

Quantum®

Storage solutions for digital transformation in the television industry

Unlock the power of data ...

We can make a significant difference & achieve great success!

📍 VTV - 43 Nguyen Chi Thanh

SPEAKER

Mr. Jun Jie Zhang
Engineering at Quantum



Wednesday **AUG 21ST**
CONFERENCE 2024

CONFERENCE AGENDA

START AT 14h30

- 1 - Prominent issues that television stations in the world often face
- 2 - Quantum intro - How Quantum change the world
- 3 - Quantum solutions
 - 3.1 - Quantum StorNext Filesystem, The core of Quantum for M&E

TEA BREAK

- 3.2 - ActiveScale Object Storage for archival data in the most cost-effective ways
 - 3.3 - StorNext for M&E references (Content Productions, Sports Content Producers)
 - 3.4 - CatDV AI/ML Enhancement capability
 - 3.5 - High Level Proposed Architecture for VTV
- 4 - VTVBroadcom MS is a strategic partner of Quantum in Vietnam
- 5 - Discuss

PARTY DINNER ON THE 5TH FLOOR OF THE VTV BUILDING





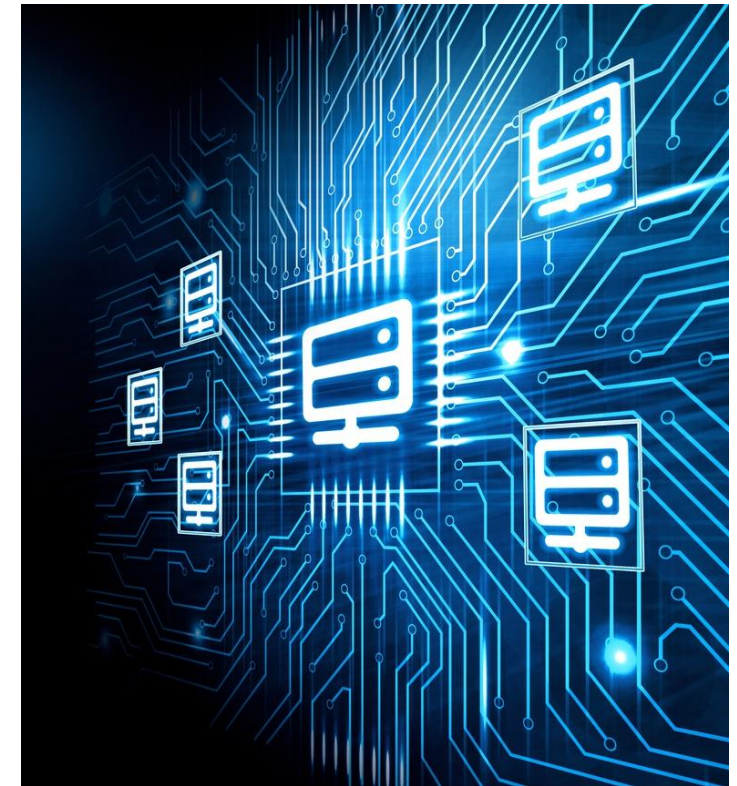
Prominent issues that television stations in the world often face

*“How can we solve a problem when we ourselves don't even know what issues we are facing?
The first step to change and succeed is not to hastily seek solutions, but we must accurately
identify our own current situation.”*

Quantum[®]

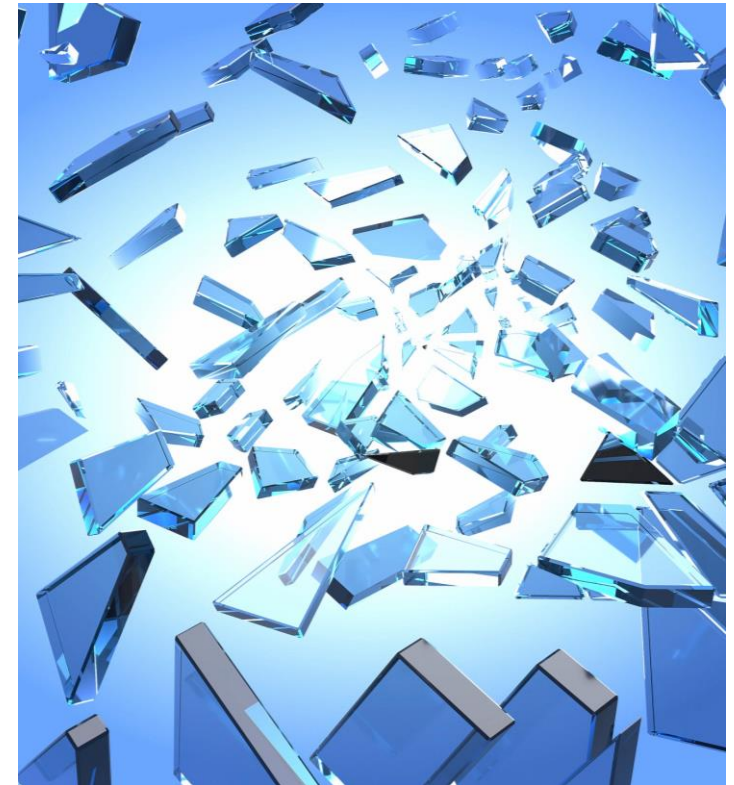
1. Core Database Platform Lacks Big Data Optimization

- **Scalability Issues:** Challenges in scaling the database to manage growing data volumes effectively.
- **Performance Limitations:** Significant slowdowns during high-demand data processing and retrieval periods.
- **Legacy Technology:** Reliance on outdated systems that are insufficient for current big data needs.
- **High Maintenance Costs:** Increasing expenses related to the upkeep and enhancement of the database platform.



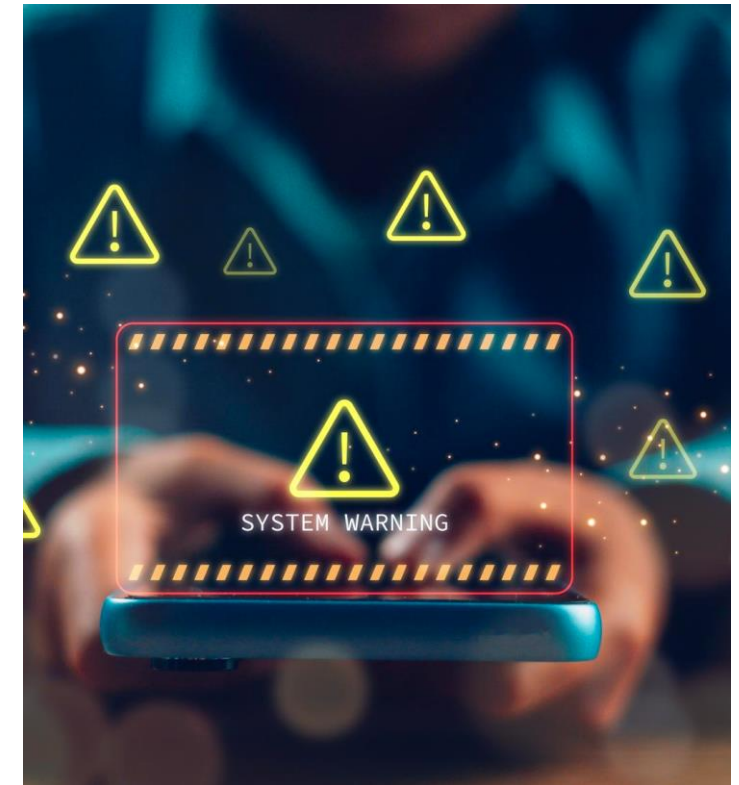
2. Fragmented data & Underutilized processing capability

- **Data Inconsistency:** Challenges in maintaining uniform data across multiple platforms.
- **Complex Data Integration:** Difficulty in integrating data from various sources.
- **Resource Misallocation:** Ineffective use of resources due to fragmented data systems.
- **Legacy System Challenges:** Mismatch between modern software and outdated hardware.
- **Poor System Optimization:** Inadequate tuning leads to suboptimal performance.



3. Overload because of weak management & security

- **Weak Access Controls:** Inadequate measures for controlling who can access data.
- **Vulnerability to Cyber Threats:** Increased risk of cyberattacks due to poor security protocols.
- **Data Mismanagement:** Challenges in effectively managing and categorizing large datasets.
- **High Computational Load:** Excessive processing requirements leading to system strain.
- **Latency in Output:** Delays in video rendering and output generation.



4. Complexity and poor system customizability

- **Rigid Software Architectures:** Inflexible systems that cannot adapt to new requirements.
- **High Costs of Customization:** Expensive and time-consuming to tailor systems to specific needs.
- **Incompatibility with Future Needs:** Systems quickly becoming obsolete as needs evolve.
- **Fragmented Infrastructure:** Diverse components make coordinated upgrades challenging.
- **Incompatibility with New Technologies:** Difficulty in integrating new tech with existing systems.



5. System conflicts with multiple suppliers

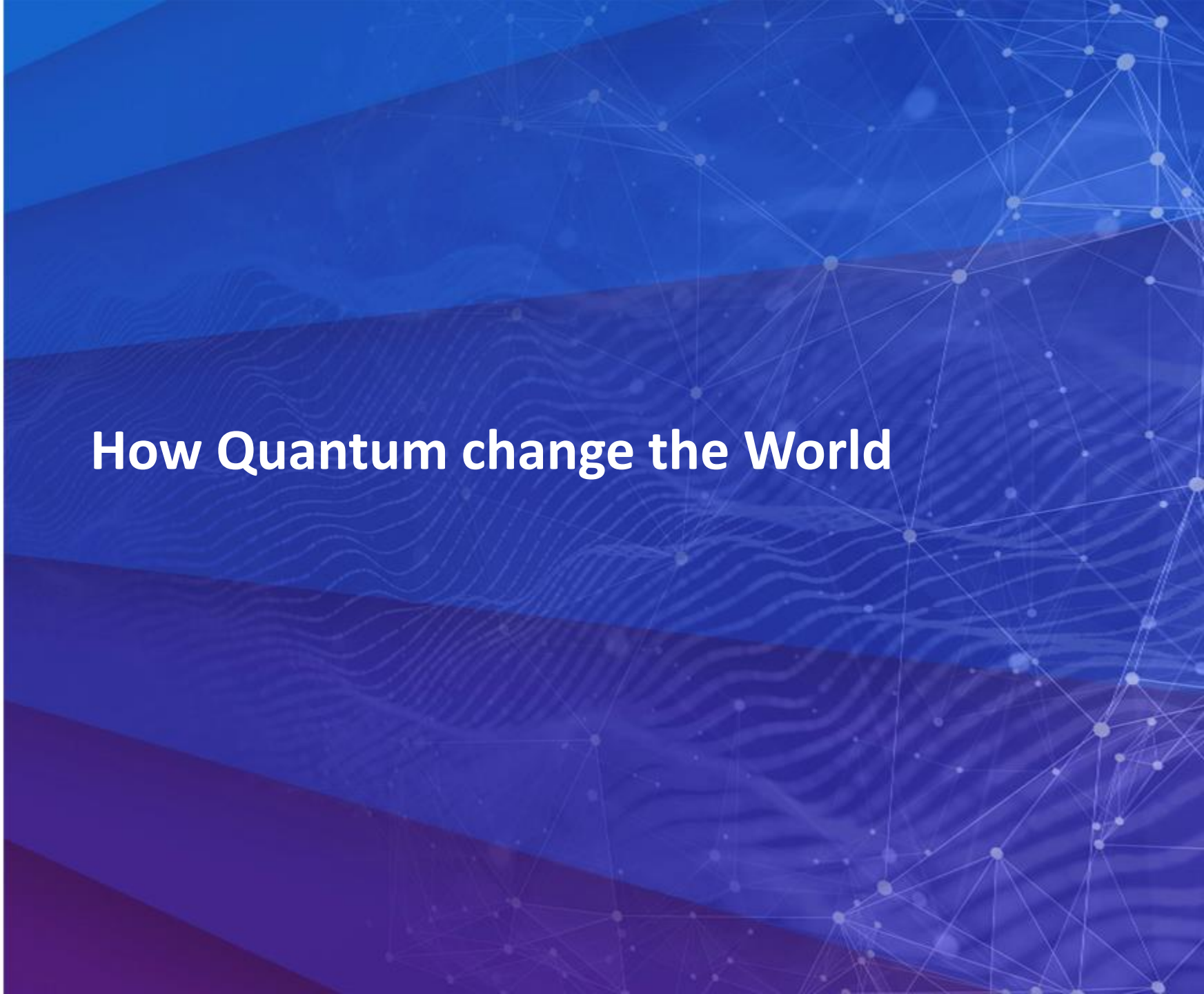
- **Cultural and Operational Misfit:** Difficulty in aligning foreign models with local practices.
- **Resistance from Stakeholders:** Pushback from employees and management against unfamiliar systems.
- **Communication Barriers:** Language and communication issues during implementation.
- **Supply Chain Vulnerabilities:** Exposure to risks from supplier failures or disruptions due to inconsistent service quality.
- **Vendor Lock-In Risks:** Challenges in switching suppliers due to system dependencies.



The Quantum logo features the word "Quantum" in a sans-serif font. The "Q" is a medium blue, while the remaining letters "uantum" are a darker purple. A registered trademark symbol (®) is located at the top right of the "m".

Quantum®

Your difference is in your data.™

The background of the slide is a deep blue gradient. It features several layers of abstract patterns: wavy lines in the lower half and a network of white dots connected by thin lines in the upper half, resembling a data network or molecular structure.

How Quantum change the World

About Quantum (NASDAQ: QMCO)

We deliver end-to-end solutions for unstructured data across the entire data lifecycle.

Analyze and Enrich

~10,000
Customers

Store and Manage

52%
Fortune 100

Protect and Preserve

84+ Exabytes
Stored and Protected

Our Customers Include...



