

## **Tape is alive and kicking**

### **Energy and environmental issues are solidifying its place in the data storage hierarchy**

#### **Tape storage is moving back into strong focus as the preferred medium for use in data archives.**

Whilst disk has rapidly become the medium from which to restore recently backed up files, tape has unrivalled attributes of vast capacity, scalability, long lifespan, very low cost per gigabyte, zero energy consumption when offline and thus exceptional environmental credentials making it the clear preferred choice for archiving data & long-term back-up.

Over the recent past the amount of digital data being generated has grown astonishingly. Part of this is due to more regulation with business data having to be kept longer so as to satisfy regulatory and compliance concerns, for example, Sarbanes Oxley and the European Union Data Retention Directive. More data has been and is being generated in vast amounts as previously analogue media files for sound, images and motion pictures, move to digital formats.

Business is also continually generating more operational data as well as the constant and growing flood of e-mails. Then there is the steady expansion in the use and capability of hand-held intelligent devices. There has been a widely publicised IDC report <sup>(1)</sup> which calculated that the amount of information created and copied was 161 exabytes in 2006. IDC predicted that this will surge to a virtually unimaginable 988 exabytes in 2010 - an exabyte being one billion gigabytes.

This data has to be stored and its important core has to be stored for a very long time, twenty or thirty years or more. That is where tape comes into its own because into this area disk fears to tread.

#### **Tape and disk**

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Tape has a long and distinguished history, having been invented in the nineteen fifties. There have been many different formats which have now consolidated into three groups: entry-level formats such as DAT and AIT; mid-range and larger capacity formats such as LTO and the larger capacity AIT versions; and mainframe tapes.

Capacities have steadily increased, with LTO 4 and S-AIT2 now offering 800GB of raw data storage. Mr. Hasegawa, General Manager, from Sony Recording Media & Energy, says: "It could actually reach much higher capacity with the technology currently being developed thanks to higher level of areal density. That means tape will cost below 10 cents per GB in those cartridges. Disk can't compete with that."

Disk storage capacities have also increased in leaps and bounds with 250GB being available for notebook computers and 1TB serial ATA (SATA) disks for drive arrays; both being made possible by perpendicular recording. Such capacities have made it attractive to backup files to disk from where they can be restored at disk speed.

Files backed up to tape are restored more slowly because they are stored sequentially, one after the other, and not randomly as on disk. Also, when tape cartridges are stored offline, in tape library slots for example, then it takes additional time to move the cartridge into a drive slot. This time extends even further if the tapes are stored in a secure vault.

Mr. Greenwood, Product Sales Director, NCE Computer Group, believes that the role of tape is changing because of this. The single tape-based approach is no longer enough to serve every backup, archiving and disaster recovery (DR) need. John expects disk to disk to tape (D2D2T) strategies to gain even more ground in the near term as disk takes over the storage of recent backup files from which the majority of restores are carried out.”

As disk capacities have risen, along with network bandwidth, file and block data protection technologies like snapshots and replication have made possible the hosting of business continuance and disaster recovery functions on either tape or disk. Tape has the undeniable advantage of portability off-site whereas disk offers faster disaster recovery with the risk of onsite storage. Customers face a trade-off between greater data security and speed of recovery.

### **It's different with archives**

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However disk is not as attractive as tape for archive purposes but also long-term back-up/disaster recovery purpose. Its solid appeal is founded on a tripartite base: greatly better cost, lower energy consumption, and much more robustness. However a fourth attraction of tape archives is virtually exploding into awareness, based on rapidly accelerating data centre power and space limitations.

#### **1. Cost**

An automated tape system costs rather a lot less to acquire, install and operate than a disk-based alternative and cartridge cost per gigabyte (GB). This cost advantage is not going away. Assuming electricity costs remain the same, the cost to acquire, power and cool disk systems for five years is almost 8 times the cost to acquire, power, and cool automated tape systems, according to the Clipper Group. <sup>(2)</sup>

#### **2. Lower energy consumption**

The Gartner Group <sup>(3)</sup> estimated that data centres account for two percent of global carbon emissions, an amount similar to that of the airline industry. Servers have to be powered and cooled, which takes more power. So too do network boxes and storage arrays. So too do automated tape devices - but they use far less power, because there are far fewer actual drives.

If you envisage a thermal image of a data centre then the server and networking racks are hot as are the disk drive arrays. But the tape devices are cool oases in a data centre-wide expanse of heat. They simply consume less energy: less is needed to power the drive and less is needed to cool them.

#### **3. Greater robustness**

Tape has been proven for more than a decade in enterprise archive use. Tapes are tested and proven to be resistant to harsh environments. Their life expectancy is estimated to be around 30 years in normal conditions of use unlike disc whose lifetime does not exceed seven years. If you put your precious data into an archive you absolutely must be able to get it out again. That's why it's been put there in the first place. You can't afford to take chances with the archive storage medium.

