Quantum®

Building a Forever Archive

Durable, long-term data retention to maximize data value at the best price/performance.

INFOBRIEF

Preserve What Matters—Forever

In an era where data is the foundation of innovation, regulation, and institutional memory, some information must be preserved not for just years—but for decades or even centuries. Whether it's genomic sequences, national records, or proprietary datasets for future AI models, this data must remain intact, accessible, and verifiable over time.

Quantum's ActiveScale® is a unified object storage platform designed for long-term data preservation. It ensures that your most critical data remains intact and accessible for decades—without skyrocketing costs or operational complexity. With its optional ActiveScale Cold Storage tier, it delivers unmatched durability and cost efficiency for data that must be retained but is rarely accessed. It's a future-proof foundation for organizations that need to protect their data, comply with regulations and unlock long-term value.

A Forever Archive Needs More Than Just Storage

Not all archived data is the same. In a true forever archive, some data must be accessed frequently, some occasionally, and some very rarely—yet all of it must be preserved with integrity and accessibility over time.

ActiveScale is built as a multi-tiered solution to match the access needs of different data types:

- **All-Flash and Spinning Disk Tiers**
  For access to frequently used datasets like active research and AI training sets.

- **ActiveScale Cold Storage Tier**
  For long-term, low-cost archiving of data that is rarely accessed but must be preserved indefinitely.

This tiered architecture delivers the best price/performance balance across the data lifecycle, ensuring that your archive is not only durable, but also efficient and adaptable.
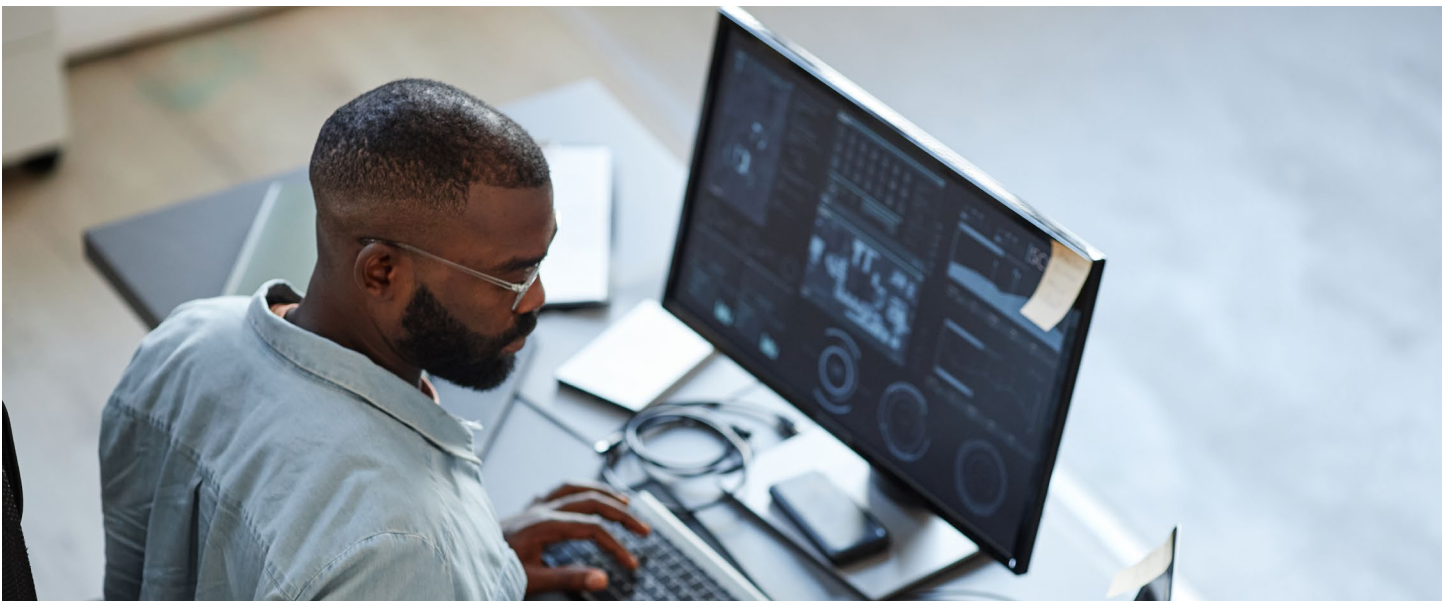
The Challenge: Why Forever is Hard

Preserving data for 10, 50, or 100 years introduces challenges that go far beyond traditional backup or archiving. Storage media and technology become obsolete. Data silently decays. Vendors disappear. Compliance requirements evolve. And the people who manage the systems today won't be around tomorrow.

Organizations that need to retain data for the long haul face seven critical challenges:

1. **Technology Obsolescence**
    Storage hardware and formats evolve. Without seamless migration, archives become very difficult to manage, or even inaccessible. A forever archive must support transparent, automated migration across generations of storage media.

2. **Data Integrity Over Time**
    Bit rot and silent corruption can destroy data that's never verified. Long-term archives must include end-to-end checksums and periodic background verification to ensure data remains intact.

