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Quantum

Your difference is in your data.™

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ActiveScale™ Object Storage

for data analytics, active archiving and long-term retention

P01296A-v03

Data is increasing in volume, value, and the potential for future enrichment

Explosive unstructured data growth has many challenges

Increasing scale and growth break classic NAS and object architectures

Managing data and data silos takes too much time

Protecting big data sets is too complex

Data must be online and accessible

Data must be securely retained for years, decades, longer

Why ActiveScale?

Addresses massive data growth with simplicity and industry's lowest TCO

Reduces administrative overhead to focus more on value creation

Simplifies and lowers DP and DR cost with a modern, efficient architecture

Enables big data repositories that users can easily access on an ongoing basis

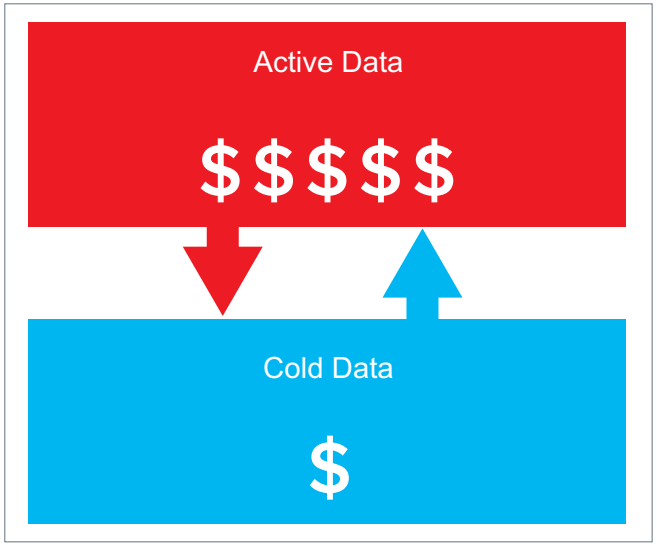
Meets security, durability needs of ongoing access, archiving and retention

ActiveScale: Object Storage Designed for the Next Era of Data

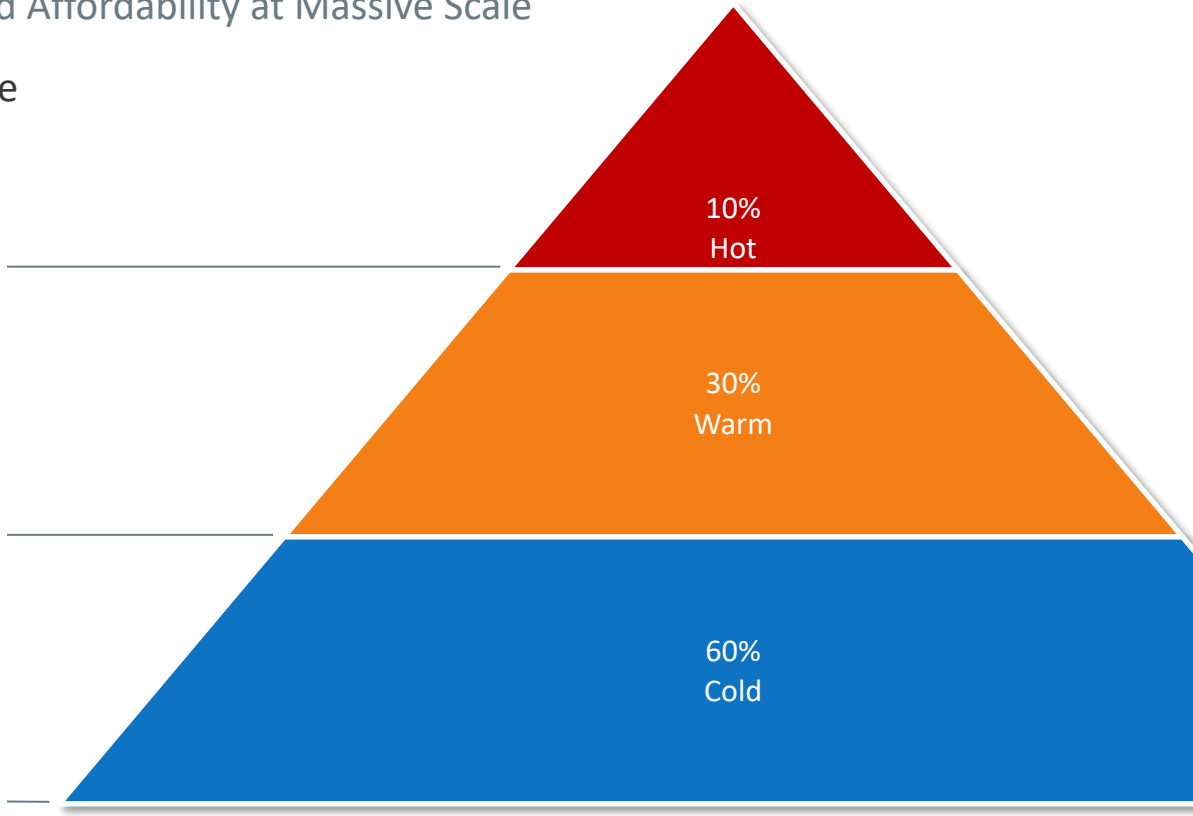
Security, Resilience, Performance and Affordability at Massive Scale

S3 Standard and Glacier Class Storage

Terabytes to Exabytes



ActiveScale Object Storage



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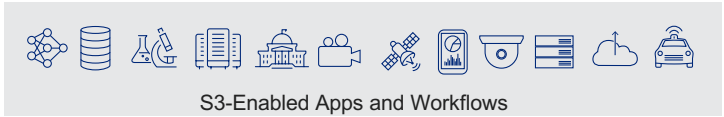
Build Your Own Private Storage Cloud

Bring the hyperscale cloud storage architecture to your enterprise

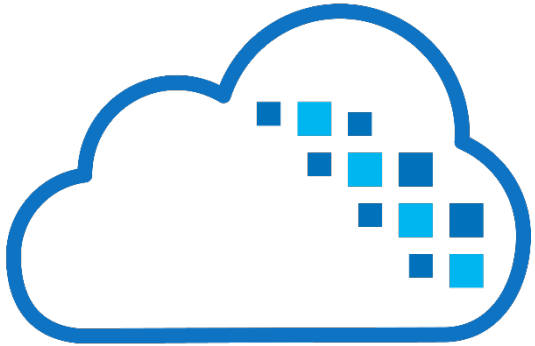
Store and protect billions of files and objects

S3 and S3 Glacier in one system

Available as-a-Service or capital purchase



S3 Standard
S3 Glacier
Lifecycle Policies



Quantum ActiveScale

The industry's 1st and only object store architected for both active and cold data

- Lowest $ per TB
- Best-in-class performance and price/performance
- Ultra-secure, green data storage
- Simple management at massive scale
- Cost predictability

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Tired of unpredictable Cloud Storage costs?

Cool off your wallet with Quantum ActiveScale Cold Storage

Is your cloud storage bill impossible to predict and breaking your IT budget?

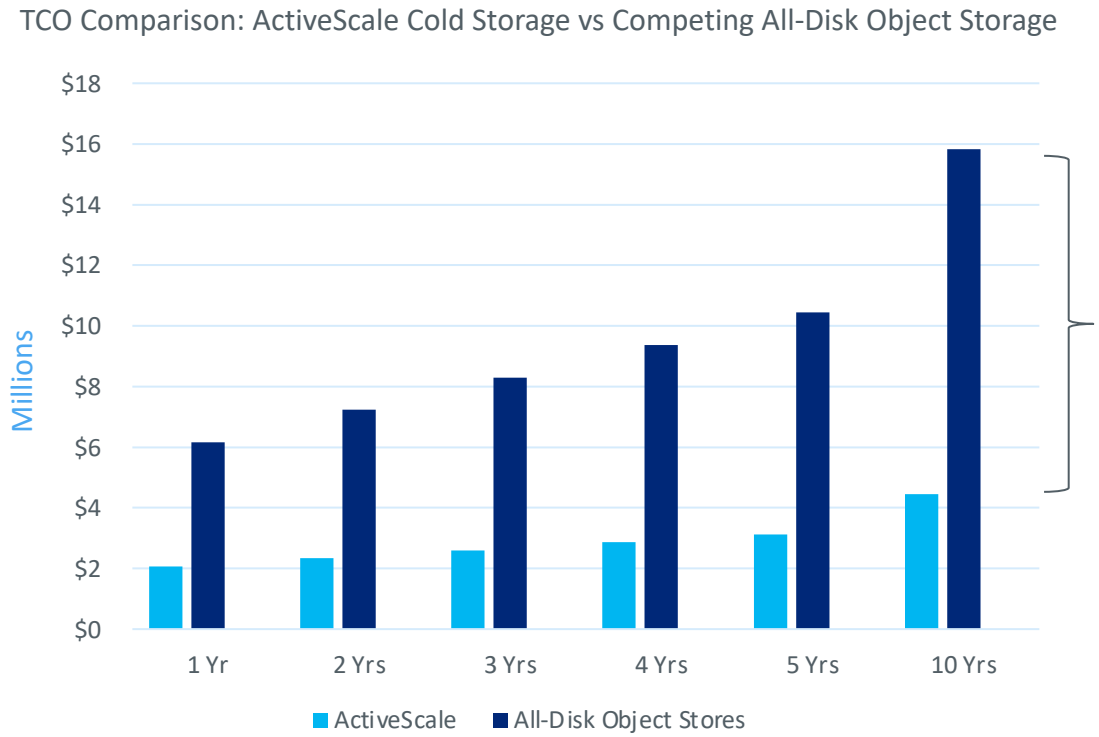
Reduce your cloud storage costs up to 60% with Quantum ActiveScale!

Build Your Own Private Storage Cloud with ActiveScale

Reduce total cost of ownership across active and cold data

Cloud Storage Challenges at Scale	ActiveScale Solves
Loss of data control	Data control and easy access
Expensive egress fees	No egress fees
Unpredictable egress and access fees	Predictable cost model
API fees	S3 API compatibility
Vendor lock in	Multi-cloud freedom
EES reporting	Minimize power, cooling, emissions
Power and cooling costs	Secure ransomware recovery and protection
Ransomware concerns	Object locking and air gapped tape
Data sovereignty concerns	Maintain data sovereignty

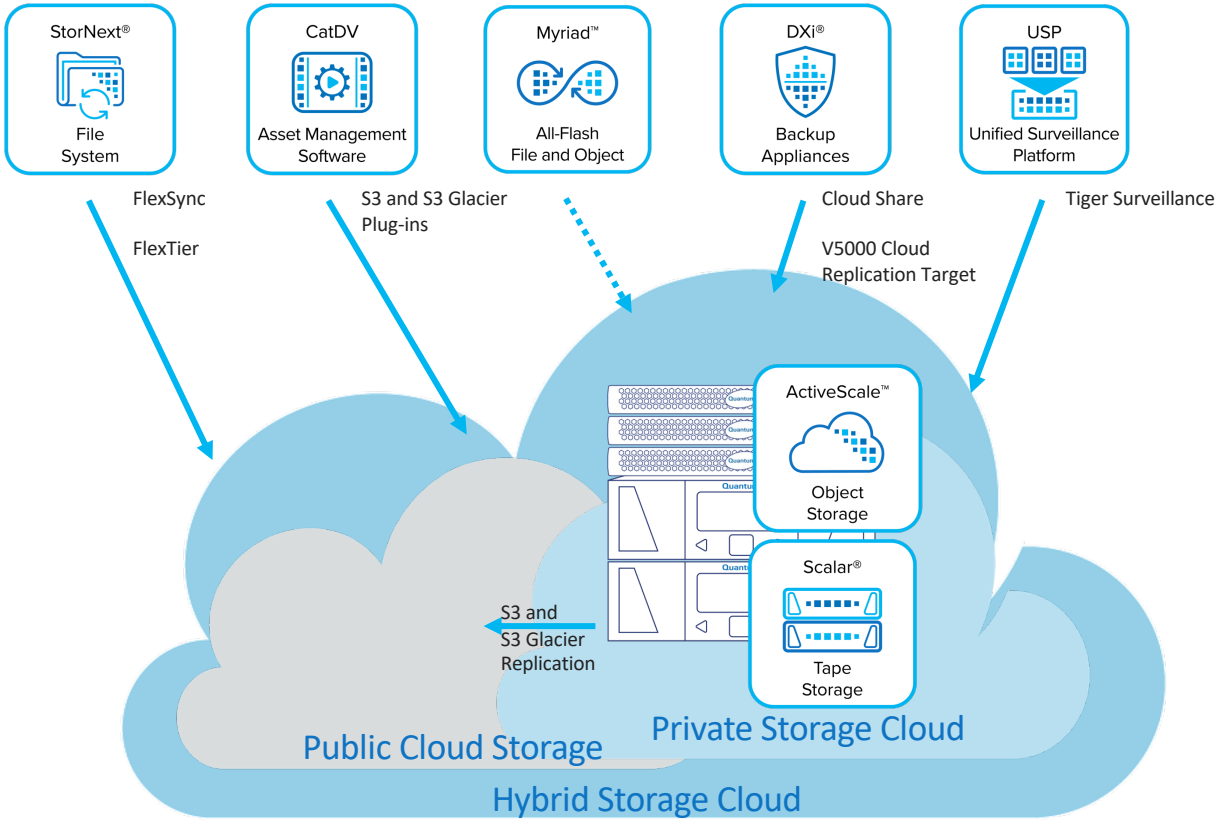
ActiveScale Cold Storage Delivers ~72% TCO Savings vs Disk-Based Object Storage



ActiveScale Cold Storage delivers $11.3M of savings over 10 years when storing 45 Petabytes

Quantum Portfolio Integration with ActiveScale

ActiveScale forms the basis for private and hybrid enterprise storage clouds



Common ActiveScale Use Cases

Long-Term Retention & Backup

As tape replacement; certified as an S3 backup target with Veeam, Rubrik, Cohesity, Commvault, Veritas, and more.

Life Sciences & Earth Sciences

As a cost-effective, long-term repository for genomics, medical and digital imaging.

Data Analysis

For logs, IoT sensor, telemetry and transactional data; Modeling and simulation, AI/ML/DL across retail, manufacturing, financial services, web-scale applications, ADAS.

Content Archive for Video, Images, Audio

For media production, distribution, and surveillance. Content can be searched, shared, and distributed.

Storage-as-a-Service

As an on-prem solution or the basis for MSP/CSP storage services

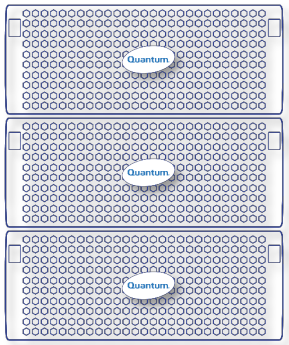
Broad Application Ecosystem for a Wide Range of Use Cases

S3/S3a Compatible Applications

Custom Developed Apps	File Sync & Share Collaboration	File Systems	HSM, Data Management & Archive	Media/Digital Asset Managers	Backup & Recovery	Analytics
Java, python, C++, C#	globus, ctera	StorNext, WEKA.IO, NASUNI	komprise, QSTAR TECHNOLOGIES	CatDV SQUARE BOX SYSTEMS, Atempo Data Protection by ASG Technologies	rubrik, COHESITY, VERITAS, VEEAM, COMMVAULT	splunk>, APACHE hadoop

Easy to enable multiple use cases

- Uniquely authenticated
- Dedicated bucket(s) per use case
- Support for millions of buckets
- Thin provisioned



ActiveScale Object Storage

ActiveScale Object Storage Platform Portfolio

Flexible deployment and purchase vehicles from Terabytes to Exabytes and beyond

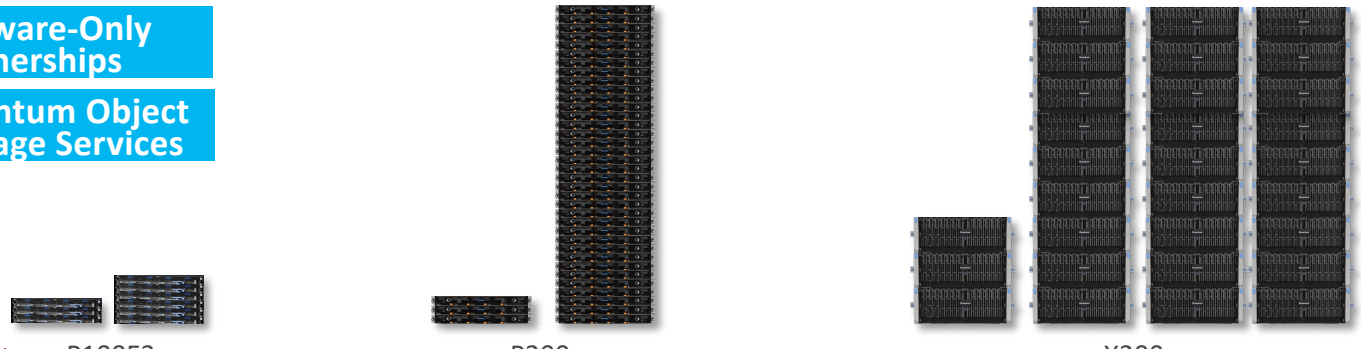
ActiveScale™

Object Storage

Appliances

Software-Only Partnerships

Quantum Object Storage Services



504 TB — P100E3 1.1 PB 470M Objects

648 TB — P200 Unlimited Active Data Unlimited Objects Unlimited Cold Data

1.62 PB — X200 Unlimited Active Data Unlimited Objects Unlimited Cold Data

Entry — ACTIVE — Raw Capacity — COLD

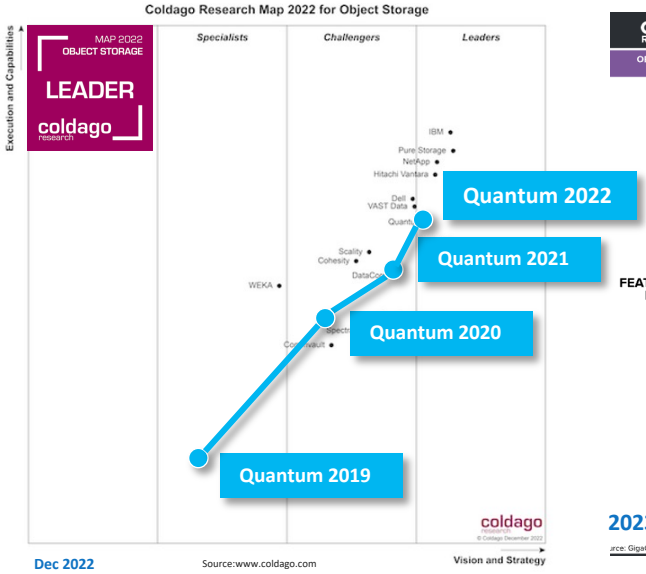
Non-Disruptive Expansion with NO Rebalancing Required

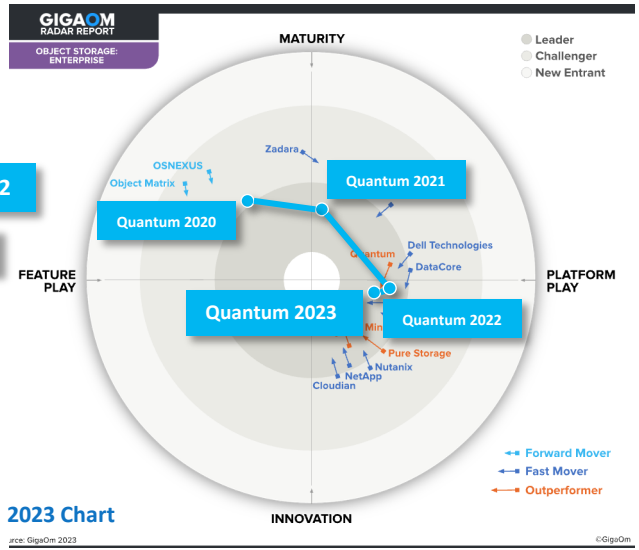
Cold Data expansion only limited by the system's maximum object count.

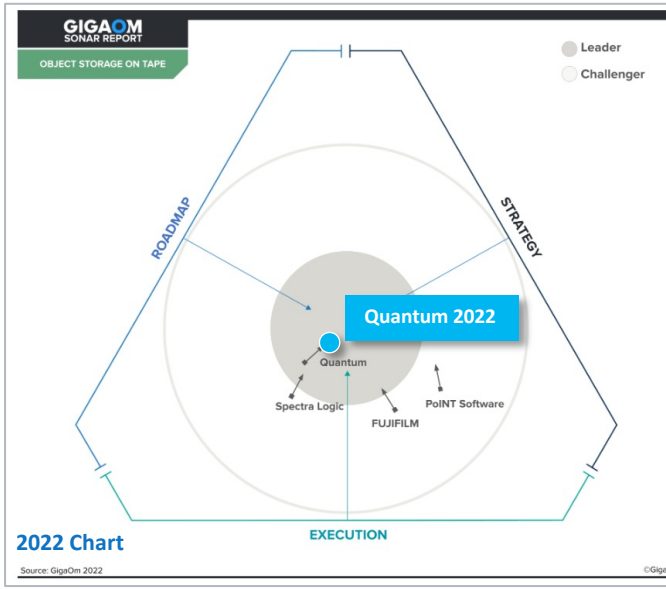
Minimum software license: 100 TB usable

ActiveScale Object Storage

Execution, Capabilities, Vision, and Strategy







Quantum Object Storage Services (QOSS)

A Simple, Affordable, Long-Term Storage Solution

Maintain Data Sovereignty and Control

Reduce Operational Costs

Unlock the Value in Your Data

Preserve Your Data for Decades

Quantum Object Storage Services include:

- Installation and integration
- Mission-critical Premium Gold support services (24x7)
- Proactive monitoring and management
- Onsite troubleshooting
- Ongoing capacity and quality assessments
- Tech refreshes and data migration as required
- MyQuantum access – customer dashboard (metrics, cases)

Installable at your data center, colocation facility, or hosted IT environment

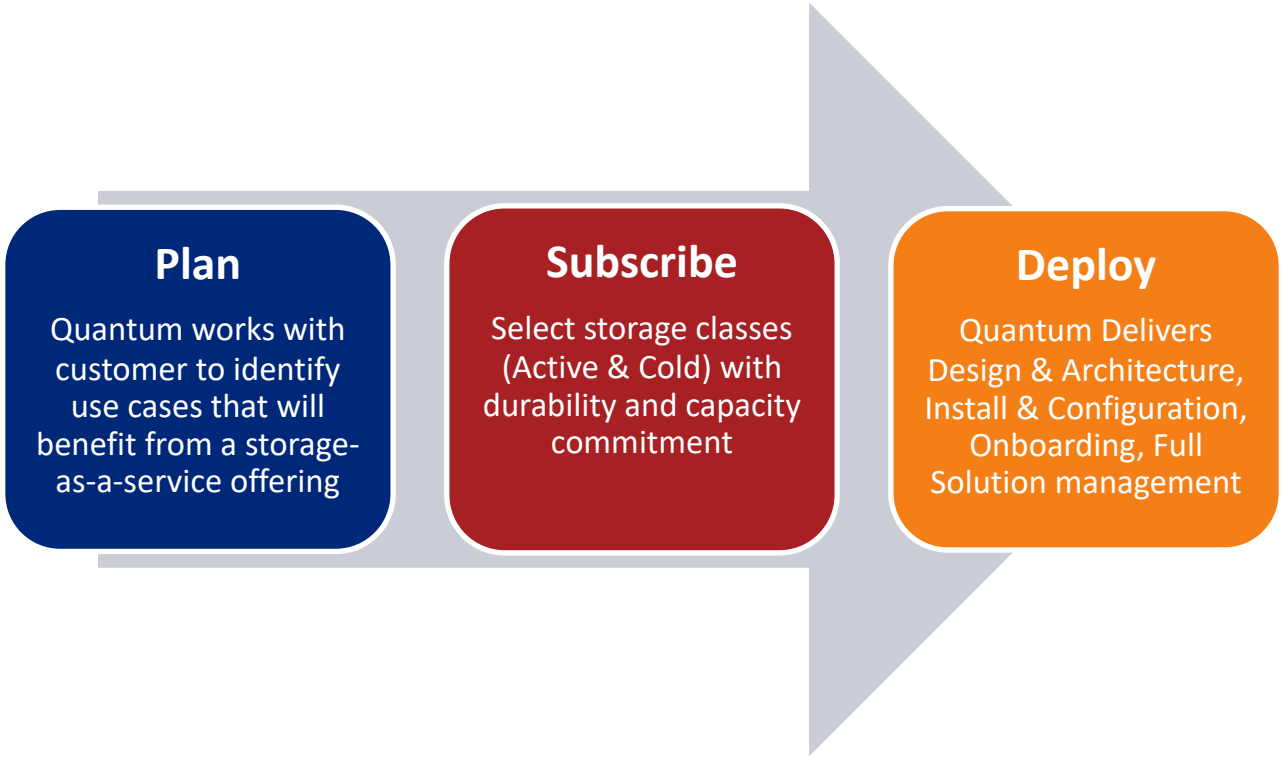
Fully Managed, As-a-Service Solutions

Quantum Object Storage Services bring the cloud experience to wherever data lives

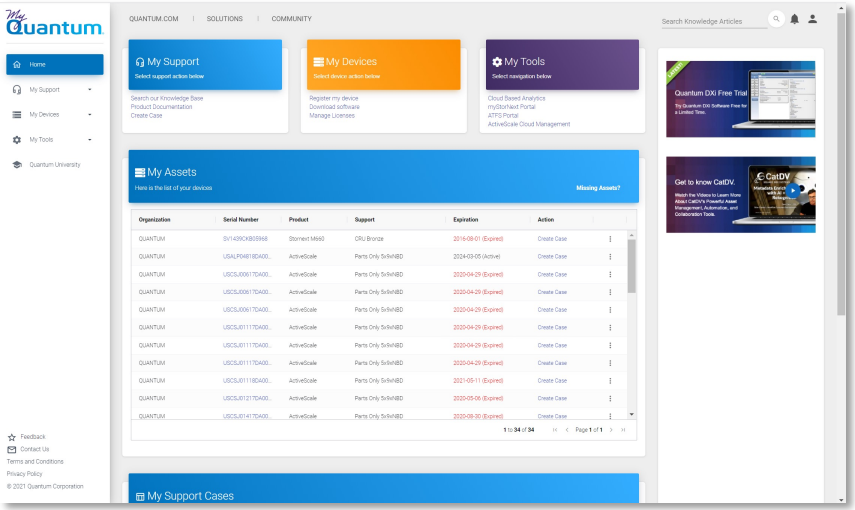
Object Storage Services	For Active Data	For Cold Data
Data Retrieval Time	Milliseconds	Minutes
How is data accessed	S3 Standard Class	S3 Glacier Class
Durability	15 9's	15 9's
List Price	$15 per TB per month No data access fees	$3 per TB per month No data access fees

Minimum commitments:
Active Data: 1 Petabyte capacity, three-year term
Cold Data: 4 Petabytes Capacity, three-year term

Purchasing and Using Object Storage Services

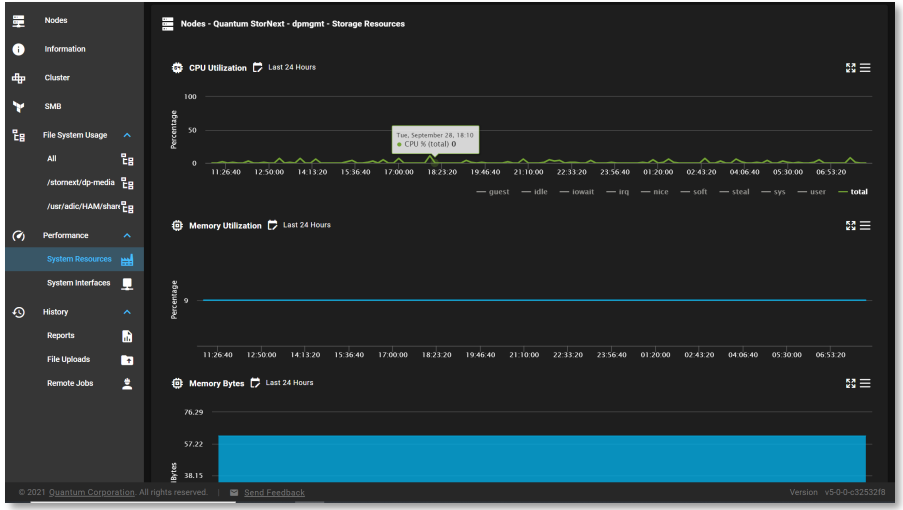


Services Delivered with Quantum Expertise and Technology



MyQuantum Service Delivery Platform

Summarizes account activity and system statistics, portal for requesting additional capacity and more



Quantum Cloud-Based Analytics (CBA)

AIOps software that captures telemetry data, monitors systems, uses predictive analytics for system maintenance

Benefits of Quantum Object Storage Services

- Fully managed by Quantum from deployment through the full data lifecycle
- All the advantages of a private cloud while minimizing business risk
- Reduces the burden on IT architecture, admin ,and procurement teams, freeing them for other tasks
- Enables organization to adopt a cloud operating model with cloud consumption/cloud economics
- Simplify long-term retention planning and growth with simple capacity upgrades

ActiveScale Sample Customers

Challenge

Outcome

Over 100 Petabytes of Genomic Data

Genomics england

- Mandate to sequence 5M genomes by 2023
- Isilon cluster couldn't scale beyond 21 PB
- Needed to scale up to 150 PBs of data

- Reduced cost per genome by 75%
- Enhanced resiliency with geo-spreading across 3 data centers
- Reduced complexity with a simple to use and manage solution

Preserving 50 Years and 15,000 Hours of Jazz Music (14 PBs)

EPFL ECOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE | METAMEDIA CENTER

- Remove risk of deterioration / obsolescence risk to valuable audio-visual archive
- Digitally preserve and enable access to researchers and the general public
- Enrich content with extensive metadata

- Long-term solution with data protection and availability
- Archives easily accessed, searched and shared by many constituents
- Cloud-level scalability and rich metadata improves value

Seamless access to their entire multi-PB asset library (11 PBs)

ILLUMINATION MACGUFF

- Keeping up with capacity for growing needs of multiple feature film projects
- Need for continued online access to all content for reuse and monetization

- Entire asset library online, at the speed, scale, durability and economics required
- Simple to manage solution supporting all digital artists and animators
- Highly available system across two data centers

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Quantum®

Your difference is in your data.