Disks fail. That is why we have RAID arrays. You simply cannot afford to put data on disk, intending to store it for thirty years, and find your disk doesn't work in ten years time. A disk archive would need RAID protection too and that means it needs to be located in a data centre environment, consume lots of energy and take up space, both commodities that are going to be in short supply.

Disks are wonders of mechanical and electrical ingenuity and we all depend upon them for front line storage in our notebook, desktop and server computers. But they crash, they fail. As drive arrays get larger and larger in capacity RAID protection has had to become cleverer and cope with a second disk failing while the array is re-covering from an initial disk failure (RAID 6).

Tape cartridges don't contain drives, just a reel of tape. They are mechanically much, much simpler and far less likely to suffer mechanical failure. In the reliability stakes tape wins out over disk every time.

#### **4. Worm**

An easy answer to meet compliance. Tape is best suited to help meet new regulations of storing data for long periods securely with WORM (write once; read many) functionality that protect the data from erasing. Mr. Hasegawa, General Manager, from Sony Recording Media & Energy says the company has introduced WORM functionality to two thirds of its tape products. As a result of this and other advances, the reliability of large tape cartridges is extremely high.

#### **5. Data centre space and power limitations:**

Research groups are forecasting that data centres are going to become stuck between a rock and a hard place, with power and cooling costs being the rock and space being the hard place. Despite the miniaturisation represented by blade servers the world's data centres constantly need more IT devices: more servers; more network switches and routers; and more disk storage. There simply won't be enough energy available to many of these data centres to power the new IT boxes and cool them as well.

On top of that the data centres were built for less energy-intensive kit and will run out of physical space.

What can be done? One option is to exchange disk storage space for tape storage space which is much less demanding in energy terms and which is capable of being stored outside the data centre if necessary. A large tape library can store vastly more data in its enclosure than the same floor space dedicated to disk drives.

There is a growing trend of thinking which points out that far too much infrequently-accessed data is kept on disk storage. The Green Data Project <sup>(4)</sup> has been founded as a users' community resource to develop and exchange best practice in archiving such data. It states, according to quoted research from Sun Microsystems <sup>(5)</sup> that only about 30 percent of a hard disk's data is relevant and frequently accessed. Forty percent of the remainder needs to be kept for regulatory or historical reasons and should be in an archive. This and the remaining thirty percent of unwanted data should and not be taking up valuable and costly disk real estate.

It is as if the data centre's arteries are being clogged up with unwanted data cholesterol. By removing such data many disk arrays can be reduced in size thus helping to avoid the rising power and cooling costs and coming space impasse.

#### **6. Scalability:**

Tape libraries can easily scale to accommodate data growth by simply adding tape cartridges, tapes offer infinite capacity

#### **7. Removability/portability for off-site archiving in case of disaster for data protection:**

RAID and Disc back up in the same site cannot prevent data from disaster. Offline management is effective to prevent data against a human error and virus. It also allows a quick access, even in case of power failure or hardware breakdown

**8. Encryption.** Encrypting data is simpler with tape with no additional costs. Tape drives can have built-in encryption capabilities so that data flowing to and from the tape is automatically encrypted/decrypted. With the development of company-wide key management systems there is an interaction between the key manager software and an encrypting tape drive to ensure the secure and consistent management of keys along with the convenience and speed of the encrypting drive itself.

Such systems are tending to replace individual encryption appliances inserted in a network between servers and storage devices.

#### **What about de-duplication?**

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A new technology called data de-duplication looks for repetitive patterns in the bytes and blocks of data at a sub-file level. Where there is a lot of inherent duplication, as in backup files made sequentially over time,

then seemingly amazing reductions in the space needed to store the data can be made. Vendors are making claims of de-duplication ratios of 15:1, 20:1 and even 30:1 or more. This means that a disk-based backup system could store twenty or thirty times as much data than before de-duplication.

Does this increase disk's attractiveness as an archive medium?

It will clearly lower the cost per GB of a disk archive but it doesn't get over the fact that disks fail. With de-duplication as well there is an increased vulnerability. There could be hundreds, even thousands of files depending upon one single bit pattern for parts of their contents. If the single master copy gets corrupted or is lost then the ramifications of that single loss can spread out to affect hundreds and thousands of files in a de-duped disk archive. It doesn't bear thinking about.

### **What about other Media?**

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There is another potential archive medium and that is optical disk. Magneto-optical disks found a place in the health market, storing X-ray images for example. Optical media can readily be made a write once, read many (WORM) format, thus increasing the security of the written data for 50 years.

Optical media has always been challenged on the capacity front when compared to tape. The new optical medium Blu-ray format now at 50GB, is a good archiving format with a committed road map up to 400GB in the future.

A newer holographic optical format is being developed and the first disks are now available with a 300GB capacity (InPhase). However the drives cost several thousand pounds and the write speed is slow. It is obviously a developing technology and may eventually have capacity, cost and performance that approach that of tape, but this could take ten years or more.

