IBM Research Sets New Record in Magnetic Tape Data Density (w/ Video)

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IBM researchers today announced they have demonstrated a world record in areal data density on linear magnetic tape - a significant update to one of the computer industry's most resilient, reliable and affordable data storage technologies.

This breakthrough proves that tape technology can increase capacity for years to come, which has important implications, as tape storage systems are more energy efficient and cost-effective than hard disk drive storage systems. As the physical world becomes increasingly networked with sensors, vast amounts of data are amassed in various formats from medical images to security camera feeds to supply chain sensors to financial records. All of this data needs to be archived, replicated for disaster recovery, and/or retained or regulatory compliance.

The scientists at IBM Research - Zurich, in cooperation with the FUJIFILM Corporation of Japan, recorded data onto an advanced prototype tape, at a density of 29.5 billion bits per square inch - about 39 times the areal data density of today's most popular industry-standard magnetic tape product. To achieve this feat, IBM Research has developed several new critical technologies, and for the past three years worked closely with FUJIFILM to optimize its next-generation dual-coat magnetic tape based on barium ferrite (BaFe) particles.

"This exciting achievement shows that tape storage is alive and strong and will continue to provide users reliable data protection, while maintaining a cost advantage over other storage technologies, including

hard disk drives and flash," said Cindy Grossman, vice president, IBM Tape and Archive Storage Systems.

These new technologies are estimated to enable cartridge capacities that could hold up to 35 trillion bytes (terabytes) of uncompressed data. This is about 44 times the capacity of today's IBM LTO Generation 4 cartridge. A capacity of 35 terabytes of data is sufficient to store the text of 35 million books, which would require 248 miles (399 km) of bookshelves.

"This tape storage density demonstration represents a step towards developing technologies to achieve tape areal recording densities of 100 billion bits per square inch and beyond. Such technologies will be necessary to keep up with the rapid increase in digital information. IBM is in the unique position to help clients store, maintain and analyze the wealth of data accumulating, and thus help them achieve efficiencies and advantages in the way they do business," comments Evangelos Eleftheriou, IBM Fellow.

Critical business data is often contained in automated tape libraries, where one or more tape drives service dozens to thousands of tape cartridges. High-end tape libraries can store petabytes - millions of gigabytes - of information. On a per-gigabyte basis, tape systems currently cost about one-fifth to one-tenth of a hard disk drive (HDD) storage systems, depending on the size. Also, tape is by far one of the most energy-efficient storage technologies available today.

For the past several years, scientists from IBM Research - Zurich have dramatically improved the precision of controlling the position of the read-write heads, leading to a more than 25-fold increase in the number of tracks that can be squeezed onto the half-inch-wide tape. In addition, they have developed new advanced detection methods to improve the accuracy of reading the tiny magnetic bits, thereby achieving an increase

in the linear recording density of more than 50 percent. Another key enabling technology for achieving the required track-follow performance in this demonstration was a new, low-friction read-write head developed by IBM Research - Almaden, which has also been collaborating with FUJIFILM to develop next-generation media.

IBM has a long history of innovation in magnetic-tape data storage. Its first commercial tape product, the 726 Magnetic Tape Unit, was announced nearly 60 years ago. It used reels of half-inch-wide tape that each had a capacity of about 2 megabytes. The areal density demonstration announced today represents a potential increase in capacity of 17,500,000 times compared with IBM's first tape drive product.

Source: IBM