

## EXECUTIVE SUMMARY

### Key Challenges

- Storage of critical data that is not easily replaceable
- Sharing of data with multiple world wide research teams
- High performance to support complex data analysis
- Ability to increase storage capacity based on project need

### Solution

- LSI™ 3ware® 9650SE SATA II RAID offers real time data protection with RAID 6 redundancy using dual parity to support up to 2-drive failure in an array.
- Network teaming to support 2Gb/s transmission of data which can scale up as 10Gb/s networks are introduced
- StreamFusion™+ feature supports high performance in multiple stream environments typical in shared data space used in research centers
- Online Capacity Expansion offers the ability to add drives dynamically to an existing array increasing capacity as storage requirements grow.

### Results

- Processing of 1GB data files per telescope running over 300 days a year
- Capacity of 5.45TB of storage in a single six drive array
- Support for multiple projects including CMB (Cosmic Microwave background), COFE (Cosmic Foreground Explorer), and TOSS (Transient Object Scans)

## UCSB Uses 3ware RAID Controllers to Store Astrophysical Data

The University of California, Santa Barbara's (UCSB) Experimental Cosmology group studies the early moments of the creation of the universe. Using ground-based, balloon-borne, and satellite experiments, they record measurements of the remnant heat from the Big Bang. Each experiment has the potential to generate many terabytes of data, which must be stored in an easily accessible and effective manner.

The UCSB Experimental Cosmology group has two current research projects. The first, called Planck, is a satellite based mission to measure the Cosmic Microwave Background (CMB) and includes the Cosmic Foreground Explorer (COFE) to map the galactic emission to improve maps of the CMB. The second project is an optical project called TOSS, which scans the sky nightly looking for Transient objects. This nightly scan can generate approximately 1GB of data per telescope per night and has the potential to run over 300 days per year. The group plans to expand this project to as many as 10 telescopes so that over 10GB of data would be produced per night. To accommodate their essential data storage needs for their research projects, UCSB has chosen LSI™ 3ware® RAID controller technology.

Mission-critical data can comprise very large data sets to which researchers need rapid, continual access as well as high bandwidth I/O. All data sets are archived indefinitely as a reference for future projects. Jet Propulsion Laboratory (JPL) and European Space Agency (ESA) are two examples of customers that are using this data.

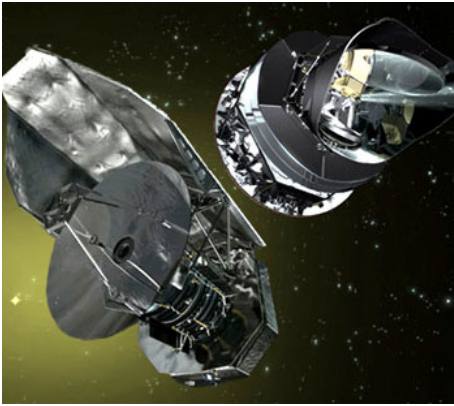
"Currently," says Jonathan Crass of UCSB, "we share data using a LAN with gigabit Ethernet capabilities as well as high-speed internet connections to core networking in Los Angeles.

This allows both local and remote access to data for scientists around the United States and beyond. With new technology including teaming functionality (combining multiple network connections to act as one) our current storage system has an equivalent 2GB connection allowing multiple users to have rapid access to data. Combining this with Fault Tolerance (the switching of networking from a failed port to a working port) readily allows us data access."

The application performance requirement in throughput can vary. UCSB uses software such as IDL for data analysis which pulls the data sets over the network to the local computer. The server with the 3ware RAID controller has network teaming allowing 2Gb/s data transmission within the network. The current server running the RAID controller is a Windows® Server 2008, Core2 Quad Processor 2.83 GHz and 4GB of RAM. Currently, UCSB is running the array with 6 x 1.5TB Seagate drives in RAID 6, capacity at 5.45TB.

### 3ware RAID Controllers: A Great Choice for Storing Astrophysical Data

3ware RAID controllers offer a high-performance solution to the storage of astrophysical data, which requires long-term storage with minimal



Artist Conception of the Herschel and Planck satellites just after separation

chance of data loss due to hardware failure because the data can be very difficult to replace. The combination of hardware-based RAID and the StorSave™ BBU with write journaling optimizes protection for that data. Using large-capacity SATA drives in RAID arrays enables low-cost storage while the RAID technology enabled by the 3ware controller provides the performance needed to support these types of specialized applications. Using enclosures with hot-swap backplanes allows drives to be removed and replaced as needed for ease of maintenance, while RAID controllers provide access to data while the array rebuilds. Furthermore, the high speed RAID array allows easier access to data at ever increasing rates to help accommodate the higher speed networking in the future (10Gb/s or higher). UCSB stores their collected data directly to the array and also copies and stores data from other projects there for data analysis. With numerous UCSB projects stored on the array, it is possible for people worldwide to access the data simultaneously.

LSI 3ware RAID controller-based system allow researchers to access collected data that answers some of the most fundamental questions of the universe, all with the knowledge that any completed analysis is stored safely and is readily accessible.

### About LSI 3ware RAID Controllers

LSI 3ware 9650SE SATA II hardware RAID controllers deliver industry-leading RAID 6 and RAID 5 performance, robust fault tolerance, and support for multi-terabyte capacities. Features include a PCI Express® host interface, Multi-lane connectivity, StorSwitch® architecture, and SATA II support. These controllers deliver over 700MB/s RAID 6 reads and 600MB/s RAID 6 writes and support RAID levels 0, 1, 5, 6, 10, 50, Single Disk, and JBOD.

The advanced features, SATA II connectivity, and architecture of the LSI 3ware 9650SE RAID controller make it a great choice for vertical applications that require the highest levels of sustained write and read performance including NAS storage, cluster servers, super-computing, near-line backup and archival, and other demanding applications that need high-bandwidth, high-capacity storage.

For more information and sales office locations, please visit the LSI web sites at [lsi.com](http://lsi.com) [lsichannelgateway.com](http://lsichannelgateway.com)

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