Quantum

BRINGING MAXIMUM SPEED AND EFFICIENCY TO VFX AND ANIMATION RENDERING WORKFLOWS

Solving the Challenges of Legacy Storage Systems

Creatives have long had to contend with highly inefficient, poorly scaling NAS storage to serve their animation and VFX workflows. They have had little choice other than standing up these solutions in multiple islands in their facilities to support their artists and deal with the performance, cost, and complexity as best they can.

Getting to transformative leaps in productivity for animation, VFX, and rendering is all about ensuring fast access to animation and VFX files, fast output of render files, and minimizing copying back and forth from dissimilar storage systems— all while protecting that data against accidental deletion or other human error that can impact a project.

New all-flash storage system technologies and architectures can dramatically transform VFX and animation operations to deliver projects faster, remove duplicative steps, unlock new ways of designing your animation and VFX workflow and rendering operations, and embrace new opportunities.

Expanding VFX and Animation Opportunities

The explosion in demand for effects-rich streaming content and the general expectation of having effects in every kind of content have been a boon for VFX and animation experts.

The visual effects market is estimated to grow at a rate of 13.71% and add an additional $8.9 Billion in market share between 2022 and 2027, driven by the demand for high-quality content and professional effects in more kinds of media.

New opportunities are emerging that leverage these same VFX and animation skillsets and open up large new markets:

Augmented Reality and Virtual Reality

The use of augmented reality (AR) and virtual reality (VR) is rapidly growing, with new uses and adoption rates increasing quickly. The assets used in AR and VR are familiar to VFX and animation creators and continuous content producers. This market is expected to reach $200.1B by 2030 at a CAGR of 24.2% - attributed to surging adoption in gaming, entertainment, tourism, healthcare, and retail sectors.

Myriad™

All-Flash File and Object
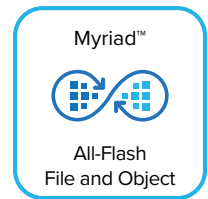
BUSINESS BENEFITS

- **Consolidate Your Workflows:** Eliminate redundant systems with a single easy-to-manage-and-scale system that powers all content operations.

- **Deliver Maximum Efficiency and Performance:** VFX, animation, rendering, AI, and ML workflows all perform at maximum speed without impacting other operations.

- **Accelerate AI, ML, and Rendering:** Easily manage large data and training sets, and feed content transformation and rendering pipelines at maximum speeds with lowest latencies.

- **Gain Seamless 'Cloud-Also' Agility:** Deploy and run the same solution on premises and in the cloud, and easily shift data between them.

- **Customize and Future-Proof Your Workflow:** Add unique content and data processing based on file and object attributes and classification, integrate system reporting and detailed analysis into your own applications.

Gaming Technology Workflows with Live Production

The adoption of game technology tools for environmental and scene effects are also creating a boom in the live production industry and have revolutionized live action production. This market is expected to grow to $5.40B at a 13.68% CAGR between 2021-2027.

Images courtesy Noah Kadner

Digital Twinning

Digital twinning – the creation of data-intensive models to aid product development through manufacturing also leverages critical skills used in VFX and animation. This market is already projected to be an $11.1B global market and is growing exceptionally quickly – at a 37.5% CAGR projection in North American markets from 2023-2030. The use of new Artificial Intelligence (AI) and Machine Learning (ML) tools is also expected to rapidly boost productivity of creative assets at scale in this market as well.

VFX and Animation Pain Points

As exciting as each of these growing markets are, there are several pain points that must be considered in creating a workflow to efficiently create and protect content efficiently at even the largest scale.

Siloed NAS Islands

Many VFX and animation workflows have had to resort to standing up individual NAS storage systems for each animator, given the difficulty and complexity of scaling up legacy storage solutions. This makes it extraordinarily difficult to manage a growing fleet of systems and a time-consuming process to copy assets to and from different systems.

Exponential Complexity

To try and scale these systems for both capacity and performance to meet rising demand requires more hardware and ever more networking infrastructure to try to keep the file system view coherent across all nodes. Adding more scale-out nodes requires considerable networking expertise and planning to reserve IP network address ranges, troubleshoot connections, and optimize the system.

