

Managing the Enormous Growth of Medical Images with ActiveScale Object Storage

Highlights

- **Simple to Deploy**—Power and network connections are all you need
- **Limitless Scale**—Grow your storage in line with your capacity needs
- **Cloud Availability**—Survive an entire data center outage with geographical distribution of data
- **Linear Scalability**—Scale up performance with additional capacity
- **Highest Efficiency**—Highest capacity per square foot and lowest power per TB

Challenge

- **Budget Constraints.** Need affordable, highly dense cloud-scale systems for long-term medical image archiving
- **Availability Requirements.** Ensure easy access to images and data regardless of where it is stored, how old it is or even if a data center goes offline.
- **Data Integrity.** No data loss. Must remain intact and unaltered.
- **Complexity Sprawl.** Simplify overall deployment and management of storage infrastructure and operations

Solution

ActiveScale™ is a fully integrated rack-level system that delivers cloud-like economics and manageability to handle the massive growth of medical images. Utilizing high speed hard drives with HelioSeal® technology the system's modular scalable architecture fits 4.5 petabytes of usable capacity storage in a single rack with aggregate throughput up to 8GB/sec.

The Medical Image Storage Challenge

Unprecedented growth of digital information in healthcare organizations presents an immense and growing storage challenge for the IT organizations supporting them. Advances in diagnostic technology, digital medical imaging and electronic health record systems have resulted in an explosion of data in a wide variety of file formats that reside in different locations within the organization. Research from IDC anticipates overall healthcare data to grow at 48% per year, reaching 2.3 zettabytes by 2020¹. It's no wonder healthcare IT is struggling to deliver efficient and effective multi-petabyte storage services at ever increasing service-levels.

Medical imaging was identified by the Enterprise Strategy Group as the largest contributor to the enormous healthcare data growth². With advancements in healthcare, people are living longer, leading to more imaging procedures over their lifetime. In addition, advanced imaging technology is generating more detailed and dense images that consume increasing amounts of storage capacity per image.

Medical image retention is another factor. Regulations can vary greatly from state to state with some providing specific requirements. Federal regulations like Health Insurance Portability and Accountability Act (HIPAA) require organizations to put policies in place for image retention, backup, and disaster recovery. Given regulation complexity and an organizations ability to implement them, many healthcare organizations adopt a "lifetime of the patient" storage policy. In some cases, patient records are stored even longer. This contributes to the rapid growth of image archives that is driving CapEx and OpEx higher, stressing IT's already tight budget.

Lastly, the need to easily access and share medical images across departments and organizations is important for delivering better patient care and reducing operational costs. The primary technology in use today – picture archive and communications system (PACS) – uses proprietary application software that makes it difficult to share images and information across other vendor PACS.

Image Storage Pain Points

PACS users are experiencing growth pains in two areas. The first is the sprawl of different PACS across multiple departments such as radiology, cardiology, and other ology's that have unique workflow and process requirements. Different performance and storage requirements have also contributed to departments implementing a tailored PACS. Incompatibilities between different vendors systems create more complex workflows for clinicians sharing diagnostic images and for IT who needs to ensure the silos of data are properly protected.

¹ IDC, EMC, The Digital Universe, Driving Data Growth in Healthcare 2014

² ESG Research Report 2011 – North American Health Care Provider Market Size and Forecast

The second pain point is when departments change PACS vendors as they strive to improve diagnostic workflows, collaborate across departments and manage enormous data growth. Moving to a different PACS vendor can be a costly and time consuming effort as all images and associated data must be migrated to the new system. Most importantly, the resulting disruption directly impacts the quality of patient care and department productivity as clinicians adjust to the new system.

Strategies for Storage Consolidation and Simplification

PACS storage architecture consists of three tiers: Fast low-capacity primary storage for image and data related to current examinations; moderately fast, large-capacity storage for near line access; and a slower system like tape or optical with very large capacity for offline backup and disaster recovery.

For some organizations, a single enterprise-wide PACS is the best solution. Very large hospitals and healthcare networks, however, must support multi-PACS deployments. These organizations often choose to consolidate less active data onto centralized near-line and offline storage systems. With the widespread adoption of electronic health records systems, many of these organizations are also deploying vendor neutral archive systems to more efficiently organize and manage their data across a standard imaging platform.

It is not uncommon for an organization to have multiple petabytes to manage through a very long lifecycle. Careful consideration of the underlying storage technology and architecture is essential at this massive scale to safeguard patient information and ensure that it is accessible whenever and wherever it is needed.

Legacy Storage Technology – Not Suitable for Petabyte-scale Archives

The disk-based near-line storage tier is where the explosive capacity growth is occurring. RAID plus replication is typically used for data protection and online backup. RAID, introduced nearly 40 years ago, was not designed for today's multi-terabyte drives or petabyte-scale systems. When a single large drive fails, rebuilding the data can take weeks during which time system performance is severely degraded. If a second drive fails during the long rebuild, the risk of data loss significantly increases. Tape on the other hand consumes little power and is fairly cost efficient; however, it can take a long time to restore image data, and tape media can deteriorate over the long data retention lifecycle, increasing overall management complexity.