5 of 5
Largest US Broadcasters

4 of 5
Largest US Public Transit Systems

5 of 5
Largest Hyperscalers

The Largest
Media Companies

6 of Top 10
Hotel, Casino, Resort Companies

6 of Top 10
Largest Financial Institutions

The Most Recognized
Brands

10 of the World's
Highest-Volume Airports

17 of 18
US Intelligence Agencies

13 of 30 MLB Teams
15 of 32 NFL Teams

100+
Universities

14 of 17
National Labs

End-to-End Solutions

Streamline Creative Media Workflows



- ✓ Grow revenue
- ✓ Create more content
- ✓ Build your brand

Modernize Infrastructure for Video Surveillance



- ✓ Improve efficiencies
- ✓ Consolidate and simplify
- ✓ Reduce business risk

Enable Long Term Data Archiving and Digital Preservation



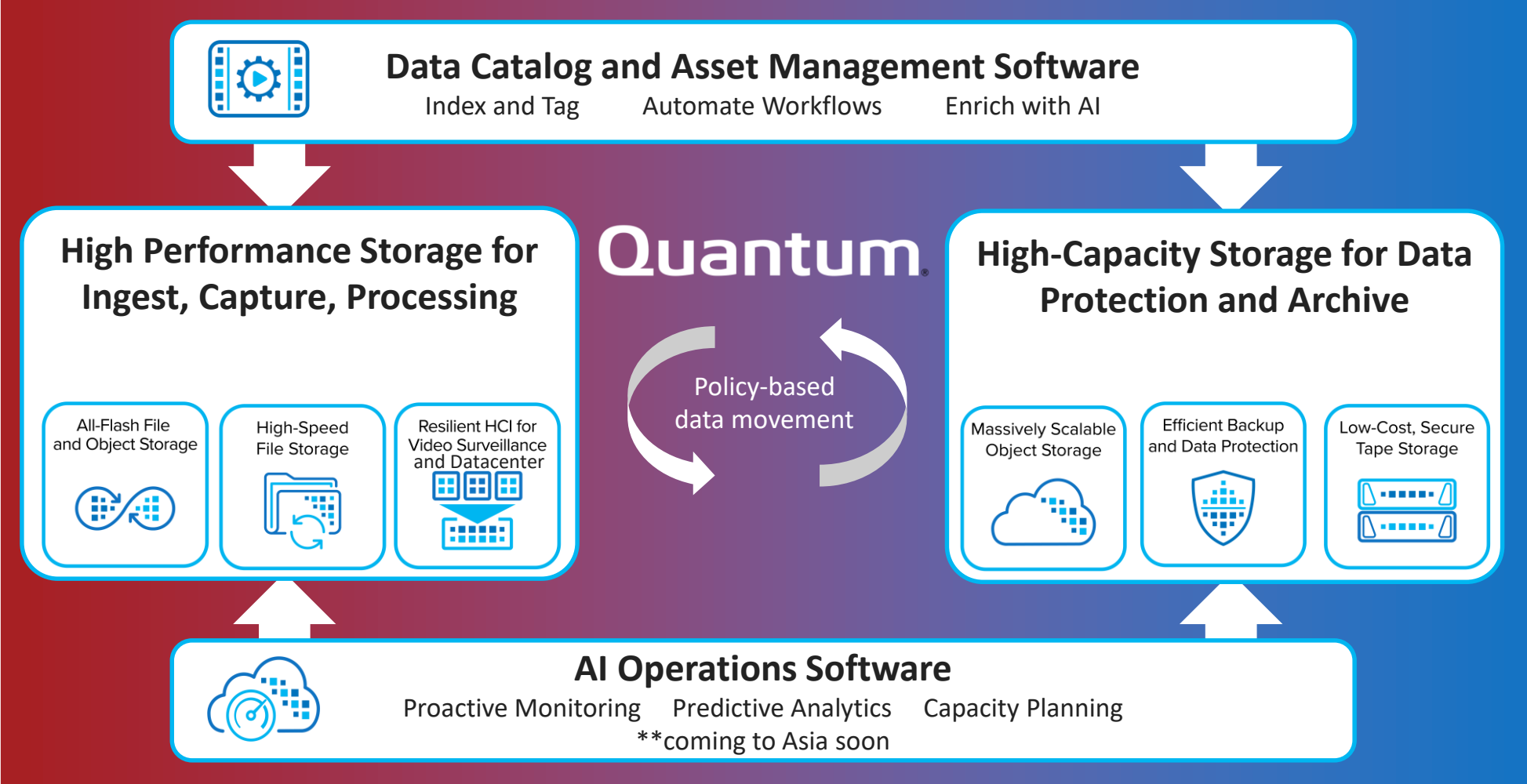
- ✓ Reduce costs
- ✓ Reduce public cloud spend
- ✓ Meet ESG goals (Environmental, Social and Governance)

Strengthen Cybersecurity via Multi-Layered Data Protection



- ✓ Reduce business risk
- ✓ Improve efficiencies
- ✓ Reduce backup costs

The Platform for the Next Era of Data

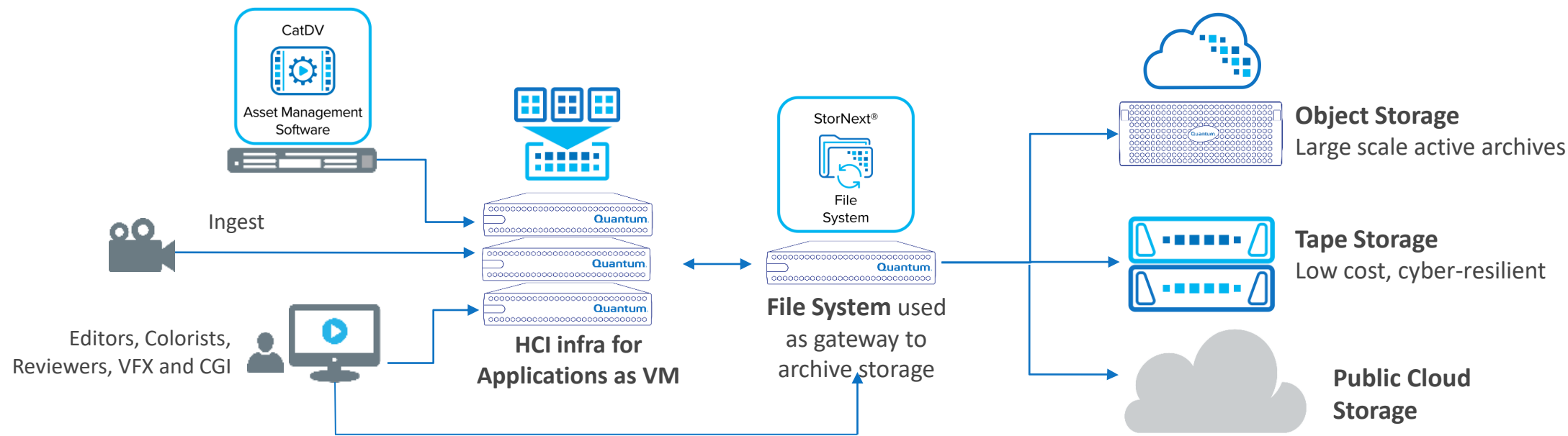


End to End Solutions for Modern M&E Workflow

Asset Management and Workflow Orchestration

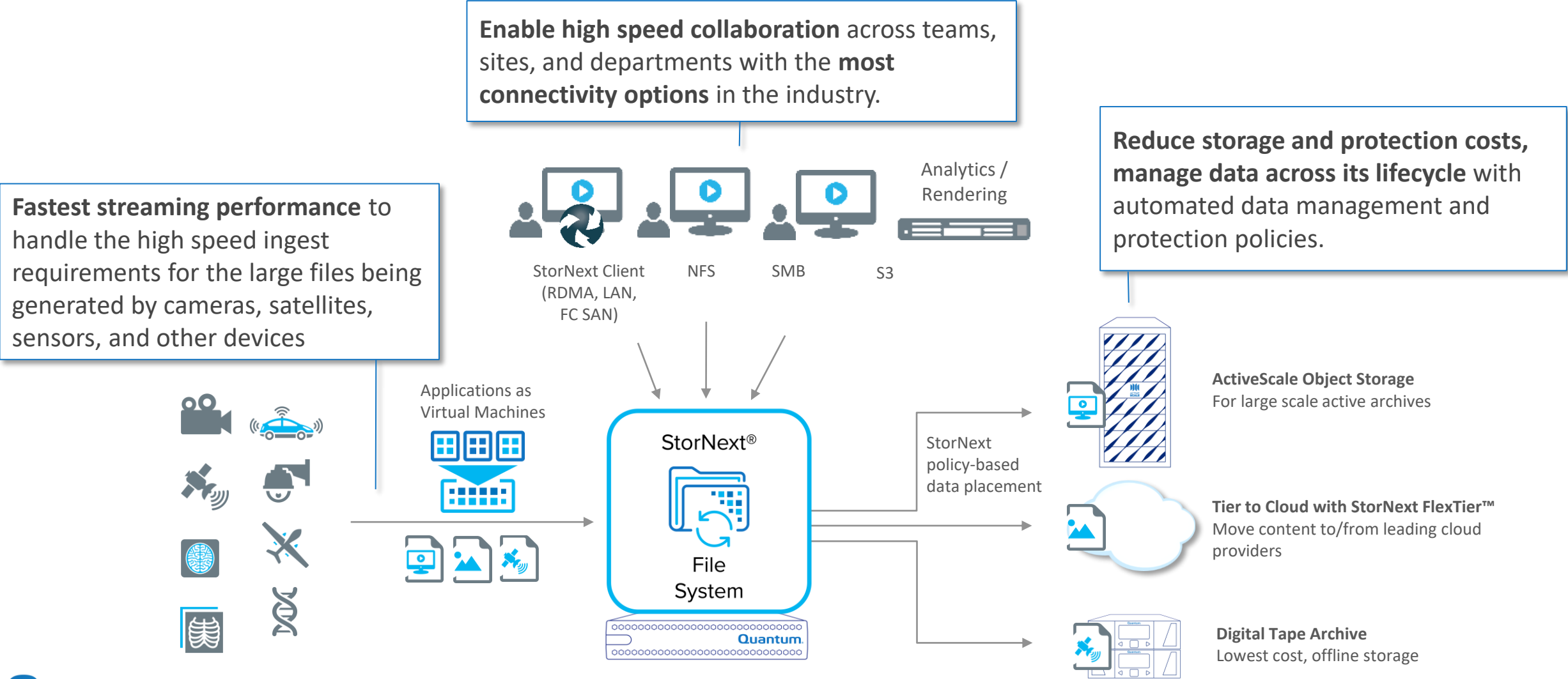
Resilient unified server and storage platforms

Reliable, low-cost storage for long term retention



- ✓ Spend more time creating, less time managing content
- ✓ Consolidate and simplify video recording infrastructure on a highly resilient platform
- ✓ Address long term retention requirements at the lowest cost

Featured Products: StorNext File System and Appliances



Quantum Achievement

ResourcesBlogJournalists

Log InSign UpData PrivacySend a Release

CISION®
PR Newswire

NewsProductsContact

Search

News in FocusBusiness & MoneyScience & TechLifestyle & HealthPolicy & Public InterestPeople & Culture

Quantum StorNext Sets New Performance Records for Video Workloads

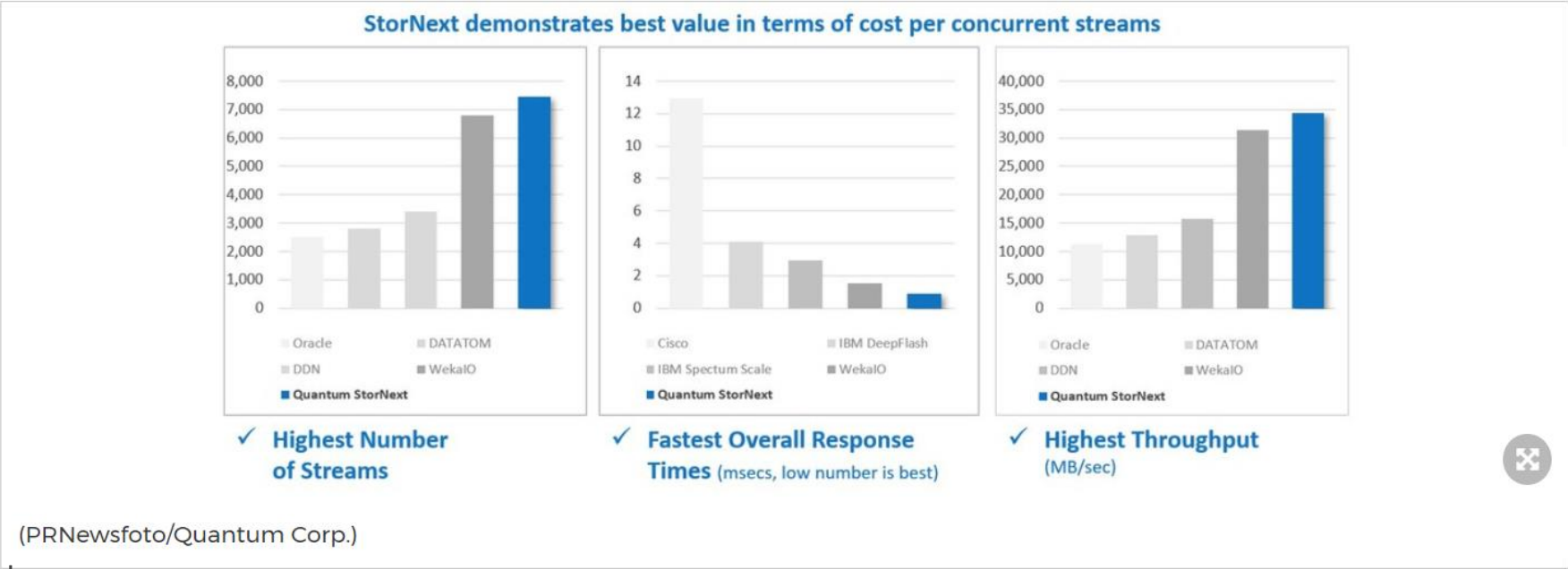
StorNext 7 outperforms all other file systems across all three SPEC SFS 2014 metrics using 57% fewer storage nodes than the next nearest competitor



Link : <https://www.prnewswire.com/news-releases/quantum-stornext-sets-new-performance-records-for-video-workloads-301235534.html>

Quantum Achievement

SAN JOSE, Calif., Feb. 25, 2021 /PRNewswire/ -- Quantum Corporation (NASDAQ: QMCO) today announced that its StorNext® File System is the fastest file system for video workloads. In testing using the independent SPEC SFS 2014 benchmark, the StorNext 7 system outperformed all other file systems across all three performance metrics, using a reference architecture with 57% fewer storage nodes than the next nearest vendor and at a much lower cost per concurrent stream.



