

Storage System Provides “Amazing” Performance at a Lower Cost than Big-Name Alternatives

Using FlashDisk® with RAID 6



It is Rocket Science

Intelsat is the largest provider of fixed satellite services worldwide. The company enables providers of media, telecom and government services to deliver information and entertainment to people at home, in the office or on the move. Intelsat utilizes a fleet of approximately 50 satellites and a large, complementary terrestrial infrastructure including seven owned teleports, fiber connectivity and more than 50 points of presence in almost 40 cities.

A spacecraft represents both an enormous expense as well as an extremely valuable asset. For the lifetime of the satellite, and long after, Intelsat needs to maintain all of the control signals that it



sends to the satellite and all of the telemetry data concerning position, distance and communication signals sent to and received from the satellite. Intelsat users obtain tabular or graphical data on

a regular basis to make critical operating decisions.

Key Ground Systems

Intelsat uses two different ground control systems. EPOCH is a commercial off-the-shelf system developed by Integral Systems, Inc. while GNS was developed internally by Intelsat. “The primary usage we had in mind for this new storage system was to support long term data archival of the entire satellite constellation,” said Jacqueline Lawler, Principal Engineer of IT Operations for Intelsat. “Much of our legacy Epoch storage was aging and difficult to maintain due to lack of vendor support so we began the process of data migration on our Epoch systems to the new Winchester NAS.” “During the system architecture and planning stages for our new storage we decided to use the Solaris 10 operating system and ZFS file system because it is easy to allocate space for our Linux and Unix users by thin provisioning space to be easily allocated to servers, on a just-enough and just-in-time basis.”

Crucial Communications Data

Control data generated by Intelsat’s 50 satellites is downloaded to local storage and accessed on a regular basis to ensure satellite performance and reliability.

This storage is critical to Intelsat’s real-time satellite communications operation. “During the search for a storage solution we were mindful that we needed a compatible storage system that could provide high performance and bullet-proof data security at a low price,” said Lawler. She needed a storage system for one of its critical control systems with **i n c r e a s e d** access speed and higher data integrity.



Lawler discovered that the FlashDisk SX-3404R disk array from Winchester Systems with 1 TB SAS (Serial Attached SCSI) disks delivered exactly what she was looking for. “With the system in operation since the fourth quarter of 2009, it is working flawlessly and performance is amazing,” Lawler said. “Data security is assured by RAID 6 which protects us against data loss if we happen to lose two drives simultaneously and SAS end-to-end checking which ensures data moving to or from the drive is never redirected, eliminating a key cause of data corruption.”

Superior Price/Performance Value

Lawler obtained quotes from big-name storage suppliers and found that they could deliver a quality product but that their prices were very high. "I wanted to get the same capability at a much lower price so I looked for an alternative," Lawler said. "I was online one day and I saw Winchester Systems. I went on their web site and read case studies that showed they had worked with major companies and large government agencies. I talked to the Winchester Systems sales rep and discovered that they offered systems with a very high performance to price ratio."

The rep helped to configure a FlashDisk SX-3404R RAID disk array with 8 Gb Fibre Channel ports, dual redundant controllers and an SAS 4x wide host interface that is expandable up to 224 TB. The storage system interfaces with an Oracle Sun Netra X4250 server. "Winchester offered a product with the same storage and a big cache memory at a much lower price than competitors," Lawler added. "We saved tens of thousands of dollars and we got an addition 4 TB of usable disk space per shelf with Winchester compared to our other high-end NAS vendors. We configured the system with a large cache which is important because it's not uncommon for our users to request the same data multiple times. For example, a user might request 10 days plot data on a telemetry point then later request 20 days on the same point. The second time they get their data much faster."

Critical Data Integrity

The SX-3404R's support for SAS drives improves both data integrity and performance. According to, "An Analysis of Data Corruption in the

Storage Stack," a large-scale study of data corruption funded by the National Science Foundation,

physical interconnect malfunctions cause up to 68 percent of storage subsystem failures. Lacking inherent dual-port failover capability, SATA systems often report such interconnect failures as a "drive not found" error. SAS reduces data corruption with end-to-end error checking that ensures data traveling to or from the drive is never misdirected. SAS drives also offer 135% average performance increases over SATA and far greater throughput on sequential read/writes.

The use of "High Speed RAID 6" Winchester Systems helps meet the critical data protection requirements of



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Principal Engineer, IT Operations

this application. RAID 6 is a dual distributed parity mechanism that permits two disk drives to fail in an array and still be able to recover and rebuild data from the remaining disk drives. RAID 6 increases the mean time to data loss (MTDL) by two to four orders of magnitude relative to RAID 5, providing an MTDL measured in thousands of

months or hundreds of years instead of a fraction of a single year. Parity is performed at high speed using dedicated ASIC parity chips embedded on the RAID controllers.

"The last thing I want to worry about is losing two disks at one time," Lawler said. "If that should ever occur, RAID 6 gives me the opportunity to install a replacement disk without any data loss. We have staff on site that can replace a disk within one hour. Based on our internal capabilities, we went with the standard warranty that is included at no charge and that is saving us a lot of money compared to running several of our old systems, which we retired."

Improved Engineering Productivity

"In the fourth quarter of 2009, we moved the data from the EPOCH system over onto FlashDisk disk arrays," Lawler said. The people using the GNS system liked what they saw on EPOCH so much that we are now in the process of moving the GNS system over to FlashDisk as well. I have mountains of data from two ground systems writing to the FlashDisk disk arrays as of first quarter 2010 and we are not seeing any performance hits. The performance improvements provided by the new storage system is helping us improve engineering productivity while providing a much higher level of data integrity."