Hewlett Packard Enterprise

Brochure

TAPE FOR TOMORROW

How HPE StoreEver provides security, low cost and sustainability to Big Data

Check if the document is available in the language of your choice.

“LTO cartridge capacity and data throughput have kept up with data growth over the years. Tape density and capacity keep growing to pack more data into the same physical space. Throughput has similarly increased, meaning that IT organizations can continue to meet their backup and recovery SLAs even in the face of massive data growth.”

‘Using Tape to Solve Data Management Problems’, IDC, March 2021

INTRODUCTION

"At first you may not think there are any similarities between Tyrannosaurus Rex and storage tapes: one is a carnivore that died out at the end of the Cretaceous period, the other is a magnetic medium for high capacity data storage. Yet the features of each mean that they face an evolutionary dead-end and replacement by nimbler, more adaptable, alternatives."

Jon Mills, Managing Director, Sepaton, October 2010

This vivid – yet sadly inaccurate – comment from 2010 highlights a dilemma that many IT users have when assessing the value of tape. Tape seems ancient and yet it remains the perfect fit for many of their storage challenges. How can this be?

While tape has not been around for quite as long as the dinosaurs, it is arguably the most enduring of all data protection solutions that still enjoys widespread usage. Today's HPE StoreEver LTO tape drives and libraries are the culmination of more than twenty years of data protection innovation across multiple generations of LTO technology.

FIGURE 1: LTO Ultrium technology generations.

Perhaps it is this longevity that makes some critics impatient to signal tape's ultimate demise, even though it bears little relation to what customers are doing. While most businesses are making or planning a transition to cloud-centric data management strategies, they still do not appear to be making an exodus away from tape.

This would support a theory voiced by ESG Senior Analyst, Mark Peters, who said:

"Most of the issues with tape have to do with perception rather than reality. The challenge is fiction, not function."

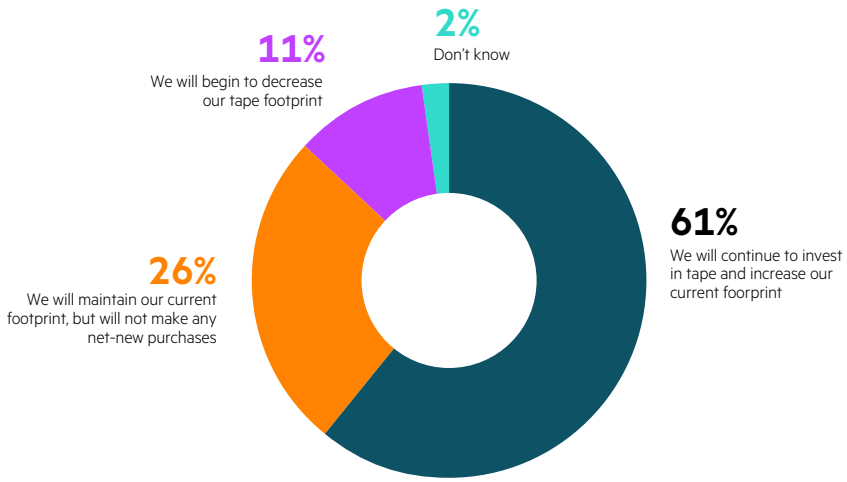


FIGURE 2: Tape investment plans. Source: ESG Tape Landscape Study, October 2020.
Similarly, as recently as October 2020, a study by Enterprise Strategy Group, revealed that 87% of tape users said they intend to increase or maintain their tape footprint[1].

So clearly, predictions about tape facing an evolutionary dead-end in 2010 (and since) have been proven totally inaccurate. In fact, since the 'dinosaur quote' above was first published, the amount of data stored on LTO Ultrium tape has progressively increased. Only a very slight, pandemic-related, dip in 2020 has checked the astonishing growth of tape capacity demand.

But in order to understand why tape is still thriving, first of all, we need to consider the wider world in which tape solutions are still being deployed.

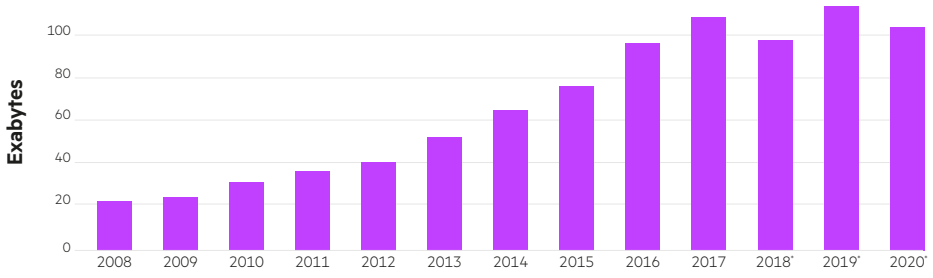


FIGURE 3: Total capacity of LTO media shipments by year thru' Q419[2] (EB compressed).

So what is the opportunity for a mature storage technology in a digital society that is moving into the Zettabyte Era?

[1] ESG Tape Landscape Study, October 2020
[2] Aggregate capabilities in 2018 and 2019 do not include LTO-7 Type M shipments. Source: LTO Program, August 2020.

THE ZETTABYTE ERA BEGINS

We are entering a new era of Big Data growth and the applications that will harness the power of digital information almost beyond imagination.

"In 2020, 64.2 ZB of data was created or replicated, defying the systemic downward pressure asserted by the COVID-19 pandemic on many industries and its impact will be felt for several years," according to Dave Reinsel, senior vice president, IDC's Global DataSphere.[3]

In the latest DataSphere forecast, IDC projects that global data creation and replication will experience a compound annual growth rate (CAGR) of 23% over the 2020-2025 forecast period.

