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BUYER CASE STUDY

Banner Health Implements Bycast Scale-Out Storage in the Cloud for Medical Image Archiving

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IDC OPINION

Changes in the healthcare provider segment of the healthcare industry are having an impact on storage and IT infrastructure. As providers shift from legacy paper-based processes to automated tasks enabled via healthcare applications, more patient information is borne online. Applications including PACS, electronic medical record (EMR), document imaging, integrated patient records, and physician order entry are all causing increased storage demand. As these applications are used by personnel to treat patients, the reliability, recovery, and availability of data they manage become paramount. Because of the high-bandwidth network characteristics of PACS, EMR, document imaging, and the sharing of other critical clinical data, providers often face growth in network bandwidth usage. In an often cost-constrained industry, healthcare providers and their IT organizations must work smarter. In addition:

- An IT trend spanning many industries is the use of cloud-based infrastructure to provide IT services that are dynamic and resilient and leverage shared infrastructure to provide lower-cost services. These services can include a variety of IT functions including backup, disaster recovery, archiving, and medical imaging storage.
- Cloud-based services can be private to an organization, operating within a private corporate network, or leverage a public cloud such as Amazon S3. Benefits to a cloud-based service include cost savings by using shared infrastructure and increased IT efficiencies and service levels.
- Health providers, faced with data privacy and security requirements such as HIPAA, may first look at private clouds as a means to reduce cost and increase IT efficiency. IDC believes that healthcare providers that leverage scale-out cloud-based infrastructure to support applications including PACS, EMR, and document imaging can service their communities more effectively and will be able to deliver state-of-the-art patient care.

IN THIS BUYER CASE STUDY

This IDC Buyer Case Study examines the application environment, supporting IT infrastructure, and information retention initiatives at Banner Health, a leading healthcare provider operating across seven states.

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Filing Information: June 2009, IDC #218727, Volume: 1
Archiving and Hierarchical Storage Management: Buyer Case Study

The IT department at Banner Health currently supports over 70 applications including patient and business systems. This Buyer Case Study provides specific details of some of the challenges that Banner Health faced in its storage environment for its PACS and outlines the benefits provided by Bycast, a provider for storage virtualization software for digital archives.

SITUATION OVERVIEW

Organization Overview

IDC recently conducted an in-depth interview with Liz Devereux, director of IT Storage and Digital Imaging at Banner Health. The topics of the interview included questions regarding Banner Health's overall IT environment, application portfolio, and new IT initiatives as well as the impact these new initiatives have on storage and data archiving.

Based in Phoenix, Arizona, Banner Health is one of the largest nonprofit healthcare systems in the country. With more than 35,000 employees, Banner Health has operations in Alaska, Arizona, California, Colorado, Nebraska, Nevada, and Wyoming. In the Arizona region alone, the company employs approximately 20,000, making it the state's second-largest private employer. Across the regions it serves, Banner Health has 22 hospitals and other facilities that offer an array of services including hospital care (inpatient and outpatient), home care and hospice care, nursing registries, surgery centers, laboratories, rehabilitation centers, and residential care.

In addition to emergency and medical services, Banner Health offers a variety of specialized services, from heart and cancer care to high-order multiple births and organ transplants, as well as Level 1 trauma services, rehabilitation services, and behavioral health services. Banner Health is also involved in cutting-edge research aimed at helping patients suffering from some of the most serious diseases and conditions, including spinal cord injuries and Alzheimer's disease. The Banner Alzheimer's Institute in Phoenix is a distinguished area of service. The company has annual revenue of approximately $4 billion and assets totaling $5.3 billion (citing 2007 unaudited figures). It has 3,793 licensed acute hospital beds (as of September 30, 2008) and averages 300–600 beds per hospital facility.

Information Technology Overview

Close to five years ago, when Banner Health started its Care Transformation Initiative, the organization sought to apply technology to its clinical practices. The company was confident that a goal of improved patient care would also translate into improved efficiencies and information technology ROI/cost savings. The company strove to move existing facilities to a "paper light" environment, which meant retrofitting older facilities. With new facilities deployed, the IT organization sought to move to an IT franchise model, whereby each hospital was running the same set of applications and capabilities. The use of technology would improve patient care by increasing accuracy and expediting treatment. The standardization on particular technology would reduce IT costs and increase efficiencies.