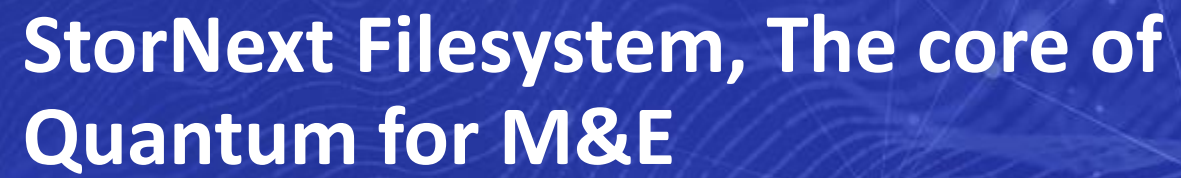
Link :

<https://www.prnewswire.com/news-releases/quantum-stornext-sets-new-performance-records-for-video-workloads-301235554.html>

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Quantum®

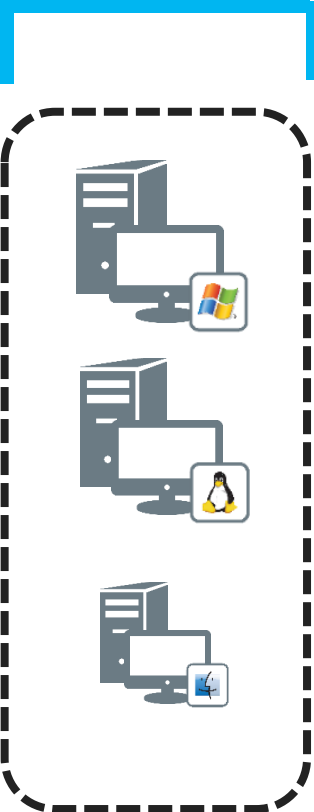
Your difference is in your data.™

The title "StorNext Filesystem, The core of Quantum for M&E" is displayed in white, bold, sans-serif font against a dark blue background with a network pattern.

**StorNext Filesystem, The core of
Quantum for M&E**

WHAT IS STORNEXT ?

OS Agnostic



Multi Protocol Access:
FC, iSCSI, DLC, NAS

S3



StorNext Scale-Out Storage High Performance Shared File System



Policy Driven
Auto Tiering



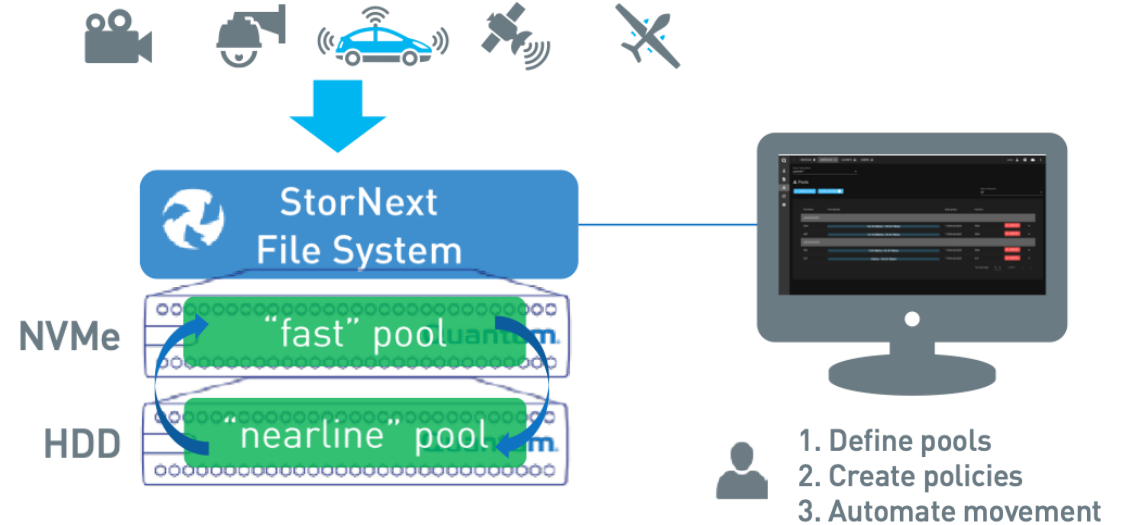
StorNext Tiered Archive Policy Driven, Cost Effective Tiering



Storage Pools and NVMe Optimization

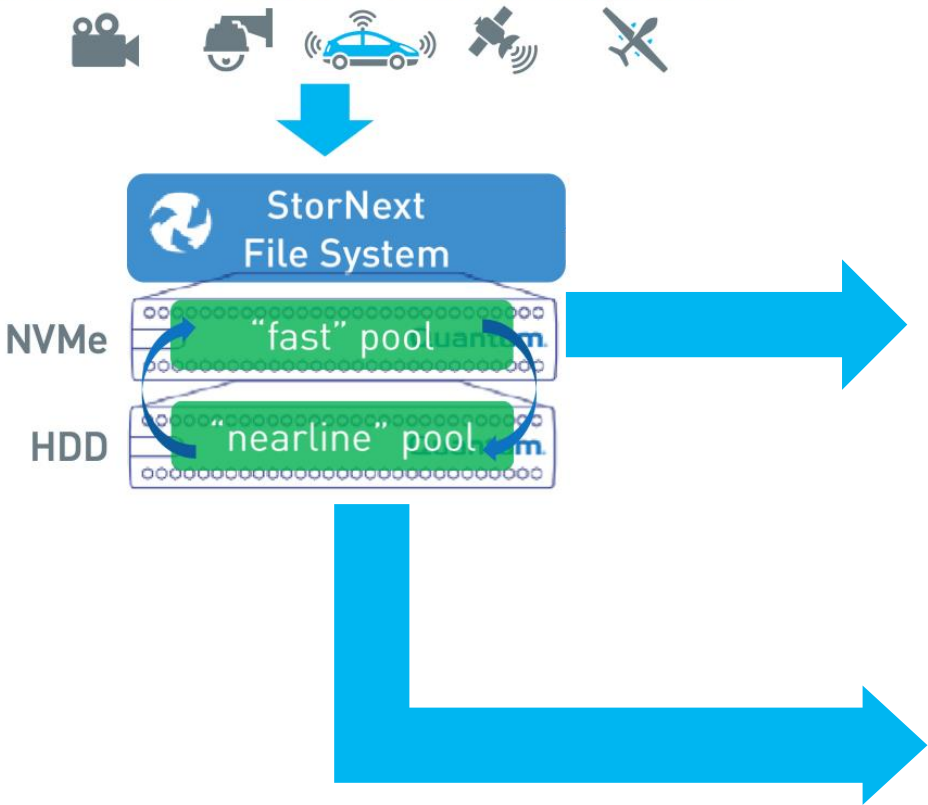
- Compose Precision Workflow Storage Pools
- You define the composition, tiers and context – NVMe+SSD, NVMe and HDD, etc.
- You define movement:
 - Automatic
 - By job
 - By file type
 - By file age
 - By REGEX matching
- Pair with FlexTier and FlexSync for expressive, more automatic file movement and workflow intelligence

HIGH-THROUGHPUT, LOW-LATENCY WORKLOADS

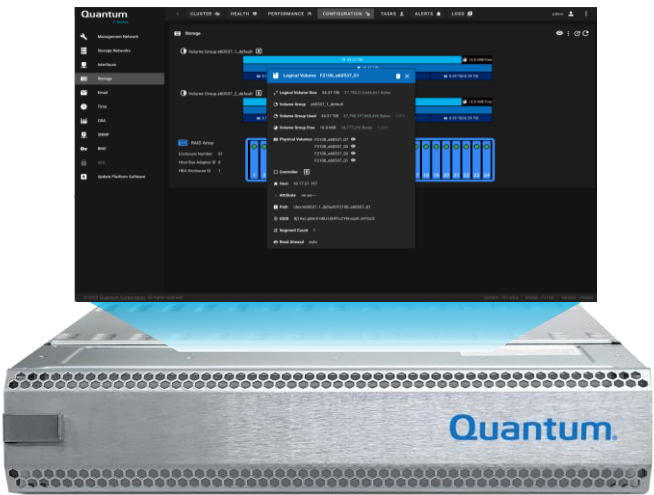


Storage Pools and NVMe Optimization

HIGH-THROUGHPUT, LOW-LATENCY WORKLOADS



The New Quantum F2100 NVMe Storage Appliance



- Power and Precision to Re-Invent Every Workflow

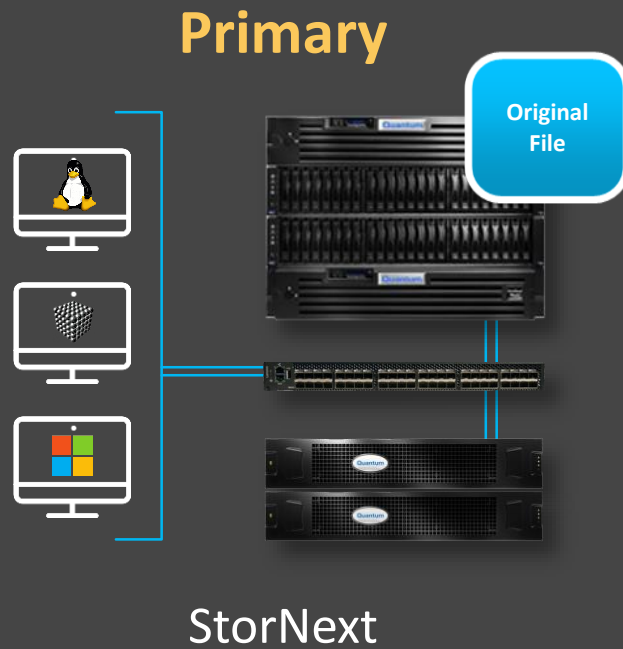
The New Quantum QXS-5 12G NL-SAS Storage



- Better throughput and IOPs performance
- Better performance as arrays scale up
- Improved read-ahead cache for video streams
- Extremely dense 5U, 84-drive configuration

Tiered Data Management (Storage Manager)

[]



Tiered Data Management (Storage Manager)

[]

Files Immediately Protected in Multiple Locations



Tiered Data Management (Storage Manager)

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Truncating a File Frees Valuable Primary Storage Space and Leaves a “Stub” Pointing to Archived Copies



Tiered Data Management (Storage Manager)

[]

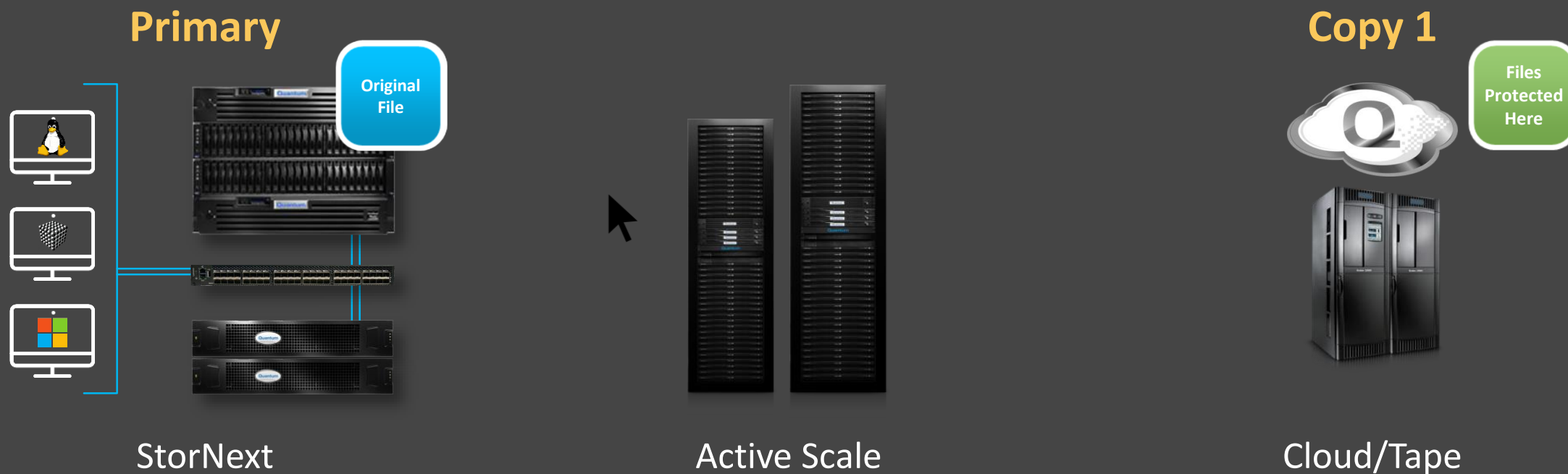
Archived Copies Can Be “Aged Off” of Any Tier Automatically Based On Time



Tiered Data Management (Storage Manager)

[]

Files are Accessed and Restored Just By Clicking



Quantum[®]

Your difference is in your data. [™]



Tea Break Time~



5-8 mins~

ActiveScale™ Object Storage

for active archiving and long-term retention

Quantum®

Your difference is in your data.™





Scalable, multi-class object storage for affordable, durable access across the data lifecycle

Performance

Best-in-class performance at any scale across multiple storage classes for data-intensive pipelines and workflows.

Simplicity

S3 compatibility, seamless growth and effortless management from terabytes to exabytes.