Meanwhile driven by the steady growth in the amount of data created and replicated, IDC expects the unabated expansion of the StorageSphere to produce a five-year CAGR of 19.2% in the installed base of storage capacity across the globe. While not all data created or replicated is saved (or needs to be saved), growth of data creation does ultimately drive growth of the StorageSphere installed base.

"The Global StorageSphere installed base of storage capacity reached 6.7 ZB in 2020, and is steadily growing but at a slower annual growth rate than that of the Global DataSphere, meaning we are saving less of the data we create each year," according to John Rydning, research vice president, IDC's Global DataSphere. "Organizations should consider preparing now to store more data as they seek to achieve digital transformation milestones and improve business metrics by accelerating innovative data analytics initiatives."[4]

As an example of what is driving these trends, according to PwC, global data consumption in 2020 increased 30.4% over the previous year, and is expected to rise at a 26.9% CAGR between 2020 and 2025[5].

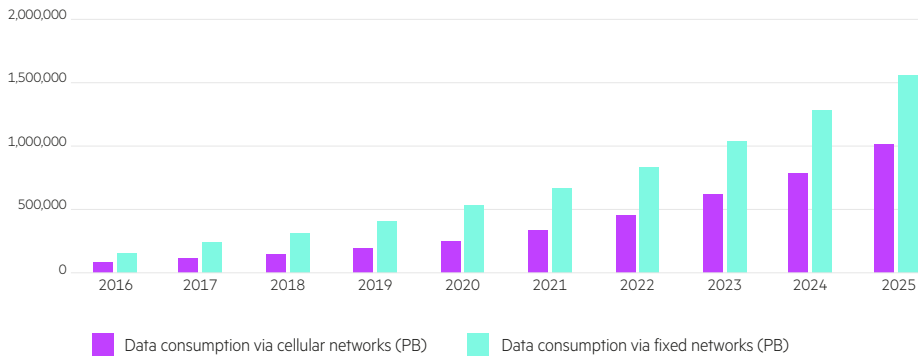
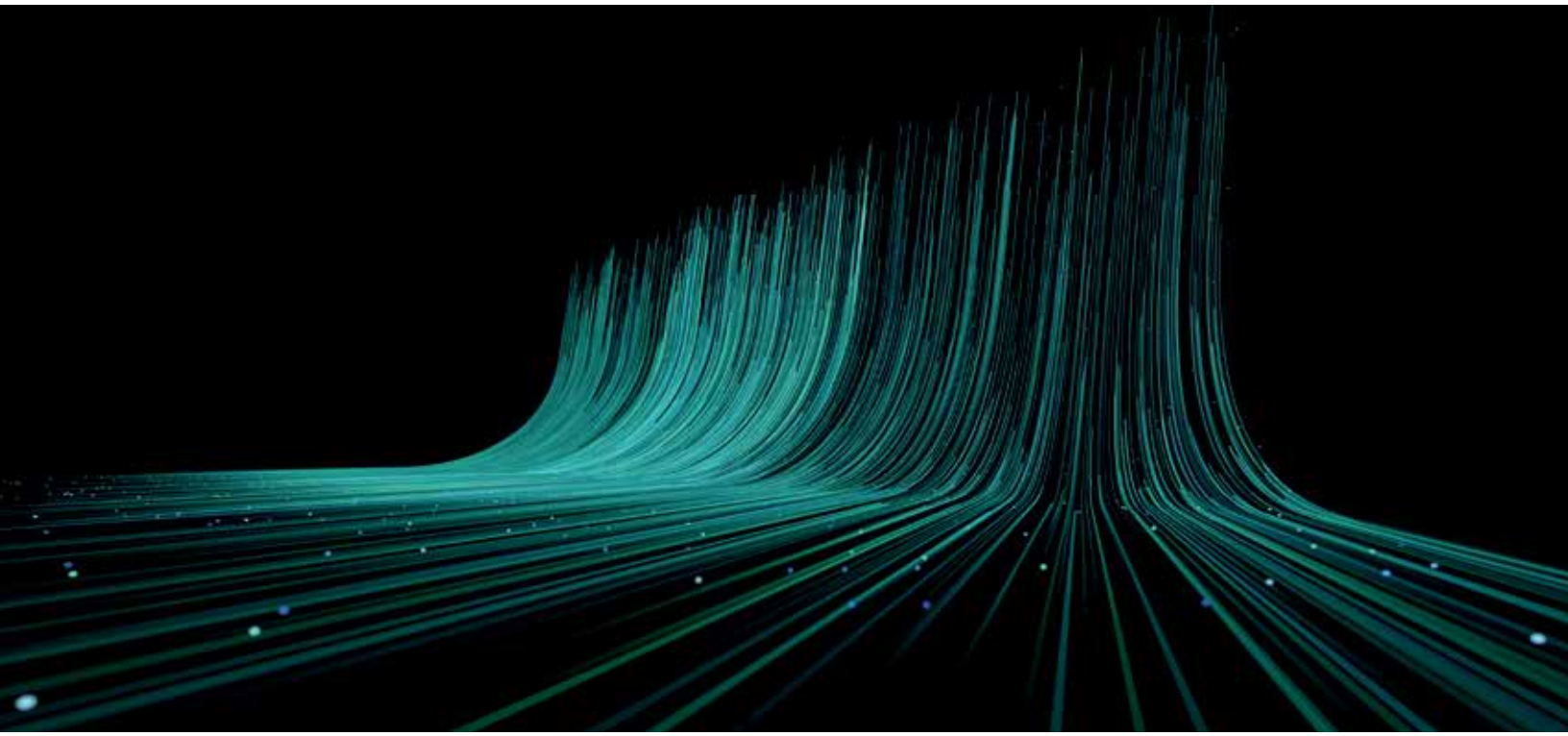


FIGURE 4: Growth in data consumption via cellular networks and fixed networks (Global, data consumption by content category, 2016-25). Source: Global Entertainment and Media Outlook 2021-2025. PwC. Omdia.