ActiveScale Cold Storage

A Scalable, Durable Architecture for Next Generation Large-Scale Archives

2D EC and the Quantum RAIL Architecture

Quantum

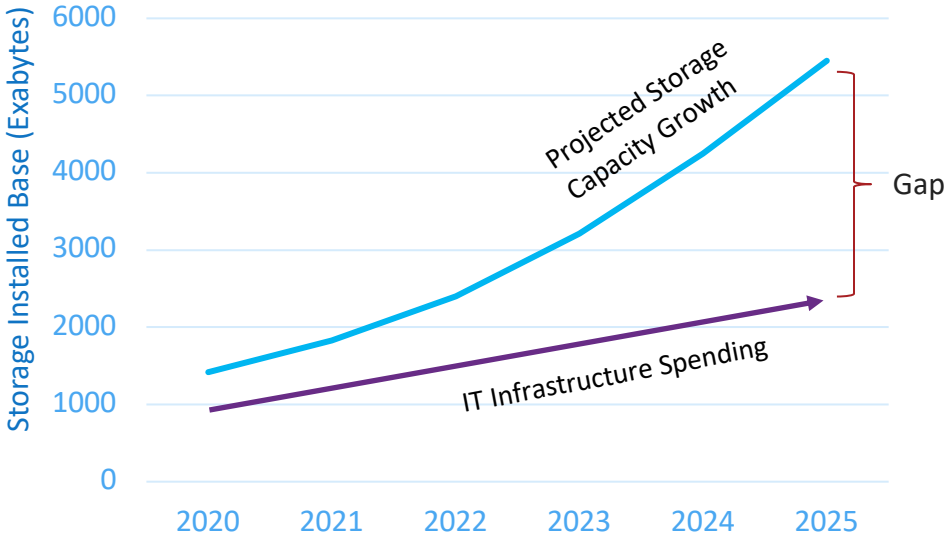
Quantum is the Leader in Hyperscale Cold Storage Archives

5 of the Top 5 Hyperscalers
use Quantum in production; 7 hyperscale customers globally

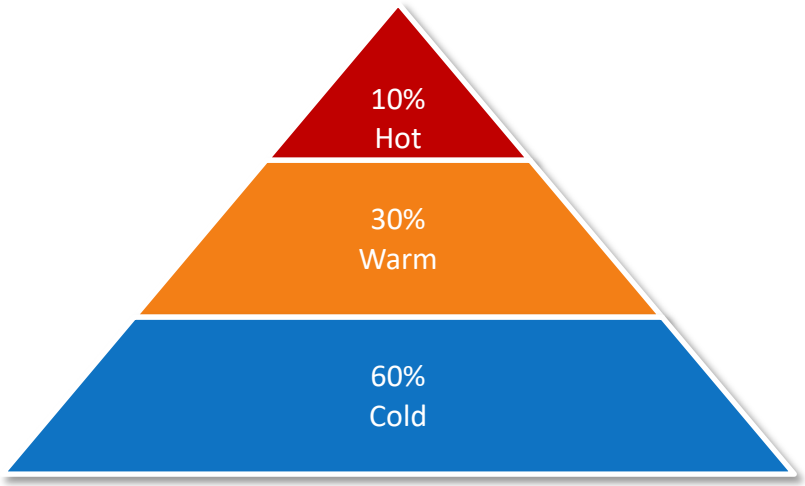
65+ Exabytes
deployed globally

Over 3M LTO tapes
under management

Data Growth Outpacing Storage Budgets, Most Data is “Cold”



Storage capacity growing 30%+ annually, IT infrastructure spend growing 10-15%*



60%* of all data is “cold”:
Inactive data that is accessed infrequently

*Source: IDC InfoBrief, sponsored by Quantum, “Data Deluge: Why Every Enterprise Needs a Cold Storage Strategy”, Doc. #US48119821, August 2021.

The Need for a New Class of Storage

- Explosive data growth, mostly unstructured
- Data contains immense value and potential for future enrichment
- Must be protected and remain accessible – for years, decades, longer
- Public cloud is expensive, data owners reluctant to give up control
- Existing file- and object-storage systems too expensive

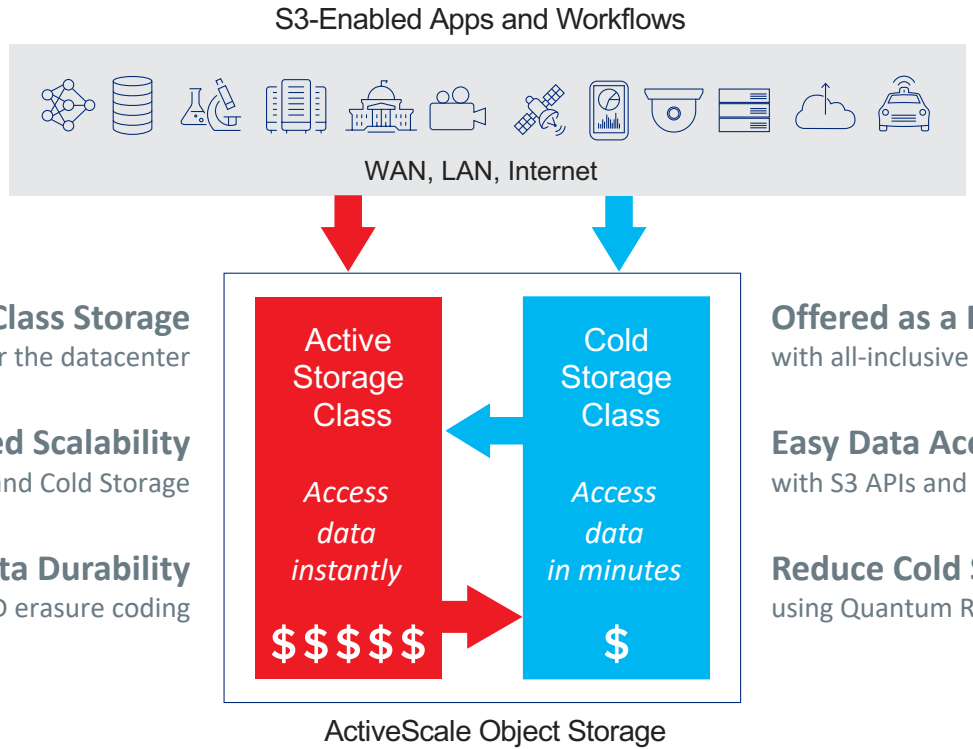
Quantum

ActiveScale Cold Storage

- **S3 Glacier Class storage** in the data center of your choice
- Retrieve objects from cold storage **in minutes**
- **No data access fees**
- **30+% savings** relative to public cloud cold storage services
- **Up to 80% savings** relative to disk-based solutions
- **100x to 1Mx better data durability** than multi-copy approaches
- **Up to 40% better storage efficiency:** Overhead as low as 15% is possible

ActiveScale Cold Storage: A New Class of Storage for Cold Data

Secure, highly durable, and extremely low-cost storage for archiving of cold data



S3 Glacier Class Storage
for the datacenter

Unlimited Scalability
of both Active and Cold Storage

Up to 19 9's Data Durability
using patented* 2D erasure coding

Offered as a Fully Managed Service
with all-inclusive pricing and no data access fees

Easy Data Access
with S3 APIs and lifecycle policies

Reduce Cold Storage Costs by 80%
using Quantum RAIL tape architecture

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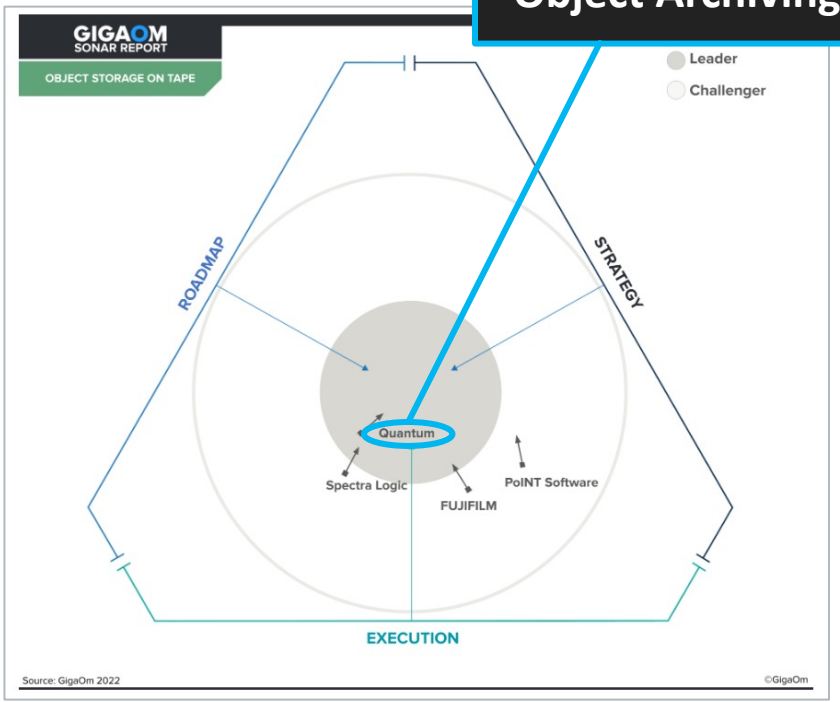
*U.S. Patent #11,216,196

Quantum Named the Leader in Object Storage on Tape

Quantum
The Leader in
Object Archiving

Industry-best marks for
Strategy, Execution, and Roadmap

"**Strengths:** Quantum offers an end-to-end object storage experience on premises with a native S3-compatible cold storage class. The solution provides advanced capabilities and ease of use with a compelling as-a-service consumption model and flexible scalability."



ActiveScale Cold Storage

Fully integrated S3 Glacier Class support

Up to 80% cost savings for cold data

- S3/S3 Glacier compatible
- Unlimited scalability
- Up to 19 9's data durability
- Available as a fully managed service

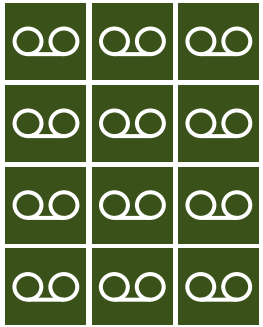
Key Innovations

- Two-dimensional erasure coding (**2D EC**) software
- The **Quantum RAIL** tape architecture
- Software-defined **Object on Tape** management

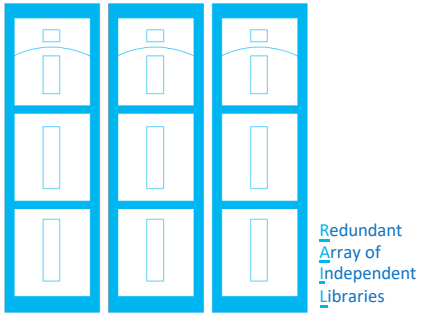
ActiveScale Cold Storage Innovations

Simultaneously maximizes access performance, data durability, and storage efficiency

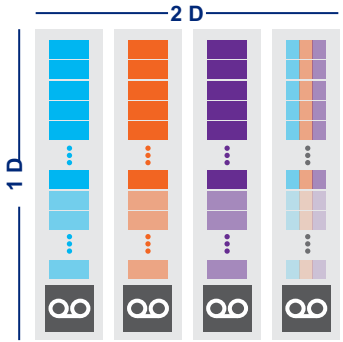
Object on Tape Management



Quantum RAIL



Patented* 2D Erasure Coding



*U.S. Patent #11,216,196

Brings Hyperscale Cold Storage Architecture to the Enterprise

The Industry's Most Advanced Cold Storage Archive Deployable Anywhere

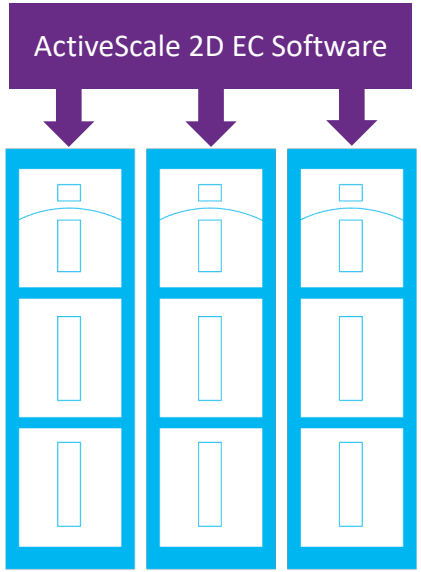
2D EC encodes data across the Quantum RAIL architecture (single site or 3GEO)

Key Innovations

ActiveScale patented* two-dimensional erasure coding (**2D EC**) software

The **Quantum RAIL** hyperscale tape architecture

Software-defined **Object on Tape** management



The Quantum RAIL Architecture

Redundant Array of Independent Libraries

Achieve new levels of performance, durability, and storage efficiency

Simultaneously maximizes

- data access performance,
- data durability, and
- storage efficiency

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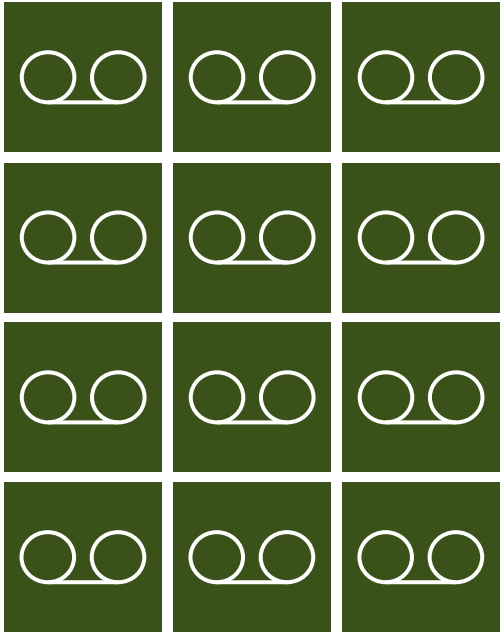
*U.S. Patent #11,216,196

ActiveScale Cold Storage

Software-defined object on tape management

OUTSTANDING TAPE ECONOMICS

- Lowest cost storage option
- Longest life span (30+ years)
- Ultra-low power consumption
- Most reliable media
- Strong capacity roadmap
- Air-gapped storage
- Continued cost leadership for the next decade



SIMPLIFIED TAPE MANAGEMENT

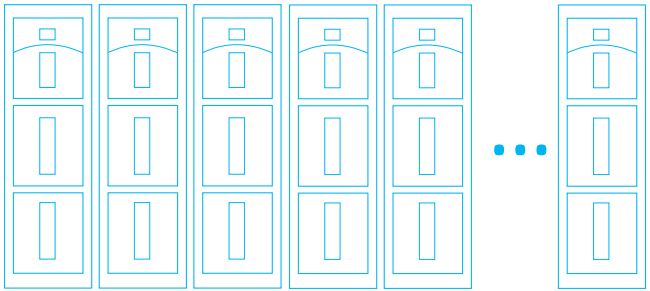
- Fully integrated into software-defined workflows
- No handling of tape media
- Intelligent, programmatic use
  - 2D EC across all tape resources
  - Architected for long reads/writes
- Simple serviceability of the Quantum RAIL architecture
- As-a-Service solution with Quantum Object Storage Services

The Quantum RAIL Architecture (Redundant Array of Independent Libraries)

Results in the Lowest TCO Solution

Deploy multiple, smaller libraries in an array

Libraries function independently,
but are redundant with others in the array



Scale-out architecture

- Performance and availability increase with each library added, scale linearly

Simplified design

- Higher reliability, simpler installation
- 100% customer serviceable

Modular, flexible footprint

- No contiguous space requirement
- Can purchase in small increments

Protect across sites

- 2-site replication and 3-site geospread configurations available

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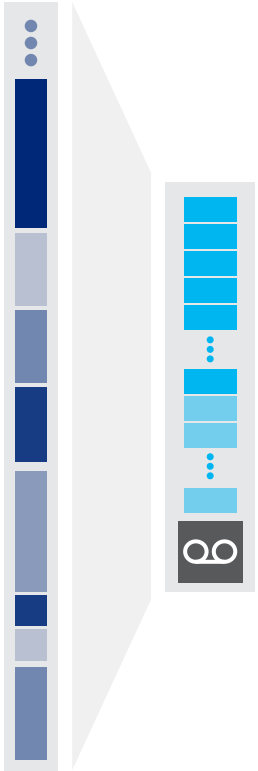
Patented* Two-Dimensional Erasure Coding (2D EC)

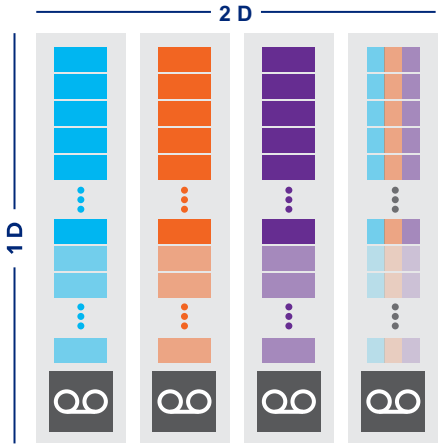
Industry-Leading Durability, Performance, Availability, and Storage Efficiency

Aggregated container of objects staged in Active Storage free space…



…written as a single erasure coded stream to tape.

Multiple independent streams written across multiple tapes, tape drives, tape libraries, data centers…



…with cross-tape parity written to one or more tapes, tape drives, tape libraries, data centers.

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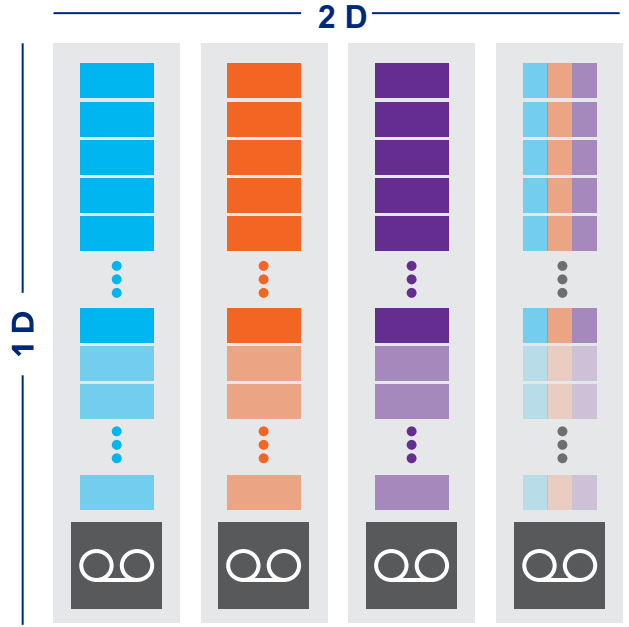
*U.S. Patent #11,216,196

Two-Dimensional Erasure Coding (2D EC)

Conceptually, its simple

1D: Aggregate multiple objects into a larger container
Write shards of *data* and shards of *parity* to a tape

2D: As multiple streams (data+parity) are written to multiple tapes, write cross-tape parity shards to additional tapes



Why?

- Single tape read to access and restore objects
- Within-tape parity protects against most data read errors
- Cross-tape parity protects against tape and library failures
- Overhead as low as 15%
- Durability as high as 19 nines

Patented* 2D Erasure Coding (2D EC)

Designed by Quantum Tape and Object Storage Experts

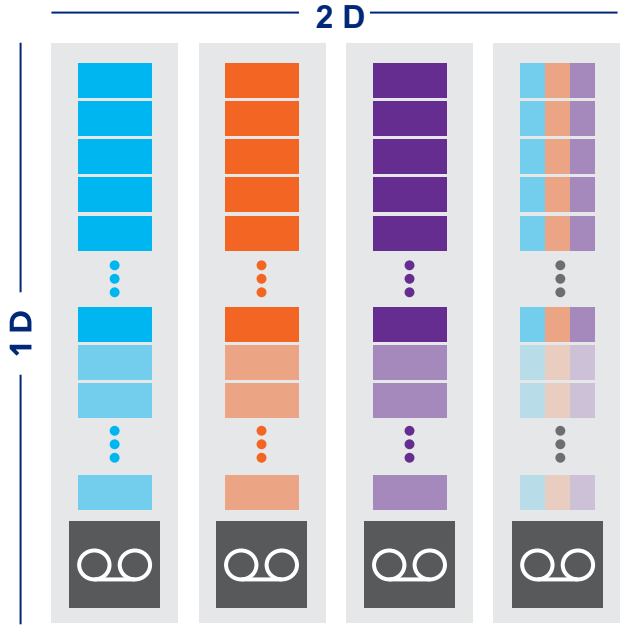
Optimized for the characteristics of tape

- Instant acknowledgement, strong consistency, robust data protection using erasure-coded disk-based staging area
- Aggregated object containers for streamed TB writes
- Ordered read queues for streamed object recovery
- Objects restored in minutes from a single tape

Industry-best availability, durability, efficiency

- Simplified recovery from soft tape errors
- Elegant recovery from multiple tape failures
  - Lose up to three tapes without losing data
- End to end data integrity checking at time of each write
- Proactive periodic tape checking
- 3GEO support for ultimate availability and protection

Fully configurable according to use case characteristics, performance requirements, cost constraints



Up to 19 9's for 100x to 1Mx better data durability**
40% greater storage efficiency**
As low as 15% overhead in wide-spread configurations

***Relative to multi-copy or replication*

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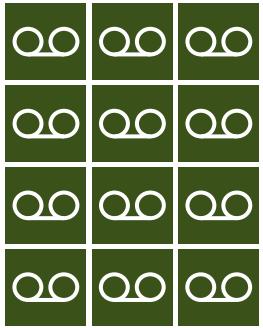
*U.S. Patent #11,216,196

ActiveScale Cold Storage Innovations

Simultaneously maximizes access performance, data durability, and storage efficiency