Finally, there are also removable hard drive cartridges now on sale. These certainly do have the removability of tape that up to now has been so lacking with disk. But they also have that other disk characteristic that is just unacceptable in an archive medium, and that is disk's propensity to fail.

### **The Best Archive Medium**

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**For the foreseeable future the best archive medium available is tape.** Disk can simply not compare in terms of archive cost, archive medium reliability and archive environmental credentials. As businesses find their data centres literally bursting at the seams as well as under assault for environmental wastefulness then archiving more and more data to tape will become the preferred escape route from this rock and hard place.

Disk will have a role as a backup medium and in business continuity and disaster recovery scenarios where recovery speed is of the essence. But for long term, secure and cost-effective archival of data for periods going well beyond seven years tape is the undisputed best choice.

### **Sony media offering**

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#### **Sony background**

Sony offers a broad range of quality magnetic and optical media to address a wide range of data storage requirements, from backing up a single PC to the archiving of a large corporate network, such as SAIT, AIT, LTO, SuperDLT, DLT IV, DLTVS, 4mm and 8mm tape cartridges, MO disc, Blu-Ray, DVD and CD.

Sony is the only tape media manufacturer that produces the tape hardware sub-systems. This comprehensive offering delivers optimum performance of the hardware and media products and with Sony's future storage development plans ensures maximum protection for your data now and decades into the future.

### **Ultra reliable storage from a world leader**

With over fifty years experience in the research and development of media and drives, Sony is a natural storage partner for business. From the Soni-Tape KA series in 1950 to the current range of AIT tapes and Blu-Ray discs, Sony is consistently investing tremendous amounts of time and resources in storage media R&D.

Sony also offers write-once, read-many (WORM) media to protect data from accidental or intentional alterations, amendments or deletions, providing the ideal solution for information governed by strict compliance regulations.

## **Storage support**

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### **1. Lifetime Guarantee**

Sony offers a Lifetime Guarantee on storage tapes. This guarantee covers any manufacturing defect due to workmanship or materials during the life of the product. Sony tapes fail very rarely indeed. If one does then we'll provide a replacement free of charge\*.

### **2. Technical Support**

Sony Technology Centre in France provides a range of data related support services to ensure you have a reliable and the most effective use of your Sony tapes. Services include:

- The Advanced Technical Laboratory that performs media health checks, identifies and analyses problems, and proposes effective solutions.
- Dedicated Customer Support Technicians provide help, advice and information on media and drives. They can visit a customer installation to offer pre- and post-sales support. They have world-class expertise in the restoration and migration of legacy media to meet the growing demand for content archiving and delivery within the Broadcast Industry.
- European Zone Quality Assurance guarantees all Sony media meet strict legislation and standards for quality, safety and the environment.

### **3. Customised Labelling Service**

With half inch tapes increasingly being used in automated systems, labels are essential for easy identification of tapes which results in faster and reliable access to data. Sony offers a high quality alpha numeric labelling service. Labels are applied in a clean environment and are guaranteed free from defects for five years.

### **4. Business Support**

With dedicated account management that understands media needs, plus reference guides on compliance, regulatory directives, backup operational manuals, and LTO drive and media compatibility charts, Sony provides a wide range of essential business support tools to improve the management of your data.

For more detail on Sony storage media offering, and to get electronic copies of our drive media compatibility guide, specification sheet, and catalogue, go to [www.sonybiz.net/storage-media](http://www.sonybiz.net/storage-media)  
Alternatively, you can contact your Sony representative or usual supplier.

## References

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  3. Gartner press release: Gartner Estimates ICT Industry Accounts for 2 Percent of Global CO2 Emissions; April 26, 2007; URL: <http://www.gartner.com/it/page.jsp?id=503867>
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- IDC: WHITE PAPER Creating Cost and Energy Efficiency Through Outsourcing Hosting Solutions. Daniel Fleischer James Eibisch, August 2007.

\* Terms & conditions apply. For more detail, please ask your Sony representative or usual supplier.

**ENDS**

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### **About Sony:**

Sony manufactures audio, video, communications and information technology products for the global consumer and professional markets. With its music, pictures, game and online businesses, Sony is uniquely positioned to be one of the world's leading digital entertainment brands. Sony recorded consolidated global annual sales of EUR 55.44 billion (yen 8,871 billion) for the fiscal year ended March 31, 2008, based on an average market exchange rate for the same period of yen 160.0 to the EUR. It employs approximately 180,500 people worldwide.

In Europe, the Sony Group recorded consolidated annual sales of EUR 12.73 billion (yen 2,328 billion) for the fiscal year ended March 31, 2008. Sony Europe, headquartered at the Sony Center am Potsdamer Platz in Berlin, is responsible for the company's European electronics business and registered consolidated sales of EUR 9.55 billion for the same period.

**Sony Europe's Recording Media & Energy (RME)** division is responsible for the retail and corporate data media, consumer and professional media and battery business. For more information, please visit <http://www.sonybiz.net> and <http://www.sony-europe.com>

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