[3] Worldwide Global DataSphere Forecast, 2021–2025: The World Keeps Creating More Data — Now, What Do We Do with It All?
[4] Worldwide Global StorageSphere Forecast, 2021–2025: To Save or Not to Save Data, That Is the Question
[5] Global Entertainment and Media Outlook 2021-2025 PwC Omdia



The unstoppable growth of data and its fundamental importance to how we live and work creates an incredible number of opportunities. HPE believes that data is one of your business's most valuable assets, fueling innovation and powering informed decisions. Data needs to be always-on, always-fast, automated, protected and available on-demand. But as your business advances, complexities arise. You need a simple way to transform from IT operator to service provider for your business – so you can focus more on innovation and less on administration - and help your business get more value from its data – wherever it resides.

So where does tape fit in this exciting perspective on what is about to come?

Well, whatever your vision of the future may look like, the technology you use to deploy it will not be ethereal or intangible. Servers, switches, disk arrays - and yes - tape libraries - will be the real-world building blocks of your data management and data protection strategy. And here we get into the nitty gritty of why HPE StoreEver tape will almost certainly be a technology you should consider as you plan your business transformation.

LTO Ultrium tape technology continues to survive and thrive for five key reasons.

INNOVATION

Tape innovation through the decades

In an earlier quote, it was argued that tape was an evolutionary dead end in storage terms because it could no longer adapt or evolve. And yet throughout the period from 2010 to the present, the LTO Program has introduced: WORM technology; Linear Tape File System; native hardware encryption; all the while increasing capacity-per-tape by 1100% (from 1.5 TB for LTO-5 cartridges, to 18 TB for LTO-9 cartridges).

What is Areal Density

Areal density[7] is the measurement of how many bits can be stored on a magnetic recording surface. Because hard disk drives have a much smaller surface area than an LTO tape (a 3.5 inch diameter platter versus a one kilometer long tape) they need much higher areal densities to achieve the same amount of capacity. Scaling down at this microscopic level is very difficult, especially when HDDs **already** have a very high areal density: for instance, recent 18 TB hard disk products use 1022 Gb/in2 whereas the new 18 TB LTO-9 Barium Ferrite cartridge will only require 12 Gb/in2. This does not mean HDD areal densities are "superior"; on the contrary, it means tape has far more headroom for capacity growth.

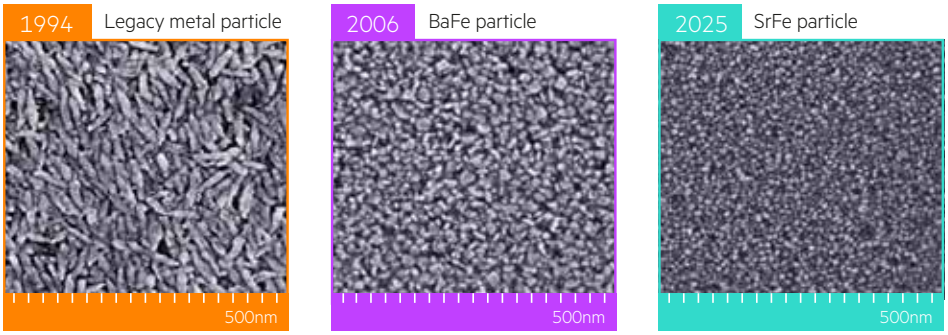


FIGURE 5: Areal density projections for tape and hard disks.

Furthermore, in 2021, the LTO Program announced advanced research by IBM and Fujifilm into new media formats using Strontium Ferrite particulate technology that demonstrate the feasibility of cartridges of at least 550 TB[6].

Whatever limitations tape may have, a lack of innovation isn't one of them!

Areal Density Limitations of HDD Technology

One of the arguments against tape is that data needs to be always available, always on, for it to be useful. To achieve the outcome of having ever present access to your data would most likely mean using hard disk drives (HDDs) since mechanical hard drives have a lower cost per TB than SSD flash drives and, more critically, are generally held to have a longer working life span. But organizations that base their archives solely on HDD are likely to be challenged by the slowdown in areal density growth and performance that has been evident in the published roadmaps of leading HDD vendors.

[6] https://www.lto.org/2021/09/tape-innovation-uncovered/
[7] https://www.youtube.com/watch?v=GRz4U-dnUU8

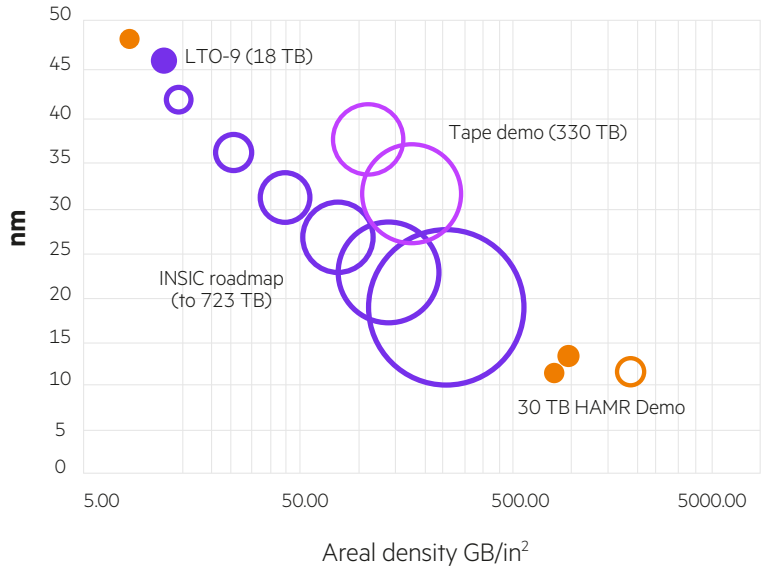


FIGURE 6: Recorded Bit Length v Areal Density and Capacity Projections (Capacity = Bubble Size). Source: INSIC, Technology Roadmap 2019.