Object on Tape Management



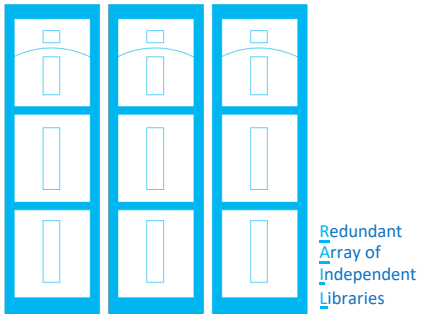
Integrated staging to disk

No handling of tape media

Intelligent, programmatic use

Architected for long reads/writes

Quantum RAIL



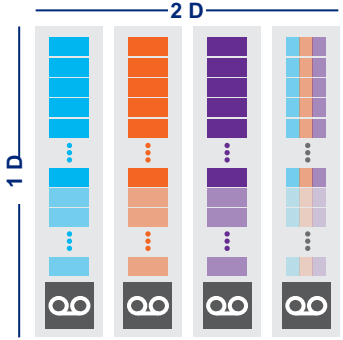
Scale-out architecture

Designed for RAS

Modular, flexible footprint

Multi-site protection

Patented* 2D Erasure Coding



Single tape read data access

Fully protects against tape and library failures

Overhead as low as 15%

Durability up to 19 9's

*U.S. Patent #11,216,196

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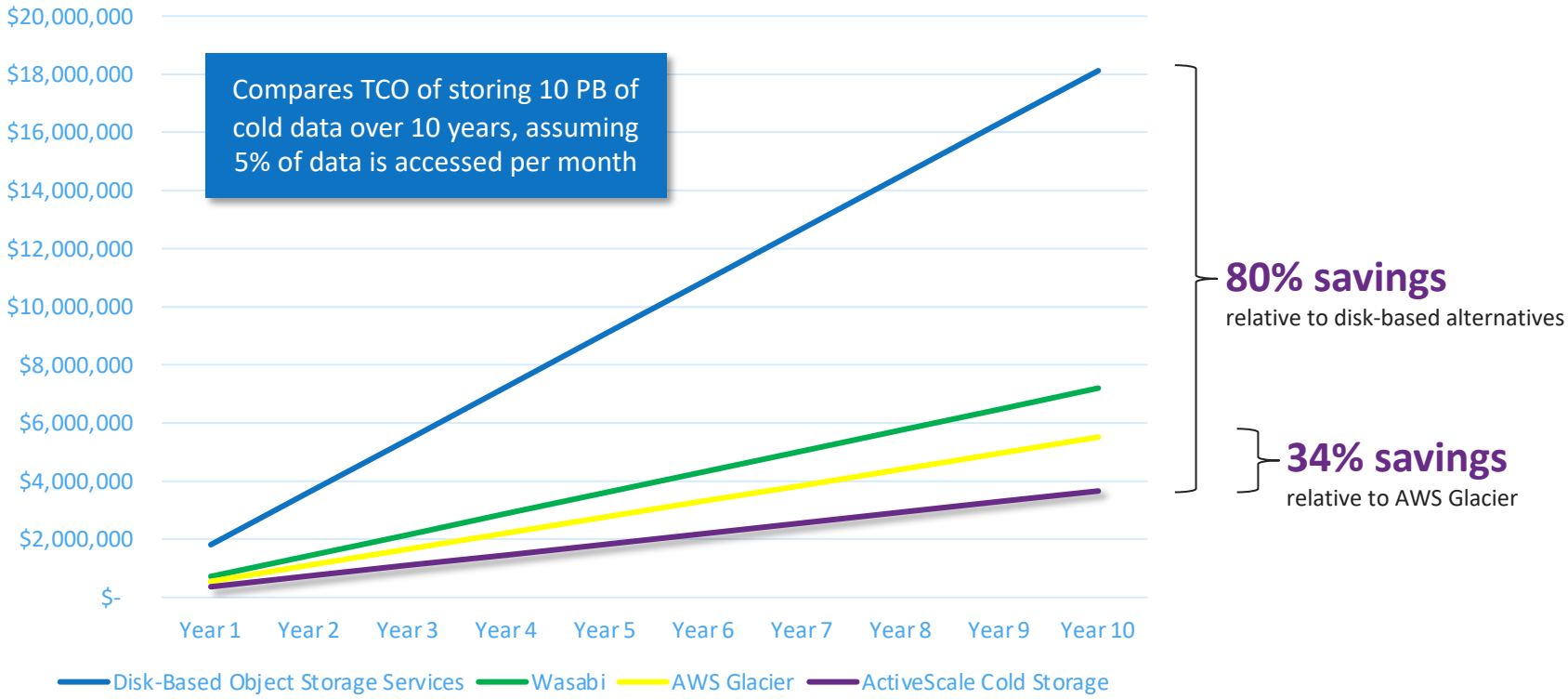
Example: 7-library RAIL setup

- 62PB RAW → 50PB usable
  - 2D EC Overhead = 1.25
  - Across-Tape EC: 21/3 (=18+3) & Within-Tape EC: 102/4
- Can support up to 3 simultaneous tape failures
- RAIL architecture protects against 1 tape library going down (e.g. robot failure)

	ASCS with 2D EC	1-Copy	2-Copy	3-Copy
Overhead	1.25	1.0	2.0	3.0
Durability	16 Nines	3 Nines	6 Nines	9 Nines

ActiveScale Cold Storage Reduces Cold Data Storage Costs by 80%



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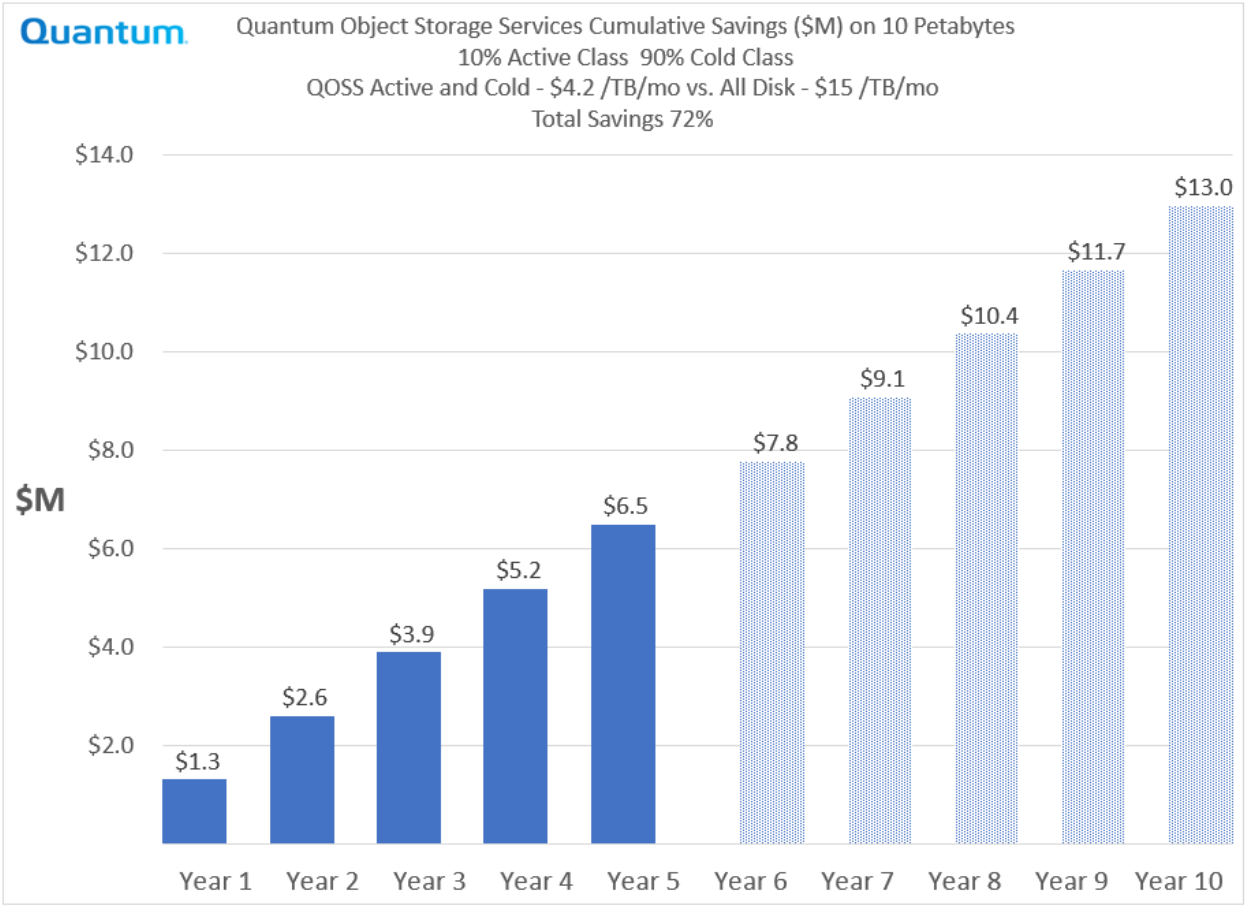
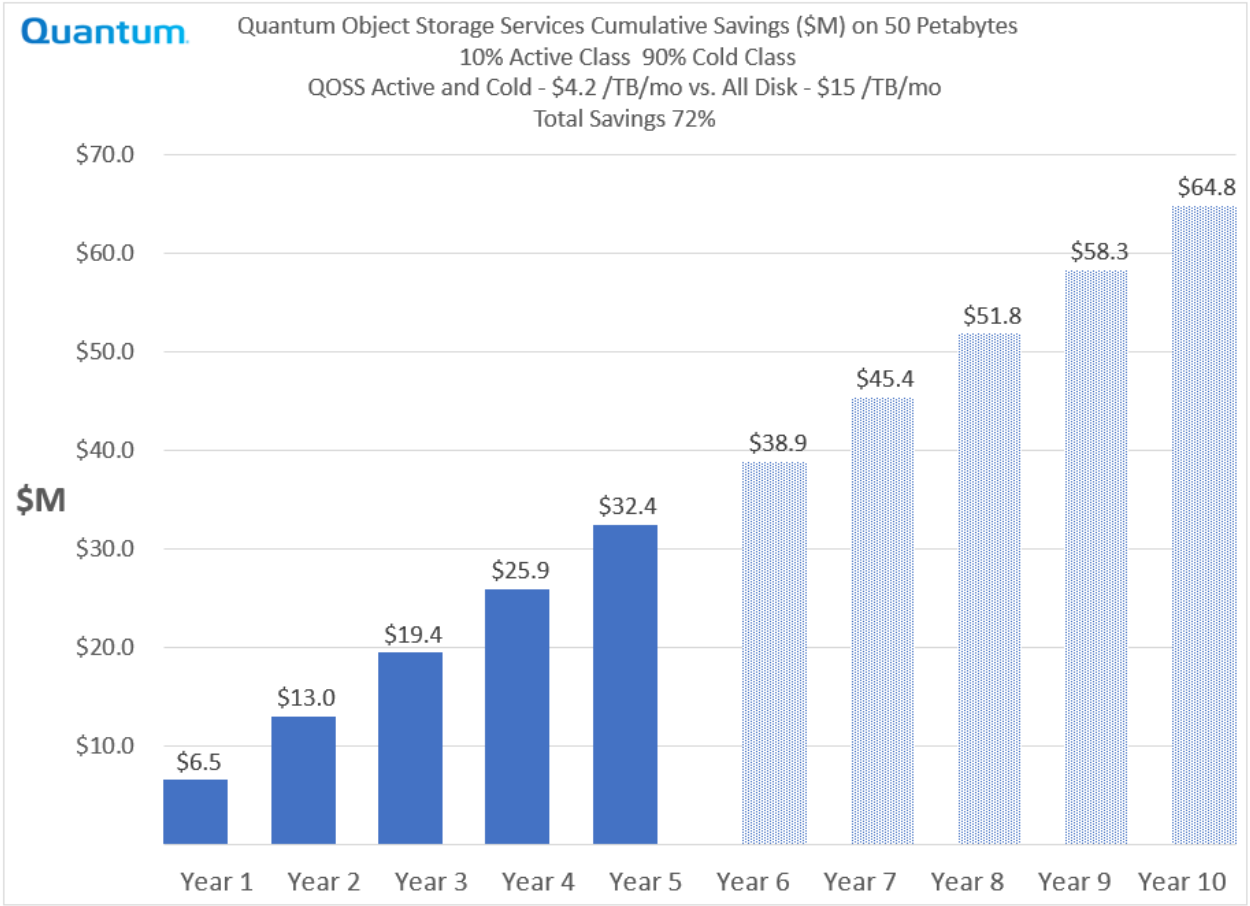
Quantum Object Storage Services

TCO Analysis (List Price)



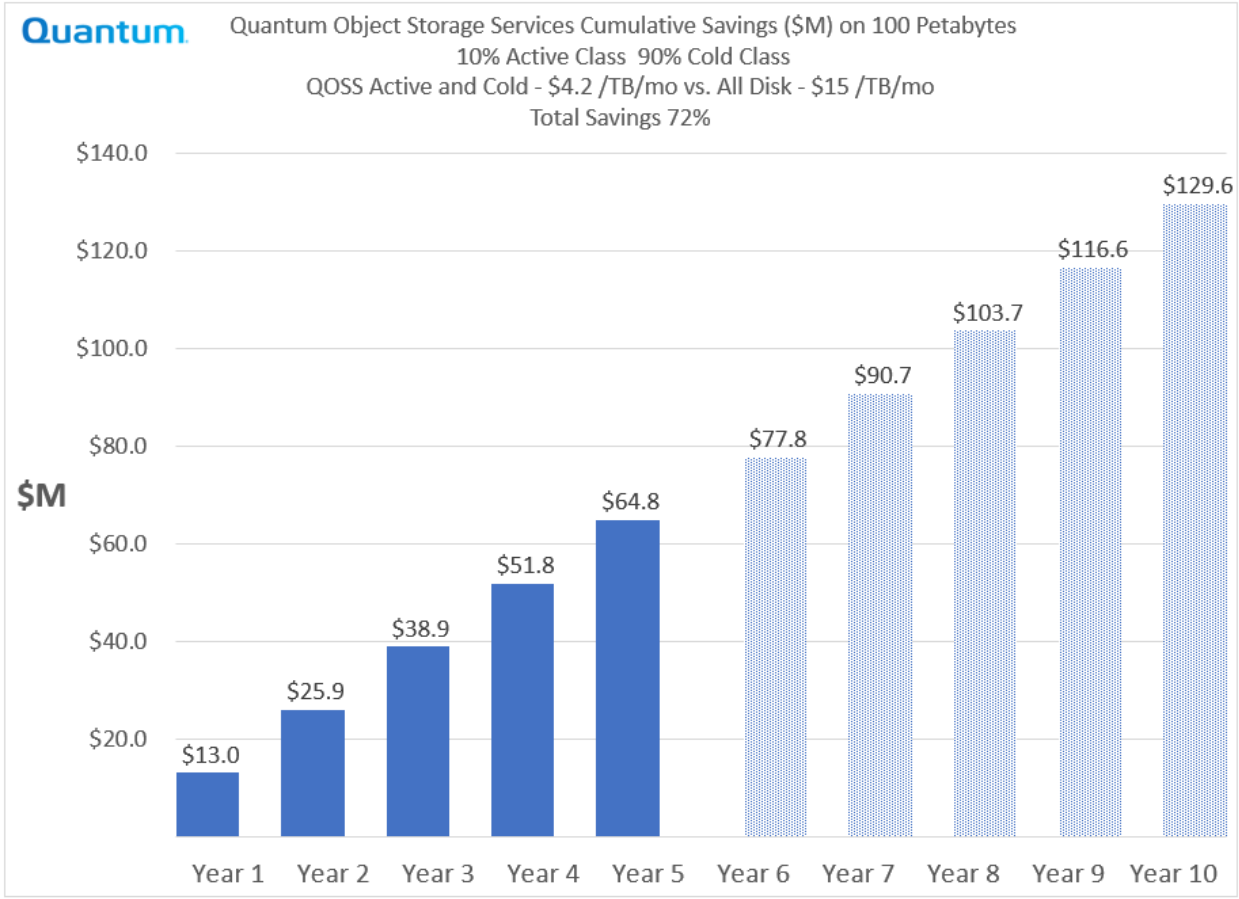
Quantum Object Storage Services

TCO Analysis (List Price)



Quantum Object Storage Services

TCO Analysis (List Price)



ActiveScale Cold Storage Ecosystem

Currently Qualified Solutions

File Systems

Quantum StorNext

Media Asset Management

Quantum CatDV

Unstructured Data Management

ATEMPO (Myria)

NODEUM

STARFISH

Backup and Recovery

COMMVAULT

VERITAS

ATEMPO (Tina)

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ActiveScale Cold Storage and Quantum Object Storage Services

Key Business Outcomes

Address massive data growth and reduce cold storage spend by 80%

Preserve and protect your data for decades, while maintaining control and security

Unlock value in massive cold data sets without expensive access fees

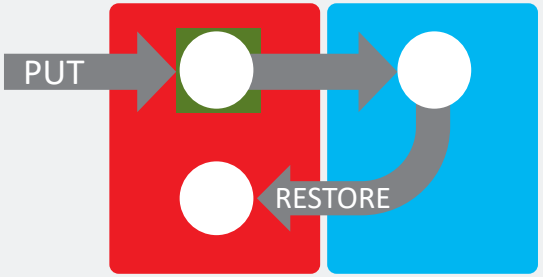
S3 Storage Classes and Lifecycle Policies

Simply integrate into existing and emerging workflows

S3 Standard, S3 Glacier-compatible

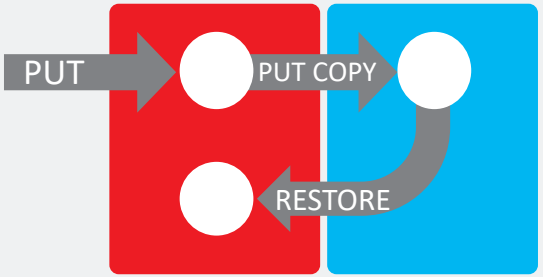
PUT of objects to S3 Glacier are first erasure coded to Active Storage free space for immediate acknowledge and consistency

PUT an object directly to S3 Glacier



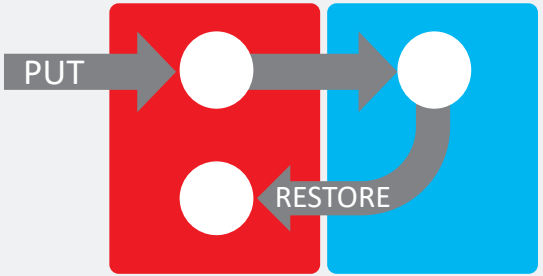
PUT an object to S3 Standard Class

PUT COPY to S3 Glacier Class



PUT an object to S3 Standard Class

Transition via Lifecycle Policy to S3 Glacier Class



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ActiveScale Cold Storage is Not an “S3-to-Tape Gateway”

S3 Tape Gateways	ActiveScale Cold Storage
✗ Provide an S3 interface that goes to a file system or RAID, then is copied to tape	✓ Is S3 Glacier Class Storage; PUT, GET, RESTORE, use lifecycle policies
✗ Uses ‘multi-copy’ – or no protection – for files stored on tape (high data loss risk)	✓ Patented* 2D EC is 100x to 1Mx better data durability (data loss risk is almost zero)
✗ Overcoming data loss risk means make 4 copies of data, storage overhead is 300%	✓ Lose up to three tapes without losing data, with storage overhead as low as 15%
✗ Multiple namespaces, multiple vendors, hard to manage	✓ Single namespace, single system, single vendor, manage Exabytes easily

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*U.S. Patent #11,216,196

ActiveScale Cold Storage ISV Certification Program

Extends existing ActiveScale program

CERTIFICATION RESOURCES

- Functional Virtual Machine (FVM) available today
- Staffed certification lab to support:
  - Self-certification
  - Co-engineering
  - Quantum-led certification of 3rd party software
    - Requires ISV kit and test plan

PRODUCT AVAILABILITY

- Generally Availability today (6.1 OS)
- Opportunities for:
  - ISV Ecosystem Press Release(s)
  - Solution Briefs / Web Pages / Reference Architectures
  - Joint marketing events and activities

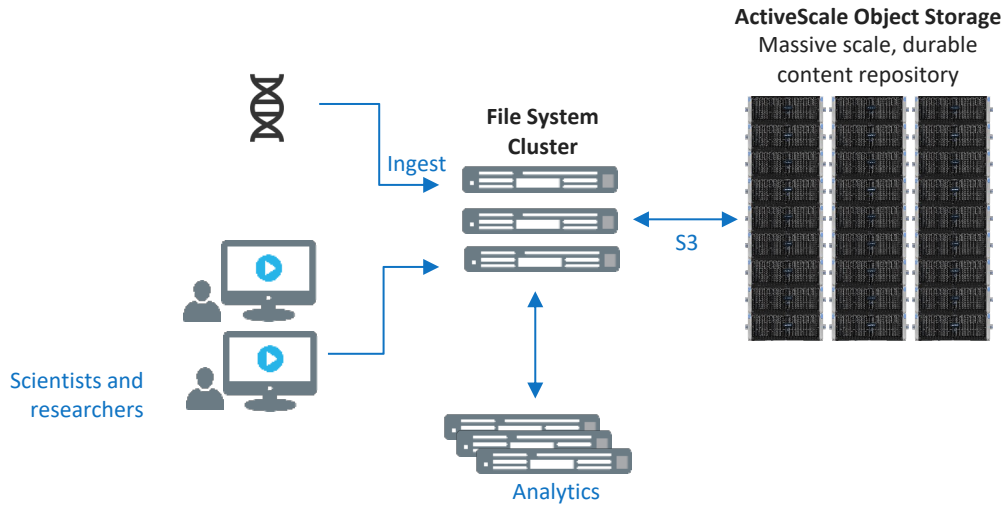
ACTIVESCALE FVM REQUIREMENTS

- OVA format
- VMware
- 12GB RAM
- 2 virtual CPUs
- Storage
  - Thick provisioned: 1 TB storage
  - Thin provisioned: (consumes storage as needed)

ActiveScale Use Cases

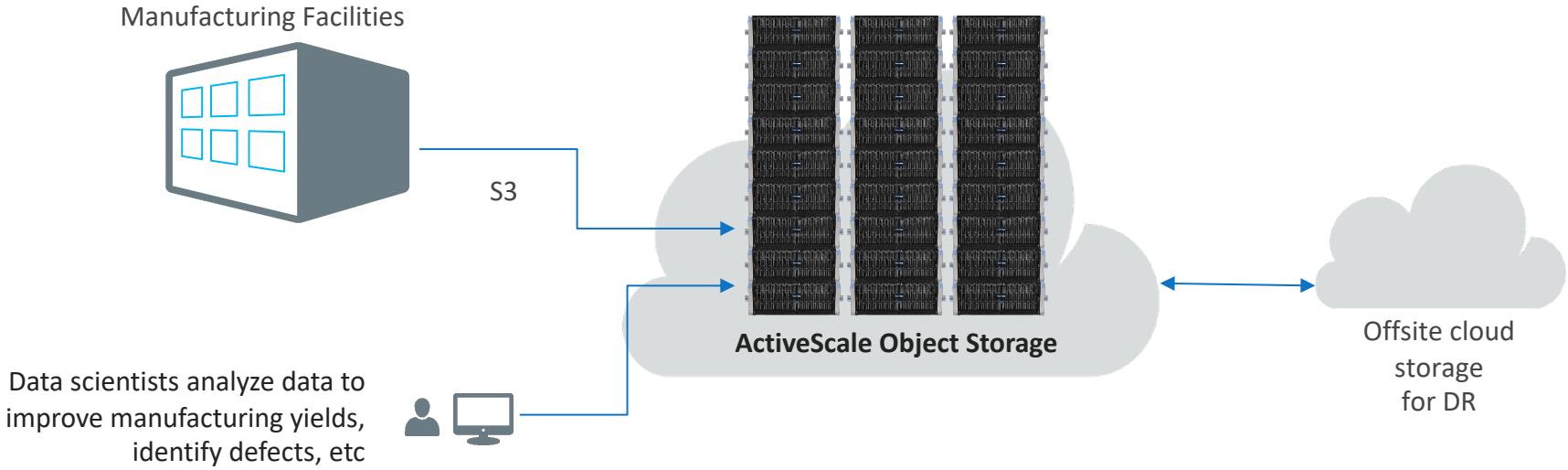
Quantum

Storage Repository for Genomics Sequencing Data



- ✓ Protect and preserve research data
- ✓ Best-in-class performance
- ✓ Retrieve data from ‘live’ archive

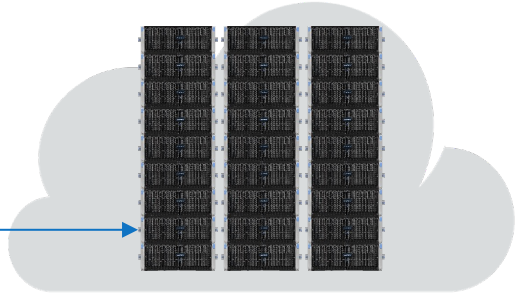
Data Lake for Manufacturing “Big Data” Analytics



Addressing Business Requirements for Data Protection, Compliance, Retention

As part of 3-2-1-1 Data Protection Infrastructure

- ✓ Ensure business continuance
- ✓ Meet any RPO and RTO
- ✓ Protect against system issues, disasters, and ransomware
- ✓ Avoid public cloud egress charges



ActiveScale Object Storage
Long-term archive storage

DXi Backup Appliances
High-Speed Backup, Instant Recovery

Scalar Tape Storage
Offline copy to protect against ransomware

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ActiveScale in Backup and Recovery Environments

Quantum

Solutions for Data Protection and Strengthening Cybersecurity

Maximize recovery, cyber resilience, and efficiency

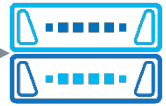
Multi-layered data protection from terabytes to exabytes

- **3** copies of your data on
- **2** different media with
- **1** copy offsite and
- **1** copy immutable/offline

Myriad
All Flash File and Object

ActiveScale™
Object Storage

DXi®
Backup Appliances



Scalar®
Tape Storage

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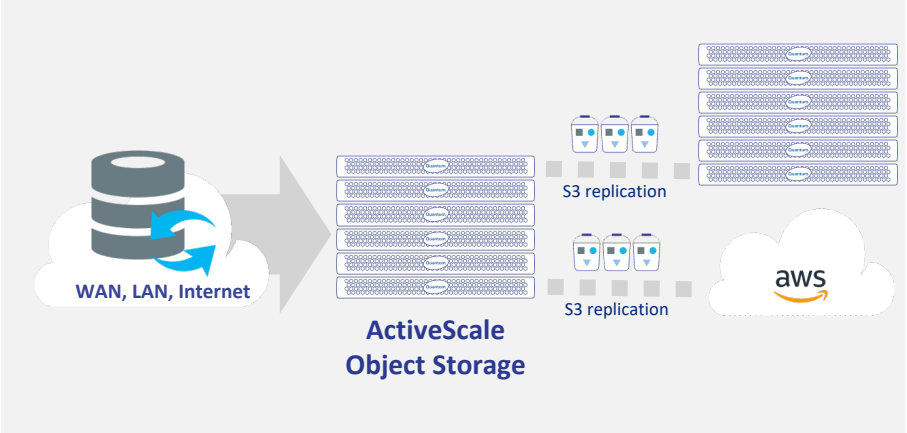
Why ActiveScale for Backup?

For many, object storage is the new tape

Extreme Availability

- Simple-to-manage onsite or offsite backup target
- Always online for easy recovery
- Accessible over distance
  Disaster- and failure-tolerant
  - Geospreading across 3 GEOs
  - Replicate to ActiveScale or to the cloud



Highly Secure

- Data exclusively accessible by backup process
- In-flight and at-rest encryption
- Immutable object locking and versioning

Long-Term Durability

- Proactive data scrubbing guarantees data quality over time

How Does ActiveScale Help Protect Against Malware/Ransomware?