Today, Banner Health runs approximately 70 systems with critical applications, including:

- **Radiology PACS** including Fuji SYNAPSE, Agfa HeartLab, and MOSAIQ ImPACs
- **Centralized electronic medical record** system for charting and patient information provided by Cerner
- **Other business applications** including Lawson and Kronos

The company has two major IT hubs in Colorado and Arizona. There are three datacenters: one large datacenter in Phoenix, Arizona, and two smaller datacenters in Colorado and Alaska. The company has a 4GB private optical network within Arizona to enable centralized services such as imaging. A state-of-the-art production datacenter will be built from scratch, using high-density bladed architectures and new applications. Today, Banner Health's disaster recovery capabilities rely upon a three-way cluster and replicated data-enabling recovery of specific applications. However, the longer-term objective is to be able to recover an entire datacenter by bringing up a whole suite of patient care and business applications in an alternate location in the event of a regional failure or disaster.

The company has a diverse set of infrastructure running its applications. Its operating environment is 60% Windows and 40% Linux, with a total of approximately 1,000 physical servers running on IBM 8000 and HP EVA storage arrays with 750TB in storage capacity. Banner Health also has 400 VMware virtual machines; its goal is to become 90% virtualized in the next few years. Its SAN environment consists of Brocade and Cisco MDS switches with 14 HP EVA systems, four IBM DS8100, and 800 Fibre Channel ports.

Challenges and Solution

Performing over 800,000 radiology and cardiology procedures annually, Banner Health faced 30% year-over-year data growth in its PACS. The PACS were running on Fibre Channel monolithic storage and made use of array-based replication services to provide disaster recovery. The organization realized the cost per gigabyte and complexity of this model and sought to rightsize its applications to a lower cost and complexity offering without compromise in quality and reliability. Core requirements in looking for an alternative to its current PACS storage environment included:

- **Recovery.** Two distinct copies of all patient medical images must be kept in physically separate locations for disaster recovery purposes and to support HIPAA federal requirements.
- **Low TCO.** Banner Health needed to lower the cost per gigabyte and reduce administration complexity over the current monolithic storage architecture.
- **Fault tolerance.** Banner Health required a scale-out architecture with infrastructure redundancy to automatically recover from component failures but also able to support islanded operations in a specific location in the event of a WAN outage.

- **Image volume and size.** Banner Health creates images for 800,000 annual cardiology and radiology image procedures. Some images such as an ultrasound might be 1GB in size, while others might be 50,000. Banner Health needed a solution that could support to that volume and image size.
- **Replication services.** In addition to maintaining two copies of an image, the solution needed to handle bursty PACS data sets versus a steady stream of data.
- **Accessibility.** Banner Health needed to provide remote access to PACS images across seven Arizona hospitals without causing long access delays. Banner Health required access speed for clinical treatment across these locations.
- **Open format.** Banner Heath required storage of data in an industry-standard versus a proprietary format. Most clinical applications store data in a proprietary format. This raises migration issues. Banner Health was looking for a solution that supported access to the data without the PACS application.
- **Multiple applications.** Banner Health needed a solution that could support different PACS applications in multiple distributed locations.

Banner Health engaged a consultant to help the organization in selecting and rolling out an enterprise-level radiology PACS. The consultant recommended that Banner Health consider a solution from Bycast. Bycast develops a StorageGRID software architecture that simplifies the management of massive fixed-content storage systems and enables the tiering of storage based on access requirements while ensuring data integrity and availability. StorageGRID allows for the creation of archives that scale to petabytes of data across geographically dispersed sites. The StorageGRID software is licensed globally through strategic OEM partnerships with suppliers such as IBM and HP.