Unlike tape, where industry group, INSIC, are predicting tape capacities to broadly match data growth rates[8], hard disk manufacturers haven't found a way to increase areal density in line with projected data growth. This is due to a constraint of magnetic media recording physics known as the 'superparamagnetic limit'. As the particles hosting the bit cells become smaller, they lose their ability to maintain a stable magnetic state. Beyond the superparamagnetic limit, the error rate created by this phenomenon is too severe to support reliable data recording.

The only logical outcome is that pure disk archives of the future will probably need to rely on greater numbers of HDD units, which will only exacerbate the cost differentials discussed above, as well as creating additional challenges relating to the utilization of data center rack space and energy consumption. Simply put, if your HDD medium holds less data, you will need more HDD units, additional data center infrastructure, power, cooling and administrative resource to manage that data.

Tape on the other hand, offers the reverse scenario. Much higher density storage media leading to greater optimization of data center resources and much lower energy costs.

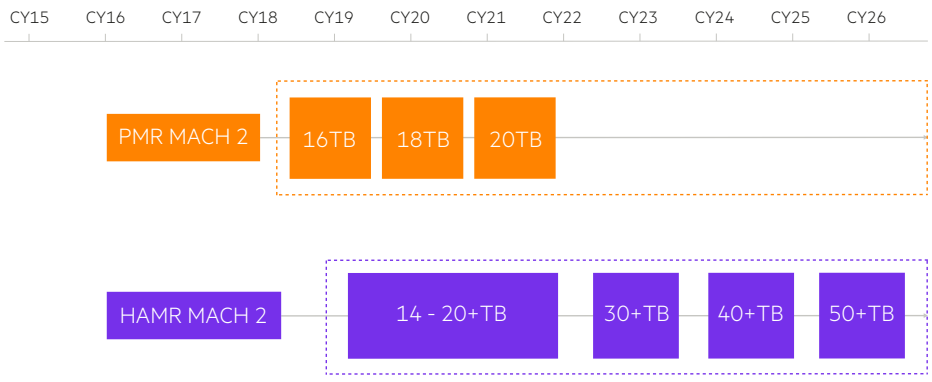


FIGURE 7: PMR and HAMR roadmaps. Source: Seagate Investor Briefing, March 2021.

[8] https://insic.org/

To put this into context, LTO-9 solutions with 18 TB native cartridge capacities have just come to market in 2021. Based on the LTO roadmap, LTO-12 cartridges with 480 TB could be available in the later part of the decade. LTO-12 would represent a 10X increase in capacity over today's latest LTO-9 solutions, whereas the roadmaps of HDD vendors suggest that 100 TB disks might be available by the late 2020s, which in comparison is only a 5X improvement in cold data storage potential. As yet, such HDD innovation is unproven, even in prototype form. And even LTO-12 itself will be surpassed by the current SrFe prototype discussed above.

It's worth remembering that the new approaches being developed by HDD manufacturers (e.g. Heat Assisted and Microwave Assisted Magnetic Recording - HAMR and MAMR), and the multi-actuator technology required to maintain random IOPs-per-TB performance) are both relatively unproven at the kind of scale that will be required and they will add cost and complexity to production.

New Frontiers for Tape

FIGURE 8: New frontiers for tape. Source LTO.org.

In comparison, tape's evolutionary path builds on existing technologies while refining them with new innovations[9] – e.g. new low friction tape head technology to allow the use of very smooth tape media, and an ultra-narrow read sensor just 29 nanometers wide to read back data written to SrFe media.

So although LTO tape is a very familiar sight in data centers, HPE expects that it will take at least ten more years before tape might begin to run into some challenges caused by areal densities and the superparamagnetic threshold. Information stored on tape today should be accessible until well into the middle of the current century. Despite much discussion about alternative recording media, such as holographic discs, DNA storage, femtosecond laser-etched glass etc – none of these are capable of matching HPE StoreEver LTO tape technology when it comes to meeting zettabyte demand for archival storage in the short or even medium term.

[9] https://www.youtube.com/watch?v=nyZXHuwqFno

LOWEST COST

From the financial standpoint of purchasing, operating, expanding and supporting automated tape systems versus disk-based archives, tape already has a clear advantage over all-disk or all-cloud approaches[10] (ultimately, the public cloud is just another server or disk array that you rent instead of own, so the same economic considerations apply).

And as data volumes increase, the impact on total cost of ownership (TCO) for additional drive units, rack space and data center utilization (arising from the effects of the superparamagnetic threshold and the limitations of HDD capacity) will be felt more profoundly.

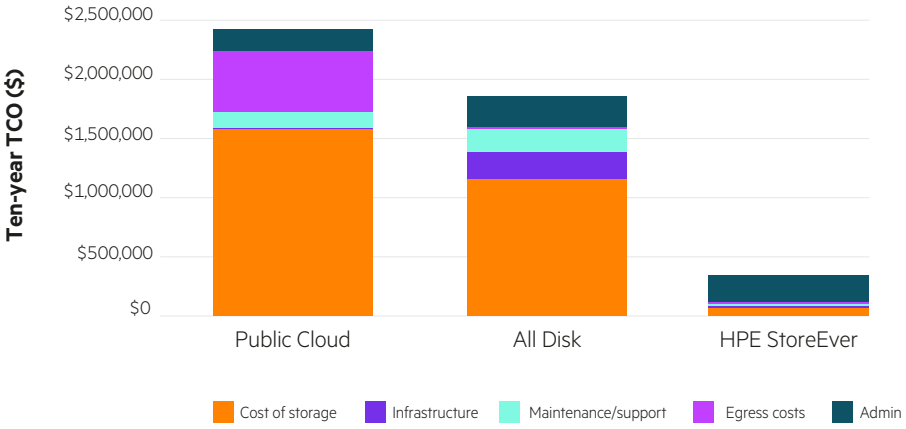


FIGURE 9: Ten-Year TCO: HPE StoreEver vs. All-Disk vs. Public Cloud. (1 PB archive, 10% annual growth, 3% monthly retrieval). Source: Enterprise Strategy Group.

