State of Tennessee

Enterprise Storage, Backup / Recovery, and Tape Virtualization

Category:

Business Continuity and Disaster Recovery

2009 NASCIO Recognition Award Nomination

Section B: Executive Summary

During these days of economic belt-tightening, it's a rare occurrence when a state can implement new technologies that not only streamline operations, improve performance and enhance Disaster Recovery, but will also save over $300,000 per year and are environmentally friendly. The State of Tennessee did just that, and more. Providing a robust Disaster Recovery capability to 25 State agencies was becoming increasing difficult with the State's aging tape infrastructure. Twenty-year old tape drives and tape cartridges ranging from five to 10 years old were the foundation of the recovery process. During Disaster Recovery tests, it took 24 hours to recover the mainframe and there was concern that some of the media could not be read during an actual disaster.

So the State chartered a project team to evaluate the existing tape infrastructure. The project was to focus on providing data protection and recovery capabilities for systems that are essential to the State's security, safety, and critical systems delivery infrastructure. Tennessee needed a dependable, highly available, affordable solution for data storage, backup /recovery, and archival that could be implemented by State employees and could be easily maintained.

The project goals included designing and building a mainframe tape / storage solution that would automate processes, reduce cost, and enhance the disaster recovery capabilities of the State of Tennessee. The high-level design caused the team to rethink the way virtual tape was used. The team wanted to see how newer tape technology could improve data protection, reduce exposure to data loss, and enhance near-line report viewing requirements.

The solution that was eventually implemented provided enhanced disaster recovery capabilities – 62,000 tapes were converted to 12,000 cartridges. With fewer tapes to handle and process, recovery time on the mainframe decreased from 24 hours to less than 13. Offsite storage costs dropped dramatically, and now almost all production datasets have two copies. The state-of-the-art technology uses one tape silo, one device type, and one tape media which simplifies operation, tape handling, and repair procedures. The State will realize cost savings from reduced annual maintenance ($256,000/year) and lower costs for offsite storage ($60-$80,000/year). The new technology also consumes less electricity and generates less heat which will result in lower utility bills.

Section C: The Business Problem and Solution

Due to the State's aging tape infrastructure, which consisted of 3490 and 3590 cartridge drives, Tennessee was experiencing a continuing increase in the time it was taking to create backup files for disaster recovery. Not only were the tape drives aging, so too were the cartridge tapes. In the event of a true disaster, there were doubts that the media could be read and data recovered. Too many tapes were required for a complete recovery leading to confusion and uncertainty. Another problem was the cost of purchasing, storing, and shipping the recovery tapes, as well as the cost of maintaining 30,000 plus long-term archival cartridges at an offsite secured location. Major concerns included managing the shipping, tracking and receiving of all of these cartridge tapes. With the State facing a budget shortfall, the decision was made to consolidate all of the tape technology.

An evaluation of the tape infrastructure led the State's technology division to make the decision to replace the tape drives with newer devices. The evaluation revealed that the 32 3590-drives and the 32 3490-drives attached to the Sun/STK 9810 Powder Horn silos could be replaced with one Sun/STK SL8500 silo with 44 9840C-drives. From the spring of 2007 to the spring of 2008, the project team replaced all of the older technology and copied all of the existing offsite media to virtual tape. Using CA-VTAPE, all State agency long-term storage and recovery media was converted to 3490-sized virtual tapes. With the addition of the 9840C drives, the State was able to reduce the number of channels from 30 ESCON to 10 4GB FICON channels for faster data transmission.

By employing virtualization technology, two copies of all agency tape data are now created. Two copies of the data means the that the State now has a higher rate of recovery, less risk and potential for lost data, and by keeping one copy onsite has quicker restore times. Two CA-VTAPE subsystems are used. One handles all of an agency's application data and the other all of the agency's disaster recovery data. The number of agency offsite media was reduced from 30,000 plus cartridges to less than 500. This resulted in decreased hunt time and pull time, which allows critical data to get moved offsite sooner each day. These dual copies provide additional protection for all agency production data. One copy (for state disaster recovery data) is stored offsite and the other maintained onsite for quicker access. This eliminates the time and costs associated with storage and delivery of the data from an offsite location. All of this was accomplished without any significant changes or disruption of service to State agencies.

Section D: Significance

As a result of this project, the State's business continuity plan has been enhanced. The tape technology has been refreshed and backup times have been reduced by one third. What was taking an average of six to six-and-a-half hours now takes approximately four hours to complete. With the addition of the 9840C cartridges, the State now has 100 times the capacity per tape compared to the 3490 cartridges, and two times the capacity compared to the 3590 MagStar cartridges. By reducing the number of tapes that are managed, there are fewer disaster recovery tapes to be handled, faster tape mount times, and application data is accessed and recovered quicker. Several agencies have a 24 hour recovery time objective. The mainframe can now be recovered in less than 13 hours whereas before, recovery time was 24 hours.