Durability

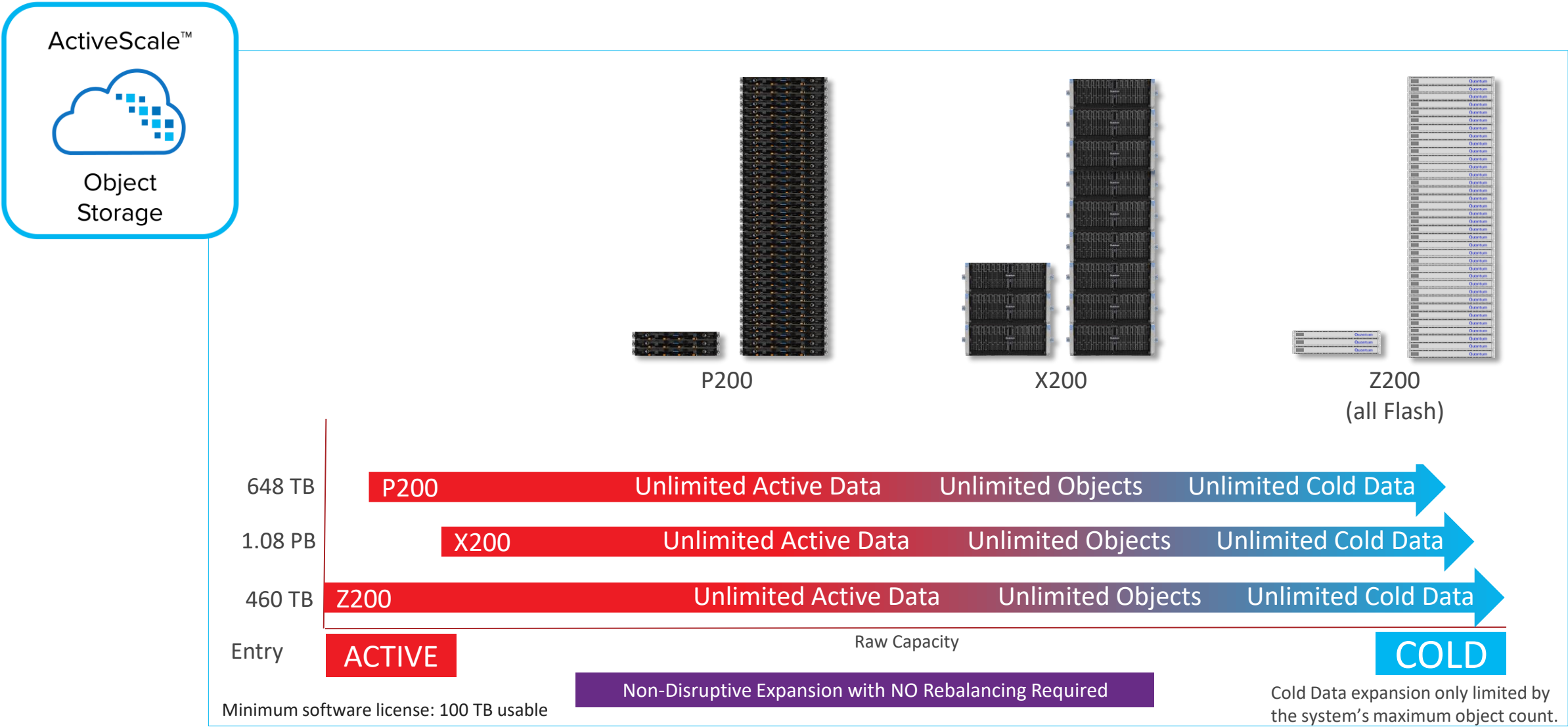
Secure online access, availability, and protection throughout data's life, from years to decades.

Lowest TCO

Available with flash, disks and cold storage options for performant, cost-effective analytics, data lakes and storage clouds.

ActiveScale Object Storage Platform Portfolio

Flexible deployment and purchase vehicles from terabytes to exabytes and beyond



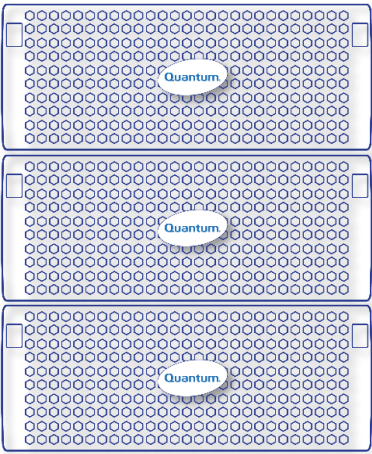
Broad Application Ecosystem for a Wide Range of Use Cases

S3/S3a Compatible Applications



Easy to enable multiple use cases

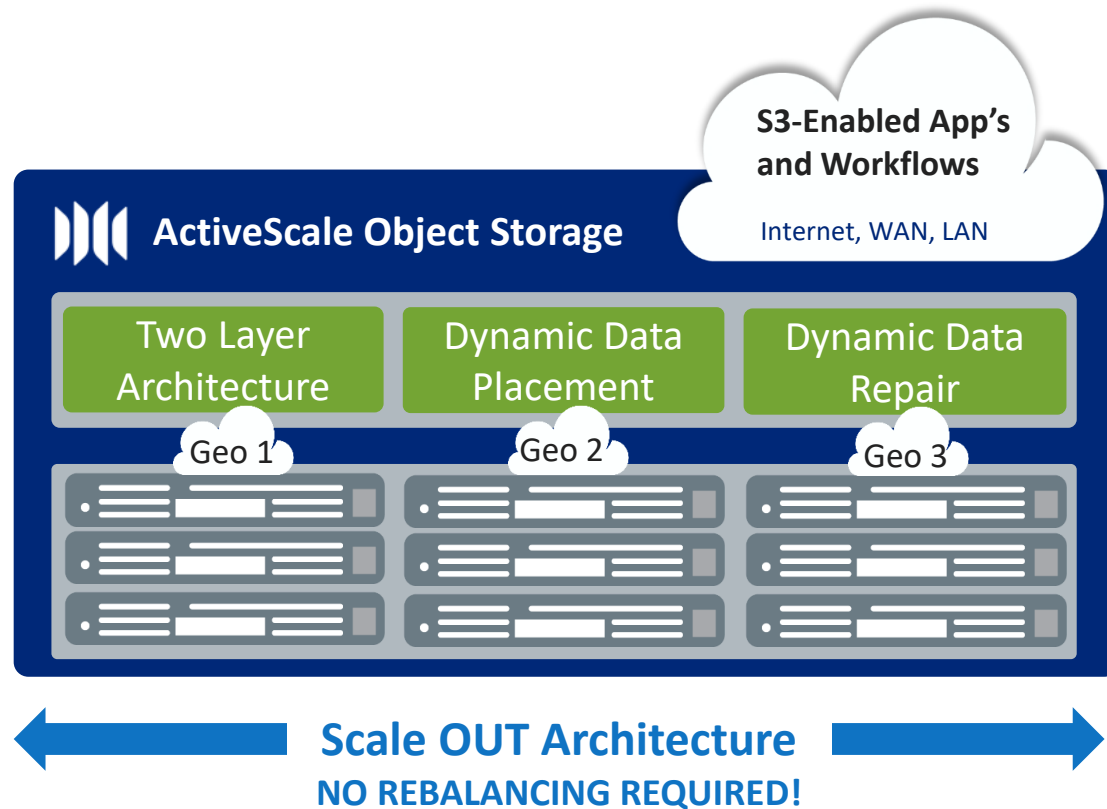
- Uniquely authenticated
- Dedicated bucket(s) per use case
- Support for millions of buckets
- Thin provisioned



**ActiveScale
Object
Storage**

Simple to Manage, Simple to Grow

Single system, Seamless expansion, Built for scale



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

Scale-out architecture

From terabytes to exabytes and billions of objects

Two-layer architecture

Flash performance with cost benefits of hard drives

Dynamic data placement (DDP)

Durability, availability, and performance – at any scale

Dynamic data repair (DDR)

Maintains durability over time and removes rebuild risks

Advanced erasure encoding and 3-Geo

Protects against component and site failures for Always-on availability

ActiveScale's Unique Two-Layer Architecture Delivers Scale, Performance, Availability

- ActiveScale separates the “Access Layer” from the “Data Layer”

- The Right Storage for the Task
 - Utilize SSD for Access Layer on System Nodes
 - Utilize HDD for Data Layer on Storage Nodes
- Any Object is accessible from Any Access/System Node

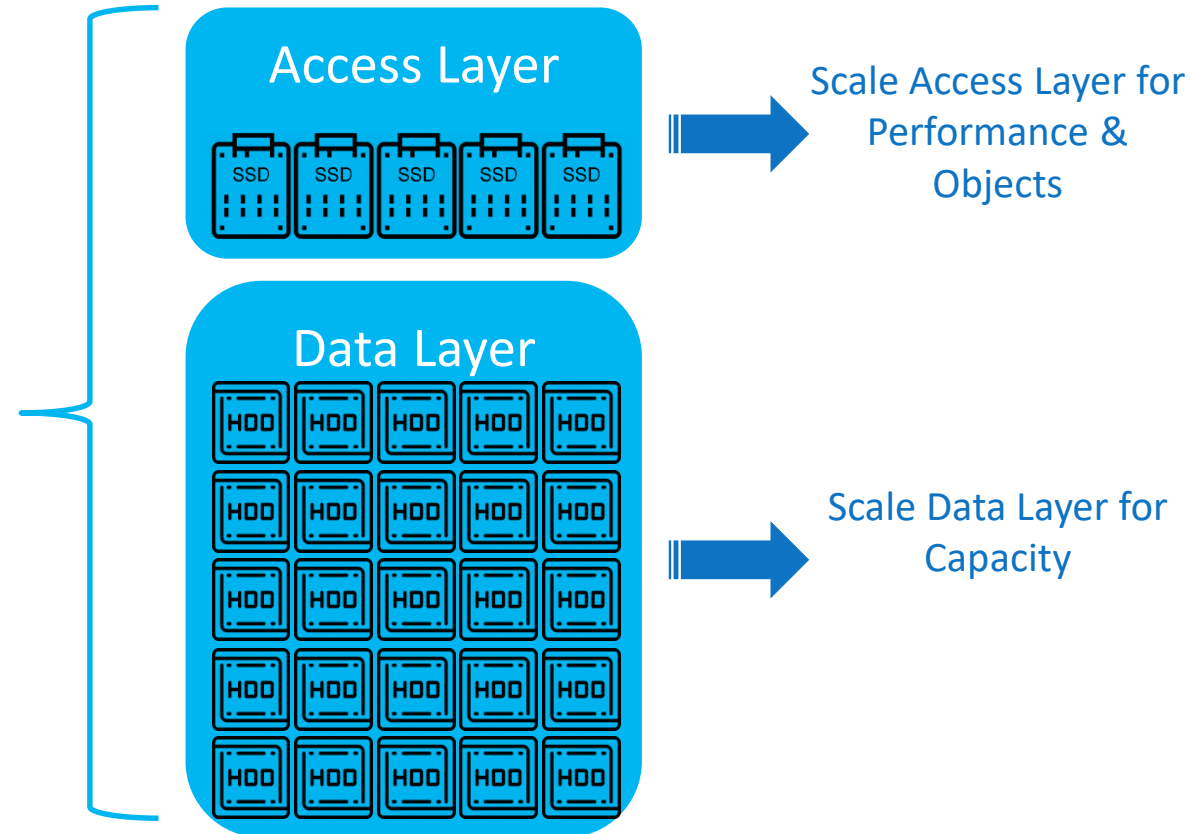
- Access Layer on System Nodes

- Provides Global Namespace
- Manages Object Metadata
- Manages Authentication

- Data Layer on Storage Nodes

- Multiple Data Pools
- Manages Data Placement
- Manages Data Repair

ActiveScale
Independent
Software Layers



ActiveScale Dynamic Data Placement (DDP)



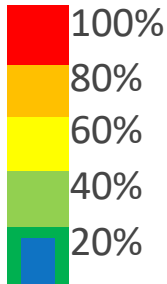
- Algorithm accommodates failed or offline hardware



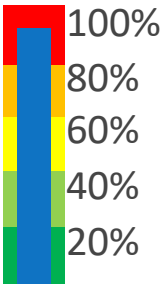
- Blockstores with higher available capacity are preferred to ensure even data distribution

- Blockstores with a lower I/O demand are preferred to prevent I/O “hot-spots”

Most Preferred



Low Capacity Usage



High Capacity Usage

Least Preferred



Low I/O Demand



High I/O Demand



The ActiveScale DDP Advantage

Fixed or Static Data Placement

Competitive object stores commonly use distributed filesystems (aka RING)

Storage location is calculated/fixed

 Requires Rebalance - The Achilles Heel of Static Placement

 Affects system performance and system availability

ActiveScale Dynamic Data Placement

ActiveScale's proprietary placement logic

Software determines most ideal storage location

 Eliminates the need to rebalance data

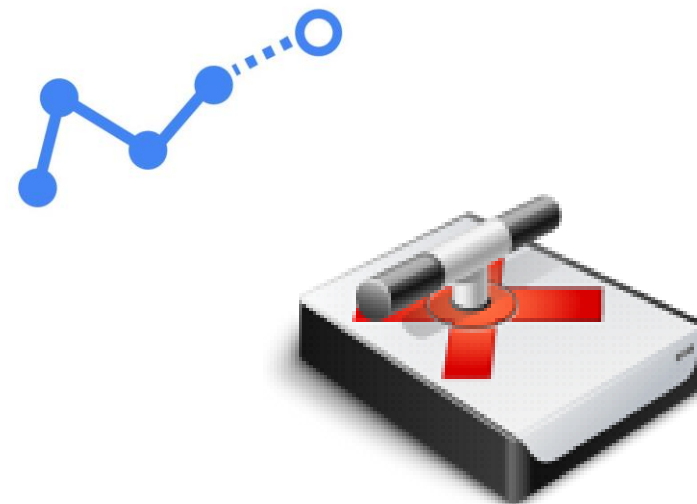
 Delivers consistent availability and performance – at any scale

Want to learn more? Watch this [5 min video on DDP](#).

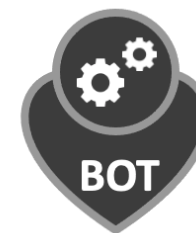
ActiveScale Dynamic Data Repair (DDR) and Monitoring

- Predicts Drive Failures
- Detects Hardware and Network Failures
- Automatic Data Repair on Blockstore (Disk) Failure
- Data Integrity Check on Data at Rest

Want to learn more? Watch this [5 min video on DDR](#).



