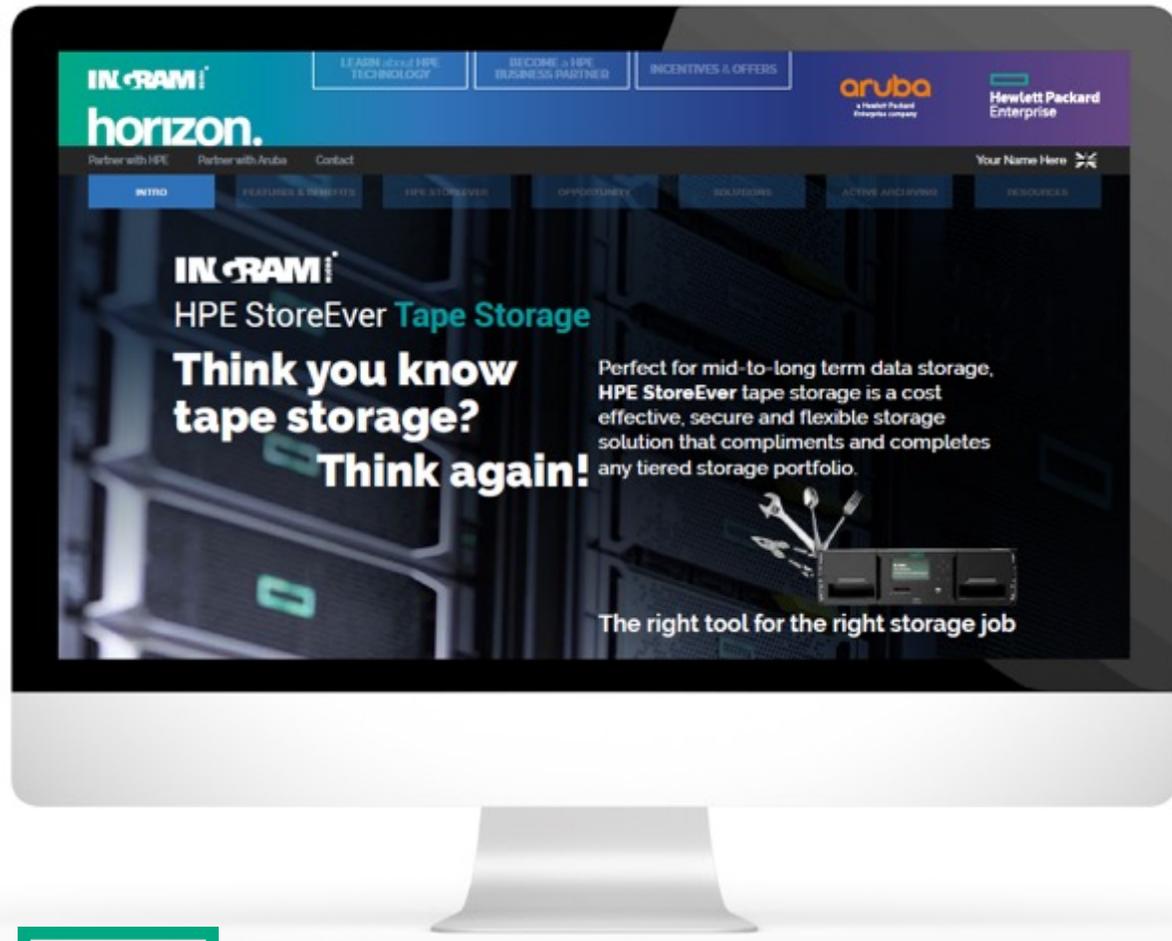


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HORIZON DIGITAL CAMPAIGN LAUNCHING THIS WEEK

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TAPE TUESDAY – RESELLER WEBINAR SERIES - REPLAYS

WEBINAR 1

Data Protection – How You Can Win Both The Battle And The War With HPE StoreEver Tape

Date: 10 November

Time: English – 10am CET; German – 2pm CET



WEBINAR 2

Ransomware – Is There A Magic Wand Solution, And If So, What Is It?

Date: 24 November

Time: English – 10am CET; German – 2pm CET



WEBINAR 3

“You Cannot Change The Laws Of Physics” – Why All Roads In The Zettabyte Era Lead To Tape

Date: 8 December

Time: English – 10am CET; German – 2pm CET



REGISTRATION

English Link:

<https://ingramhorizon.com/uk/resources/tape-tuesday>

German Link:

<https://ingramhorizon.com/at/resources/tape-tuesday>



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Q&A

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