Small attack surface

- Data only accessible by API; No end user access to OS
- Fine-grained control of user access rights (i.e., Put, Get, Delete, etc.)
- Admin does not have access to end user credentials
- Admin cannot access or delete user data

Immutable, versioned, encrypted buckets and objects

- Object Lock prevents deletion, overwriting of data
- Versioning provides multiple point-in-time copies
- Data encrypted in-flight and at-rest

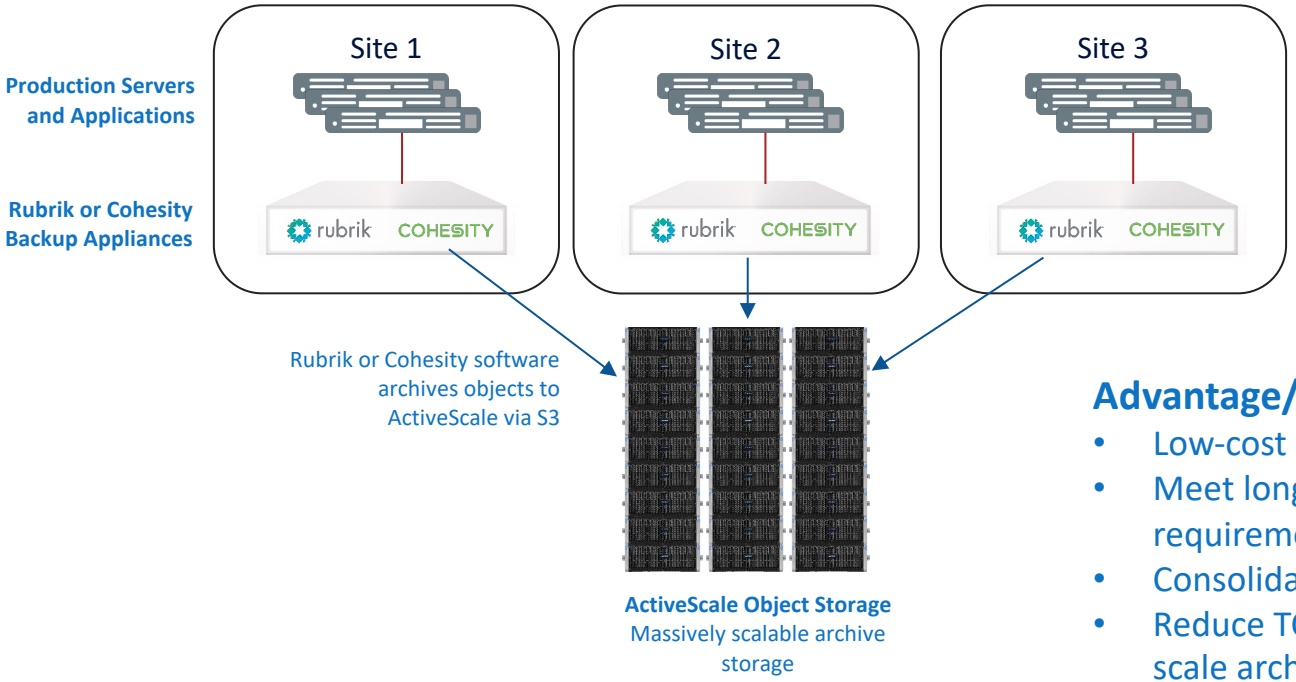
Traceability

- S3 logging provides detailed log of all access requests

Backup copies and replication

- Often, ActiveScale objects are intended as secondary, offsite data copies
- Data may also be replicated to another ActiveScale system or to the public cloud

ActiveScale Object Storage as an Archive for Rubrik or Cohesity



Advantage/Benefits

- Low-cost online archive
- Meet long term compliance requirements, without tape
- Consolidate and replace tape
- Reduce TCO via easy to manage PB-scale archives

Use Cases - ActiveScale and Veeam

Quantum

Why ActiveScale for Veeam Backup?

Veeam Ready Object with Immutability Solution

Easy to Deploy, Manage, and Grow

Extremely Available

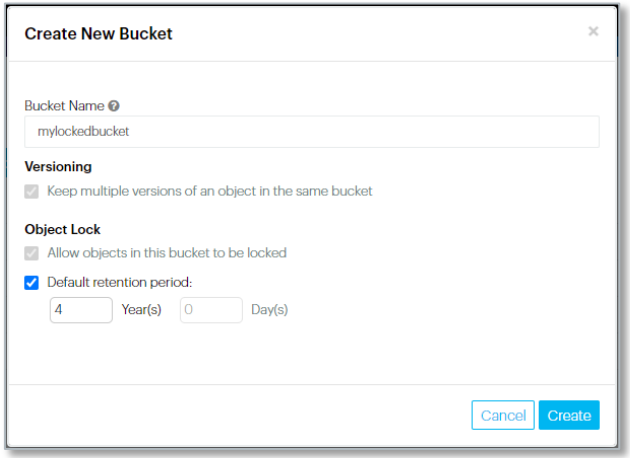
- Always online, disaster- and failure-tolerant
- Accessible over distance for an easy offsite backup target

Highly Secure

- Immutable object locking and versioning
- In-flight and at-rest encryption
- Data exclusively accessible by backup process

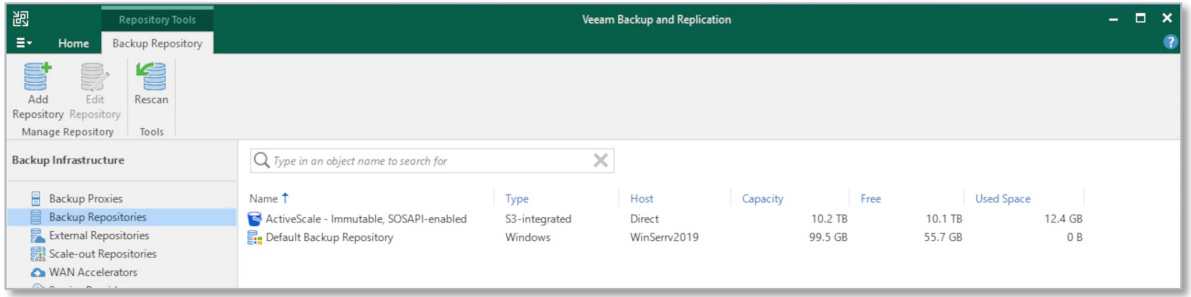
Long-Term Data Durability

- Proactive data scrubbing for data quality over time



Immutable object locking and versioning

Make objects undeletable and unmodifiable for a specified period



Integrated capacity reporting with Veeam Smart Object API (SOSAPI)

Simplified monitoring of capacity usage of Buckets dedicated to Veeam backup repositories

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How Does ActiveScale Help Protect Against Ransomware?

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- Versioning provides multiple point-in-time copies
- Data encrypted in-flight and at-rest

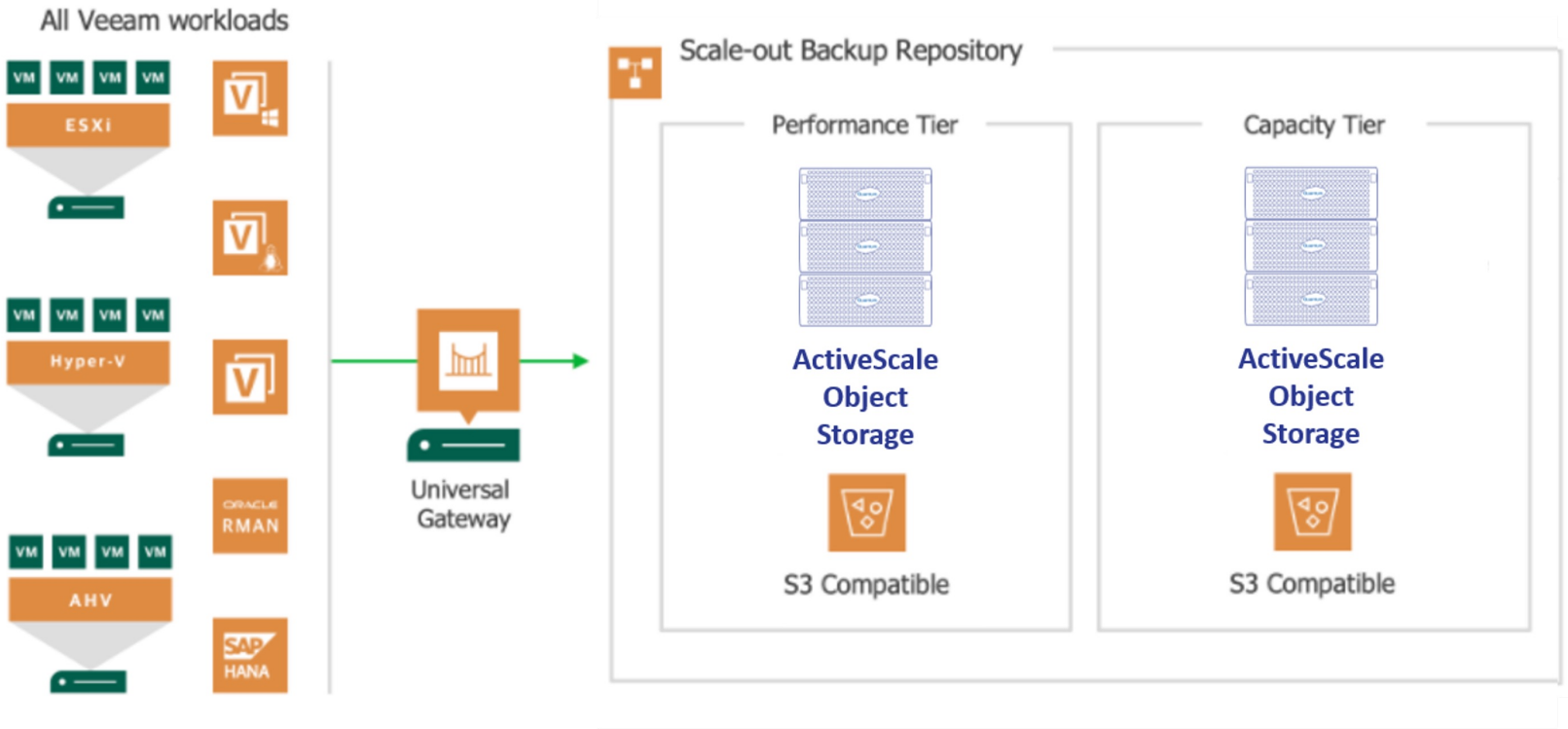
Traceability

- S3 logging provides detailed log of all access requests

Backup copies, replication, and geospreading

- Often, ActiveScale objects are intended as secondary, offsite data copies
- Built-in replication to another ActiveScale system or to the public cloud
- Geospreading across 3 geographies for built-in disaster tolerance

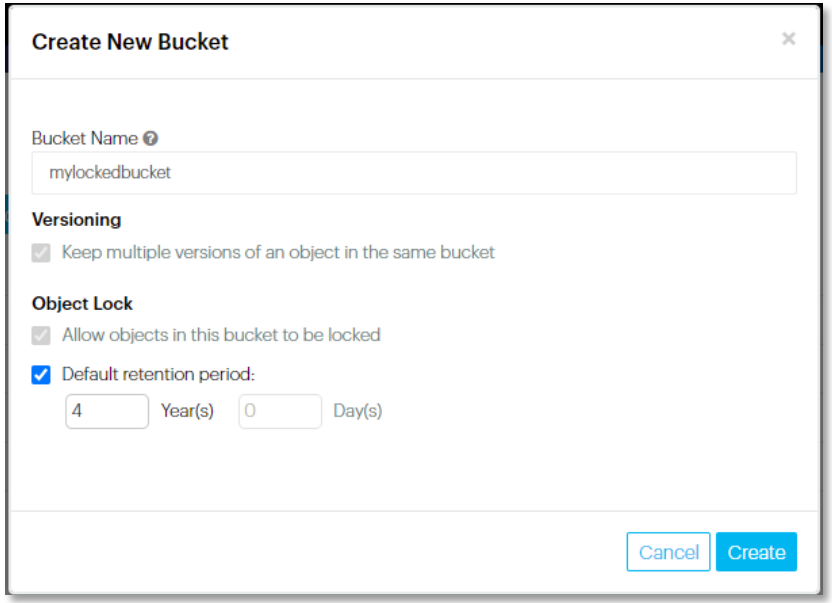
ActiveScale and Veeam



ActiveScale S3 Object Lock Support

Immutability on a per bucket and per object basis

Make objects undeletable and unmodifiable for a specified period



Combats ransomware and rogue actors

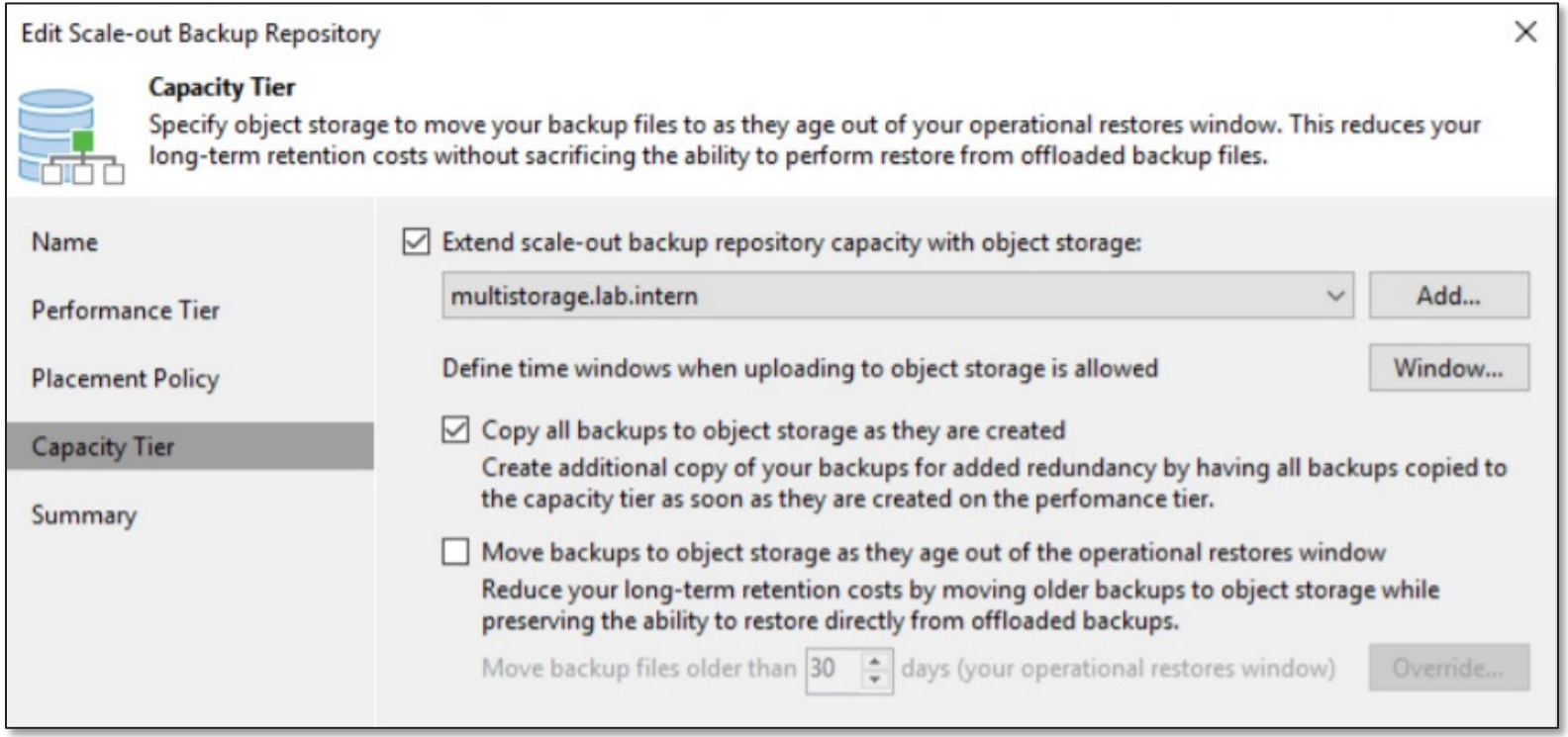
Prevents accidental deletion

Keeps history of data sets and records

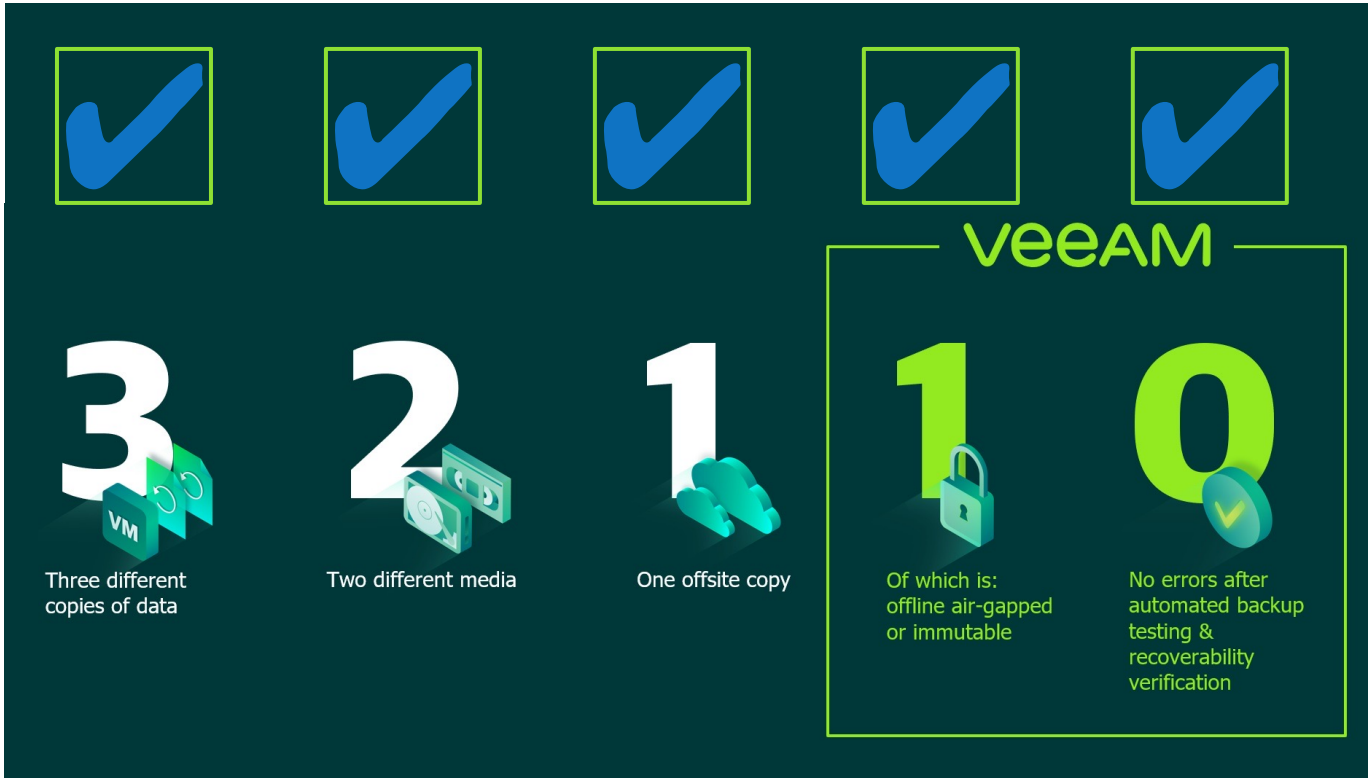
Prove that data is not tampered with

ActiveScale in a Veeam Environment

Create a copy or transition backups to long-term retention



Check all the Boxes with Quantum and ActiveScale



Use Cases - Massive Unstructured Data Stores

Quantum

Today's challenge: Create value from massive data sources

A massive data source

Massive volumes (PBs) and growing of valuable data, accumulated from digital sources

Time dependent analysis

Understanding root causes of changes in the 'system'

Plus, evolving algorithms and compute infrastructure for analysis

A data index

A contextually-aware understanding of the data, derived from analysis, enrichment, cataloging of data

An active archive

A scalable, durable, cost-effective online repository that can simply grow and scale over time

Quantum helps customers create, analyze, store, and protect massive amounts of data simply and cost effectively.

Key Trends Driving the Development of Massive Data Stores

Digital data sources creating unbounded data growth	Scalability, performance, cost are key considerations
Increasing long-term value of data, metadata stress storage economics	Need to affordably manage, access, and understand data for years to decades
Never-ending data security and protection concerns	Data security, protection, durability are primary requirements
Continued IT drive toward flexibility, agility	In-house environments need to evolve to cloud-like experience
Cloud economics untenable at scale especially with data usage and egress	A push toward hybrid and private data clouds

Key Requirements for Building Today's Massive Data Stores

Key requirements for building active and long-term archives

- **Durable** – Protected, recoverable, reliable, and secure
- **Storage Efficient** – Low cost, low overhead
- **Available** – 7x24, Geo-dispersed, monitoring and analytics
- **Accessible** – Online, performance SLAs
- **Scalable** – Linear scalability and performance
- **Adaptable** – Easy to migrate forward to new technologies
- **Searchable** – Indexable, catalogued, metadata access

Video Surveillance
Media & Entertainment
Hyperscale/Webscale Archives
Genomic and Medical Imaging
ADAS
Industrial IoT
Satellite & Sensors
Scientific Research
Financial Analytics
AI/ML Workloads

Effective Use of Multiple Storage Media Types is Key to Savings

90% of all data is infrequently accessed but must be maintained online

3X $ HDD

10%
Hot

4-5X $ Tape

30%
Warm

<$1/TB/mo

60%
Cold

Production Data

$$$$$$$$$$

Active Data

$$$$$

Cold Data

$

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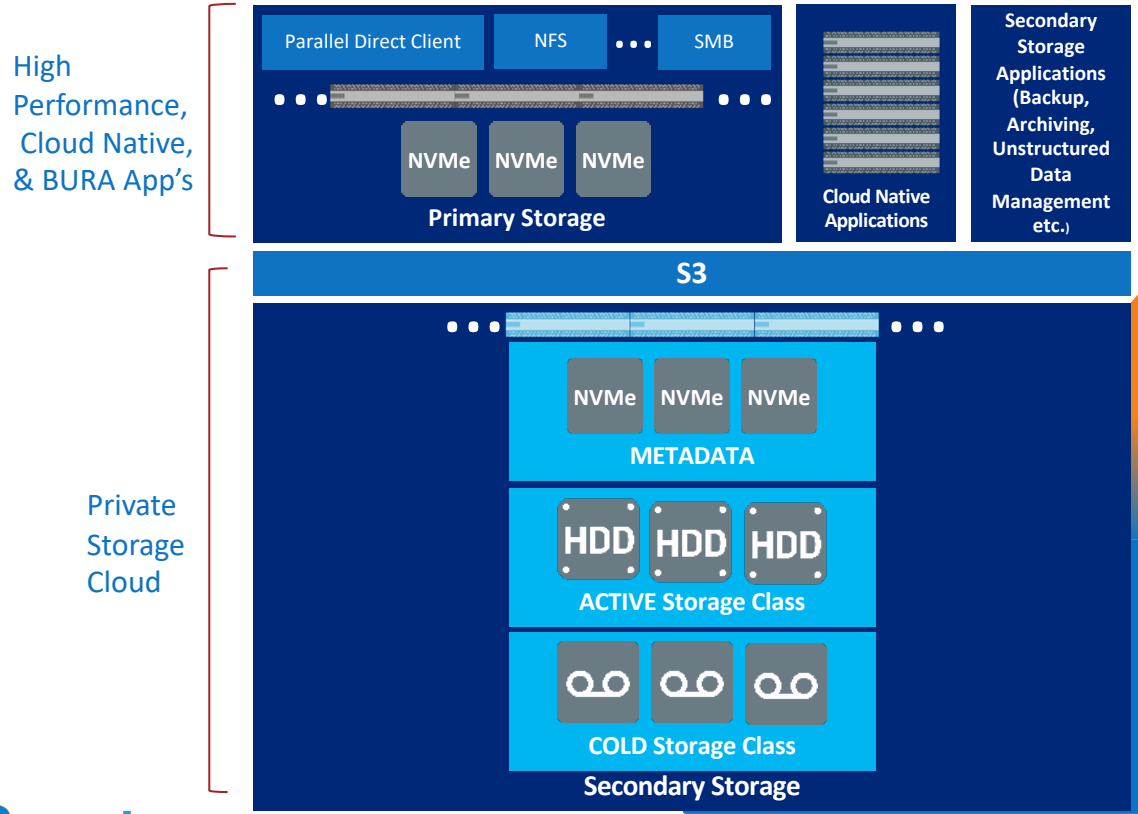
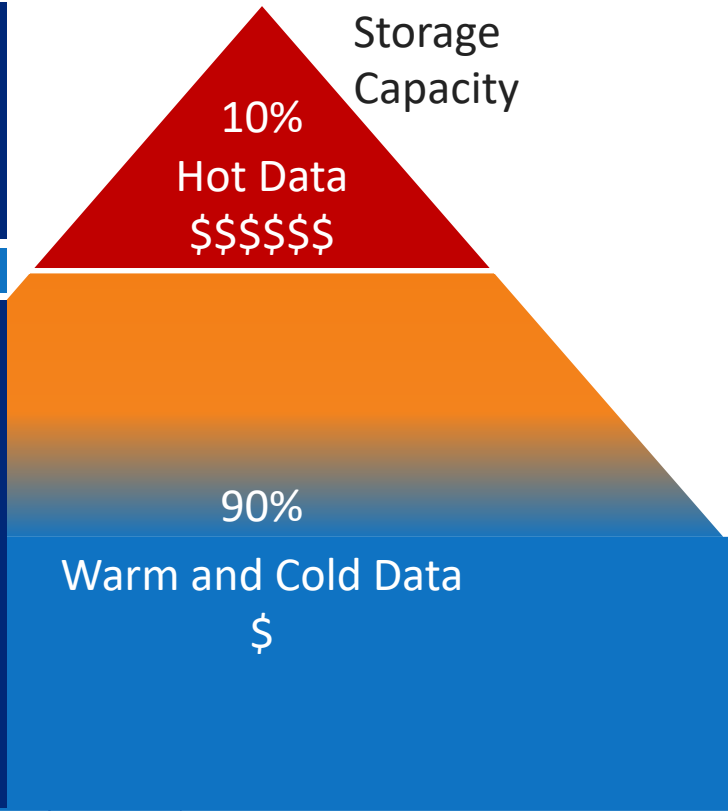
Independent Scaling of Primary and Secondary Storage

Achieve high performance and cost-effectivity

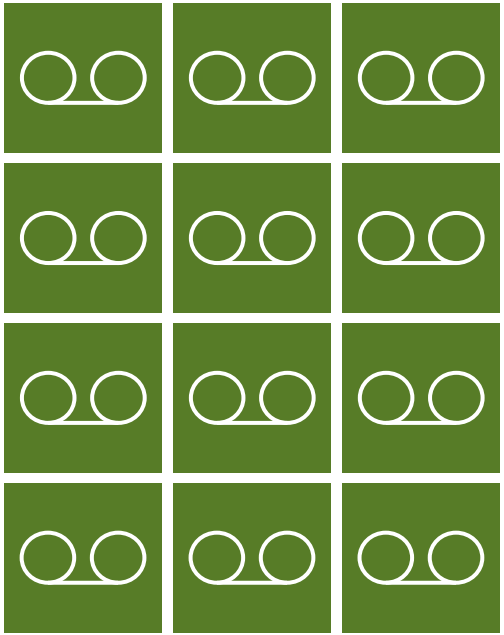




Why Tape for Long-Term Durable Storage?