3. **Durability at Scale**
    At petabyte or exabyte scale, even rare failure rates result in significant data loss. Traditional multi-copy approaches are inefficient. ActiveScale uses advanced erasure coding across both disk and tape media to achieve up to 19 nines of durability with minimal storage overhead—equivalent to a one-in-a-thousand-quadrillion chance of data loss.

4. **Vendor Lock-in**
    Proprietary formats and closed systems create long-term risk. A forever archive must use open formats and standard APIs to ensure future accessibility—even without the original vendor.

5. **Operational Simplicity**
    Archives must be easy to manage across decades and generations of staff. Systems should be self-healing, automated, and unified across active and cold data.

6. **Unpredictability of Cloud Storage**
    As cloud storage costs rise and data volumes grow; many organizations are re-evaluating their cloud strategies. What began as a flexible solution has become a source of unpredictable costs, limited control, and data sovereignty concerns. A forever archive offers a compelling alternative: lower and predictable costs, full control, and no egress fees.

7. **Auditability and Compliance**
    Regulatory frameworks demand traceability, immutability, and verifiable retention. Archives must log every write, read, and verification event—and make that data accessible for audits.

The Solution: ActiveScale with Cold Storage Tier

ActiveScale is designed from the ground up to solve these challenges. Unlike traditional tape systems or cloud archives, ActiveScale is uniquely capable of delivering this combination of scale, durability, and openness—thanks to its patented 2D Erasure Coding, deep integration between object storage and tape, and proven success in large-scale environments where billions of objects are written and verified across decades.

ActiveScale's unique integrated tape-based Cold Storage tier delivers:

- **Massively Scalable Disk Storage With an Optional Tape-Based Cold Storage Tier**
  Allowing customers to store petabytes or exabytes of data in an affordable way.

- **Unified Architecture**
  Active and cold data are managed under a single namespace, with lifecycle policies that automate data movement and reduce manual effort.

- **Transparent Migration**
  Data is automatically migrated across hardware generations, whether the data is stored on tape, HDDs, or NVMe drives. The migration doesn't disrupt data access and doesn't require manual intervention.

- **Extreme Durability**
  Using patented 2D Erasure Coding on tape to protect against both bit-level and storage device failures, achieving up to 19 nines of data durability with minimal storage overhead.

- **End-to-End Data Integrity**
  Every write and read is verified with checksums, and data is periodically reverified in the background.

- **Open Access**
  The system uses the S3 Glacier API and an open tape format, ensuring long-term accessibility and no vendor lock-in.

- **Audit-Ready Logging**
  Every operation—write, read, verify, move—is logged and can be exposed via reporting tools.

For deeper technical validation, see the ActiveScale White Paper or request a detailed overview session with one of our technical experts.

Real-World Use Cases

National Archives & Cultural Heritage
Governments and cultural institutions are digitizing centuries of records—birth certificates, treaties, photographs, and oral histories. These assets must be preserved for future generations, protected from media decay, and accessible even as technology evolves. A forever archive ensures that national memory is never lost to obsolescence or corruption.

ActiveScale supports this with open, documented tape formats, seamless migration across storage hardware generations, and S3 Glacier-compatible access—ensuring long-term readability without vendor lock-in or format obsolescence.

Scientific & Genomic Research
Research institutions generate petabytes of data from genome sequencing, climate modeling, space observation, and many others. This data must be retained for decades to support reproducibility, longitudinal studies, and future discoveries.

With support for billions of objects, up to 19 nines of durability, and automated background verification, ActiveScale provides the scale and integrity required for scientific data stewardship—while minimizing storage overhead through wide-stripe erasure coding.

Enterprise AI Training Data
Enterprises are realizing that their internal data—customer interactions, product telemetry, support logs, and operational records—will fuel the next generation of AI models. But if that data isn't preserved today, it can't be used tomorrow.

ActiveScale enables long-term retention of this data in a cost-effective, S3-native format, with lifecycle policies that automatically transition cold data to tape. This ensures that historical data remains accessible and intact when needed for model retraining or regulatory review.

Healthcare & Medical Imaging

Hospitals and research labs must store medical imaging, pathology slides, and clinical trial data for decades to meet compliance and support patient care. These files are large, sensitive, and must remain verifiable.

ActiveScale supports WORM (Write Once, Read Many) policies, encryption at rest, and end-to-end data integrity checks—ensuring that healthcare data is preserved immutably and securely, with minimal administrative overhead.

Legal & Compliance

In regulated industries, organizations must retain communications, contracts, and audit logs for years or even decades. These records must be immutable, discoverable, and auditable. A forever archive provides the infrastructure to meet legal hold requirements, support eDiscovery, and ensure long-term compliance without operational burden.

For more information on building a low-cost, long-term archive with ActiveScale, visit:
www.quantum.com/activescale

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Quantum delivers end-to-end data management solutions designed for the AI era. With over four decades of experience, our data platform has allowed customers to extract the maximum value from their unique, unstructured data. From high-performance ingest that powers AI applications and demanding data-intensive workloads, to massive, durable data lakes to fuel AI models, Quantum delivers the most comprehensive and cost-efficient solutions. Leading organizations in life sciences, government, media and entertainment, research, and industrial technology trust Quantum with their most valuable asset – their data. Quantum is listed on Nasdaq (QMCO). For more information visit www.quantum.com.

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