This has put an enormous strain on IT and admin staff and fosters a 'fire fighter' mentality of triaging IT issues with the staff available, preventing these teams from getting a clear picture of the state of their data storage, what applications are using them, and making it difficult for stakeholders to truly use that data to derive critical insights.

Poor Application Performance

Legacy storage systems are designed for the age of spinning hard drive systems which measure IOPS in the 10's of read/write operations per second. They are limited by design bottlenecks that must accommodate SATA drives and are organized around the notion of dual storage controllers that must each buffer against data loss and the need to keep a consistent view of the file system by constant interaction with its peer scale-out nodes, independently of data service.

Even when trying to boost IOPS performance by substituting higher RPM drives or SSDs, the IOPS performance is only partially lifted. When these systems serve many users and applications, high-performance applications quickly reach the limits of the performance they can extract from the system and service to users suffers. These systems also perform poorly when managing a large number of small files, as is typical in digital animation and VFX.

Poor Rendering Performance

While legacy NAS systems may have worked in the past to store assets for VFX and animation workflows, they hindered critical rendering operations. The intense demands to access possibly hundreds of thousands of small files quickly during rendering can dramatically impact performance of the system for other users. It's common for many animators to try to stage rendering actions at the end of the day and hope that the rendering was complete by morning. If changes are needed, another render may have to wait another day, losing precious time.

VFX and Animation Solution Requirements

An ideal solution for these workflows should not only eliminate the traditional pain points noted above, but also unlock new creative possibilities. We'll now look at several key technologies and benefits that make up an ideal VFX and animation solution.

In general, a system should remove workflow bottlenecks throughout the production process and perform each step as fast as possible – rarely is the adage 'time is money' more true than in content creation. Copying between different systems should be reduced or eliminated. The content and data must make use of snapshots to protect against inadvertent user error or other accidents that can jeopardize production.

Above all, a system should be simple to grow and scale as needed and allow clients and applications to connect with their preferred protocols and reliable mountpoints, and whether they prefer to read and write files or objects.

More specifically, a solution should fulfill these requirements to meet future demands:

Make Full Use of NVMe Drive Potential

NVMe flash storage modules are quickly evolving new form-factors and capacities, driven by market competition. An ideal system would be able to leverage NVMe flash drives available from multiple vendors, and benefit from the competition from these vendors as the market drives more vendors and ever higher capacities in smaller form-factors, at lower cost.

Make Full Use of RDMA Potential

All of this NVMe flash storage potential – up to 100's of thousands of IOPS and performance up to 10's of Gigabytes per second – would be wasted on a storage system designed for HDDs or a system that requires non-standard connectivity between storage nodes. A future-forward design should allow connections over readily available, market-driven fast Ethernet NICs and connections of 100GbE and higher.

Use Proven Cloud Technologies

An ideal system would also leverage technologies as used by the largest cloud infrastructure providers such as containers and microservices to ensure that every part of the file system is scalable and resilient, then use orchestration tools to manage it.

One Architecture from On-Premises to 'Cloud-Also'

Finally, any new system considered should not only be highly scalable, reduce bottlenecks, and make best use of its hardware resource on-premises, but also provide this same experience when deployed in the cloud.

Introducing Myriad

Ending the Constraints, Compromises, and Tradeoffs of Legacy Storage Architectures

Quantum Myriad™ is an all-flash file and object storage software platform for unstructured data storage. Its modern, cloud-native software architecture makes it an easy-to-use solution that avoids the trappings of hardware-centric systems, making it highly adaptable to your future needs while reducing the burden on over-extended IT staff. Myriad is ideal for rapid recovery of mission-critical data, building modern data lakes for analytics and business intelligence, and demanding VFX and animation rendering workloads.

Myriad is a system that uses readily available NVMe storage node servers and market available NVMe storage drives that scale out in an extraordinarily simple and effective way that makes full use of NVMe storage node CPU and memory. Thanks to its containers and microservices architecture and Kubernetes orchestration, Myriad can respond automatically to system events, and makes updating or upgrading any part of the system simple.

Setting up a Myriad cluster is a simple process and scaling the cluster is even easier – after racking, powering and connecting new NVMe Storage Nodes, Myriad detects and configures them automatically in minutes, requiring no advanced network expertise and no admin intervention.