- ✓ File Name: Part-05
- ✓ Parent: Sally's Spreadsheet.xls
- ✓ Bucket: Shared Bucket
- ✓ Sequence: 5
- ✓ HASH: 4723
- ✓ Consistent: 4723 = 4723



Data Spreading Algorithm

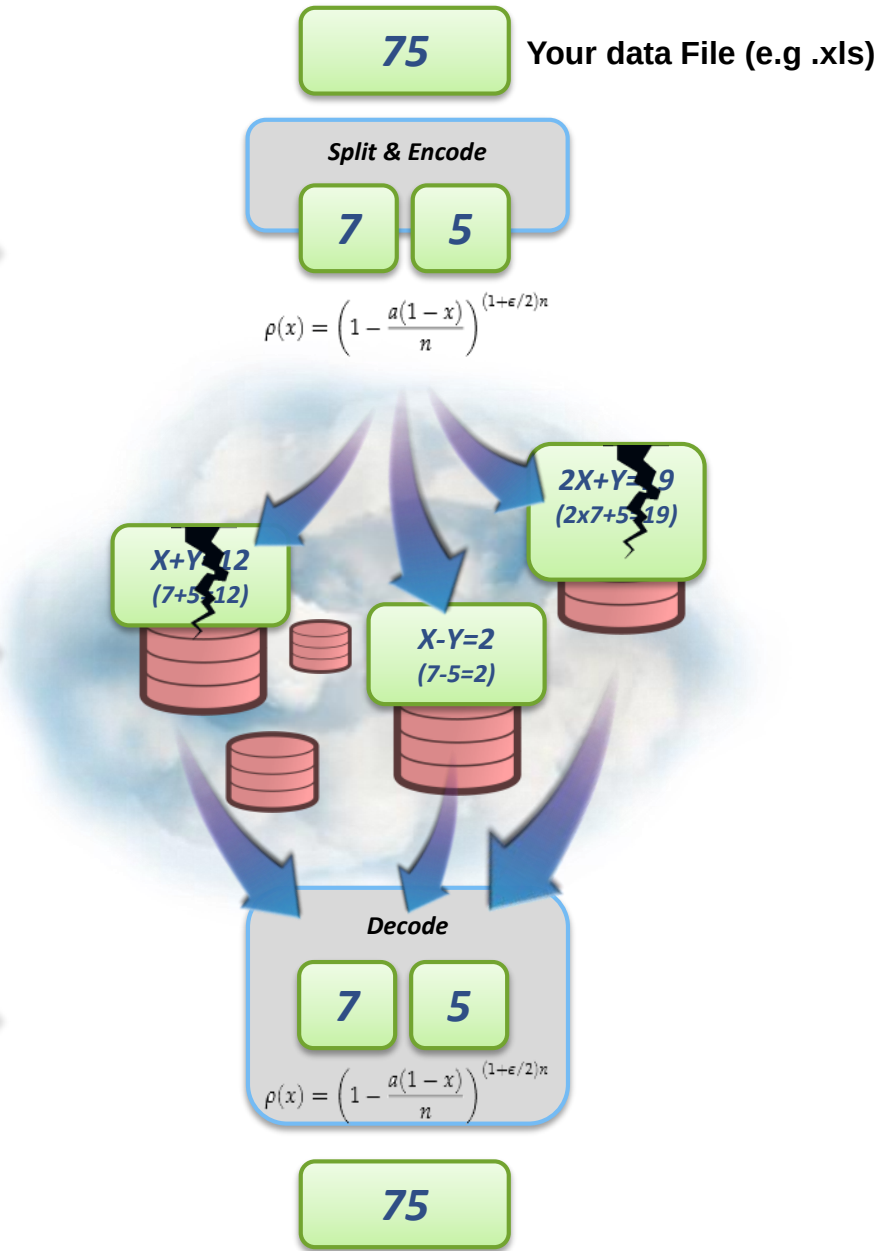
Simplified mathematics

- 1

The algorithm splits data into chunks.
Chunks are encoded into equations
- 2

The equations are dispersed
across disks, nodes, racks, sites
- 3

A subset of the equation allows
to decode the original file



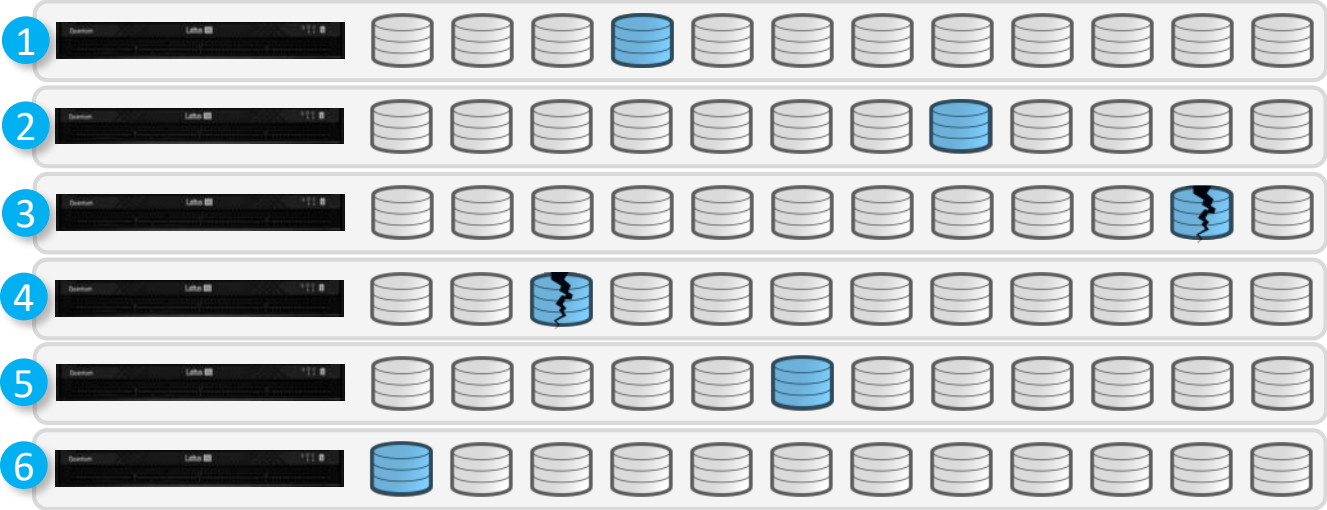
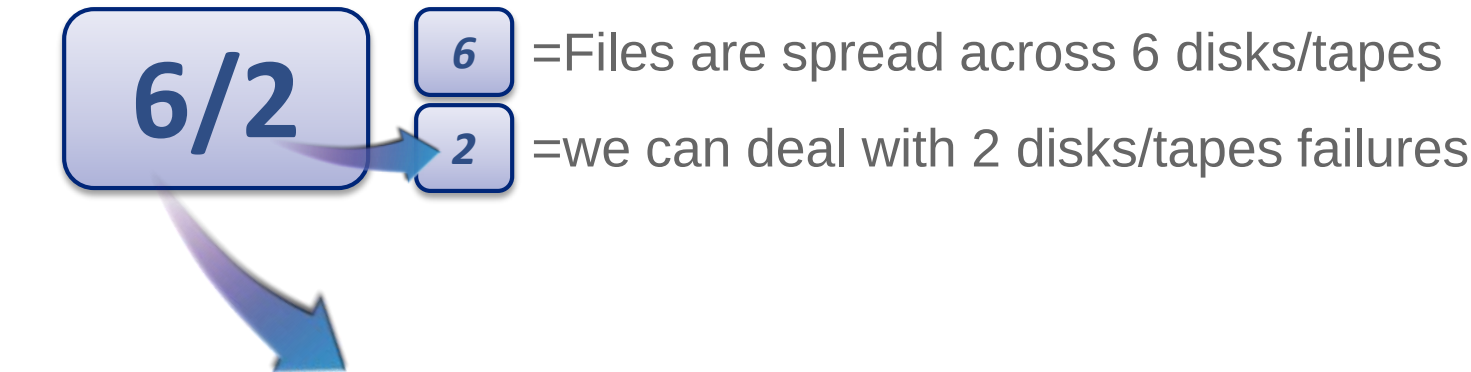
Durability Policies

The objective: building reliable data storage from unreliable components.

“I can tolerate occasional disconnection from my data but I demand a guarantee that my data is never permanently lost due to failure : I want durability”.

- Durability policies are *configurable to give customers choice*
- Durability Policy Example: 20/4 (default on high end configs)
 - 20/4 means: files are spread across 20 disks/nodes/racks/tapes
 - Data protected even with as many as 4 failures (disks/node/tapes failure)
- 20/4 policy delivers
 - Five disk/tapes failures must occur before any probability of data loss
 - Bit error corruption probability reduced to 0%

Durability Policies: a simple example



Number of Storage Node: 6
Durability Policy: 6/2
Raw capacity: 216 TB
Usable capacity: 123 TB
Raw to Ratio: 1.763
Number of Hard Drives: 72

Object 1

2 Drives failures : **NO DATA LOSS**

Durability Policies

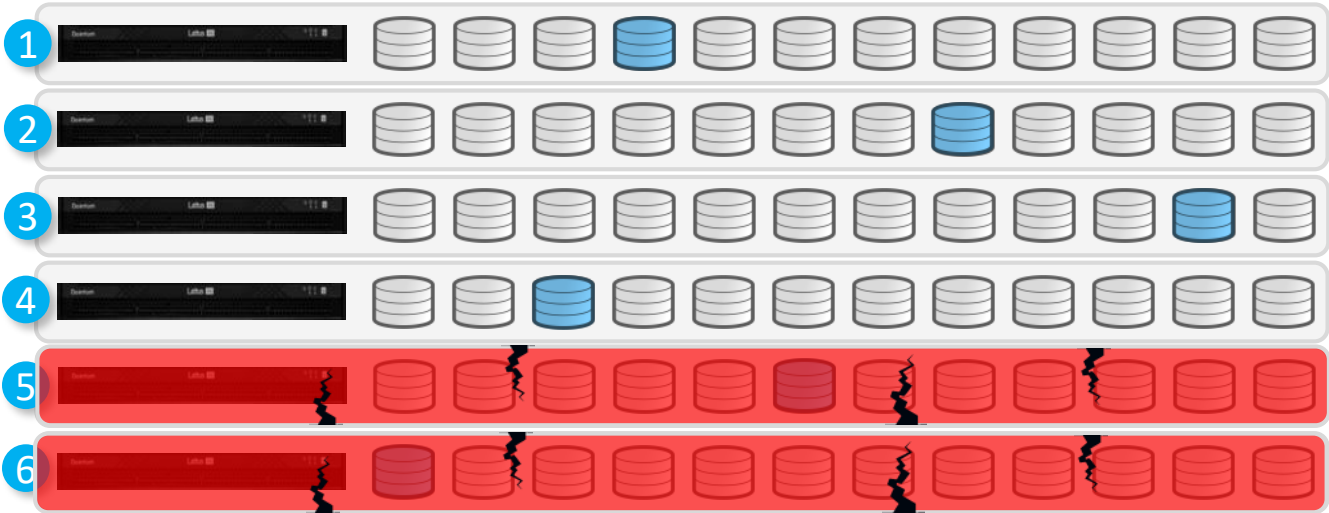
6/2

6

=Files are spread across 6 disks/tapes

2

=we can deal with 2 disks/tapes failures



Number of Storage Node:

6

Durability Policy: 6/2

Raw capacity: 216 TB

Usable capacity: 123 TB

Raw to Ratio: 1.763

Number of Hard Drives:

72

 Object 1

 2 Nodes failures : **NO DATA LOSS**

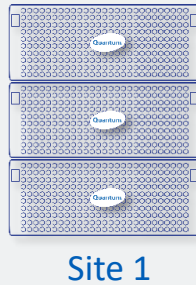
Force dispersion over machines

☒ No
☐ Yes

ActiveScale Deployment Options

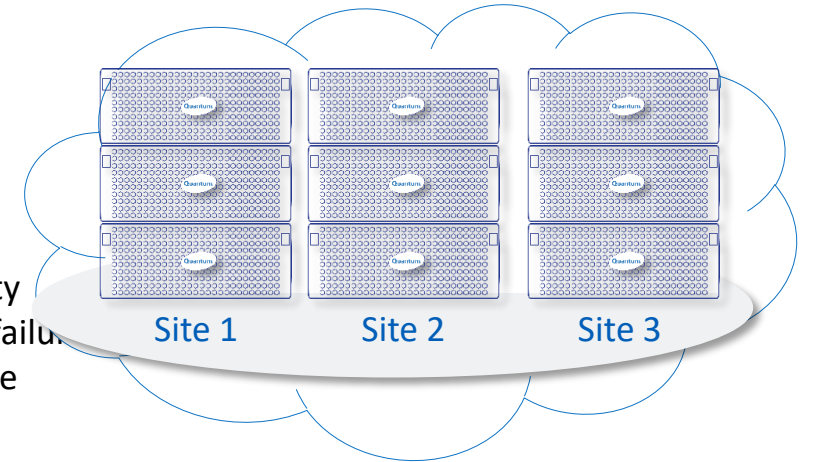
Single site

Protects against disk, node, and component failure



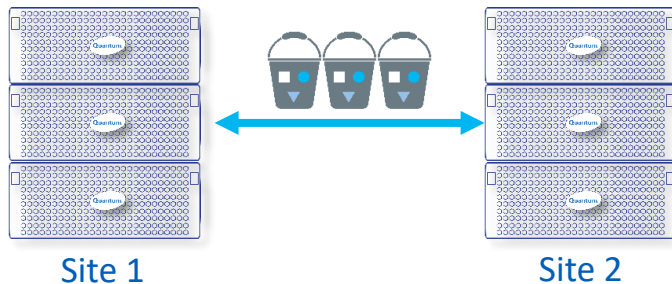
3-Geo

Highest efficiency
Single data instance
Single namespace
Highest data durability
Protects against site failure
Ingest Data at Any Site



