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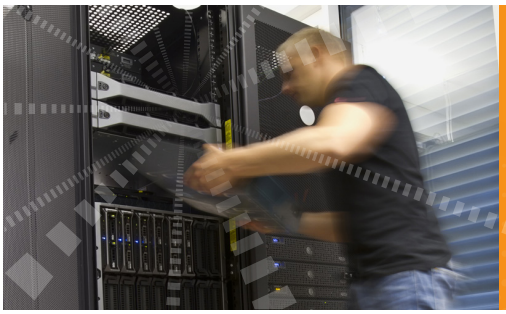
Case Study



International Computer Concepts Configures System with LSI® 6Gb/s SAS I/O to Handle Supercomputing Center's Unprecedented Data Storage Challenges

LSI MegaRAID® SAS 9260-8i and MegaRAID CacheCade® Technologies Combine for Supercomputing Performance Breakthroughs

www.icc-usa.com

The Challenge:

NCSA provides data management to some of the most challenging astronomical projects ever conceived. One is the Dark Energy Survey (www.darkenergysurvey.org) that will collect digital data from astronomical observations in a database expected to grow by 400GB daily over the one and a half year life of the project to approximately 200TB of raw image data.

The Solution:

ICC delivered a configuration for NCSA that would maximize the in-box data throughput and provide the scalability for the clustered configurations the projects will generate. The system was built around the LSI MegaRAID SAS 9260-8i low-profile MD2 eight-port internal 6Gb/s SATA and SAS PCIe RAID controller and the LSI MegaRAID CacheCade software. The addition of the CacheCade software allowed ICC to accelerate the performance of HDD arrays by enabling 3 x 160GB SSDs to be configured as an additional read cache resource available to the controller.

The National Center for Supercomputing Applications (NCSA) provides data management to some of the most challenging astronomy projects ever conceived.

One such project is the Dark Energy Survey (www.darkenergysurvey.org). This large scale project involving more than 120 scientists from 23 institutions in the United States, Brazil, Spain, and the United Kingdom will collect digital data from astronomical observations in the attempt to solve one of today's great scientific mysteries: why the expansion of the universe seems to be speeding up. NCSA is tasked with processing the data, identifying the galaxies and stars in digital maps of the heavens, and storing it all in a database expected to grow by 400GB daily over the one and a half year life of the project to approximately 200TB of raw image data.

"We will provide the data processing support for several scientific efforts related to Dark Energy," said Bernie Acs, informatics system designer and database architect at NCSA. "For the Dark Energy Survey itself, we need a platform capable of storing up to 400 1GB images every day for 500 days."

NCSA will also be supporting the Large Synoptic Survey Telescope (LSST) project, which, according to Acs, will be generating even more data. The LSST team (www.LSST.org) sizes their database at a staggering 400,000 sixteen megapixel images per night for 10 years, comprising 60 PB of pixel data. Data from LSST will be used to create a 3D map of the Universe with unprecedented depth and detail. This map can be used to locate mysterious dark matter and to characterize the properties of the even more mysterious dark energy.

These massive datasets are expected to be made available to scientific communities and the general public for research and education.

Facing this set of galactic data storage challenges, NCSA approached the team at LSI's channel partner International Computer Concepts (ICC) to tap into the very latest I/O technologies.

ICC recommended a configuration for NCSA to maximize the in-box data throughput and provide the scalability needed for the clustered configurations handling the I/O loads. ICC proposed a system built around the LSI MegaRAID SAS 9260-8i low-profile MD2 eight-port internal 6Gb/s SATA and SAS PCIe RAID controller and the LSI MegaRAID CacheCade software. NCSA agreed.

When the test platform was delivered, NCSA, conducted performance tests of their new ICC database server node and was impressed with the results. These tests performed standard database functions like building indices and populating tables to record the rates at which data was transferred.

The Result:

The combination of the 6Gb/s RAID card from LSI and its CacheCade software solved a real performance problem. It was taking NCSA four to six hours to create database indices. With the new 9260-8i card and CacheCade software, that time fell to about 15 minutes, a factor of roughly 20:1. NCSA expects the performance benefits to grow linearly from adding up to three more 9260-8i cards with CacheCade software per system.

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Bernie Acs, informatics system designer and database architect at NCSA.