Myriad also leverages Quantum's suite of tools for replication of data to and from Myriad on-premises, Myriad in the cloud, other object-based targets, and Quantum's ActiveScale™, ActiveScale Cold Storage, and Quantum Scalar® tape libraries.

The same Myriad software running on Quantum appliances can be run in the cloud using a single pain-of-glass, something other solutions can't offer.

Key Benefits for VFX and Animation Workflows:

Myriad lets you consolidate your workflows into a single fast system to reduce complexity, number of systems, and administrative overhead. Myriad can accommodate all departments, clients, and workflows, including AI and ML applications.

Myriad makes full use of NVMe drive potential by providing high performance and high IOPS capability that does not have the drawbacks or design limitations of legacy systems. As NVMe flash storage modules evolve for higher capacities, higher performance, and lower cost, Myriad can leverage them with no architectural change needed.

Myriad makes full use of NVMe RDMA potential by connecting all of its components at the highest possible performance, and lowest latencies without the need to configure specialized interconnects, switches, or networking expertise.

Myriad uses cloud technologies to deliver resiliency and simplicity. Myriad's containers and microservices architecture and orchestration tools automate system update and node deployment tasks and respond to changes in NVMe Storage Nodes to grow your system and offer more storage, at higher data resilience.

Myriad is a single architecture that provides the same experience and deploys on-premises and in the cloud to enable your 'cloud-also' workflows.

Myriad is future ready thanks to its ability to classify and index your data and content for further processing or reporting, and its API interface can integrate Myriad reporting and analysis into your applications.

More detailed comparisons of Myriad to other systems, and a Myriad architecture white paper can be found at www.quantum.com/myriad.
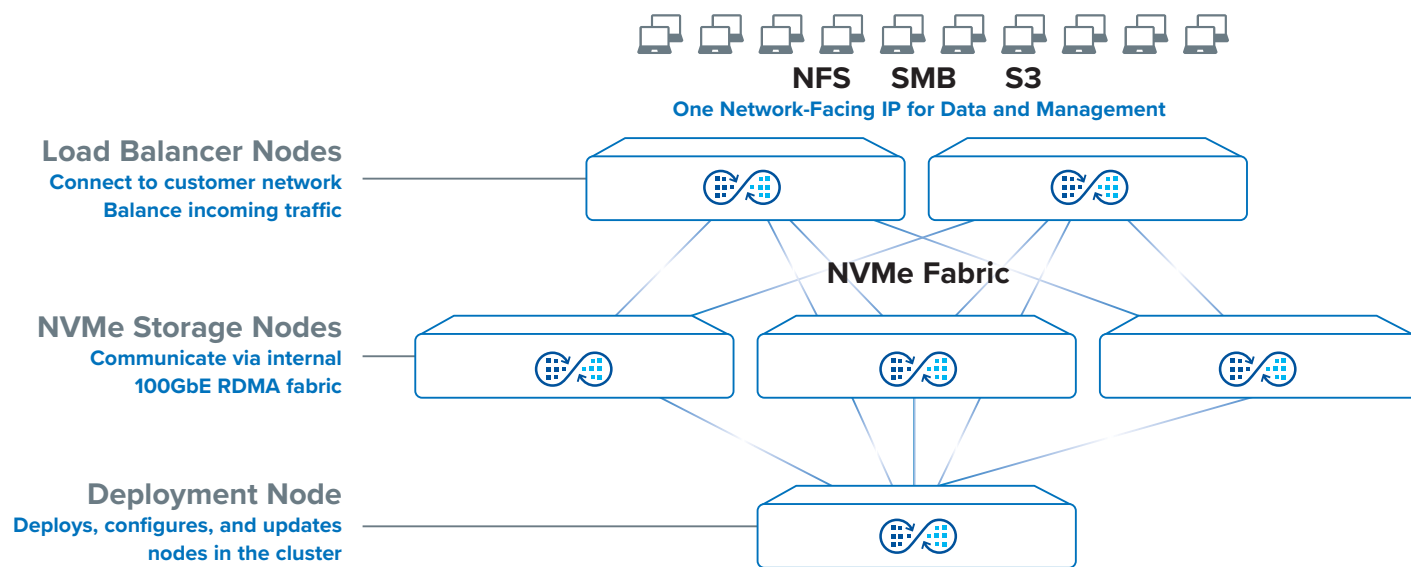
A Myriad cluster can start with as few as three* NVMe all-flash storage nodes, and its architecture enables scaling to hundreds of nodes in a single distributed, scale-out cluster.