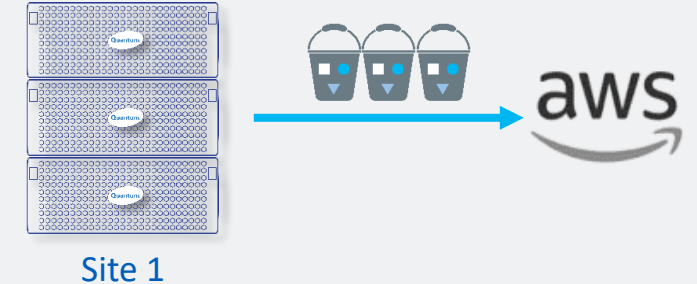
Two site

Site fault tolerance
Choose what buckets to replicate



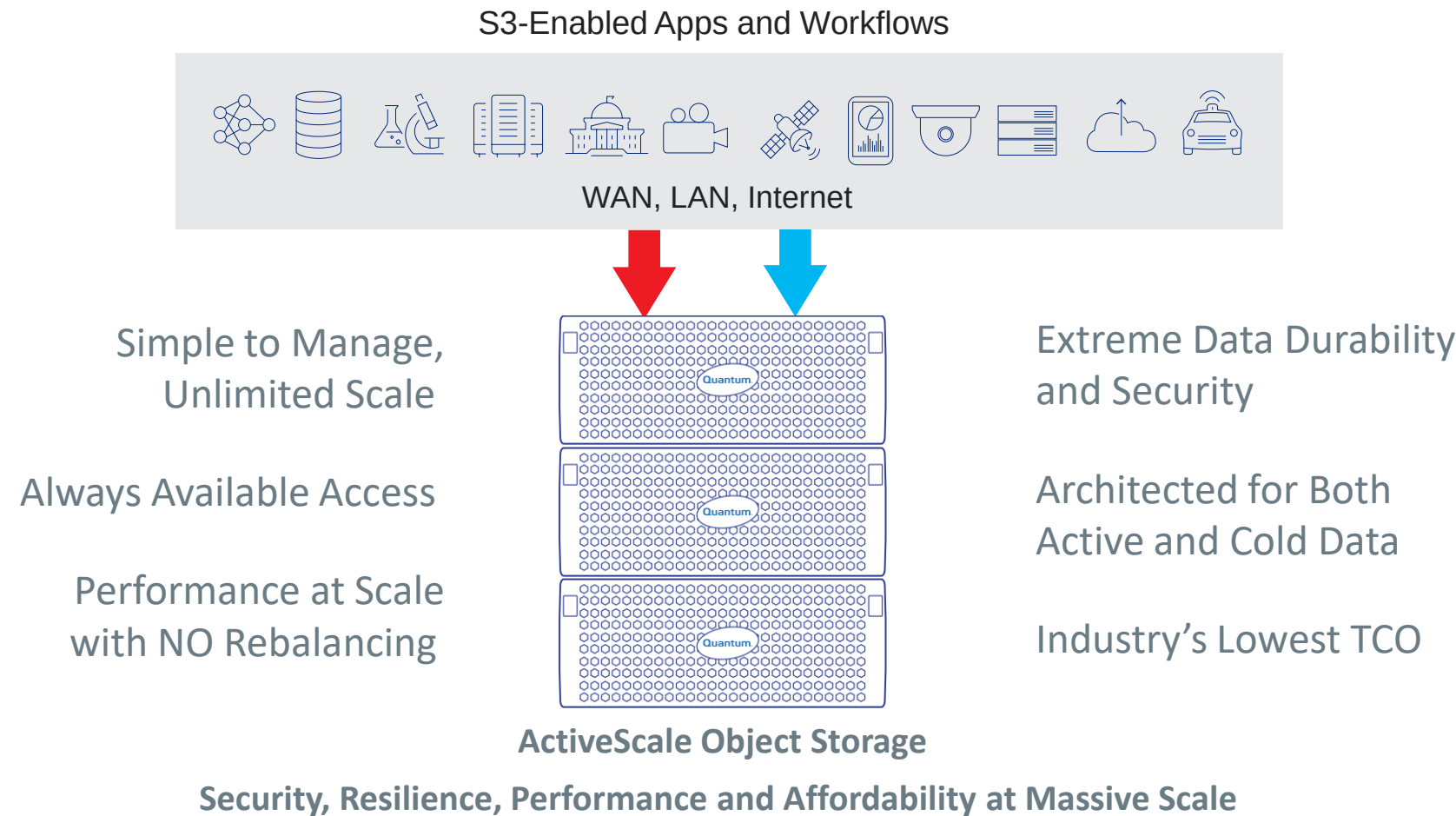
Hybrid

Choose what buckets to replicate to the cloud



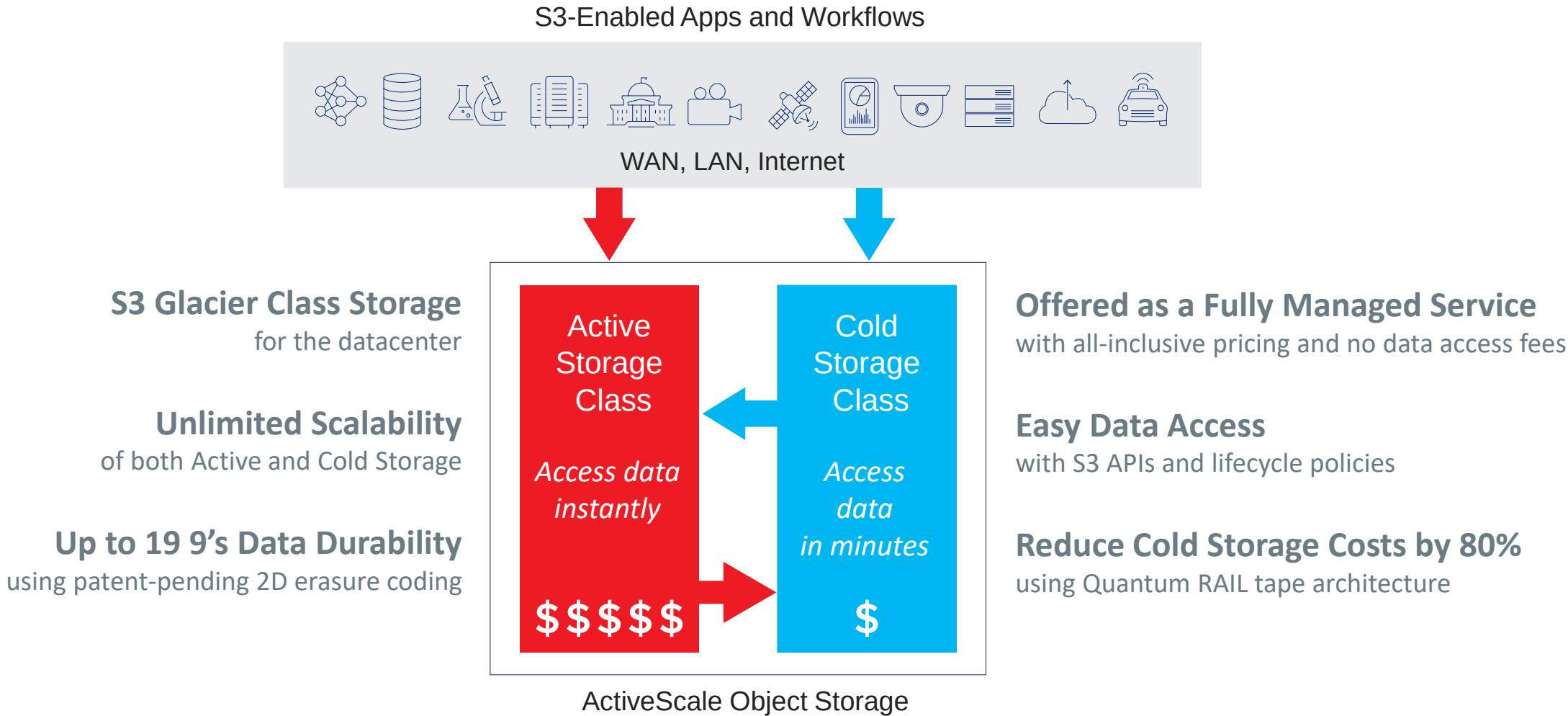
ActiveScale Object Storage

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

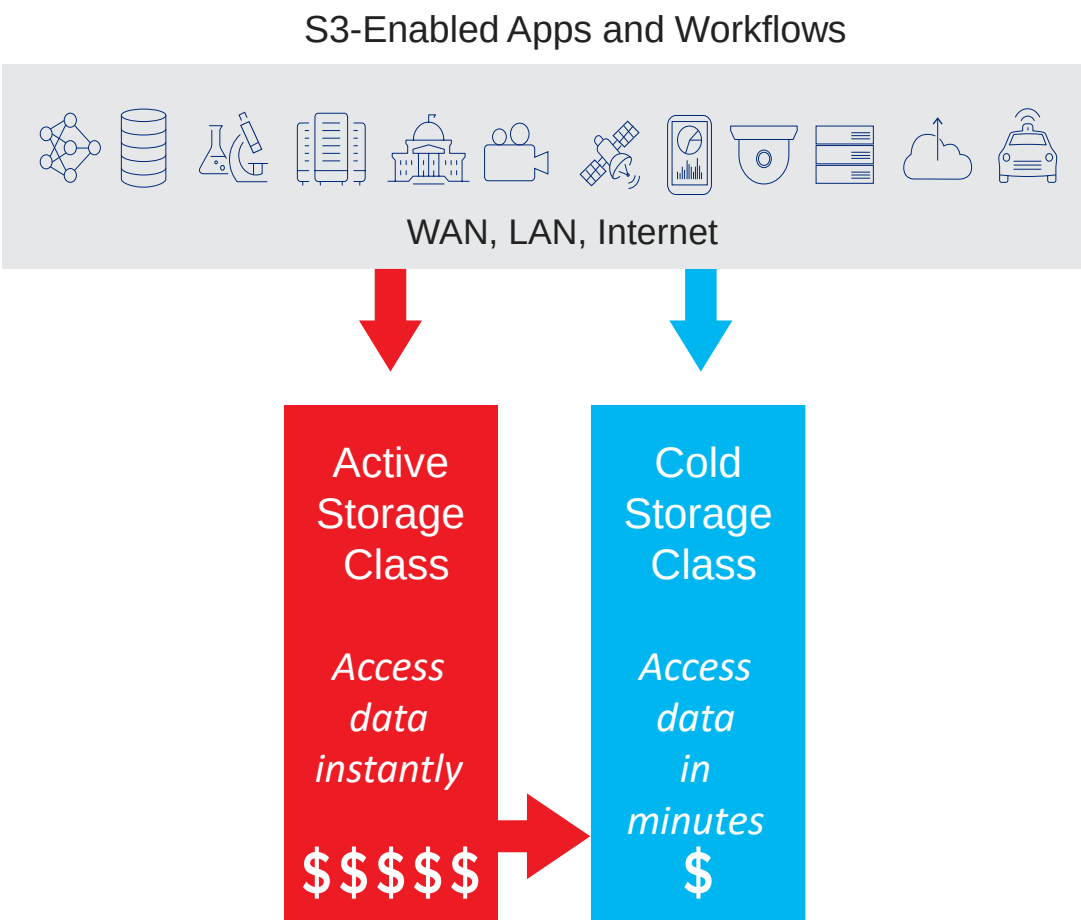
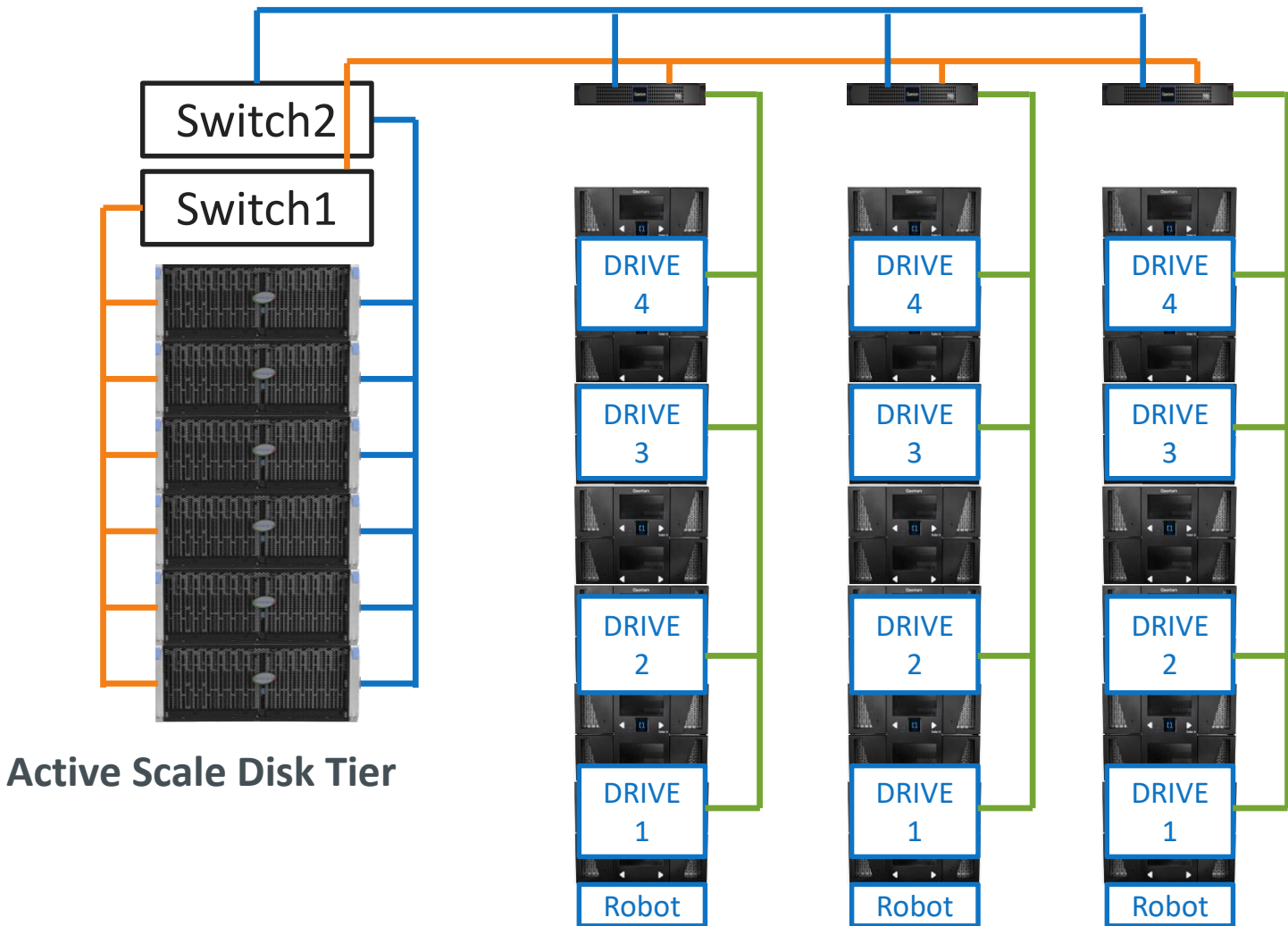