According to an August 2020 report, 'The Economic Benefits of HPE StoreEver as Active Archival Storage[11]' by analyst Enterprise Strategy Group, an organization can achieve total cost savings (considering storage, infrastructure, maintenance/support, egress, and administration) of approximately 86% ($2.358M versus $329K) over a ten-year period using HPE StoreEver for a 1 PB archive over the public cloud. The annual data growth rate in the study was set at 10%. ESG also assumed that the organization retrieved 3% of data monthly. The analyst noted that these key assumptions regarding growth and retrieval rates were conservative estimates based on ESG research of existing operational practices.

[10] https://www.youtube.com/watch?v=24o0ha7Cev0
[11] https://www.hpe.com/psnow/doc/a00104592enw

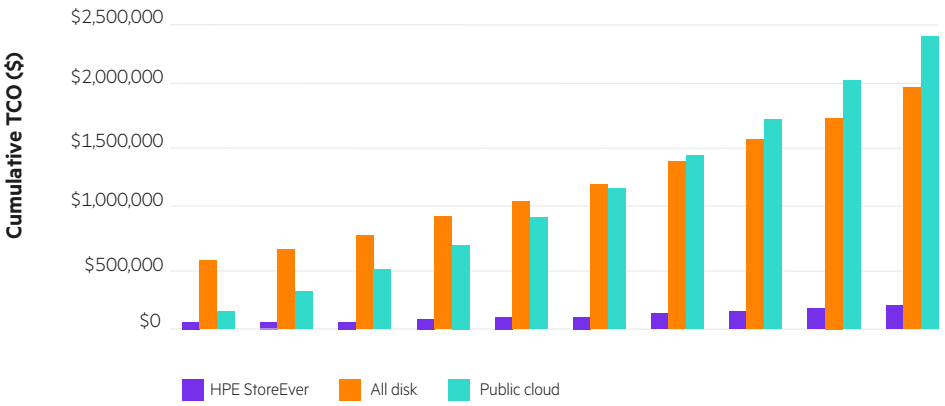


FIGURE 10: Cumulative TCO - HPE StoreEver versus All-Disk versus Public Cloud (1 PB of archived data with 10% annual growth, 3% retrieval rate). Source: Enterprise Strategy Group.

When compared with an all-disk solution, ESG also noted that LTO technology can be a viable alternative when used for active archiving. The lower capital investment for HPE StoreEver subsequently decreases costs related to power, cooling, and administration so that the TCO is 82% lower than those related to disk-based solutions ($329K for HPE versus $1.803M for all-disk)[11].

These trends do not mean that an all-disk or all cloud-based storage solution might not be ideal if companies had unlimited resource. Organizations may be advised to try and deploy as much HDD solutions - from disk appliances, to object storage servers - on-prem and in the cloud as their budgets permit. But if data is growing at 30-40% and disk capacities are only increasing at around 20%, then clearly there is a mismatch that only tape, with its extreme low cost and abundant potential for capacity growth can fill. By using a tiered storage approach, and active archiving[12], organizations can avoid having to make an artificial and unnecessary choice between disk and tape. Use both to get the best of both!

Finally, the emergence of object-native, S3 compatible, software-defined storage for LTO tape systems, such as Fuji Object Archive technology, makes it even easier to migrate data from faster, but more expensive or less storage-efficient, media, such as SSD and HDD, onto LTO Ultrium tape.

CYBERSECURITY

Computer connectivity is now being built into just about everything. From cars to houses to factories, the Internet of Things is creating a society that is networked like never before.[13]

And where there are networks, there are applications, and where there are applications, there is data, on an unimaginable scale.

Exploiting the potential of so much networked information provides opportunity for unprecedented societal development but also makes our digital society uniquely vulnerable to cybercrime and extortion.

[11] https://www.youtube.com/watch?v=C3SCKSziGbA
[12] https://www.youtube.com/watch?v=4YuXXT8EPos
[13] https://www.hpe.com/psnow/doc/a00104592enw

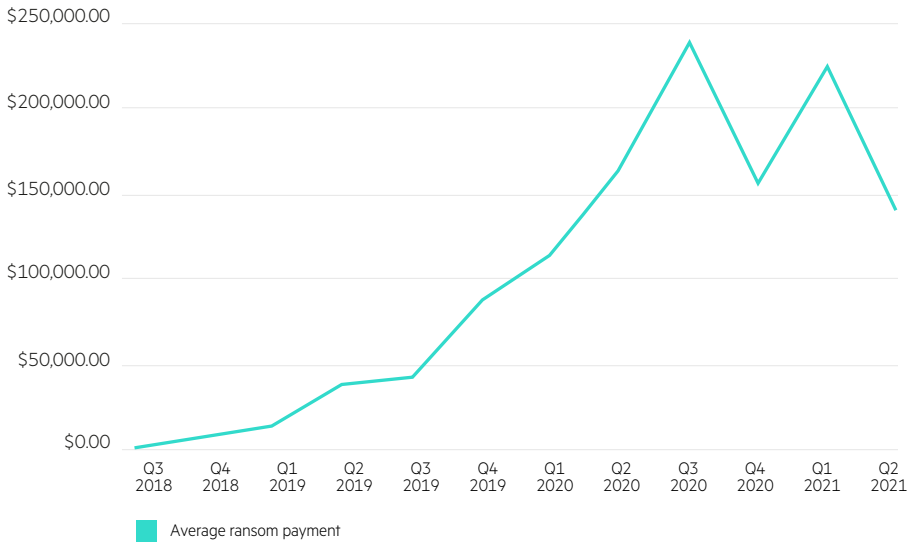


FIGURE 11: Ransom payments by quarter. Source: Coveware.