OUTSTANDING TAPE ECONOMICS

- Lowest cost storage option
- Ultra-low power consumption
- Longest life span (30+ years)
- Most reliable media
- Air-gapped storage
- Strong capacity roadmap
- Continued cost leadership for the next decade

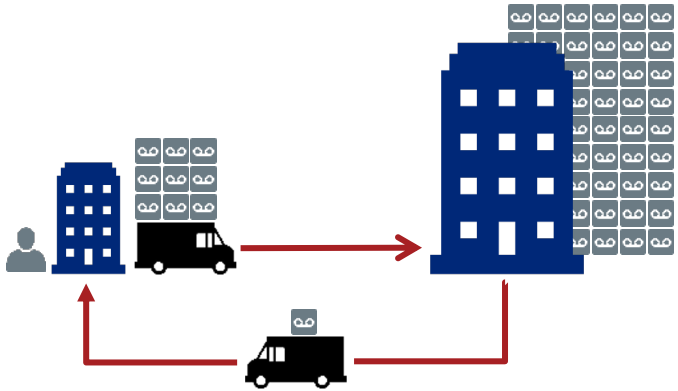


Not Your Father's Tape

A new model emerges in the deployment and use of tape resources

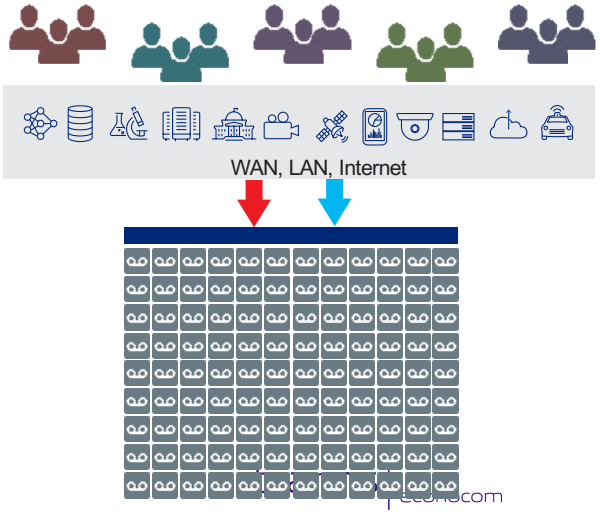
OLD

- Mostly structured data
- Primarily backup and archive
- Secondary offsite copy
- Inhouse, central data management
- Physical tape handling



NEW

- Mostly unstructured data
- Massive amounts of data
- Online, end user accessible
- Software abstraction layer
- Available as a service



ActiveScale S3-Compatible Private Cloud

The industry's only object storage platform with active and cold storage classes

S3 storage classes and life cycle policies

- S3 Standard: HDD
- S3 Glacier: Tape

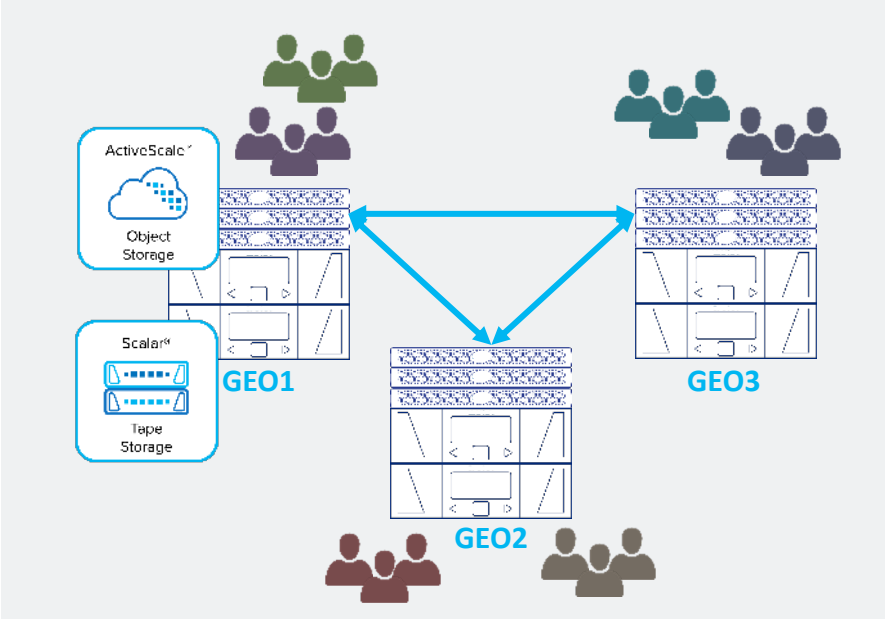
Advanced 2D erasure coding with RAIL

- performance, storage efficiency, and durability

Unlimited scale, capacity, and object count

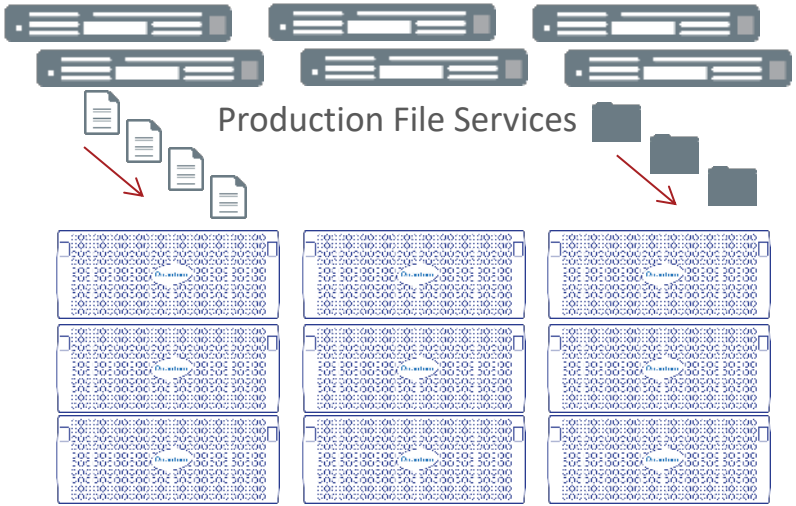
Highly available, highly efficient geospreading (optional)

Industry's lowest TCO



Unstructured Data Management, Enrichment, and Migration

Global view of all unstructured data assets



KEY CAPABILITIES

Cataloging / Curation

Tagging and Classification

Reporting and Analytics

Data Search and Query

Migration and Tiering

Governance

Protection/ Preservation

Archiving and Recovery

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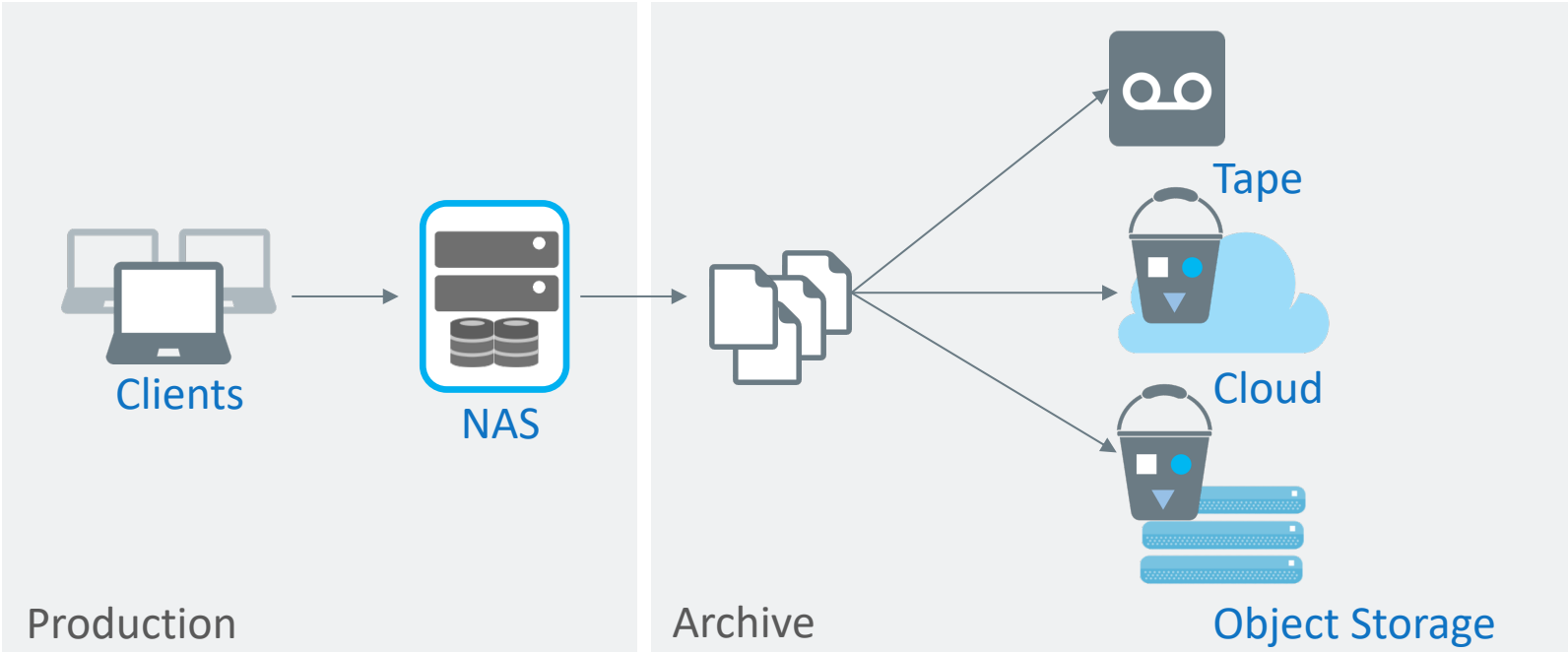
Use Cases – Content & Media Archiving

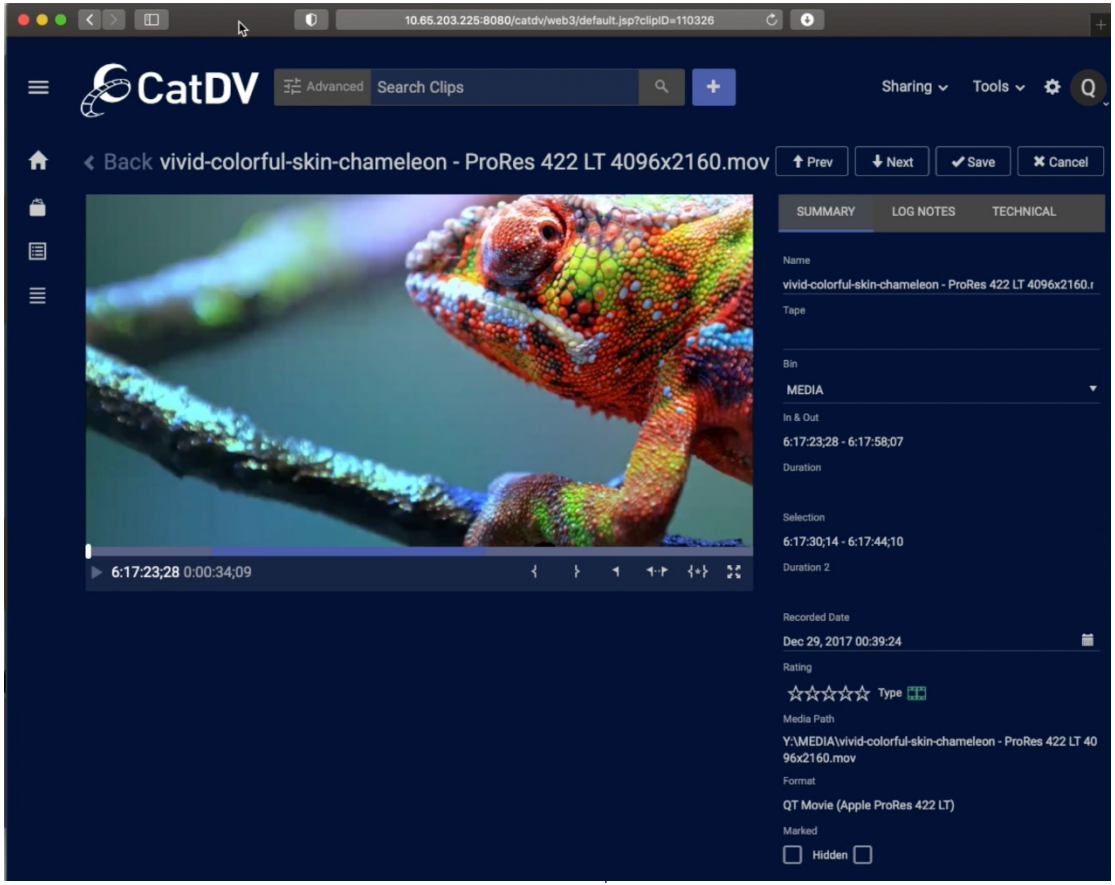
Quantum

Classically, lower cost archiving of media content has kept content opaque.



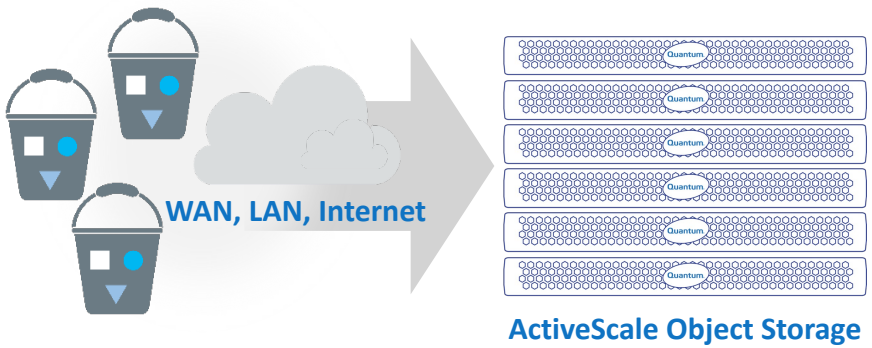
Making Large-Scale Object Storage Searchable with Quantum CatDV

- Cloud and object storage helps preserve large pools of content at scale
- Searching across content pools requires a content discovery and indexing step
- Content can be continuously enriched with cloud delivered toolsets directly within CatDV
- Quantum CatDV and ActiveScale are parts of a complete solution available from Quantum



ActiveScale Object Storage

For Content Delivery, Long-Term Retention, Monetization and Reuse



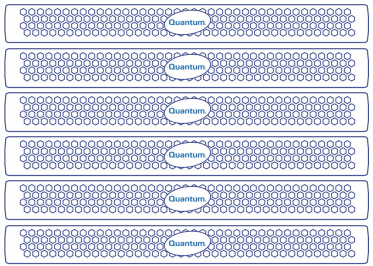
Simple to manage and grow from terabytes to exabytes

Always available access over distance

Extreme data durability and security

Industry's lowest cost online/ nearline archiving solution

Why ActiveScale for Media and Entertainment Archiving?

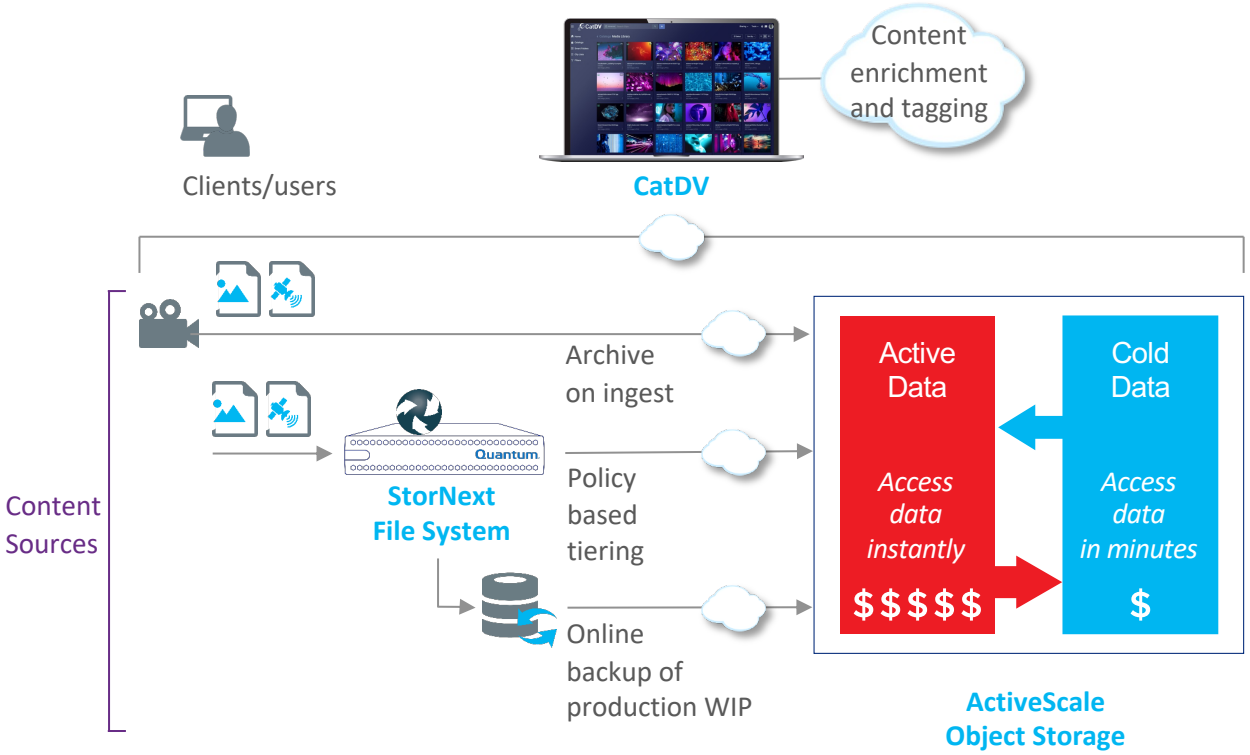


ActiveScale Object Storage

	ActiveScale Object Storage provides…
Compared to **Production Storage**	• Better price/performance • Reduces impact on production storage • Protects against ransomware • Provides offsite/hybrid as an option
Compared to **Tape**	• Online high-performance access to both disk- and tape-based resources
Compared to **Cloud**	• A lower cost solution • Higher performance access especially for multi-user and deep archives • Greater control/sovereignty/security

CatDV, StorNext, and ActiveScale for Media and Entertainment Archiving

The core of on-premises and hybrid cloud M&E workflows

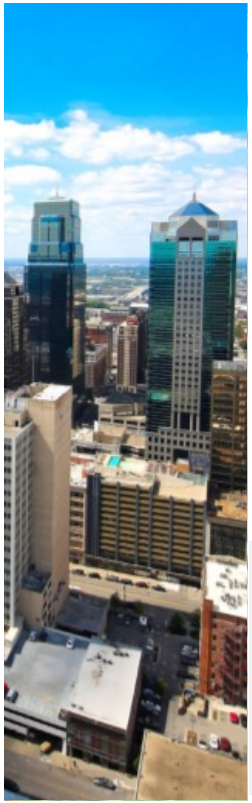


- Easy, fast online access to entire asset library
- Policy-based tiering to lower cost medias
- Offsite protection of company's media assets
- Collaborative multi-site access to content
- As a backup target for work in progress

Download the CatDV and ActiveScale Reference Architecture

A Case Study: The Kansas City Chiefs

Serving a massive fan base with high quality content



Challenge

- Manage 10TBs content growth every year
- Maximize the value of content
- Improve workflows to enhance productivity
- Create a more collaborative environment

Implementation

- CatDV, StorNext, and ActiveScale

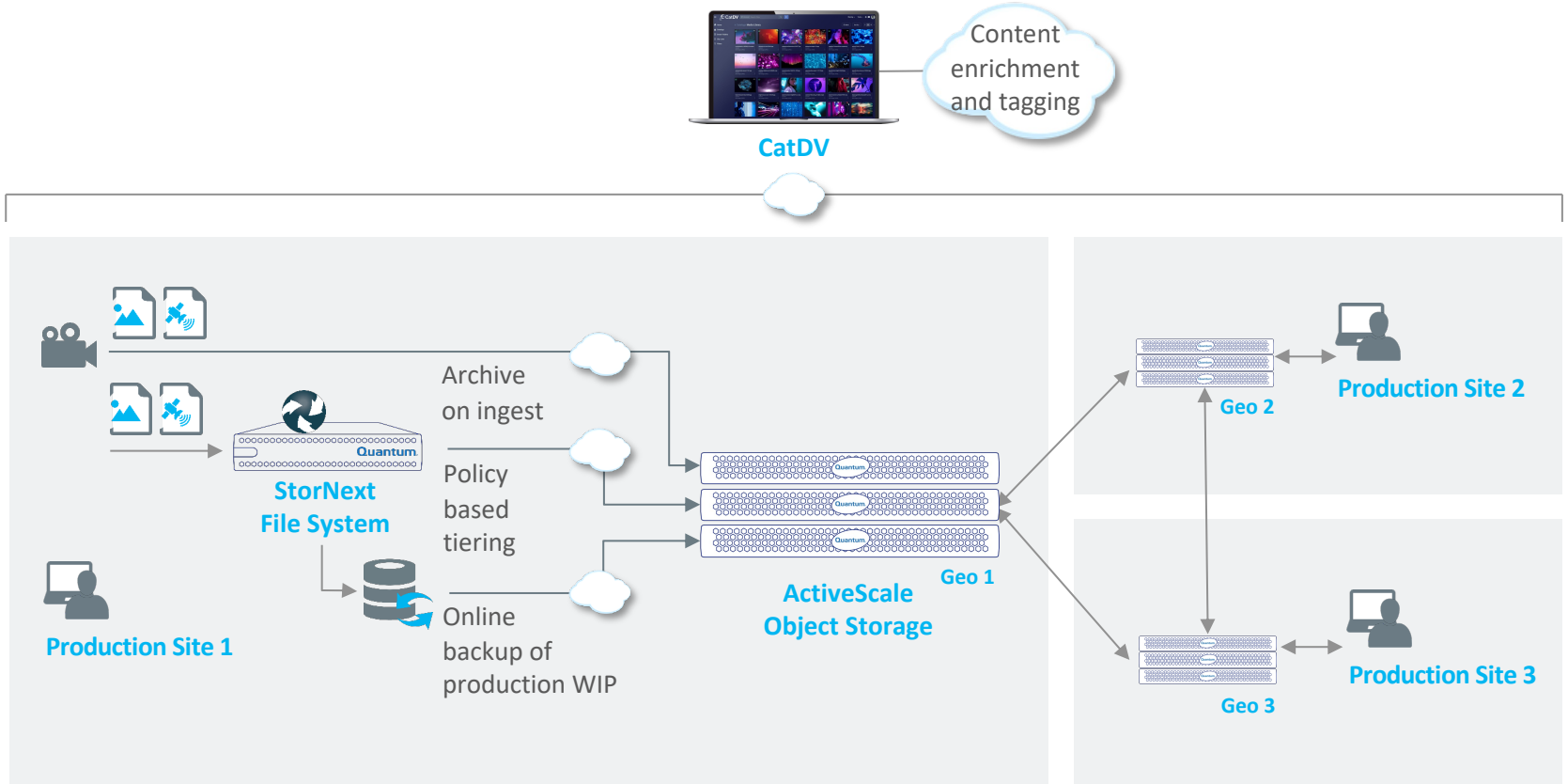
Outcome

- Quickly find, access, and reuse content with archive fully online
- Streamlined management of their growing asset collection
- Enhanced collaborative productivity, enabling multiple team members to work together on content

With easier access to video assets, the production team can tell better, more exciting stories.