Introducing ActiveScale Cold Storage: A New Class of Storage for Cold Data

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



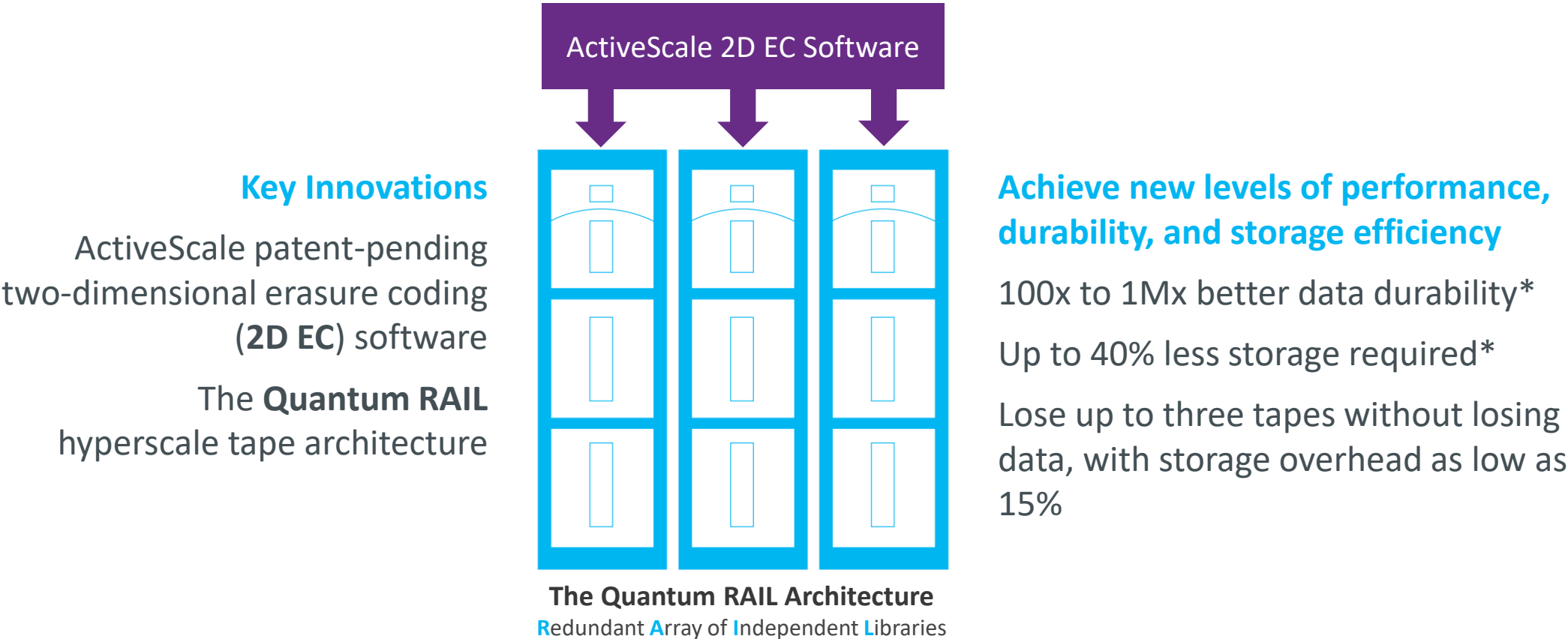
Active Scale Cold Storage Design



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), simultaneously maximizing data access performance, data durability, and storage efficiency.



A Glimpse of what the top 3 has deployed



The Quantum logo features the word "Quantum" in a sans-serif font. The "Q" is a medium blue, while the remaining letters "uantum" are a darker purple. A small registered trademark symbol (®) is located at the top right of the "m".

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The title "StorNext for Content Production" is centered on the right side of the slide. It is written in a white, bold, sans-serif font. The background behind the text consists of several overlapping, diagonal bands of different shades of blue and purple, creating a sense of depth and movement. A network of white dots connected by thin lines is visible in the upper right corner, suggesting a data or network theme.

StorNext for Content Production

Quantum StorNext for Post, Film, and Television Producers

- Work in ultra-high resolutions and more complex workflows from set to delivery
- Deliver shows and films faster for new streaming services ‘a season at a time’
- Quickly and economically retrieve archived content for new productions

Quantum's high-performance shared storage file-system lets editors work simultaneously on projects from ingest to archive to slash time to deliver finished work



PARK ROAD
POST PRODUCTION

M
FILM

LaserFilm®

Studio Hamburg
Postproduction

Fifty Fifty

the
(ark)
post production

citizen★pictures

Quantum StorNext for News and Sports Broadcasters

- Deliver live events under tighter deadlines
- Keep more content for packages, special features
- Re-use and re-purpose content for fast-evolving for customer engagement and personalization

Quantum's end-to-end architecture lets broadcasters connect every production step with different storage needs into a single content workflow



itv NEWS



Baltimore Ravens
Productions



SPORTS MAX



Quantum StorNext for Gaming, Special Effects and Animation

- Speed time to review and delivery with collaboration across entire artist team
- Serve 'hot' and 'deep' parts of creation in a unified workflow, and billions of files
- Efficiently archive for instant retrieval



Quantum's flash storage supports billions of files and ultra-fast rendering within an end-to-end animation production



Quantum StorNext for Content Publishers, Houses of Worship

- Consolidate storage and workflows for predictable production
- Extend collaboration remotely to field producers and editors
- Maintain strong control of content production and trips to archive



Quantum lets content publishers consolidate storage silos to build efficient, cost-effective, and global collaborative workflows



JOYCE MEYER MINISTRIES



Quantum StorNext for Corporate Rich Media

- Empower department or branch level teams to create more engaging training, product, and customer engagement content
- Let creative teams deploy storage and workflows that IT teams trust but are not impacting existing storage

Quantum's rich media storage and content management solutions let every organization use the technology and best practices from media and entertainment



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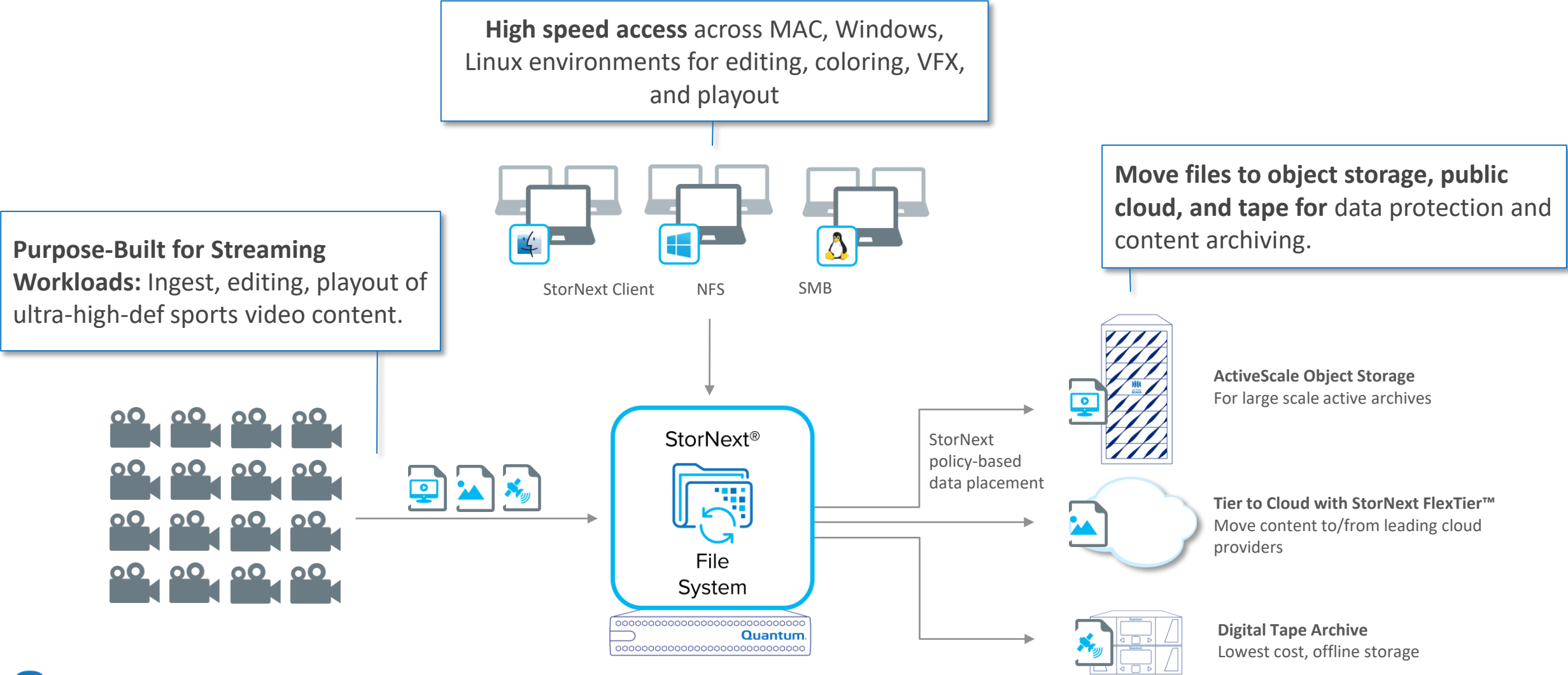
The title "StorNext for Sports Content Producers" is centered on the right side of the slide. It is written in a white, bold, sans-serif font. The background behind the text consists of several overlapping, diagonal bands of different shades of blue and purple, creating a sense of depth and movement. A network of thin white lines with small circular nodes is overlaid on the entire background, suggesting a data network or digital infrastructure.

StorNext for Sports Content Producers

Quantum and Sports Workflows Overview

- Provider of storage solutions for sports video and content production for more than 20 years
- Broadened presence with acquisition of CatDV in 2020
- Today serve hundreds of customers globally: leagues, teams, networks, universities
- Investing to drive more focus on sports as a vertical – especially with an AI/ML services focus
- Expand from point products to “end to end”

StorNext Shared File Storage for Sports Production



End to End Solutions for Sports

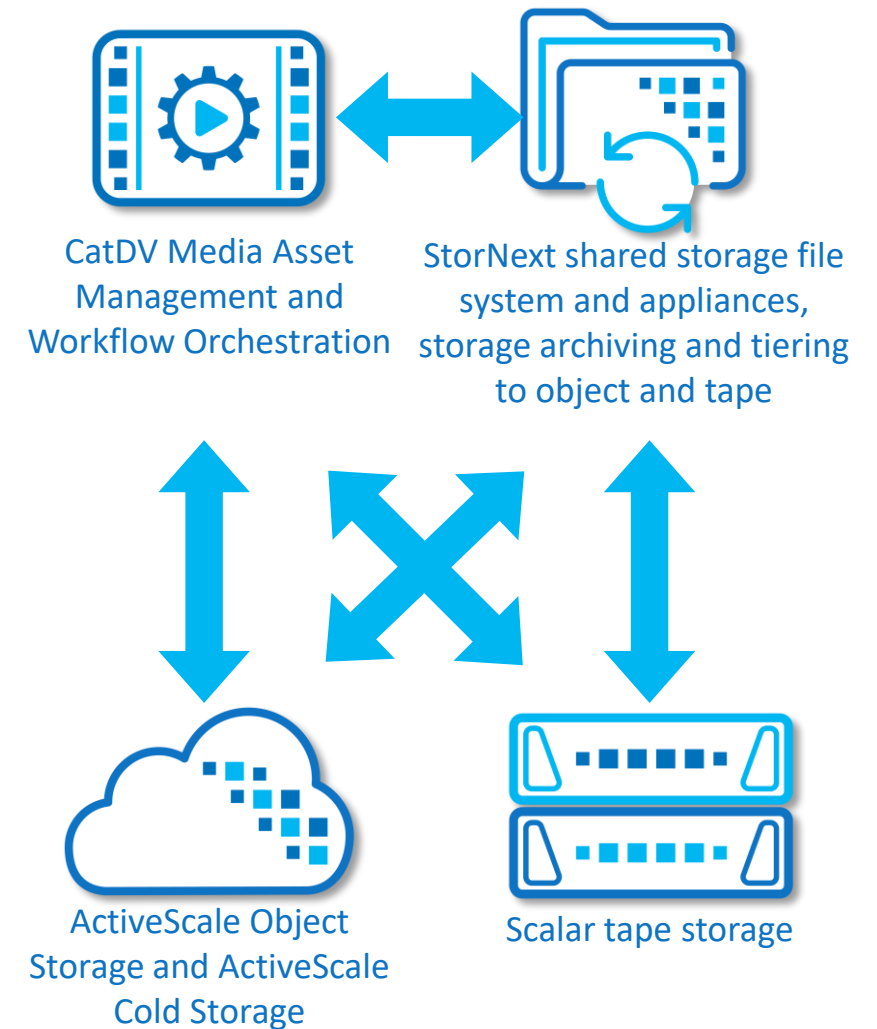


Media Asset Management and AI Enrichment

Index, catalog, and enrich team video data to streamline workflows, produce more content to engage fans.

Quantum and Sports Workflows

- **Leagues:** shared storage, media management, and media archives for long and short form film and television, league to team content services
- **Teams:** shared storage, media management, and media archives for short form production, social media, fan experiences
- **Arena/Stadiums/Ownership Groups:** media management, media archives for stadium experiences, event and team short form production



Global Leader in Sports - Professional Sports Leagues



Global Leader in Sports – 15 of 32 NFL Teams



NFL Digital Media



Baltimore Ravens



Dallas Cowboys



Denver Broncos



Indianapolis Colts



Jacksonville Jaguars



Los Angeles Chargers

Global Leader in Sports – 17 of 30 Major League Baseball Teams



Baltimore Orioles



Chicago Cubs



Cincinnati Reds



Cleveland Guardians



Detroit Tigers



Kansas City Royals

Global Leader in Sports – 10 out of 30 NBA Teams



Atlanta
Hawks



Boston
Celtics



Chicago
Bulls



Cleveland
Cavaliers



Golden State
Warriors



Houston
Rockets

Global Leader in Sports – 4 of 32 NHL Teams



Las Vegas
Golden Knights



Nashville
Predators



Minnesota
Wild



St. Louis
Blues

Global Leader in Sports – Representative University and College Teams



Stanford



CatDV: Media and Asset Management, Workflow Orchestration, AI/ML Content Enhancement

Quantum CatDV is a highly extensible and powerful media asset management, collaboration, and workflow orchestration platform in use by tens of thousands of customers around the world.