Banner Health started a six-month proof of concept (POC) with Bycast using its largest existing PACS data sets. Following extensive evaluation and implementation of the firm's ILM policies, Banner Health found the Bycast product met its requirements. According to Devereux, "I found Bycast to be one of the best vendors I've worked with in over 20 years. The technical support came from top-notch professionals." Following the POC, Banner Health deployed two Bycast cloud-based grid architectures in the Arizona (300TB) and Colorado (70TB) datacenters. Banner Health uses the Bycast StorageGRID cloud storage platform to deliver private cloud storage services to its constituents. According to Devereux, "Housed out of the two main datacenters, Banner Health relies on the Bycast StorageGRID as the software platform to deliver multiple storage services for mission-critical operations at more than 18 locations across six states." The Bycast grids serve as the primary storage for the firm's PACS Fuji SYNAPSE, Agfa HeartLab, and MOSAIQ ImPACs system images. The Bycast StorageGRID scale-out software runs across a multitier storage architecture made up of HP MSA storage and DL380 servers.

According to Devereux, one differentiation for the Bycast technology is support for business rules and migration policies, which can vary by department. For example, a radiology image might be looked at continually over several weeks but once the patient recovers, the image is likely not to be needed again. Conversely, a cardiology image is probably going to be looked at over a concentrated period initially and then on an annual basis year after year for patients with chronic heart disease. For

oncology images, patients tend to go through 3- to 18-month treatment plans, where images are accessed continually three to four times per week. Once the treatment is complete, those images are hopefully not needed again, although these images do need to be retained according to regulatory requirements, based on patient age and other factors. The business needs for access to particular images may translate to retaining certain images on a SCSI storage tier for two years before migrating to a SATA tier for seven years, where images can be retrieved for legal or teaching purposes before moving to a longer-term storage tier. According to Devereux, "Many of these images are under 26-year or longer retention rules although the decision to delete or not delete an image can have implications. No one wants to make a decision to delete an image we may need later. These variations in policies need to be managed across millions of images."

Results

The organization has been using the Bycast solution for close to three years now and has been extremely happy with the performance, scalability, and reliability of the offering. The benefits the organization has realized in implementing Bycast include:

- **Storage savings.** Storage cost savings of 30–40% were realized by moving data between tiers of storage based on access need compared with reliance upon a nontiered monolithic storage system.
- **100% uptime.** Uptime was increased by leveraging the grid architecture. According to Devereux, "The grid itself has had minimal downtime, and we have never lost an image with the Bycast architecture. Using film, industry average of, approximately 5% of films or images were lost."
- **Nondisruptive migrations.** Online migrations are done without planned downtime. During a software upgrade or a hardware refresh, there is no downtime during the migration process.

According to Devereux, "Banner Health plans to expand the use of the Bycast grid to include fixed-content data sets. We have call centers where we store call records for calls relating to nurse triage, physician referral, and patient and ambulatory services. We would like to keep these call records for quality assurance and training for at least one year." Enhancements that Banner Health has for Bycast would include enhancements in the ILM policies. According to Devereux, "We would like better control over our data and to keep a third copy of every radiology image for example." The company would also like to see some performance improvements on the underlying Bycast file system and to spread out the load on the front-end Bycast servers in a distributed manner. These performance improvements come as Banner Health considers using the Bycast grid architecture for more I/O-intensive applications, such as databases, but require improved performance on the first tier to move to this type of deployment.

ESSENTIAL GUIDANCE

For other healthcare providers facing similar issues as Banner Health, the following considerations should be made. To address the need for expanding storage capacity with lower TCO objectives, firms should evaluate scale-out storage architectures. To

address the need for retaining data over prescribed periods of time, firms should consider archiving and tiered storage projects. To address the growing volume of data, archiving, deduplication, thin provisioning, and space-efficient snapshots are all relevant technologies. Last, to address physical limitations in older datacenters, firms should evaluate consolidation and virtualization projects and in concert with replication technology can improve their business continuity and disaster recovery objectives.

LEARN MORE

Related Research

- *Virtua Health Implements Mimosa Email Archiving to Address eDiscovery Needs* (IDC #215585, December 2008)
- *Worldwide Archiving Software 2008–2012 Forecast* (IDC #212216, May 2008)
- *Community Health Network: Delivering State-of-the-Art Patient Care with a Digitally Integrated Network* (IDC #206591, April 2007)

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