When it comes to ransomware, various HPE storage solutions have technology that helps safeguard your data against cyberthreats. For example, the HPE StoreOnce Catalyst API protects mission-critical data stores from ransomware attacks by providing data isolation and preventing ransomware from accessing backup data on the HPE StoreOnce, ensuring data integrity. HPE SimpliVity enables you to restore a 1 TB VM in less than a minute from a clean backup source. HPE's Zerto solution offers the power and convenience of Continuous Data Protection (CDP) so that you should always have an ultra-fast, pre-ransomware roll back point for the data under its watch.

Unfortunately, as we have seen in numerous incidents, the very connectedness that is the strength of disk or cloud-based storage strength in certain contexts, such as speed of recovery, makes them vulnerable in others. Ransomware is primarily a function of our connected digital society. The more connected we become through edge computing or the Internet of Things, the more widely we create opportunities for criminal activity.

3-2-1-1 Rule

What makes tape unique in the HPE portfolio is that is the only truly offline storage solution that can place your data behind a physical, disconnected, air gap barrier. It is the final part of the 3-2-1-1 rule which proposes you maintain three copies of your data, on at least two different media types, with one stored offsite and one stored offline.

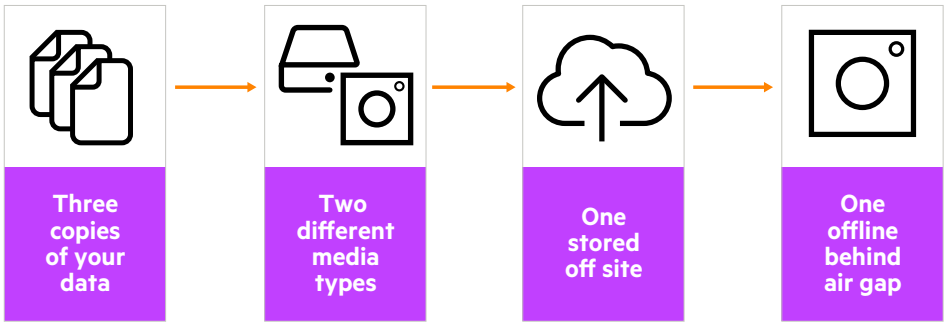


FIGURE 12: The 3 2 1 1 Rule.

3-2-1-1 is important because only by placing data behind an air gap can you guard against the risk of criminal ingenuity or unfortunate human error finding a way to undermine your cybersecurity defenses. Because tape is offline by design, it breaks the myriad chains of visibility that cybercriminals exploit. If it can't be seen, touched or tampered with, it means the data stored on tape will always provide an escape route when all other defenses have been breached. Given the high incidence of business failures reported after ransomware incidents, the relatively modest cost of a tape library could pay for itself many times over.

The following agencies and government authorities all recommend offline backup as a vital part of your customer's cybersecurity defences[14]:

1. US Federal Bureau of Intelligence (FBI)
2. US National Institute of Standards and Technology (NIST)
3. US National Cybersecurity Center of Excellence (NCCE)
4. UK National Cyber Security Center (NCSC)
5. Germany Federal Office for Information Security (BSI)
6. France Cyber Malveillance (GIP ACMYA)
7. France National Agency for the Security of Information Systems (ANSSI)

As before, it's important to stress you can choose how best to balance your cybersecurity investment. Choose the speed of a CDP solution like Zerto, or the convenience of a disk-based appliance like HPE StoreOnce for data that may need very rapid Recovery Time Objectives. Or the typically (not always) slower, but more secure and lower cost offline protection afforded by HPE StoreEver tape that can widen your defenses to cover more of your data and broaden your Recovery Point capabilities.

MOST ENERGY EFFICIENT AND SUSTAINABLE

In addition to basic their financial targets, organizations are also likely to have environmental and sustainability goals. A recent study by Brad Johns Consulting, entitled 'Reducing Data Center Energy Consumption and Carbon Emissions with Modern Tape Storage[15]' proposed that by moving 10 PB of "cold data" that is growing 35% annually from disk to tape storage, an 87% reduction in carbon emission and an 86% reduction in TCO can be achieved over ten years.

Further corroboration may also be found in a technical paper from Horison Inc, entitled 'Hyperscale Storage and Energy Consumption[16]. Because tapes at rest need minimal power or cooling to be safe and secure, this may make them a greener alternative to powered up, spinning disk, for infrequently accessed but essential data.

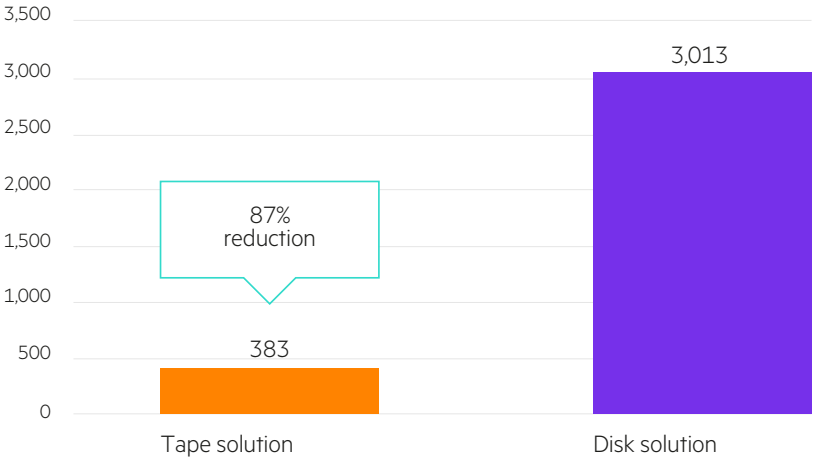


FIGURE 13: CO2 emissions over 10 years for tape and disk storage. Source: Various Government Cyber Security websites.