Myriad's architecture offers a choice of connections, a rich range of inline and automatic data services such as snapshots, clones, inline deduplication and compression.

🖥	**Clients**	NFS v4	NFS v3*	SMB*	S3*	Proprietary Client*	GPU-Direct*
⚙	**Data Services**	Snapshots	Clones	Inline Deduplication and Compression	Replication*	Data Catalog and Analytics*
⧫	**File System**	Fully distributed	Composable (one FS per user, per app, etc.)			
✎	**Transactional Key/Value Store**	Redirect-on-write	Lock-free	Self-Balancing, Self-Healing	Dynamic n+m Erasure coding	

*Some features listed are not available at initial product GA. Contact Quantum representative for details.

Deploying Myriad for VFX and Animation

Setup

Quantum Myriad™ clusters can start with as few as 3 NVMe Storage Nodes and 450 Terabytes of storage.

As part of Myriad setup, an IP address is chosen for all file and object service. Myriad automatically load balances all traffic across multiple 100GbE ports over this single IP address, making connecting your clients easy.

Myriad's storage can be segmented by department or even by user if needed without impacting the overall system performance.

Configuring Your Workflow and Applications

All departments can now connect to Myriad and access their storage on a single system for consistent, high performance for even high IOPS workloads.

Generally, you will keep all work in progress and current projects on Myriad, with access from all departments and creatives and their respective applications.

Each can connect with their preferred protocol – typically NFS for Linux workstations, SMB for Mac and Windows workstations, and S3 for object-based data movement. All file and protocol access attributes are captured and preserved by Myriad.

Applications such as ShotGrid that expect hard mountpoints can easily mount their Myriad volume via their preferred protocol and path as needed.

Scaling the System

Myriad can serve up to hundreds of thousands of IOPS, and 10's of Gigabytes per second performance. As more storage is needed, adding additional NVMe Storage Nodes provides more NVMe storage capacity and performance. Each new NVMe Storage Node is automatically discovered and configured with no interruption to service.

Optimizing Rendering Workflows

When all departments, workstations, and the rendering systems are connected to Myriad, you'll next want to test project rendering and confirm that there is no impact to other operations.

Without needing to schedule renderings after-hours, you'll find that you can now push interim and test renderings out to more parts of your workflow – giving your team more creative flexibility.

Deduplication and Compression

After using the system, you'll notice that the total aggregate stored data is larger than the initial Myriad storage size. As Myriad writes data, it is automatically deduplicated against existing data and compressed without affecting system performance. These operations are transparent to users. While each customer's data varies in compressibility and duplication across all departments, your Myriad storage may deliver up to 3x or more effective capacity.

Versioning and Rollbacks

You'll next want to familiarize yourself with how Myriad lets administrators 'snap' the state of its data to protect against data mishaps and potential user error.