Download Case Study

Multi-site content management, access, and protection with CatDV and ActiveScale



Use Cases – ActiveScale and Weka

High performance production storage for HPC, AI, and analytics

Quantum

High Performance Computing (HPC)

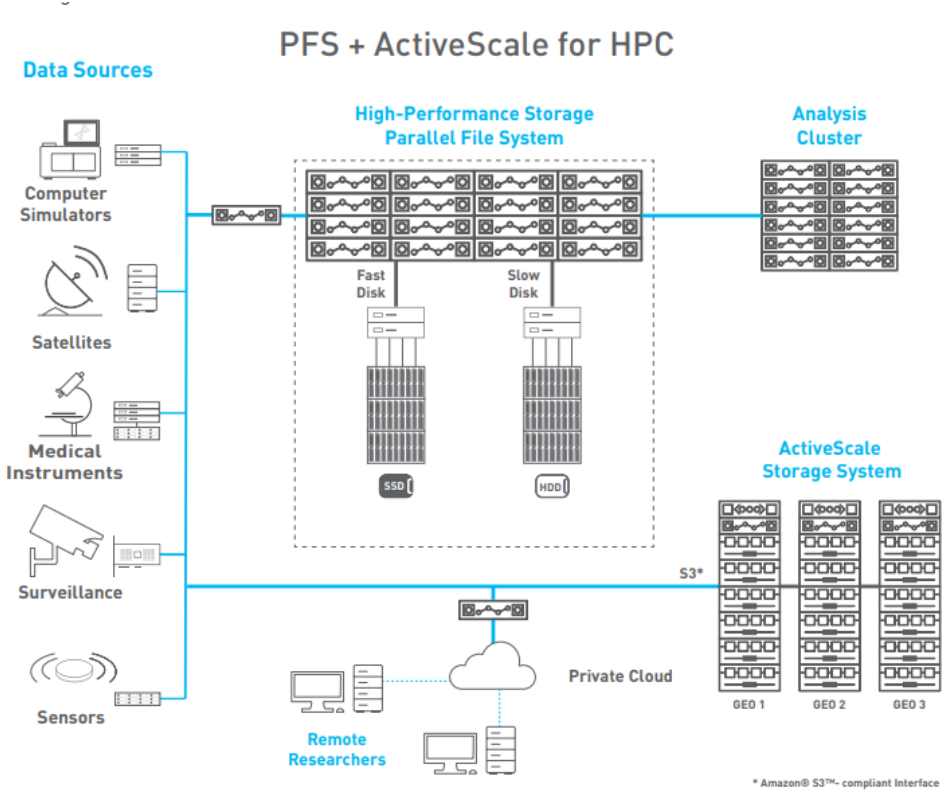


Fig. 1. HPC architecture example

Advantages/Benefits

- Store PBs of data in a durable forever archive
- Online access to data for ongoing analysis
- Manage many active PBs at the lowest TCO

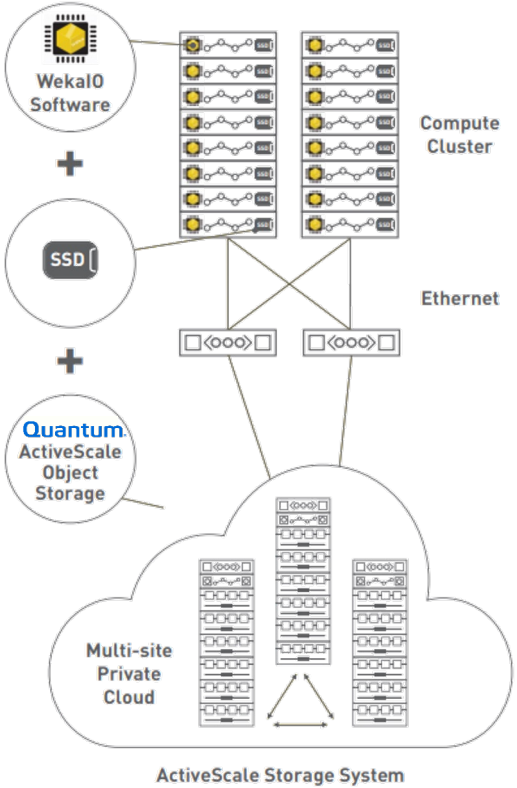
Genomics Research with WekaIO

WekaIO

Scale-out file system with high performance scalability and sub-millisecond latency

ActiveScale

Easy-to-install and manage object store delivering cloud economics to enterprises



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ActiveScale in an AWS Outposts Environment

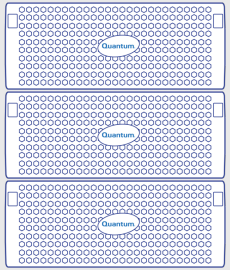
AWS Outposts
Run AWS infrastructure
and services on premises

Quantum

Scalable S3 Resources for AWS Outposts

Deliverable as a fully managed service

aws partner network | service ready aws outposts

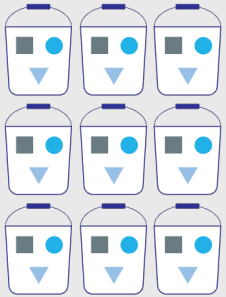


ActiveScale Object Storage

Security, resilience and performance at scale

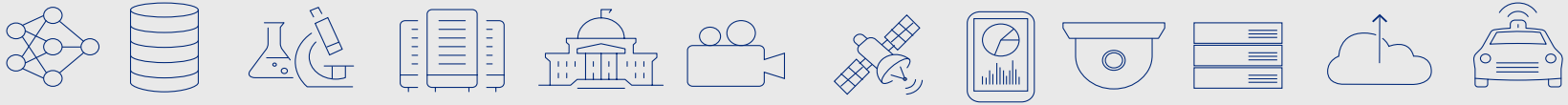
AWS Outposts

Run AWS infrastructure and services on premises



Quantum Object Storage Services

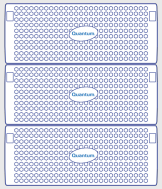
Bringing the cloud experience to wherever your data lives



Scalable S3 Resources for AWS Outposts

Deliverable as a fully managed service

aws partner network | service ready aws outposts

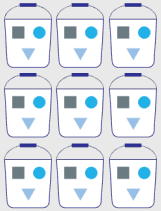


ActiveScale Object Storage

Security, resilience and performance at scale

AWS Outposts

Run AWS infrastructure and services on premises



Quantum Object Storage Services

Bringing the cloud experience to wherever your data lives

Streamline your IT operations

- Build and operate your data center with familiar AWS infrastructure, services, APIs, and tools.

Maintain data residency while reducing storage costs

- Keep sensitive data inhouse for local processing, data residency, and regulatory and inhouse policy compliance.

Simplify IT with fully managed infrastructure

- Reduce the time, resources, and operational risk of on-premises infrastructure with fully managed services from AWS and Quantum.

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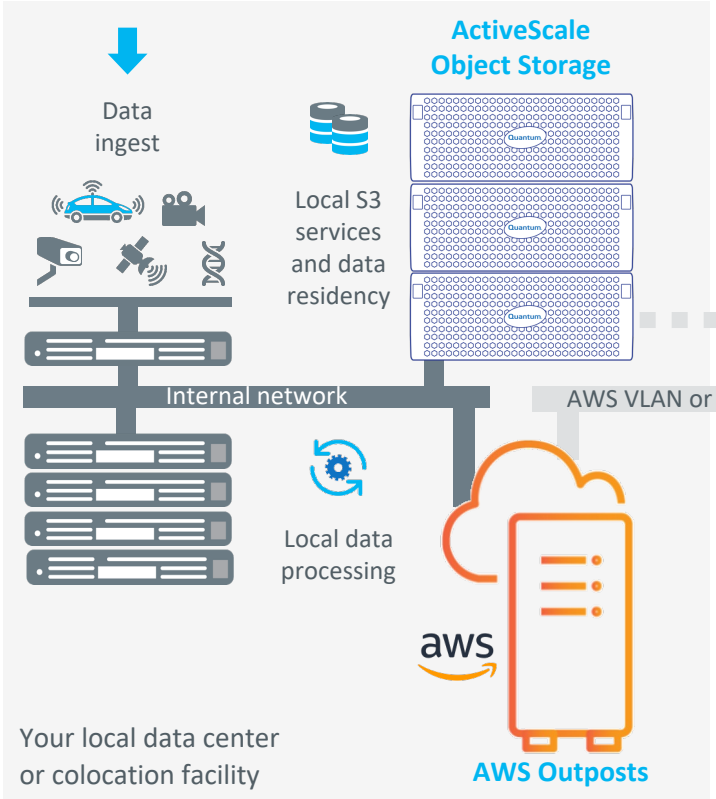
Scalable S3 Resources for AWS Outposts

Deliverable as a fully managed service

aws partner network | service ready aws outposts



For

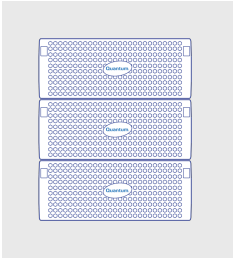
- Latency-sensitive applications
- Data ingest from local systems and devices
- Applications with local data center dependencies
- Compliance with data residency requirements

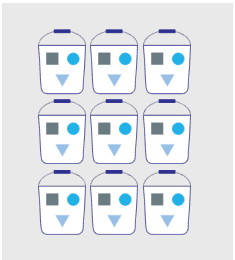
Easily manage and migrate data between your local data center and AWS cloud regions for data protection, disaster recovery, cloud bursting, scalable processing, and other cloud-based services.

Scalable S3 Resources for AWS Outposts

ActiveScale and Quantum Object Storage Services

aws partner network | service ready aws outposts





Verified Compatibility with AWS Outposts

- Strong consistency, versioning, encryption, object locking, and replication

Available as-a-Service

- Flexible pay-as-you-grow pricing, 7x24 support, and seamless expansion

Simple Management, Unlimited Scale

- Meet the performance needs for billions of objects and capacities from TB's to EB's

Always Available Data Access

- Advanced erasure coding, regional geo-spreading, and replication to/from AWS

Industry's Lowest Storage TCO

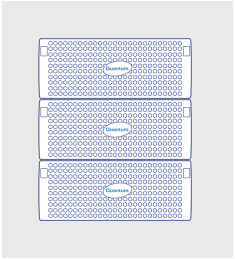
- Active (S3 Standard) and Cold (S3 Glacier) Storage Classes for up to 80% lower cost

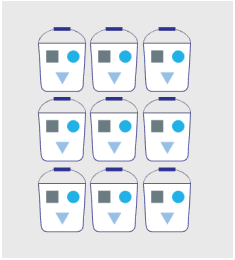
Extreme Data Durability and Security

- Ongoing monitoring and repair, authenticated access, immutable, encrypted objects, and traceability

Scalable S3 Resources for AWS Outposts

aws partner network | service ready aws outposts





ActiveScale is compatible with these Outposts Ready solutions

COHESITY

rubrik

COMMVAULT

splunk>

ctera
your files. your cloud.

VEEAM

komprise

VERITAS

NASUNI

WEKA

https://aws.amazon.com/outposts/partners/

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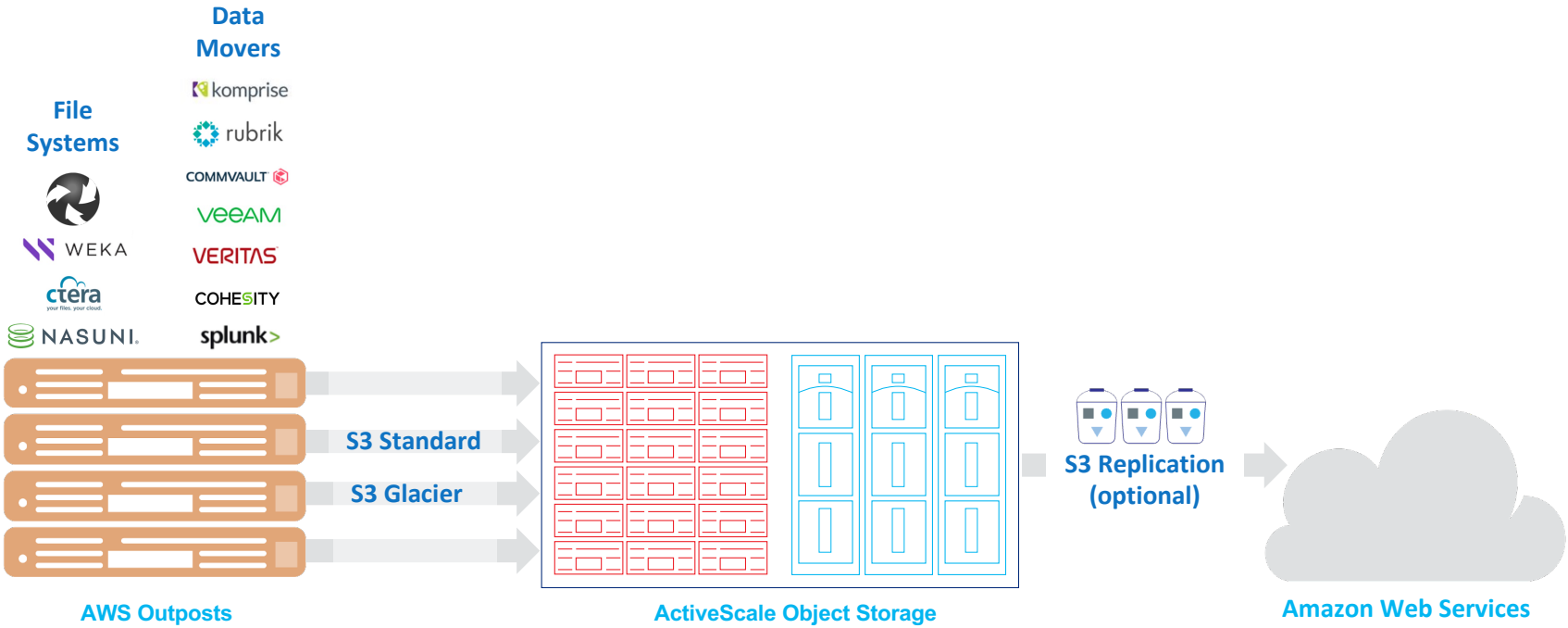
AWS Outposts Sample Data Flows



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Customer Case Studies

Quantum

ActiveScale at Massive Scale

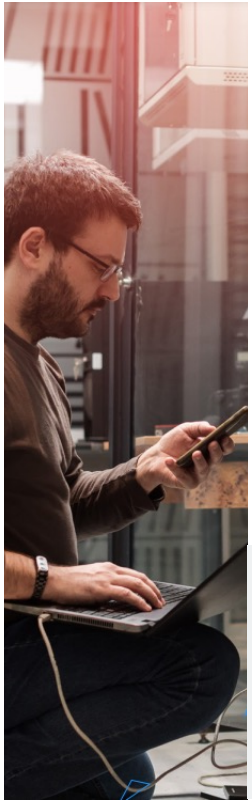
Unstructured data management, long-term retention and archiving

Life Sciences	UK’s national genome DB (Genomics England)
Industrial IoT	Top 3 semiconductor manufacturer
Satellite & Sensors	Multiple U.S. federal agencies
Financial Analytics	NY-based hedge fund with over 180 PBs
Surveillance	Top 5 airport in Asia
Media	LA-based global video distribution service
Telecom	S3 private cloud for Top 3 global telecom
Technology Manufacturing	130 PBs across 13 global manufacturing centers
Scientific Research	Japan’s National Institute of Informatics

Boreus GmbH

MSP Simplifies Backup Services

boreus
a WIIT Company



Challenge

- Aging backup storage targets near capacity
- Multiple file systems and target devices too complex to manage

Implementation

- ActiveScale in dual data centers backing up the other data center and then replicating offsite to the AWS cloud
- Commvault software

Outcome

- More responsive customer services with accelerated and more frequent backups
- Dramatically reduced management of storage infrastructure
- Twenty five percent lower cost versus alternative NAS proposals
- More time to completely automate their backup services and procedures

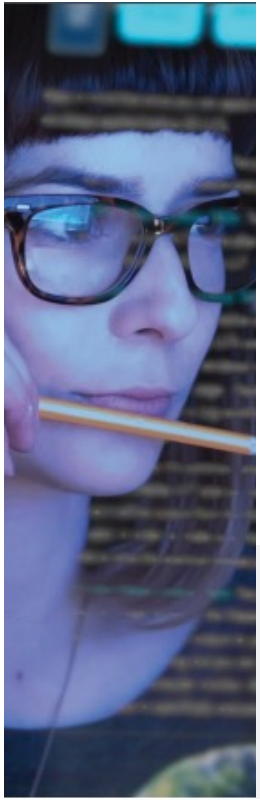
"We spend zero time managing ActiveScale… Coming from an infrastructure with a lot of different servers and storage systems, this is a huge change."

Thomas Sobirei
Storage and Data Protection Engineer

Download Case Study

MR Datentechnik

Launches New Data Storage Services with ActiveScale



Challenge

- Launch an S3-compatible storage service for backup, recovery, archiving, and data security
- Enable customers to retrieve data rapidly—anytime, from anywhere.

Implementation

- ActiveScale Object Storage Platform
- Veeam Backup & Replication software

Outcome

- Built a simple-to-manage, easily scalable online data storage service
- Seamlessly integrated with Veeam V12
- Accelerated onboarding to quickly achieve growth targets
- Always-on resiliency for reliable customer access

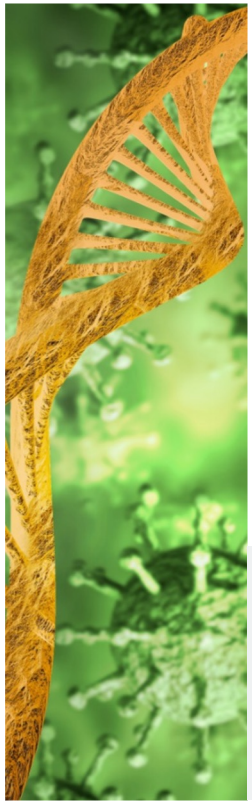
"Thanks to ActiveScale's ability to automate the onboarding process, we can onboard customers in under a day. We have reached our two-year growth target goals in less than a year."

Jochen Kraus
Managing Director, MR Datentechnik

Download Case Study

Genomics England

Over 100 petabytes of genomic data



Challenge

- Mandate to sequence 5M genomes by 2023
- Isilon cluster couldn’t scale beyond 21 PB
- Needed to scale up to 150 PBs of data

Implementation

- ActiveScale 3-geo cluster (109 PBs)
- WekaIO file system front-end

Outcome

- Reduced cost per genome by 75%
- Enhanced resiliency with a geo-spread environment across 3 data centers
- Reduced complexity with a solution that is simple to use and manage
- Increased agility for urgent sequencing of COVID-19 patients

"We love the simplicity, ease of use, and architecture of the ActiveScale systems.

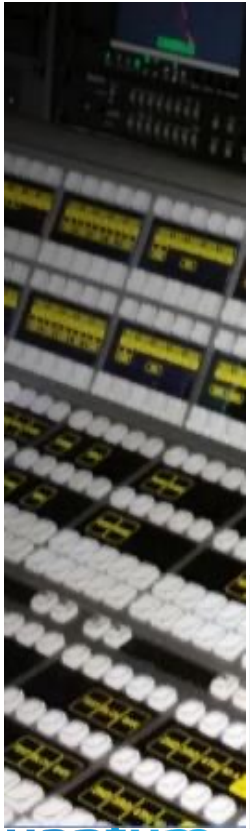
These systems are truly designed to scale seamlessly to exabyte-scale deployments...”

David Ardley
Head of Technical Delivery

Download Case Study

EPFL (École Polytechnique Fédérale de Lausanne)

Preserving 50 Years and 15,000 Hours of Jazz Music



Challenge

- Remove risk of deterioration / obsolescence risk to valuable audio-visual archive
- Digitally preserve and enable access to researchers and the general public
- Enrich content with extensive metadata

Implementation

- ActiveScale 3-geo cluster (14 PBs)

Outcome

- Data protection and availability at 48% less overhead than 3-mirror replication
- Archives easily accessed, searched and shared by many constituents
- Long-term solution with redundancy
- Rich metadata improves value
- Cloud-level scalability

"By using ActiveScale in a 3-geo configuration, we get a turnkey solution that gives us more space, redundancy and security. We can store content from every festival, add rich metadata and provide access to the concerts for a broad range of users... We don't get that kind of flexibility from any other solution."

Alain Dufaux , Director

Download Case Study

Hogarth Worldwide

High-growth, multi-national marketing firm simplifies IT infrastructure

Challenge

- Aggressive worldwide expansion drove need for multi-site collaboration and IT streamlining

Implementation

- StorNext file system and Storage Manager
- ActiveScale P100 3-Geo cluster

Outcome

- Optimized workflows by standardizing on Quantum
- Simplified deployment and reduced costs with IP-based storage solutions
- Easy team collaboration with multi-site access to tiered content repositories
- Streamlined backup with ActiveScale highly available, online archiving

"StorNext and FlexSync provide us with a really flexible backup model— and ActiveScale doubles down on this capability with its ability to geo-spread data and provide cost-effective capacity. By better protecting data, we can achieve higher availability and sustain productivity for our critical workflows."

Steven Butler, Global Head of Production Workflow and Engineering

Download Case Study

Illumination Mac Guff

Seamless access to their entire multi-PB asset library

Challenge

- Keeping up with capacity for growing needs of multiple feature film projects
- Need for continued online access to all content for reuse and monetization
- **Implementation**
- ActiveScale 2-Geo cluster (11 PBs)

Outcome

- Entire asset library online, at the speed, scale, durability and economics required
- Simple to manage solution supporting all digital artists and animators
- Highly available system across two data centers

"The ActiveScale solution gives us the required combination of speed, petabyte scale, durability, and the economics of cloud in our data center… we can't predict which assets artists will need, so the entire asset library must be online and reliably available. The on-premises archive also allows us to meet our legal obligations for dataset security." "

Bruno Mahe, Head of Technology

Download Case Study

A Case Study: The Kansas City Chiefs

Serving a massive fan base with high quality content

Challenge

- Manage 10TBs content growth every year
- Maximize the value of content
- Improve workflows to enhance productivity
- Create a more collaborative environment

Implementation

- CatDV, StorNext, and ActiveScale

Outcome

- Quickly find, access, and reuse content with archive fully online
- Streamlined management of their growing asset collection
- Enhanced collaborative productivity, enabling multiple team members to work together on content

With easier access to video assets, the production team can tell better, more exciting stories.

Download Case Study

A Case Study: Global Managed Service Provider

Enabling as-a-Service solutions across a diverse customer base

Challenge

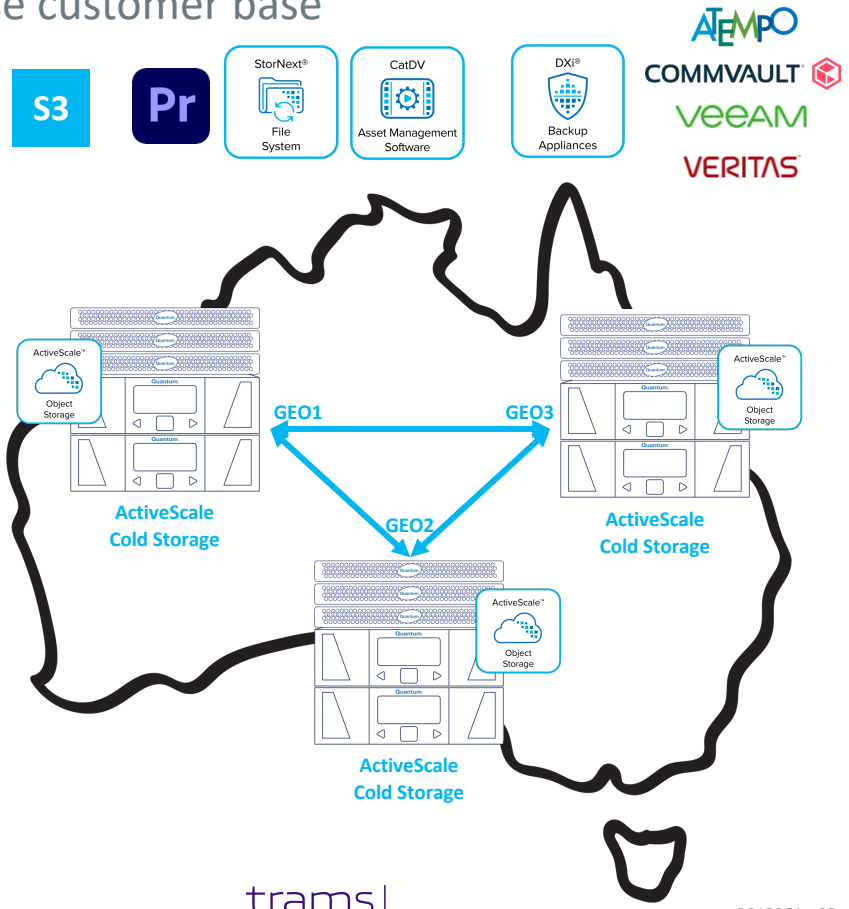
- Interested in offering cloud storage services to their clients, including a Glacier-like service

Implementation

- Quantum ActiveScale with Cold Storage
  - 3GEO cloud - 1 PB Active, 13 PB Cold
  - Unmetered access and egress for predictable costs
  - Single namespace, single system, and user interface

Outcome

- Enabling Revenue Streams across Fed, Research, Enterprise, and Media
  - S3 and S3 Glacier Target
  - Backup and Archive
  - Media Asset Management
  - Remote and Non-Linear Editing



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A Case Study: European Government Agency

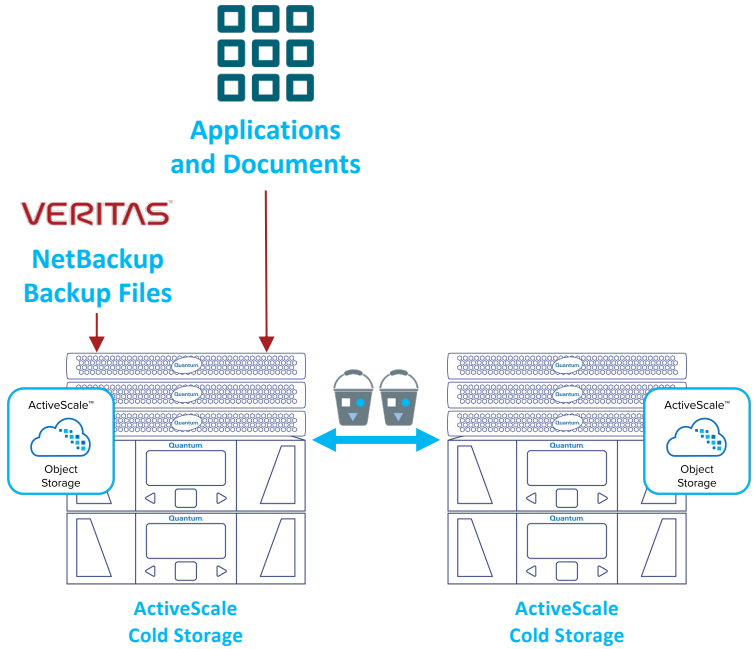
Private storage cloud for cross-agency backup, archive, and long-term retention

Requirements

- Objective
  - Create private storage cloud platform for long term storage at comparable costs to cloud and tape
- Required
  - S3 native document archive
  - Long-term retention of backup data

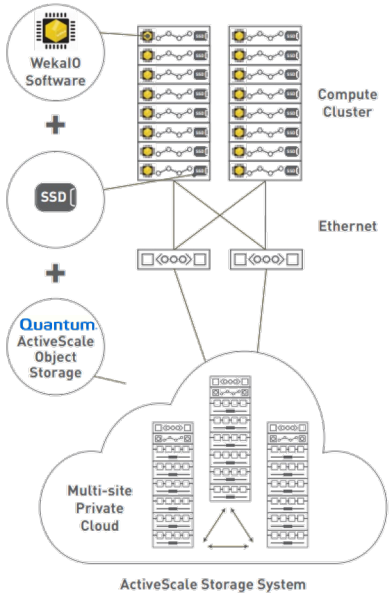
Quantum Solution and Outcomes

- Quantum ActiveScale with Cold Storage tier
- Two site redundancy - 800 TB on disk, 12 PB on tape



A Case Study: Semiconductor Manufacturing

Use Case: High performance file system/analytics



Requirements

- Objective
  - Improve wafer yield by analyzing manufacturing data using AI-based analysis
- Required
  - Daily ingest of 100 TBs from manufacturing clean rooms
  - High performance analysis of wafer fabrication data across multiple GPU clusters

Quantum Solution and Outcomes

- Quantum ActiveScale SW subscription deployed with Weka on Supermicro HW platforms
- Additional Quantum professional services
- Outstanding performance vs. NetApp
  - ActiveScale achieves **40 GB/s** sustained performance
- Deployed in 3 manufacturing sites
  - NVMe File tier based on Weka cluster
  - **10+ PBs** disk object tier based on ActiveScale cluster at each site