The number of physical cartridges used by HSM (IBM's Hierarchical Storage Manager), both for onsite and offsite storage of data, has been reduced by 50 percent. The recall time for data managed by HSM has also been reduced by using the newer 9840C technology with FICON connectivity.

In addition to the significant cost savings for hardware maintenance fees, other cost benefits have been realized as well. Floor space required for the old technology has been reduced by two thirds using the new technology. Additionally, one fourth less electricity is being consumed and less heating and cooling are required. There has also been a significant reduction in offsite media cost, saving approximately $80,000 annually.

Higher availability for backup, recovery, and batch, as well as near-line report viewing is being realized by the redundant robotics, power, and controllers. The State has seen improved performance from the new fiber connectivity over the previous ESCON, fewer tape mounts due to the higher density tapes, and the benefit of much greater compatibility with other formats such as LTO (Linear Tape Open) and DLT (Digital Linear Tape). The State now has the ability to house Windows, UNIX, and mainframe backup solutions in a single tape silo.

This project enhanced disaster recovery capabilities by generating fewer disaster recovery tapes, thus reducing daily vault pickups from twice a day to just once. Now all agency disaster recovery and long-term storage files have a redundant copy. Older technology reaching end-of-life was replaced by an industry standard technology. This industry standard is more widely accepted, and integration and certification with other hardware and software vendors is more common.

Significant efficiencies and cost savings have resulted from the reduced assortment of technologies. Having one silo, one device type, and one tape media provides the State an advantage with tape vendors and its disaster recovery service provider. A single

media type simplifies operation, tape handling, and storage, and reduces the need to define multiple device types as tape data is shipped and received from external sources. Training requirements have been reduced and documentation has been simplified as a result of standardizing on a single media type. All parts inventories and connectivity have also been standardized. Another project benefit was realized when data exchanges between state agencies and non-state entities were replaced with more secure methods such as electronic data transmission using Direct-Connect, SFTP, or other electronic file transfer methods. This increased the security of data transmission and reduced costs to agencies that were incurring tape cartridge charges.

Section E: Benefit of the Project

Enhanced Disaster Recovery Capabilities

- 62,000 tapes converted to 12,000 cartridges
- Fewer Disaster Recovery tapes to be handled, stored and processed
- Recovery time of the mainframe was decreased 54%
- Faster mount times since all Disaster Recovery tapes are placed in a silo at Sungard
- Application data can be recovered quicker (VTape system programmatically recovers data, eliminating the need for individual tape restore programs)
- More data is protected - 99% of all production datasets now have two copies
- Daily vault pickups were cut from twice daily to once a day
- Disaster Recovery tape process takes four hours less each day to be completed, picked up and vaulted offsite

Streamlined Operations

- Consolidation of two older tape technologies into one newer technology
- Replaced technology reaching end-of-life with an industry standard technology - STK is the leader in Gartner's magic quadrant
- Reduced variability – Introduced one silo, one device type, and one tape media
    - Which simplifies:
        - Operation procedures
        - Tape handling procedures
        - Repair procedures
        - Training and documentation
    - Also standardizes parts inventory and connectivity
- Improved Certification and Interoperability with other hardware and software vendors
- 64 drives were replaced by 44 new drives

Higher Availability

- Redundant robotics, power, library, paths, controllers and logic boards
- High impact cartridge design (less breakage)
- Greater MTTR (mean time to repair) and MTBF (mean time between failure)
- All State agencies now have dual copies of their tape media

Improved Performance

- Fiber connectivity as opposed to serial copper wire
- Faster read / write times which improved backup windows
- Higher density tape
- Faster internal processors, channel interface cards, and mount times
- Scalability (In the Skin)
- Enhanced Compatibility to LTO, DLT, T1000, 9840, Windows, UNIX, AS400, and the Mainframe
- Reduced job wall clock time due to faster tape mounts with the virtual system
- Faster report recovery for the State's near-line report archival engine (ViewDirect)

Near Flawless Conversion

- Only 13 out of 62,000 tapes were not converted
    - 1 tape was lost
    - 12 tapes were unreadable
- The Office for Information Resources completed 95% of all conversion activity with very little impact to the Agencies
- There were no disruptions to other production workloads

Cost Savings for the State

- Annual Maintenance savings of $256,000
- 10+ year technology with an ROI of less than 5 years
- Reduction in staff
- The new technology:
    - Uses 1/3rd the floor space
    - Generates less heat and consumes less electricity
- $60 – $80,000 annual cost savings for offsite Iron Mountain storage
- Lower cost is passed on to the State agencies

It’s not often you can refresh technology, improve performance, enhance operations, and save money. This is one example where the State of Tennessee was actually able to do just that. This project has provided actual cost savings to the state and significantly improved its Disaster Recovery capability.