Each snap marks the location of changed data, while incorporating references to existing unchanged data, making snapshots highly space efficient, while allowing you to roll back snapshots to restore earlier data states as needed. You'll want to decide if you'll want to take snapshots periodically, or at the completion of certain workflows steps, and when to copy those snapshots off to other storage such as cloud or object storage such as Quantum ActiveScale and ActiveScale Cold Storage.
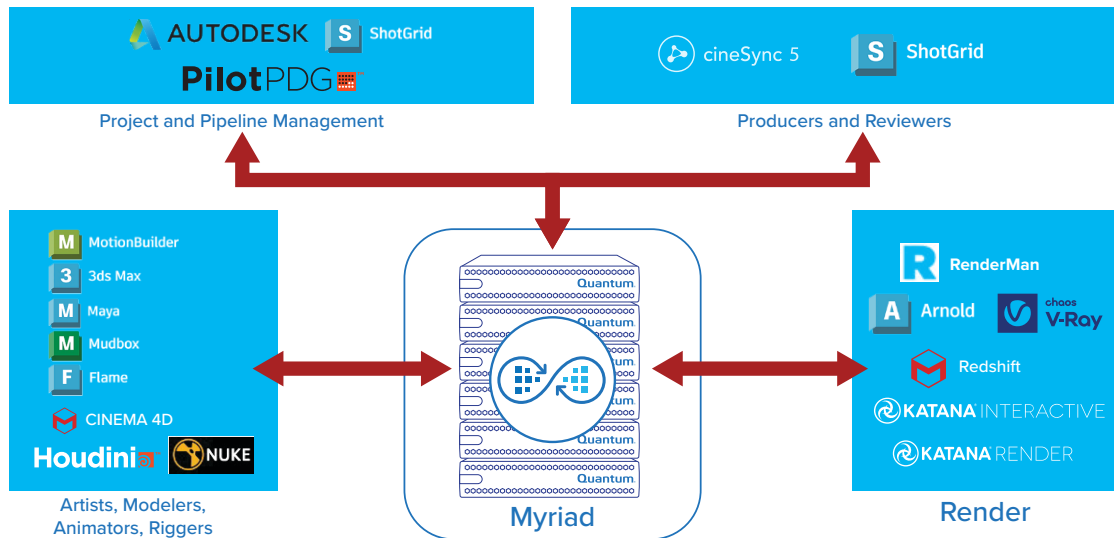
A single Myriad cluster can replace multiple legacy NAS storage systems and consolidate workflows to avoid file copying across different systems. All departments and applications can connect to Myriad via a single, load-balanced IP address across multiple, bonded 100GbE ports.
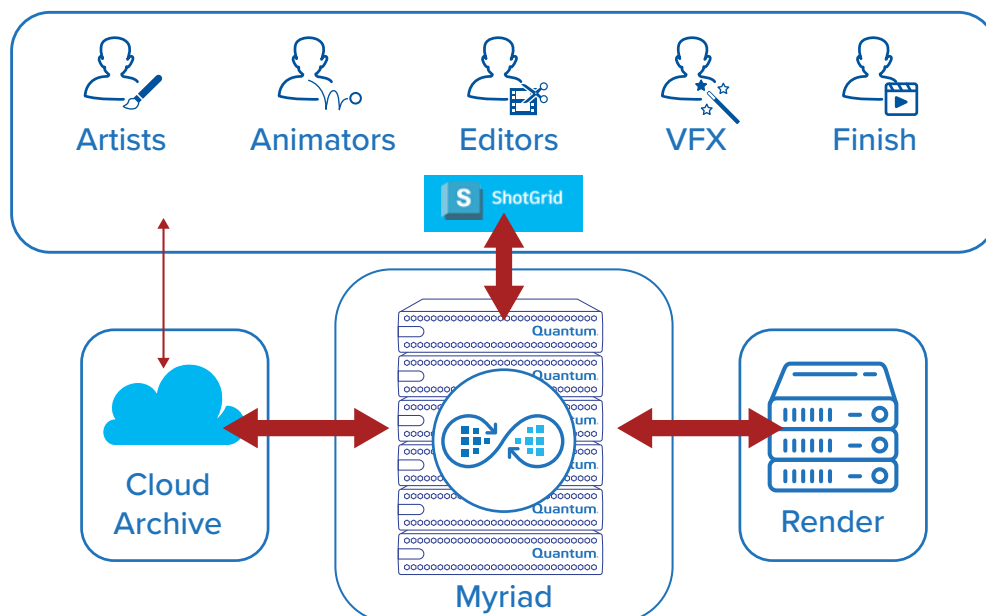
Myriad's performance allows rendering pipelines to work at fastest possible speed with no impact to ongoing file and object client access. When projects are complete, they can be moved to cloud or object storage archives and retrieved using Quantum's replication tools.

Summary

Getting to transformative leaps in productivity for animation, VFX, and rendering is all about ensuring fast access to animation and VFX files, fast output of render files, and minimizing copying back and forth from dissimilar storage systems.

Myriad can transform your existing production and serve all your collaborative, animation, VFX, and rendering workflows from a single, unified system with versioning snapshots, virtual workflow segregation, and file, group, and user monitoring.

Learn More

To learn more or to arrange a demo, visit www.quantum.com/myriad.

Sources:

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SB00234A-v01 Jun 2023