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ActiveScale Software and Architecture

Quantum

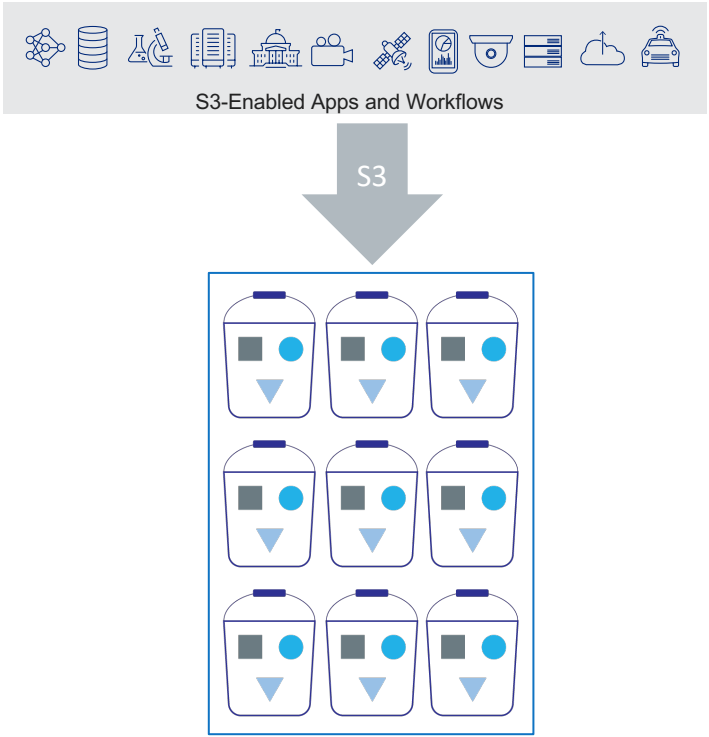
Building A Private Cloud for Active and Cold Data Archiving

In your own data center at Petabyte scale

Design Target: An S3-compatible storage cloud

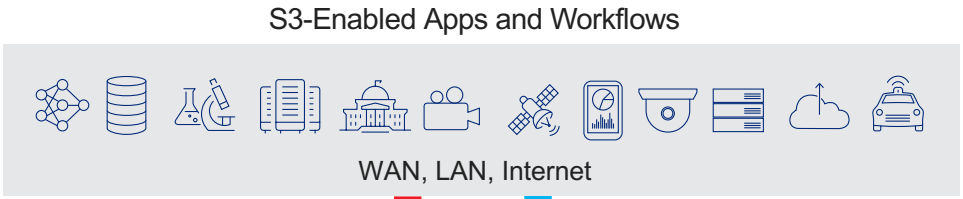
- Authenticated access over Ethernet
- Single name space, scale-out architecture
- Standardized object data model, GET/PUT data access
- Multiple storage classes
  - Multiple service levels and cost attributes
  - Life cycle policies

	Active Data	Cold Data
Storage Class	S3 Standard	S3 Glacier
Access performance	Milliseconds	Minutes to hours
Cost – per TB per month	$10-20	$2-5



ActiveScale Object Storage

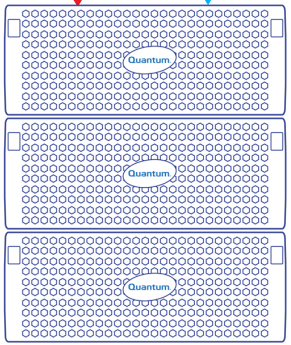
The industry's first and only object store architected for both active and cold data



Simple to Manage, Unlimited Scale

Performance at Scale with NO Rebalancing

Always Available Access



Extreme Data Durability and Security

Architected for Both Active and Cold Data

Industry's Lowest TCO

ActiveScale Object Storage
Security, Resilience and Performance at Massive Scale

ActiveScale Object Storage

From Terabytes to Exabytes

Secure, reliable, easy access to your growing active data sets and archives

Simple to Manage, Unlimited Scale

Non-disruptive expansion meets the growing needs for billions of objects and exabytes of capacity. Dynamic Data Placement optimally places objects across available resources for **performance at scale with no rebalancing.**

Always Available Data Access and Protection

With rolling system upgrades, an S3 RESTful protocol, and a geo-spread design, ActiveScale tolerates component and site failures to **maximize access and productivity.**

Lowest Total Cost of Ownership

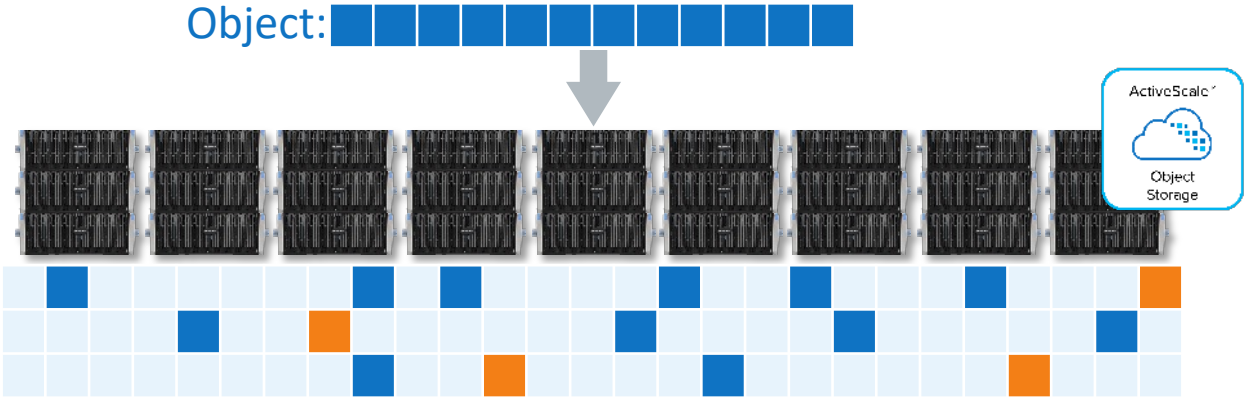
Save up to 80% in storage costs **with Active and Cold Storage Classes**. Plus, without burdensome cloud access fees, continually enrich and extract value from your data sets without compromise.

Extreme Data Durability and Security

Advanced erasure coding, versioning, end-to-end encryption, object locking, and ongoing monitoring and repair ensure that data endures for years with **up to 19 9's of durability** of both active and cold data.

ActiveScale Object Storage

Designed for massive scale



Simple to Manage, Unlimited Scale

- Based on industry-standard servers
- Seamlessly scale out by adding additional nodes
- Billions of objects, TBs to EBs in a single namespace
- Easy to deploy, manage, and grow
- Multi-generational expansion, graceful retirement

Performance at Scale with NO Rebalancing

- Highly parallel data architecture
- Wide-stripe erasure coding with parity
- Data distributed across cluster nodes based on dynamic analysis of cluster
- Consistent performance even as system expands

ActiveScale Object Storage

Designed for durability, security, and resilience

Always Available Access

- Tolerant of multi-component failures
- Geo-spreading provides multi-site protection at lower cost and overhead than replication
- Rolling upgrades and online expansion
- Uninhibited access with no data fees

Extreme Data Durability and Security

- Up to 19 9's durability
- End-to-end encryption
- Versioning and object locking
- Proactive data monitoring and parallel repair
- Multi-site replication and to the cloud

ActiveScale Cold Storage

Fully integrated S3 Glacier Class support

Up to 80% cost savings for cold data

- S3/S3 Glacier compatible
- Unlimited scalability
- Up to 19 9's data durability
- Available as a fully managed service

Key Innovations

- Software-defined **Object on Tape** management
- The **Quantum RAIL** tape architecture
- Two-dimensional erasure coding (**2D EC**) software

ActiveScale™ Object Software

- S3-compatible object storage API
  - Versioning, Lifecycle, Replication, Notification, …
- Efficient next-gen data storage
  - Durable @ low overhead
  - Highly available
- Strong Consistency
  - 1- & 3-GEO system configuration with immediate consistency
  - Asynchronous replication between systems or to public cloud
- Fully Managed System
  - Software, OS, Firmware, Network
  - Unified System Mgmt (1-click rolling upgrade, …)

S3 Compatible APIs

9's $/PB

Multi-Geo Availability Zones

Single Pane Management

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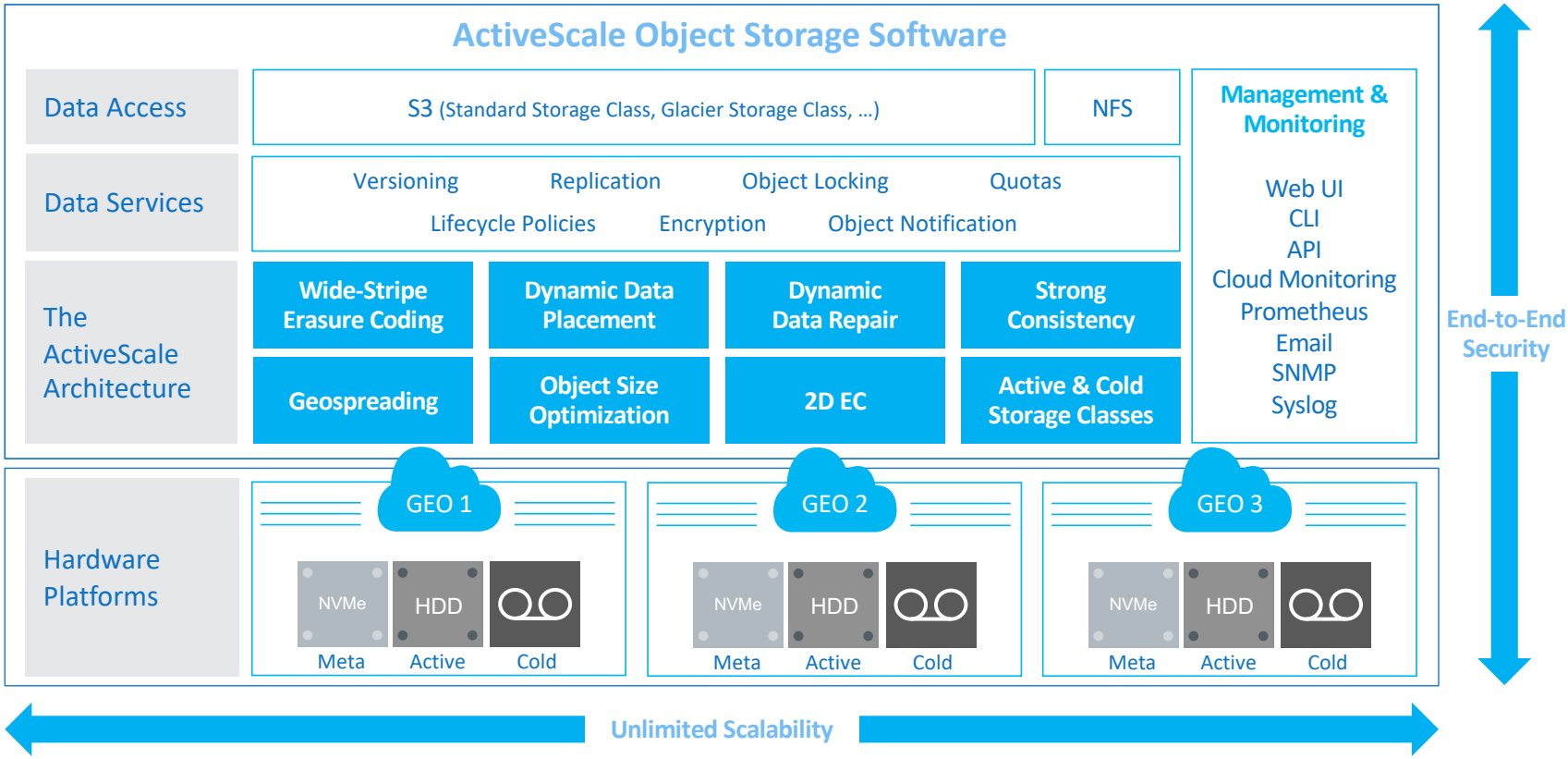
ActiveScale Feature-Rich Software

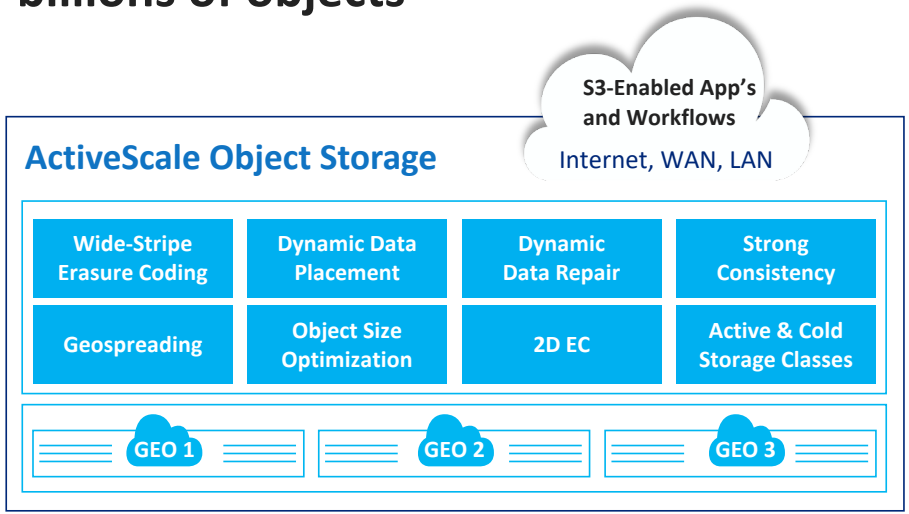
Built-in data durability, security, availability and performance



Simple to Manage, Simple to Grow

Single system, Seamless expansion, Built for scale

From terabytes to exabytes and billions of objects



Scale OUT Architecture

NO REBALANCING REQUIRED!

Single site, 2- and 3-Geo configurations available.

Active and cold data storage classes

Disk and tape economics combined for industry's lowest TCO based on two-dimensional erasure coding (2D EC)

Dynamic data placement (DDP)

Durability, availability, and performance – At any scale

Dynamic data repair (DDR)

Intelligent data monitoring and proactive repair removes data rebuild risks

Wide-stripe erasure encoding

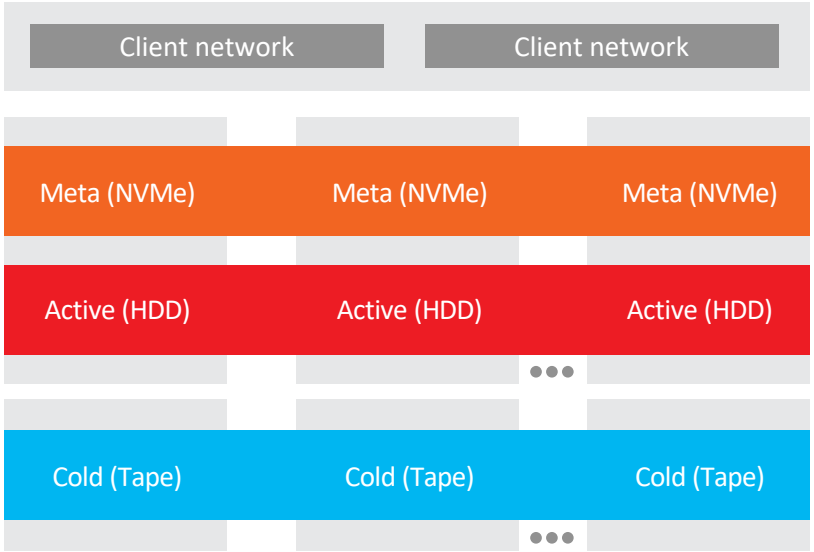
Built-in data durability and availability

Geospreading and replication

Component and site failure protection for Always-on availability

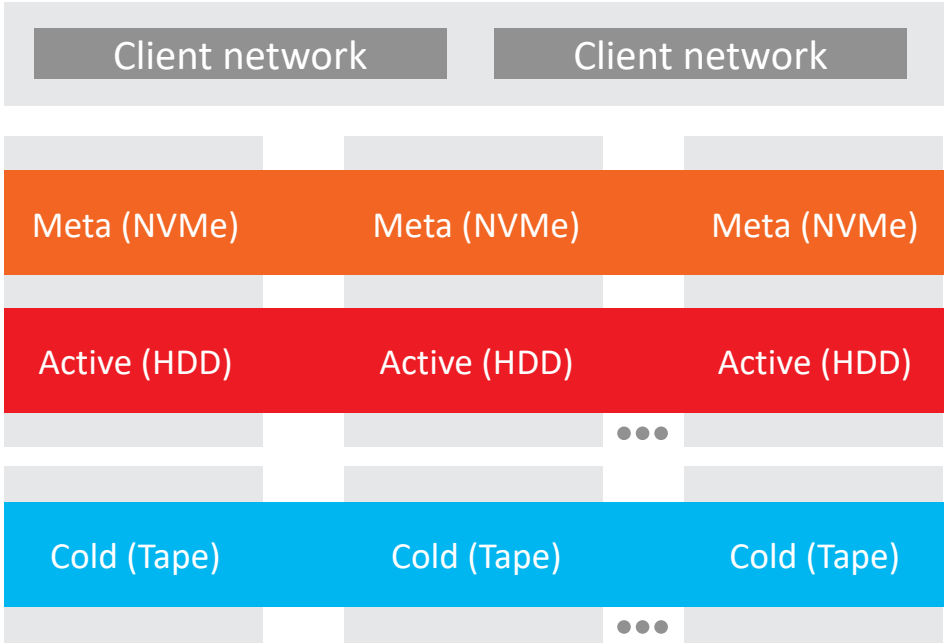
Optimized Scale-out Hybrid Storage Architecture

- Scale-up-and-out architecture seamlessly expands network, compute, and storage resources
- Single namespace across
  - Global NVME-based Metadata
  - HDD-based Active Storage
  - Tape-based Cold Storage
- Unlimited, independent scaling of Active and Cold Storage Classes
- Built-in availability, data durability, strong consistency and scalable performance



ActiveScale Built for Scale

Scale-out architecture, Global namespace, Unified management



High Bandwidth Public Switch Fabric
DNS round robin balances load across all client ports

Scalable Access and Object Management
Accessibility to all objects from across all nodes

Metadata and Object Database
Available across all nodes for fast access

High Bandwidth Private Switch Fabric
All Access processors connected to all Data processors

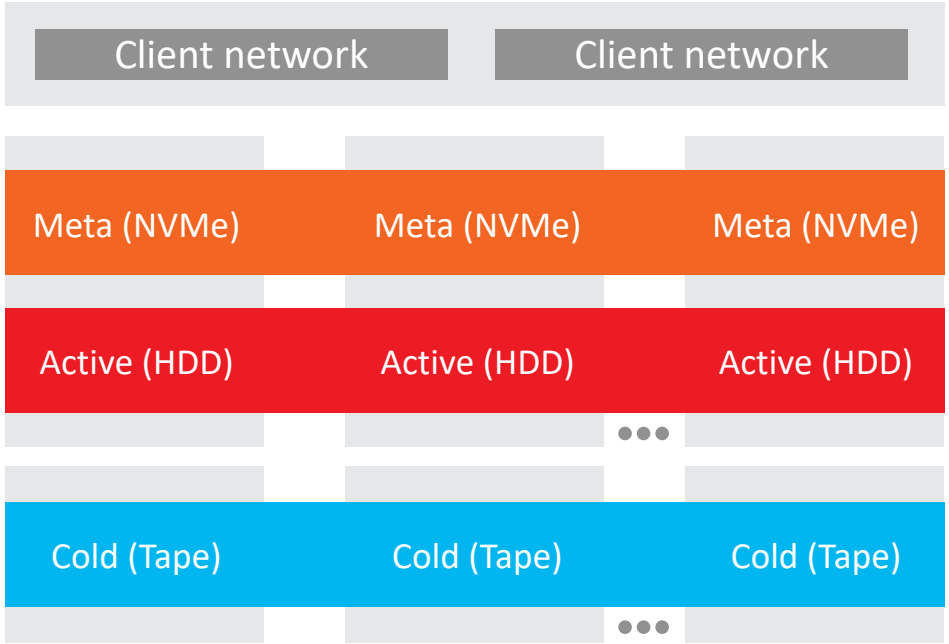
Active & Cold Storage Classes
Independent, unlimited scaling of both storage classes

Dynamic Data Placement
Dynamically place shards for balanced resource usage

2D Erasure Coding and RAIL Architecture
Modular scalability with 2D EC within & across libraries

ActiveScale Built for Availability

Always-on architecture for active access and long-term data retention



Scalable Access and Object Management
Accessibility to all objects from across all nodes

RESTful S3 API and Strong Consistency
Guaranteed write acknowledgement and cluster consistency

Dynamic Data Placement for Recoverability
Erasure coded shards distributed across nodes and Geo's to maximize data availability in case of component/site failures

Seamless Expansion, Upgrades, & Evacuation
Non-disruptive evolution of the system over the long haul

ActiveScale – Built for Data Durability

da·ta du·ra·bil·i·ty

/ dadə d(y)o͝orəˈbilədē/

Noun

1.the ability of a system to withstand data loss. Often measured in number of objects lost over time,

Example: ActiveScale 19 9's durability means 1 object out of 10 billion lost every billion years.

Advanced Erasure Encoding

Distributing object shards across a large number of drives limits the impact of individual drive and tape failures

Dynamic data repair (DDR)

Proactive disk diagnostics, integrity checks and corrective action, highly parallel rebuild process, priority-based repair

Built-in verification at all levels

MD5 & CRC checks, internal referential integrity checks

ActiveScale – Built for Data Protection

Data Security and Data Recoverability

Authentication & Role-based Access

Users have exclusive access to their data

Inflight & At Rest Encryption

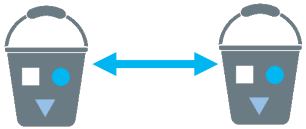
System-wide and object-based encryption

Immutability

Object locking protects an object from being deleted or changed

Object Versioning

Preserve multiple versions of an object for easy recovery



Bucket Replication

Copy a bucket of objects to S3-compatible storage over distance

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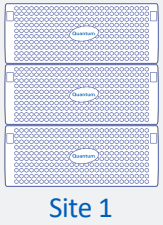
ActiveScale Deployment Options

with 3-Geo geospreading and replication

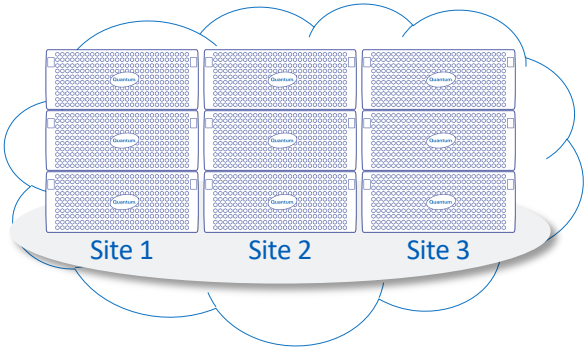
Single site

Protects against disk, node, and component failure



3-Geo geospreading

Highest efficiency
Single data instance
Single namespace
Highest durability
Protects against site failure

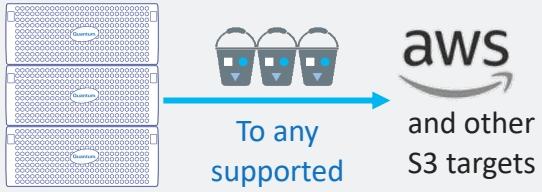


Uni & bidirectional replication

Site fault tolerance
Choose what buckets to replicate

Hybrid replication

Choose what buckets to replicate to the cloud



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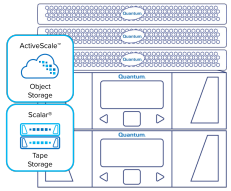
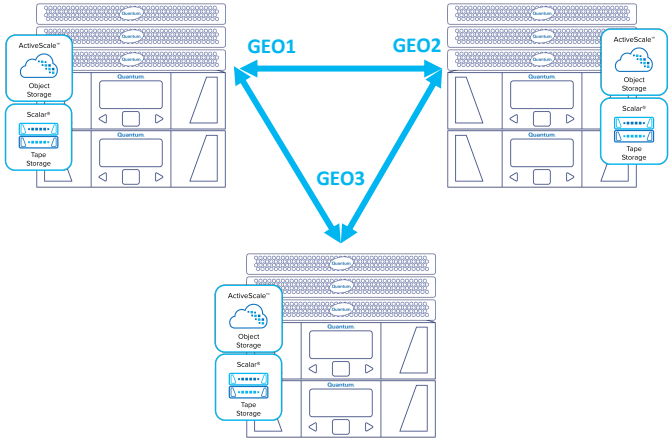
ActiveScale Cold Storage Deployment Examples

Single site, 3-Geo geospreading, and replication across storage classes

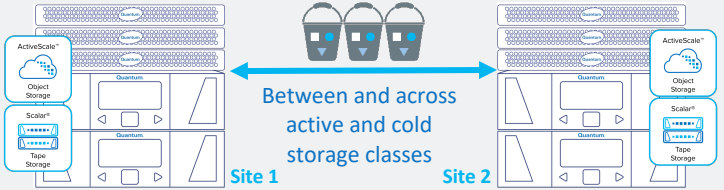
Single site



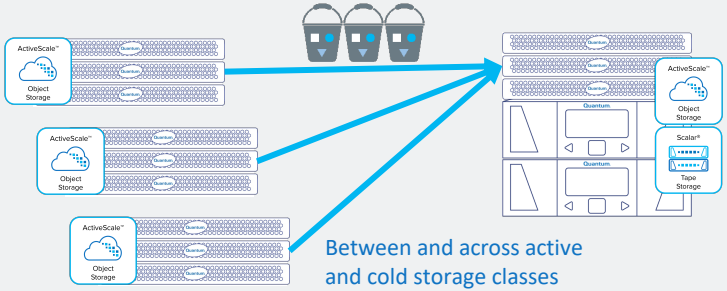
3-Geo geospreading



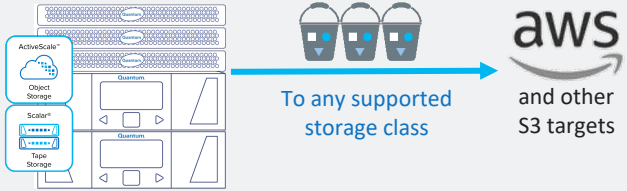
Uni & bidirectional replication



Replicate to hub



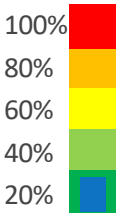
Hybrid replication



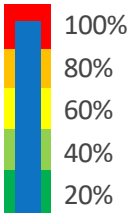
ActiveScale Dynamic Data Placement (DDP)

Algorithm accommodates failed or offline hardware

Low Capacity Usage



Disks with higher available capacity are preferred to ensure even data distribution



High Capacity Usage

Most Preferred

Least Preferred

The ActiveScale DDP Advantage

Fixed or Static Data Placement	ActiveScale Dynamic Data Placement
✗ Other object stores commonly use distributed filesystems (aka RING)	✓ ActiveScale's innovative data placement logic
✗ Storage location is calculated/fixed	✓ Software determines most ideal storage location
✗ Requires rebalancing - The Achilles' Heel of static placement	✓ Eliminates the need to rebalance data
✗ Affects system performance and system availability	✓ Delivers consistent availability and performance – at any scale

To learn more, watch this 5 min video on DDP.