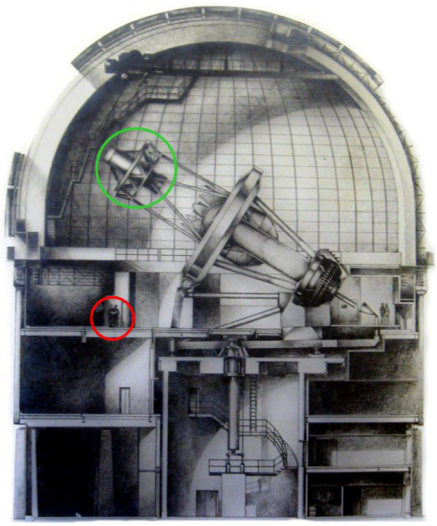
"And we expect the performance benefits to grow linearly from adding up to three more 9260-8i cards with CacheCade software per system," Acs added.

We may never know with precision the size of the universe, how or why it is expanding at an apparently increasing rate. But we will know more very soon. NCSA and ICC are building the tools that will get us closer, thanks in part to the 9260-8i card and the CacheCade software from LSI.

About International Computer Concepts

A prototype of the Dark Energy Survey camera, DECam. The final version of this camera is planned to generate, store and process approximately 200TB of raw image data. Storage technology from LSI, including the LSI 9260-8i 8-port SAS2 512MB RAID controller and LSI CacheCade software is expected be at the heart of that effort.

(Credit: Fermilab)



The 4 meter Blanco telescope. The eventual home of the Dark Energy Camera, DECam, which is planned to generate 400 1GB images per day, all of which are expected to be processed and stored on storage components from LSI, including the MegaRAID SAS 9260-8i controller with BBU, the LSI LSISS9252 SATA Adapters for Expanders and CacheCade software. The green circle marks the location of the prime focus cage where DECam will be mounted. The red circle marks a person, included for scale.

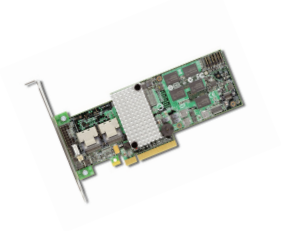
Credit: CTIO/AURA/NSF

"Now that we've proven that we can deliver the performance levels needed at the node level with a single 9260-8i card, we plan on installing multiple LSI RAID controllers in each node, which will allow even larger SSD caching pools to be used per node, and allow us to begin scaling to the full deployment"

Alexey Stolyar
ICC

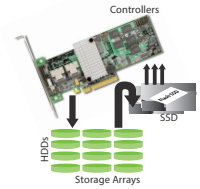
Components and Configuration

LSI MegaRAID SAS 9260-8i



Low-profile MD2 eight-port internal 6Gb/s SATA and SAS PCIe RAID controller.

CacheCade Software



The LSI MegaRAID CacheCade software is designed to accelerate the performance of hard disk drive (HDD) arrays by enabling solid-state drives (SSDs) to be configured as a secondary tier of cache. CacheCade software helps to maximize transactional I/O performance for read-intensive applications, delivering up to a 50X performance improvement with only an incremental investment in SSD technology.

ICC System Configuration

ICC recommended and delivered a custom configuration based on leading edge technologies from LSI, Intel, Seagate, and others to meet the demanding requirements in this supercomputing project.

The system designed by ICC included the following components:

- 4U Supermicro chassis with redundant 1200W power supply and 24x SAS2 drive bays
- Dual Intel X5660 processors
- 72GB DDR3 1333MHz ECC registered memory
- 16x 2TB Seagate ST32000444SS SAS2 HDDs
- 3x 600GB Seagate ST3600057SS SAS2 HDDs
- 3x 160GB SATA2 SSDs (for CacheCade)
- LSI 9260-8i 8-port SAS2 RAID controller featuring LSI 2108 ROC
- LSI battery backup unit (BBU) for 9260 controllers
- 3x LSI LSISS9252 SATA adapters for expander backplane
- LSI CacheCade software for 9260-8i 2-port SAS2 512MB RAID Controller

About International Computer Concepts

International Computer Concepts (ICC) is a system integrator of servers for high-performance computing (HPC), hosting, storage, and other IT applications. Clients include small local businesses and multinational corporations, institutions of higher learning, and government agencies. ICC is an Intel Premier Provider headquartered near Chicago and has been in the computer industry for over 15 years.

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