[14] Various Government Cyber Security websites.
[15] https://datastorage-na.fujifilm.com/wp-content/uploads/2020/11/Reducing-Carbon-Emissions-Brad-Johns-2020.pdf
[16] https://www.lto.org/wp-content/uploads/2021/03/2020_Hyperscale_and_Tape_FM1.pdf

HPE - A TRUE LEADER IN TAPE STORAGE

Absolute reliability, unbeatable economics, almost unlimited scalability, and ease of use are the hallmarks of HPE StoreEver tape storage solutions.

Check out all of these leadership advantages HPE tape solutions offer:

1. It's reliable, trusted storage from one of the world's most reputable technology companies. Competitively priced, widely available and with world-class levels of support that you associate with Hewlett Packard Enterprise.

2. HPE's Command View For Tape Libraries dramatically improves the ease of use of your HPE StoreEver system. CVTL lets you manage multiple libraries from any location – which could be handy if you're working from home – and provides a lot of features that aren't available in standard ISV backup software. And in comparison to other vendor offerings, CVTL offers greater functionality which makes it a true differentiator.

3. HPE is the only vendor that allows you to reuse tape library drive kits to help maximize your investment. So, for example, if you purchase a new and bigger library with LTO-8 drives, you don't need to throw away your previous technology. You could bring across the LTO-6 or LTO-7 drives from your older system and continue to use that equipment.

4. The HPE StoreEver MSL Library Encryption Kit is a fully self-contained encryption system which can be deployed without the need for an extra server or appliance, additional software or the complexity of a full KMIP solution. HPE is the only vendor to offer this straightforward, self-contained alternative.

5. HPE branded LTO Ultrium cartridges are designed, manufactured and tested[17] to provide outstanding reliability for backing up, archiving and restoring your data. Using real life conditions and both HPE and non-HPE devices, we supplement extensive in-process QA parametric testing with ongoing, drive based scrutiny, to make sure performance is excellent for any combination of device, duty cycle and environment. The HPE Brand specification for LTO data cartridges exceeds industry requirements to give you greater confidence in the reliability of your tape media.

[17] https://youtu.be/GG5Z30JXLv0

HPE Financial Services

HPE Financial Services (HPEFS) gives you the flexibility to access all the funding you need, without the usual drawbacks of equipment obsolescence and depreciation, plus the chance to benefit from the latest tape technology.

Now, every business can profit from a high performance HPE StoreEver LTO 1/8 Tape Autoloader, MSL3040 and MSL6480 tape solution. Instead of paying upfront to own your tape library outright, you can easily spread the cost over time. At the end of the agreement, you can pay the balance to own the equipment, hand it back to HPE, or roll the agreement into a new contract to deliver a newer, more powerful solution. HPEFS also has options for you to release capital from existing assets to fund other projects or equipment.

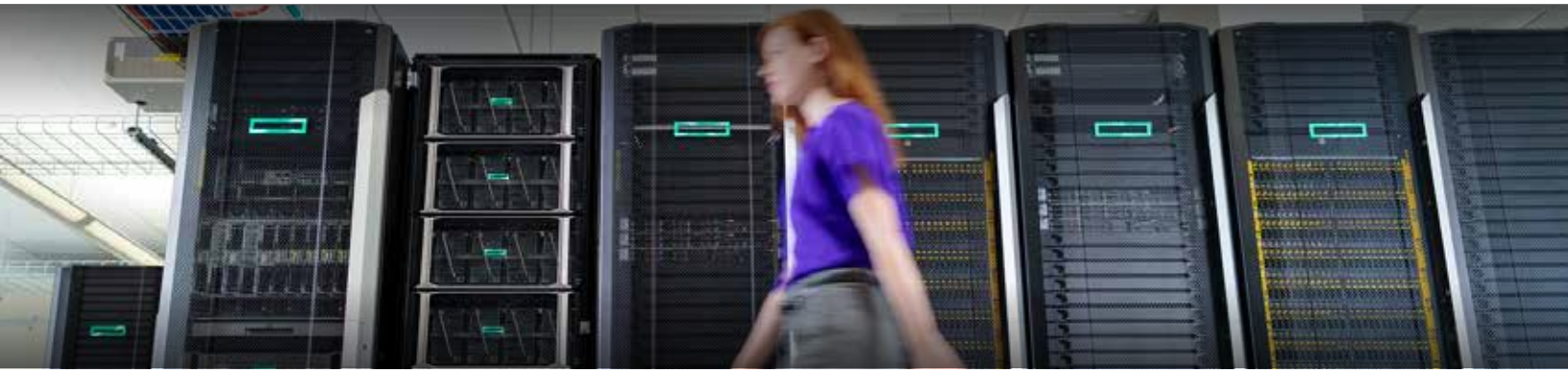
With affordable monthly payments, no large upfront costs and the opportunity to swap old for new at the end of the term, you'll pay less overall than if you bought the equipment outright. That's because we subtract the residual value of the equipment at the end of the term.

Best of all, with HPE StoreEver tape as your primary archive medium, you reap the benefits of tape's low total operating costs and increased ROI over the life of the contract.

HPE Pointnext Tech Care

HPE Pointnext Tech Care is a shift in the role of support from "fix my hardware" to "help me get the most from my HPE product and drive my business forward." HPE Pointnext Tech Care has been reimagined from the ground up to support a customer-centric and digitally enabled customer experience. It is valid for everyone who wants a reliable and consistent support experience across their IT infrastructure. HPE Pointnext Tech Care can be purchased at time of tape solution sale and by any user with existing HPE StoreEver products.