Organization

- Lets creatives work visually, and within their part of the workflow
- See all content in a single, searchable interface—from current projects through deep archives

Collaboration

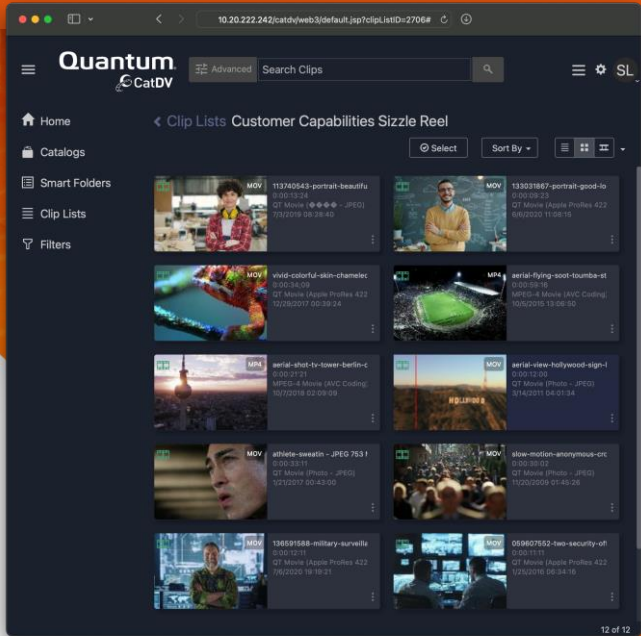
- Lets teams work collaboratively with tagging, versioning, review and approval, and messaging
- Team-wide continuous access and enhancement of content from first ingest through final delivery

Automation

- Unattended recall of content from deep archive, transparent to the user
- Automated workflow steps to avoid redundancy and repetitive tasks
- Extensive AI content enhancement services capability
- Powerful and flexible worker nodes to scale content operation and transformation

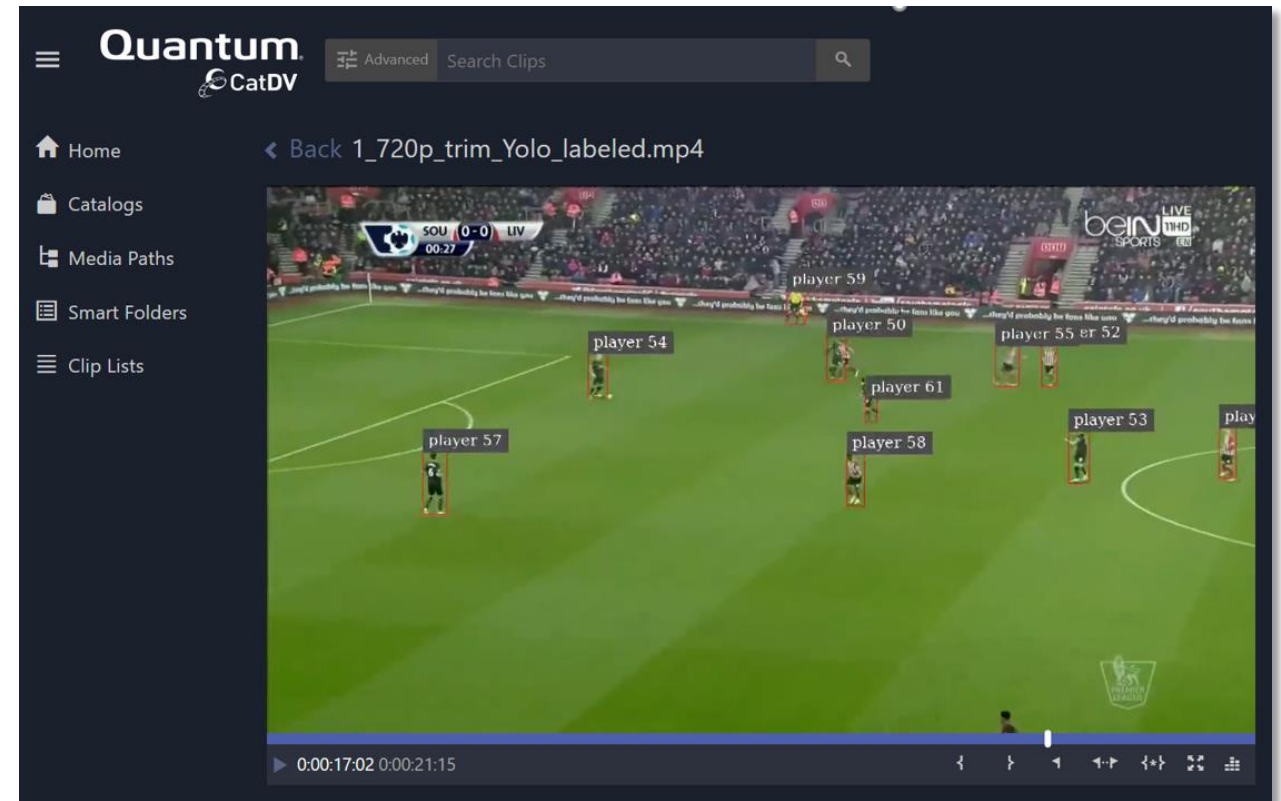
Quantum CatDV Asset Management Platform

The leading content management, curation, and orchestration software platform - helping every organization index, manage, monetize and get insight from their content.



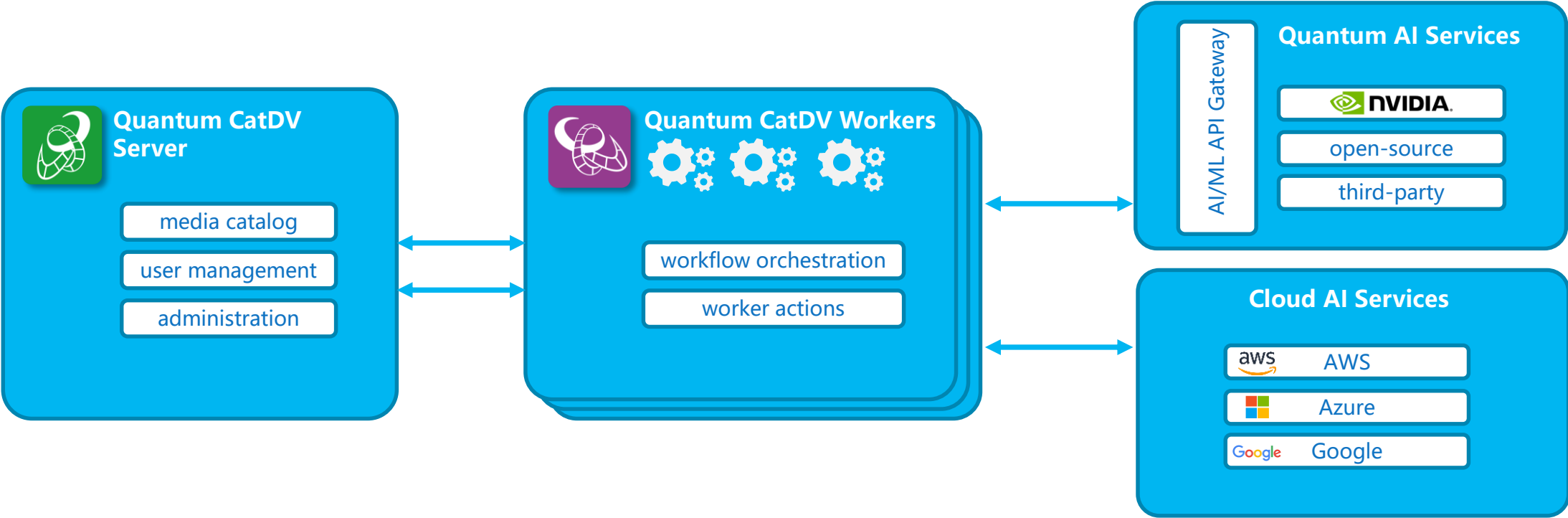
Quantum AI/ML Content Enhancement Services

- **Transcription:** Automatically transcribe speech within media files to generate searchable text.
- **Subtitle Generation:** Create subtitles in multiple languages with high accuracy.
- **Face Recognition:** Identify and recognize user defined faces within the media assets.
- **Object Detection:** Detect and categorize objects.
- **Logo Detection:** Recognize and track logos in media assets for brand analysis and monitoring.
- **Action Detection:** Analyze and identify specific actions.
- **Media Enhancement:** Improve the quality of media files using advanced AI algorithms.



Quantum AI/ML Content Enhancement Solution

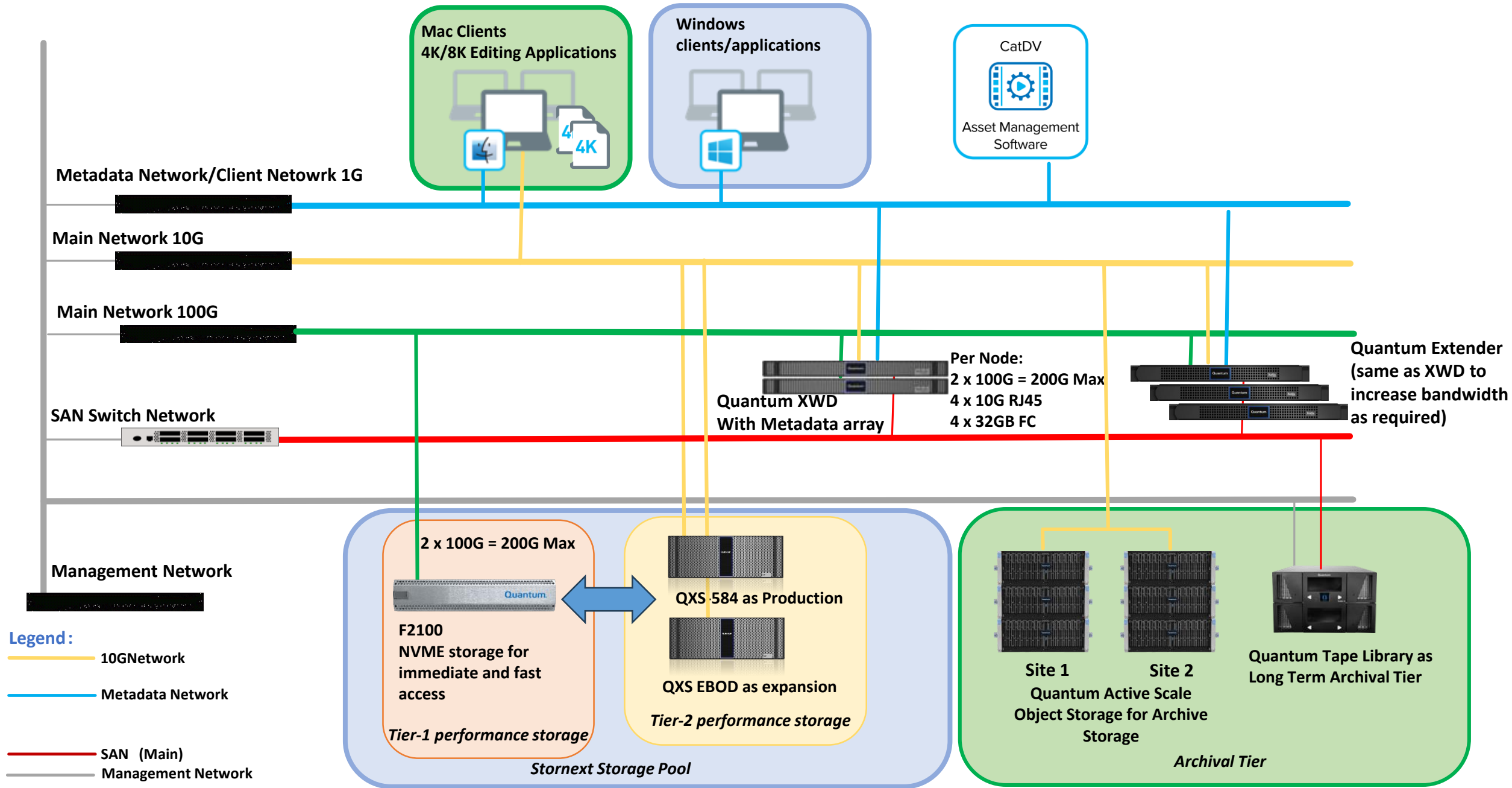
Media and Asset Management, Workflow Orchestration, AI/ML Content Enhancement



Clients connect via web, Window, macOS clients, or within panels from editing suites like Adobe Premiere Pro or Final Cut Pro X

Deployed on-premises or cloud, in Windows, macOS, Docker, Kubernetes

VTV High Level Proposed Data Management Workflow





VTV Broadcom MS is a strategic partner of Quantum in Vietnam.

"We are united in our vision for technology and are committed to delivering the highest quality and service to our clients."

Quantum
Your difference is in your data

VTV **BROADCOM**
MEDIA AND SOLUTIONS



“More than just strategic partners, we have a strong friendship built on a shared passion for technology.”

Quantum®

1. We are strongly and closely cooperating in technology

- **Knowledge Exchange:** VTVBroadcom MS and Quantum actively exchange knowledge and best practices in technology, keeping both parties at the forefront of industry trends and advancements.
- **Enhanced Capabilities:** The partnership between VTVBroadcom MS and Quantum leads to enhanced technological capabilities, including the integration of cutting-edge software, hardware, and systems.
- **Operational Efficiency:** VTVBroadcom MS and Quantum work together to streamline operations, optimize technological processes, and implement solutions that improve efficiency and reduce costs, benefiting both companies.



2. We are committed to delivering the best service at the best price

- **Quantum assists in training technical staff for VTVBroadcom:** Quantum provides in-depth training programs, equipping VTVBroadcom's technical team with the latest skills and knowledge. This ensures that staff can effectively manage and optimize advanced technology, leading to improved performance and innovation.
- **VTVBroadcom can customize Quantum's system to fit specific needs:** VTVBroadcom has the capability to tailor Quantum's technology to meet the precise requirements of their business. This customization ensures that the solutions are perfectly aligned with operational goals, maximizing efficiency and effectiveness.
- **VTVBroadcom provides fast and efficient support:** VTVBroadcom is committed to delivering prompt and effective support. Their dedicated team quickly addresses any issues, minimizing downtime and ensuring that businesses can continue to operate smoothly.
- **VTVBroadcom offers the best systems at the most competitive prices in the Vietnamese market:** Leveraging local expertise and strategic partnerships, VTVBroadcom provides high-quality systems at competitive prices. This approach delivers exceptional value, ensuring that businesses receive top-notch solutions at a cost-effective rate.





Thank
You!



Quantum[®]

Your difference is in your data.