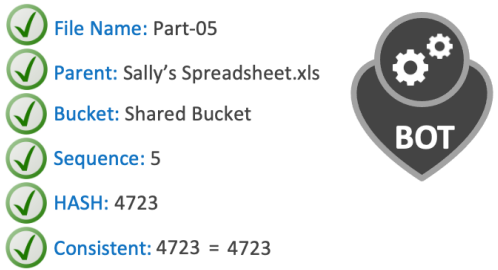
ActiveScale Dynamic Data Repair (DDR) and Monitoring

Predicts Drive Failures

Detects Hardware and Network Failures

Automatic Data Repair on Blockstore Failure

Data Integrity Check on Data at Rest



To learn more, watch this 5 min video on DDR.

ActiveScale Feature: Dynamic Data Repair

Data and Disk Monitoring and Repair

ActiveScale manages 100s to 1000s of HDDs

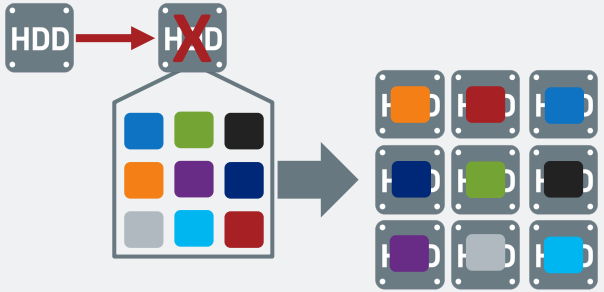
- Continually scrubs integrity of all data and repairs data as necessary
- Proactively monitors and predicts drive failures

In case of predicted or real disk failure

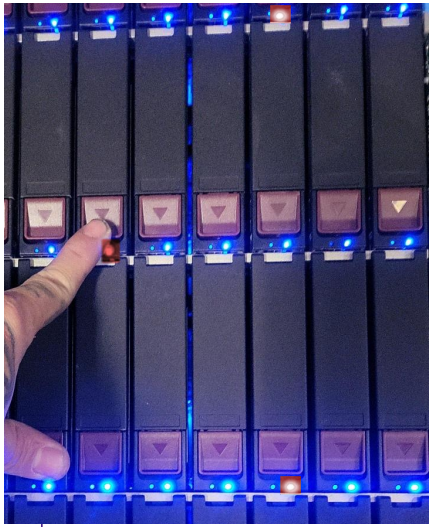
- Data migrated/rebuilt across all other disk drives in parallel
- Failed disk is decommissioned
- Failed drives repaired by simply swapping out each failed drive
- ActiveScale automatically inventories new resources and starts using them

Benefits

- Fully automated, no outages or complex procedures
- Simple, deferred maintenance on quarterly or bi-annual basis



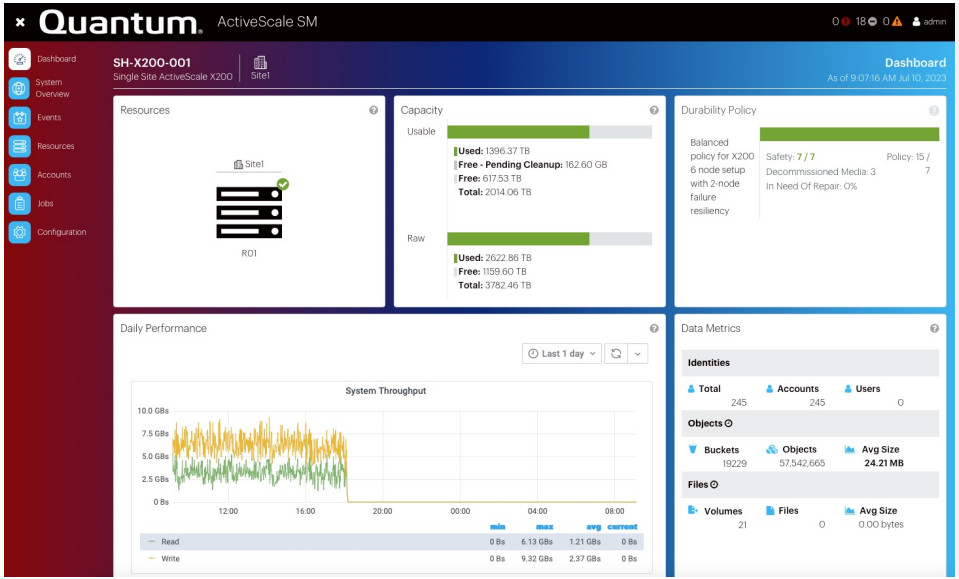
Data on failed drive automatically migrated/ rebuilt and redistributed across all resources



Failed drives indicated by red LEDs

Flexible Management and DevOps Integration

ActiveScale System Management GUI, CLI, and APIs

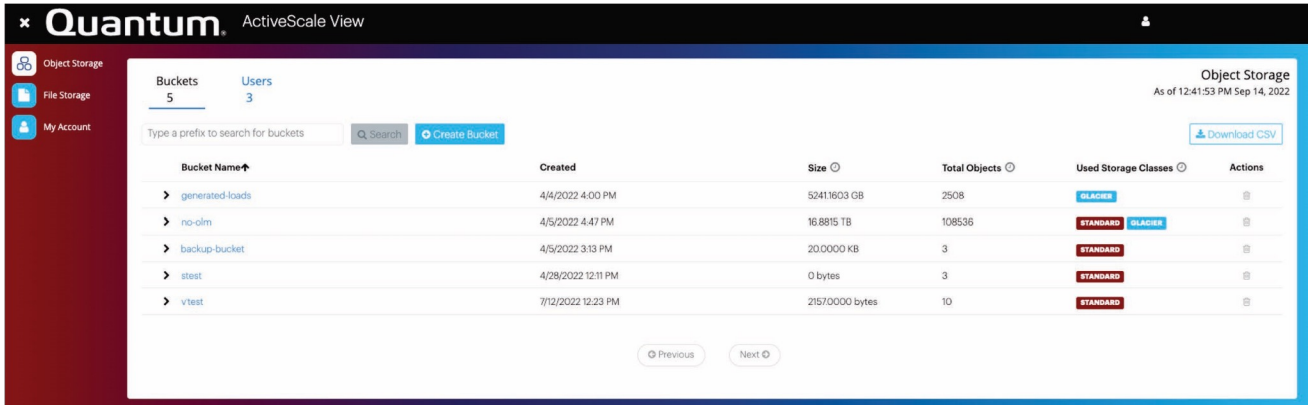


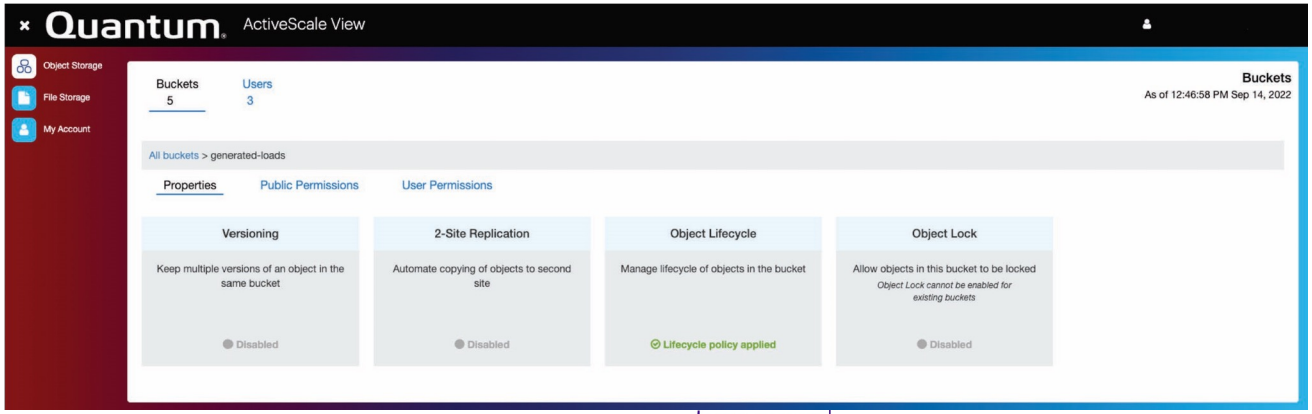
- Set & Forget Storage Policy
- Real-time Management & Monitoring
- Guided Wizards
- Account & User Management
- Real-time System Health
- One Click Upgrades
- APIs for Automation

Users and Account Administration

ActiveScale View

- Create and manage S3 buckets
- Enable versioning
- Enable replication
- Manage bucket lifecycles
- Create S3 users and manage their credentials





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ActiveScale Appliances

Quantum

ActiveScale P100E3 Configurations

(based on 14TB drives)

Scale Increment: 504 TB

Storage Nodes: 3
Drives: 36 drives
Raw Capacity: 504 TB
Usable Capacity: 210 TB
Max Objects: 235 M

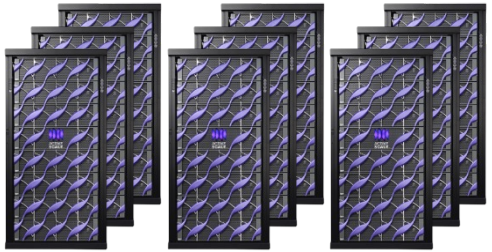
Storage Nodes: 6 storage
Drives: 72 drives
Raw Capacity: 1008 TB
Usable Capacity: 420 TB
Max Objects: 470 M

ActiveScale P100 Configurations

(based on 14TB drives)

System Nodes: 3
Storage Nodes: 6
Drives: 72 drives
Raw Capacity: ~1 PB
Usable Capacity: ~700 TB
Max Objects: 600 M

Scale Increment
1-GEO: ~1 PB
3-GEO: ~3 PB



System Nodes: 27
Storage Nodes: 162
Drives: 1944 drives
Raw Capacity: ~27 PB
Usable Capacity: ~16 PB
Max Objects: 16.2 B

Introducing the ActiveScale P200 Platform

- Simple, converged architecture
- More flexibility with unlimited scalability
- Greater capability per rack than P100
  - 1.9X more capacity
  - 2.4X PUT performance, 2.7X GET performance
  - 6.25x object count
- Investment protection
  - Scale-out P100 clusters with P200 expansion

ActiveScale P200 Single Site Configurations

System Nodes: 3
Drives: 36 drives
Raw Capacity: 648 TB
Usable Capacity: 250 TB
Max Objects: 1.25 B

Scale Increment: 648 TB

System Nodes: Unlimited
Drives: Unlimited
Raw Capacity: Unlimited
Usable Capacity: Unlimited
Max Objects: Unlimited

System Nodes: 6
Drives: 72 drives
Raw Capacity: 1.296 PB
Usable Capacity: 668-1001 TB
Max Objects: 2.5 B

Scale Increment: 1.296 PB

ActiveScale P200 3GEO Configurations

Erasure coding algorithms efficiently spread data across all 9 nodes in entry 3GEO config

GEO1

GEO2

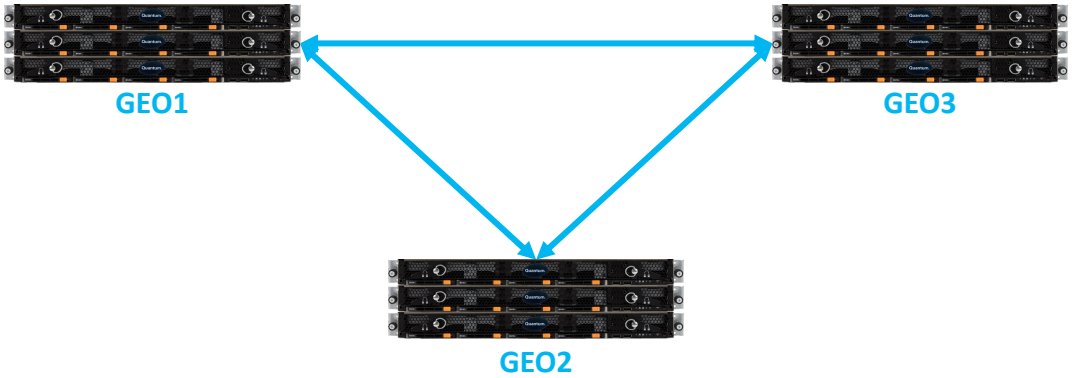
GEO3

System Nodes: 9
Drives: 108 drives
Raw Capacity: 1.94 PB
Usable Capacity: 1.148 PB
Client connectivity: 18 x 25 Gb
Max Objects: 3.8 B

Scale Increment 1.94 PB raw

Unrivaled data protection and durability

Self-protecting, disaster-tolerant 3GEO solution with 19 9's durability



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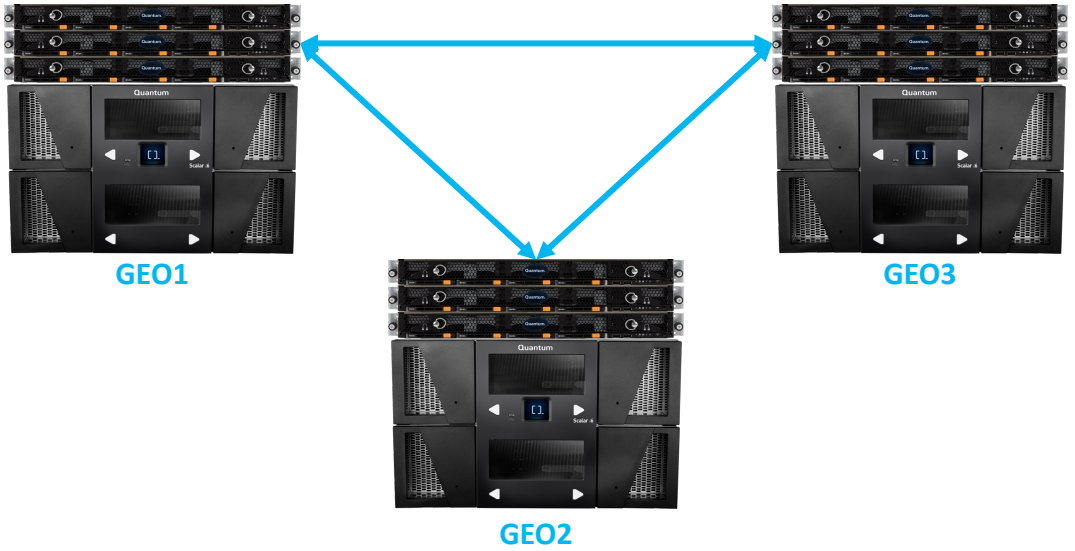
ActiveScale 3GEO P200 Deployment with Active and Cold Data

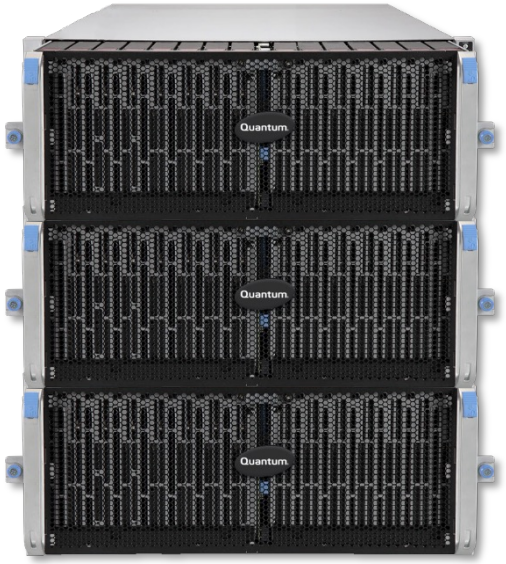
2D EC- and RAIL-protected

Expand and grow at up to 80% less cost using ActiveScale Cold Storage Class



ActiveScale X200 Platform

- New simplified & converged architecture
- More flexibility with unlimited scalability
- Greater capability per rack
  - 78% more capacity
  - 7x performance
  - 6x object count
- Investment protection
  - Scale X100 clusters with X200 expansion



ActiveScale X200 Configurations
Unlimited Scalability


Geo1

System Nodes: 3
Drives: 90 drives
Raw Capacity: ~1.62 PB
Usable Capacity: ~961 TB
Client connectivity: 12 x 25 Gb
Max Objects: 10 B

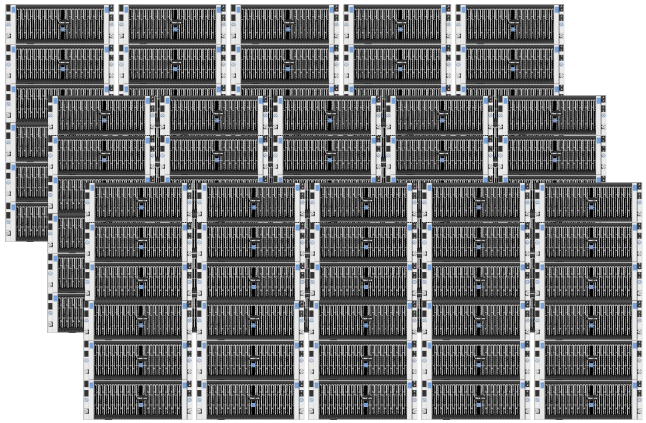
Scale Increment ~1.62 PB raw


Geo1 Geo2 Geo3

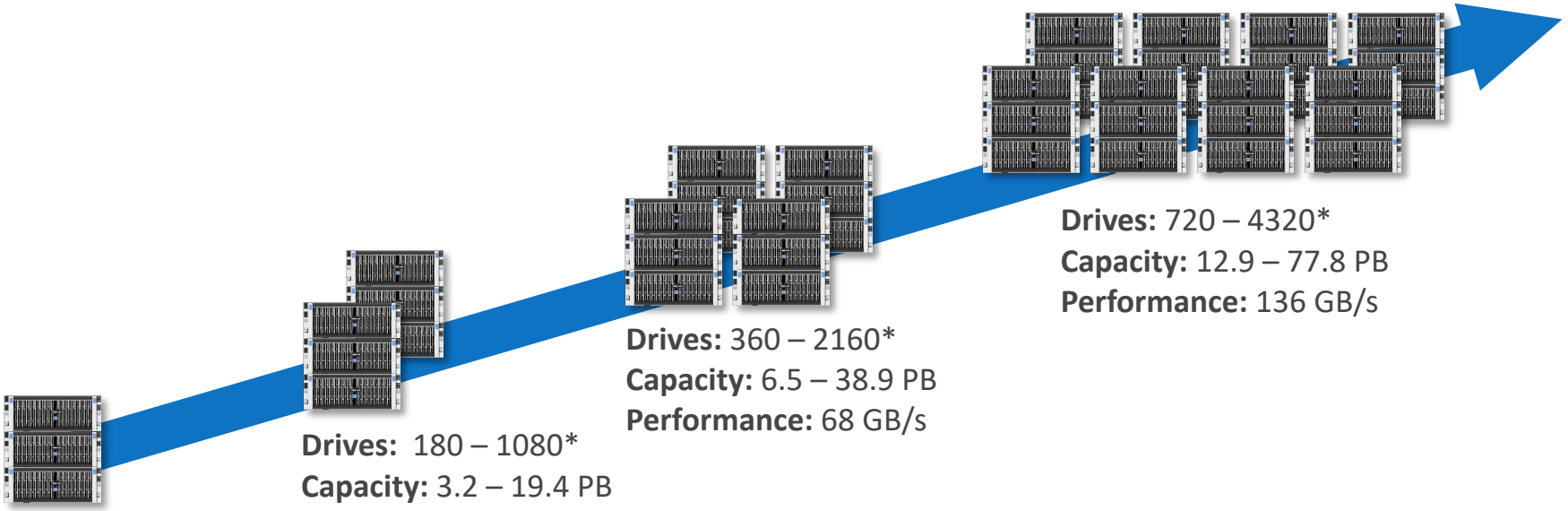
System Nodes: 9
Drives: 270 drives
Raw Capacity: ~4.86 PB
Usable Capacity: ~2.883 TB
Client connectivity: 36 x 25 Gb
Max Objects: 30 B

Scale Increment ~4.86 PB raw

System Nodes: Unlimited
Drives: Unlimited
Raw Capacity: Unlimited
Usable Capacity: Unlimited
Client connectivity: Unlimited
Max Objects: Unlimited



Simply Scale Performance and Capacity



Drives: 90 – 540*
Capacity: 1.6 – 9.7 PB
Performance: 17 GB/s

Drives: 180 – 1080*
Capacity: 3.2 – 19.4 PB
Performance: 34 GB/s

Drives: 360 – 2160*
Capacity: 6.5 – 38.9 PB
Performance: 68 GB/s

Drives: 720 – 4320*
Capacity: 12.9 – 77.8 PB
Performance: 136 GB/s

Non-Disruptive Expansion with NO Rebalancing Required

* Maximum drive count with optional JBOD expansion

ActiveScale Platform Portfolio

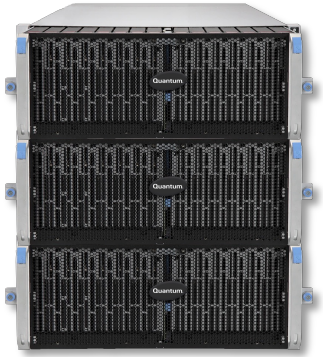
Basic Specifications

	P100E3	P200	X200
Max Active Class (HDD) Capacity	1.0 PB	Unlimited	Unlimited
Form Factor	3 x 1U12	3 x 1U12	3 x 4U
HDD Support	14 TB	18TB	18 TB
3 Node Base Capacity (raw)	432 TB, 504 TB	648 TB	1.62 PB, 3.24 PB, 4.86 PB
3 Node Base Object Count	235M	1.25B	10B
Capacity (per rack)		7.8 PB (12x P200, 36U)	14.6 PB (3x X200, 36U)
Client Connectivity (per rack)		72 x 25 Gb	36 x 25 Gb
Performance (per rack)		GET: 37.8 GB/s PUT: 31.9 GB/s	GET: 51 GB/s PUT: 36 GB/s
Number of Objects (per rack)		15 Billion	30 Billion

Three Scalable Building Blocks for Massive Data Growth

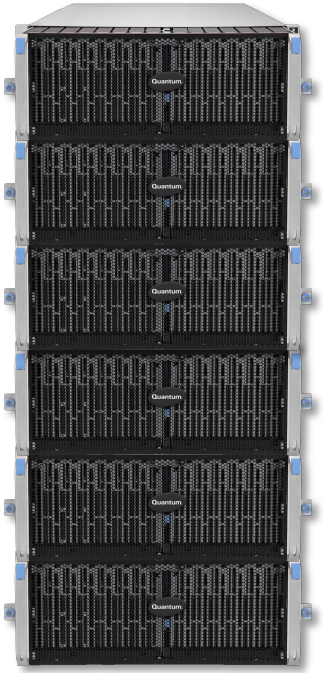
P200

(6 node) 1.3 PB raw



X200

1.62 PB raw



X200 w/ JBOD

3.24 PB raw

Unlimited Active Data | Unlimited Objects | Unlimited Cold Data

ACTIVE — Capacity — COLD

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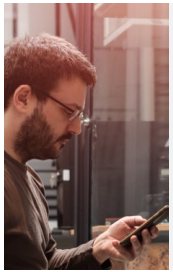
The ActiveScale P100E3

Quantum

The ActiveScale P100E3 Platform

- Simple, cost-effective S3-compatible object storage
- Converged scale-out architecture
  - 3 or 6 nodes - 1U12 servers
  - 100 – 730 Usable TBs
- Outstanding data protection and durability
- Built-in replication to ActiveScale and AWS public cloud



"We spend zero time managing ActiveScale… Coming from an infrastructure with a lot of different servers and storage systems, this is a huge change."

Thomas Sobirei
Storage and Data Protection Engineer
Use Case: MSP simplifies Commvault-based backup services with ActiveScale

boreus
a WIIT Company

Download Case Study

ActiveScale P100E3

Storage Simplified

Simple to manage onsite or offsite

Easy online access over distance

Seamless scalability (up to 730 TB usable)

Durable, secure data protection

- Highly available w/ extreme data durability
- Immutable copies and versioning
- In-flight and at-rest encryption
- Replication to ActiveScale or AWS cloud
- ActiveScale Cold Storage-Ready

Use Cases

- **Backup and Archiving**
  Certified as an S3 backup target with Veeam, Rubrik, Cohesity, Commvault, Veritas, and others.
- **Content Archiving for Video, Images, Audio**
  For media production, distribution, and surveillance.
- **Unstructured Data Management**
  Reduce costs by reducing primary storage footprint by migrating to lower cost tiers.
- **Scientific Research and Data Analytics**
  As a cost-effective repository for scientific data sets, images, logs, IoT, telemetry and transactional data across retail, manufacturing, financial services, web-scale app's, ADAS.

ActiveScale P100E3

Simple, cost-effective S3-compatible storage

- **Rich software ecosystem**
- **Ideal backup and archiving target**
- **Fully integrated with StorNext, CatDV, DXi**

ARCHIWARE
COMMVAULT
storageDNA
HYCU
arcserve
IBM
VEEAM
ATEMPO
rubrik
VERITAS
APARAVI
komprise
NODEUM
STARFISH

Deployment scenarios

- 1x P100E3 – 100-209 TB

- 2x P100E3 6 node config – 200-730 TB

- 1x P100E3 Replicated

- 2x P100E3 Replicated

- 2x P100E3 Replicating with 1x P100E3

ActiveScale P100E3 Configurations

3 NODE

Usable Capacity

14 TB Drives: 100-209 TB

Performance

- PUT: Up to 1.25 GB/s
- GET: Up to 2.75 GB/s

Object Count

- 235M objects

3 NODE + 3 NODE FIELD UPGRADE

Usable Capacity

14 TB Drives: 200-417 TB

Performance*

- PUT: Up to 1.25 GB/s
- GET: Up to 2.75 GB/s

Object Count*

- 235M objects

* Future SW upgrades will increase performance and object count to 6 node performance and object count

6 NODE (AT INSTALL)

Usable Capacity

14 TB Drives: 200-730 TB

Performance

- PUT: Up to 2.5 GB/s
- GET: Up to 5.5 GB/s

Object Count

- 470M objects