ActiveScale Object Storage is a Superior Approach

ActiveScale object storage uses erasure coding to deliver extremely high levels of data protection with lower capacity overhead than RAID plus replication. This solves the numerous challenges by combining the benefits of cost-optimized storage, with high levels of data protection, with the data accessibility of disk storage, and cloud-like scalability and manageability. With object storage, it's possible to eliminate replication copies and even the tape tier if deployed in a geo dispersed configuration. Figure 1 shows a centralized PACS infrastructure with object storage as a consolidated active archive tier.

Centralized PACS with ActiveScale Architecture Example

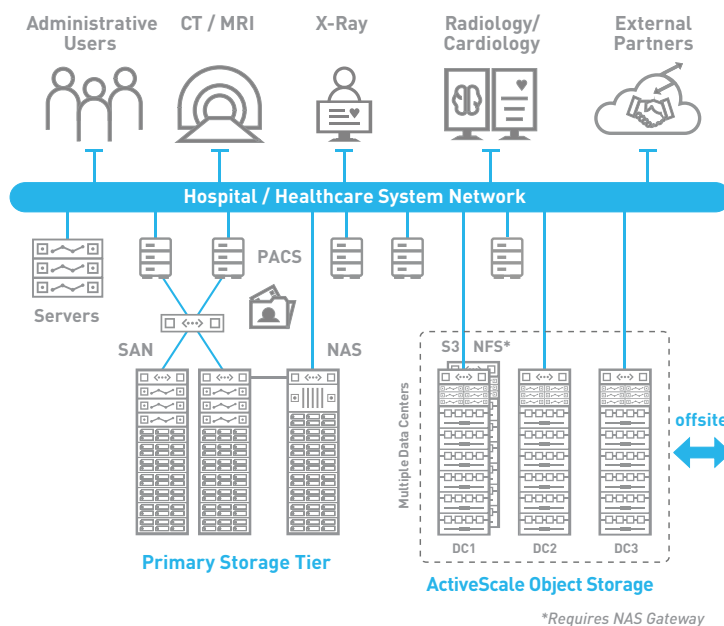


Figure 1. Simplified Enterprise Cloud Storage Infrastructure

Why ActiveScale Object Storage for Medical Images

ActiveScale is a complete out-of-the-box fully integrated rack level object storage system for petabyte-scale data that requires long term retention with fast retrieval. It is ideally suited for healthcare organizations deploying enterprise-wide PACS and VNA solutions or looking to consolidate and simplify existing infrastructure. Roll it into place, connect the power, configure the network connections and it's online, presenting an S3-compliant object interface.

ActiveScale delivers unprecedented levels of scalability, durability, and affordability. Organizations can simplify their storage infrastructure by consolidating near line, backup and archive tiers into a single ActiveScale object storage system. Leveraging hard drives with HelioSeal® technology, the system's modular architecture start at 480TB and can scale to 4.5PB petabytes usable capacity in a single rack and can scale out to 33.7PB (usable) in a 3GEO configuration. Each rack delivers up to 8GB per second of aggregate throughput performance. Patented Bitspread® technology uses advanced erasure coding to deliver 19 nines of data durability with up to 60% less capacity overhead than RAID + replication. BitDynamics® technology ensures bit perfect integrity by continuously monitoring and proactively self heals in the background with out intervention by IT or disruption to the users community.

With ActiveScale healthcare organizations no longer have to weigh the risks of a public cloud against the cost to build an internal private cloud. Through vertical innovation and integration, ActiveScale delivers extremely low \$/TB and watts/TB rivaling the cost and scale of public cloud infrastructure, but with the security and flexibility of being on premise.

On-Premise VNA with ActiveScale Architecture Example

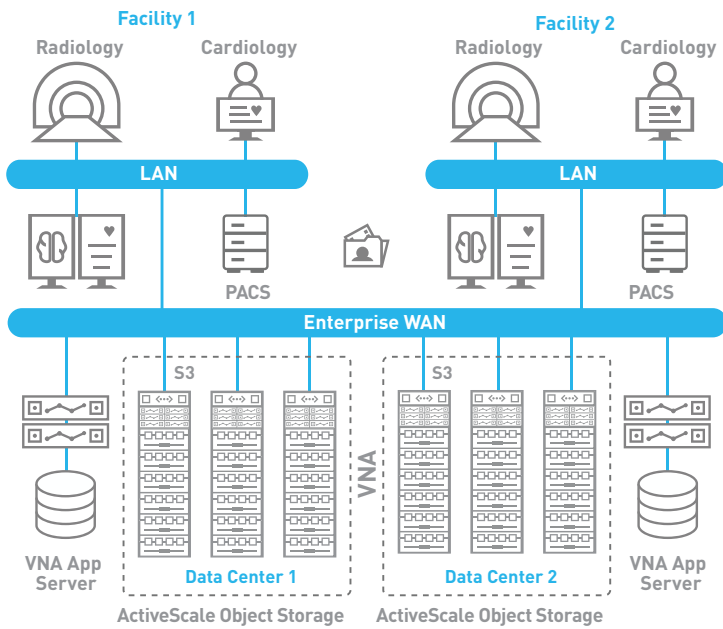


Figure 2. On-Premise Cloud VNA Storage Infrastructure

To learn more, visit www.quantum.com/objectstorage