HPE Pointnext Tech Care support offerings for HPE StoreEver provide you with a better user experience and enhanced value for money. The expanded scope of HPE Pointnext Tech Care can also help address some of the concerns that less experienced users may have about managing tape infrastructure.



CONCLUSION

The demise of tape storage systems has long been predicted but in spite of numerous attempts to finally proclaim the 'death of tape', the technology continues to be a key part of modern storage topologies, from hyperscale cloud providers down to midsize corporates and SMB customers.

Tape's ability to continuously innovate, while providing compelling TCO advantages and a unique barrier against cyber security threats, make it more essential today than it has ever been. And with the growing urgency of climate action, tape's ability to store petabytes and exabytes of infrequently accessed data with minimal environmental impact should increase its popularity still further.

Tape is not the answer to every storage need. But there remain certain applications and use cases for which tape remains the only logical choice. As with every IT challenge, there are trade offs between cost, accessibility, scalability, durability, performance and capacity that must be made.

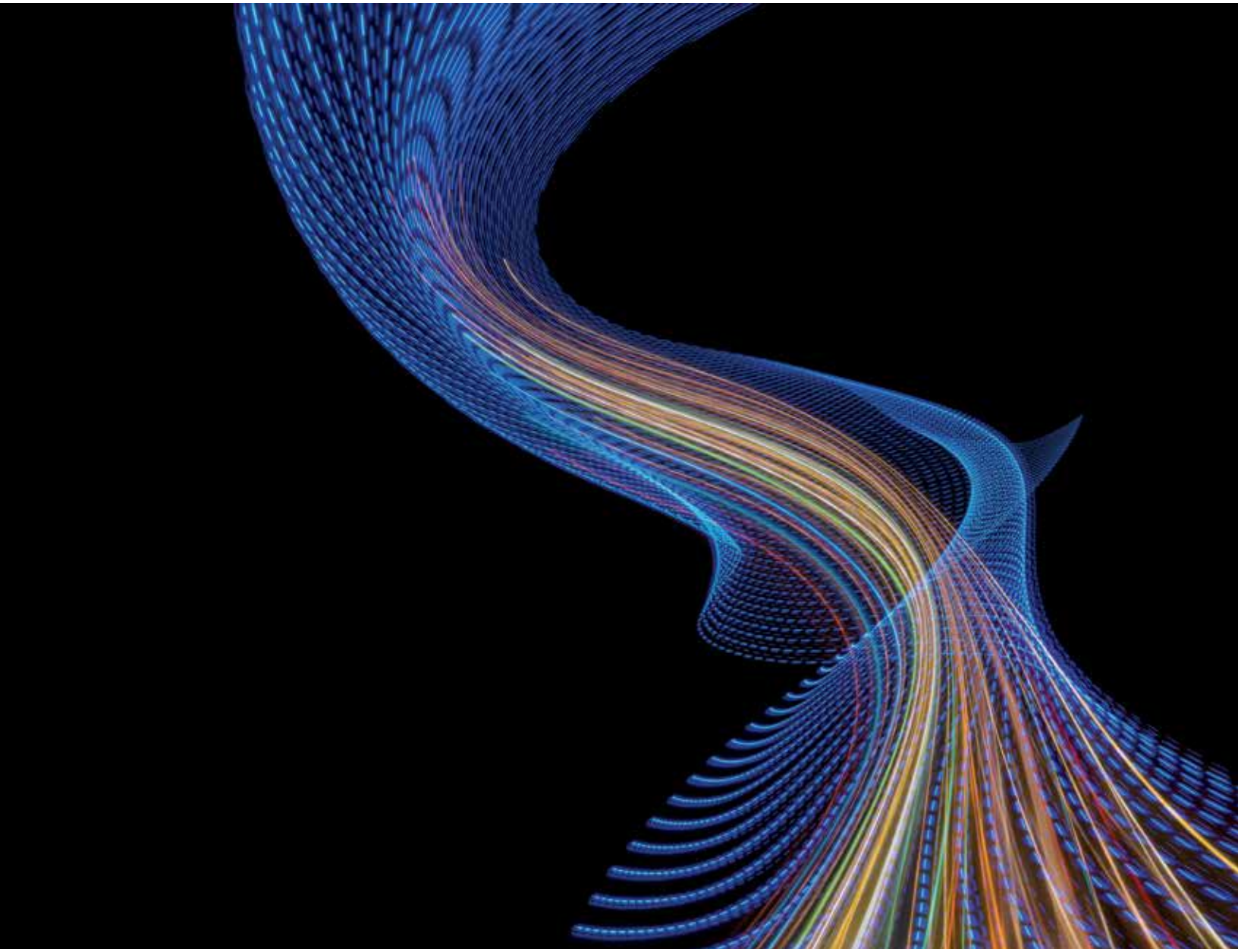
But as we move into the Zettabyte Era, HPE believes the ultimate conclusion to some of these decision making processes will be to expand your storage capabilities with HPE StoreEver LTO Ultrium tape solutions: far from being the last of the dinosaurs, it's lasting innovation that you can depend on for decades to come.

"If someone had to invent a new medium today, it would have to meet requirements that in combination seem impossible to achieve, yet tape can do it. All zettabyte roads lead to tape."

'In the ZettabyteEra, All Roads Lead to Tape', Enterprise Strategy Group, November 2020.

“We have been using HPE StoreEver for over 10 years in our data center environment and it has proven invaluable for stability, reliability, support, and compatibility. We tend to use proven, large-tier solutions rather than bleeding-edge technologies, especially when it comes to backing up data. HPE StoreEver has been our consistent “go-to” even as our software solutions have changed over time.”

IT Systems Analyst, Global 500 Chemicals Company, (TechValidate Study 2019)



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