Quantum

Quantum F-Series Reference Architectures

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INTRODUCTION

Quantum F-Series is ultra-high-performance primary storage based on NVMe-attached flash modules. Designed specifically for use with Quantum Xcellis® appliances and StorNext® software, F-Series storage excels at handling multiple simultaneous streams of high-resolution film formats, video, or similar high-bandwidth data.

This document provides high-level reference architectures for several common deployment scenarios. These reference architectures are designed to show various ways Quantum F-Series storage can fit into a StorNext ecosystem. As indicated by their name, these architectures should be used as references when designing solution architectures that solve specific customer problems.

As every customer and use case is unique, this document is not exhaustive. F-Series storage may be deployed in numerous creative ways. The appearance of a reference architecture in this document should not be interpreted as indicating that it is somehow "better" than one that is not included; those illustrated here are simply the most common.

ABOUT QUANTUM F-SERIES STORAGE

The Quantum F-Series is high-performance, highly available and reliable storage designed for studio editing, rendering, and other performance-intensive workloads.

F-Series storage uses NVMe flash drives for ultra-fast reads and writes and to support a huge amount of parallel processing and concurrent workflow connectivity. Connection to the outside is via traditional Fibre Channel or RDMA over Ethernet, which provides direct access between workstations and the NVMe storage devices, to provide predictable, ultra-fast network performance.

Relative to traditional SSD and HDD storage arrays, Quantum F-Series is orders of magnitude faster, enabling users to gain back racks of data center space. Unlike other NVMe storage arrays, the Quantum F-Series was designed specifically for film resolution and file-per-frame raw content, so it can easily handle the performance requirements of 8K and 4K content, as well as other forms of high-velocity unstructured data.

Additionally, in a StorNext 7 environment, administrators can compose Workflow Storage Pools of both NVMe and HDD/SSD, then define movement within this volume by job or policy to precisely tune and balance performance, cost, and capacity for your specific workflow steps.

F2100

The F2100 is Quantum's fastest storage offering yet. It is a 2U, dual-node server with two hot-swappable compute canisters and 24 dual-ported NVMe drives. Each compute canister can access all 24 NVMe drives, and each includes processing power, memory, and connectivity specifically designed for the highest performance and availability, with no single point of failure.

The F2100 is available in four capacity points: 92 TB, 184 TB, 368 TB, and 737 TB. For larger file system capacity, multiple units are deployed, with aggregation of capacity and performance provided by StorNext. The F2100 may be deployed as the high-performance tier in a StorNext Primary Storage Tiering environment that employs traditional SAS SSDs or HDDs as a slower and less-costly tier.

F2100 Front

24 dual-ported NVMe drives
Available in four capacities:
• 92.16 TB (24 x 3.84 TB)
• 184.32 TB (24 x 7.68 TB)
• 368.64 TB (24 x 15.36 TB)
• 737.28 TB (24 x 30.72 TB)

F2100 Rear
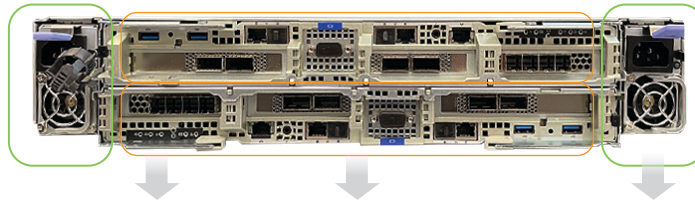
Dual-node server with two hot-swappable compute canisters.

Each compute canister can access all 24 drives.

Each compute canister includes:
• 2 Intel Xeon Gold 6230 CPUs
  (32 cores/2 GHz 48 MB cache)
• 192 GB DDR4-2933 (16 GB x 12 slots)
• 2 M.2 Boot Drives (512 GB)
• 2 100 GbE ports (or) 4 FC-32 G ports
• 3 PCIe slots
• Battery Backup

Redundant 2000 W PSUs

Figure 1 – F2100 Hardware Overview

F-SERIES SCALING MODEL

Quantum F-Series storage scales in both capacity and performance simply by adding additional F-Series systems. StorNext aggregates the capacity and performance of multiple storage systems underneath a single file system namespace. There are no complicated arrangements of RAID controllers and JBOD enclosures, or related performance bottlenecks.

As with any StorNext environment, scaling user access capacity is as simple as adding additional StorNext nodes to enable more NAS or direct client bandwidth. F-Series storage doesn't change this model.
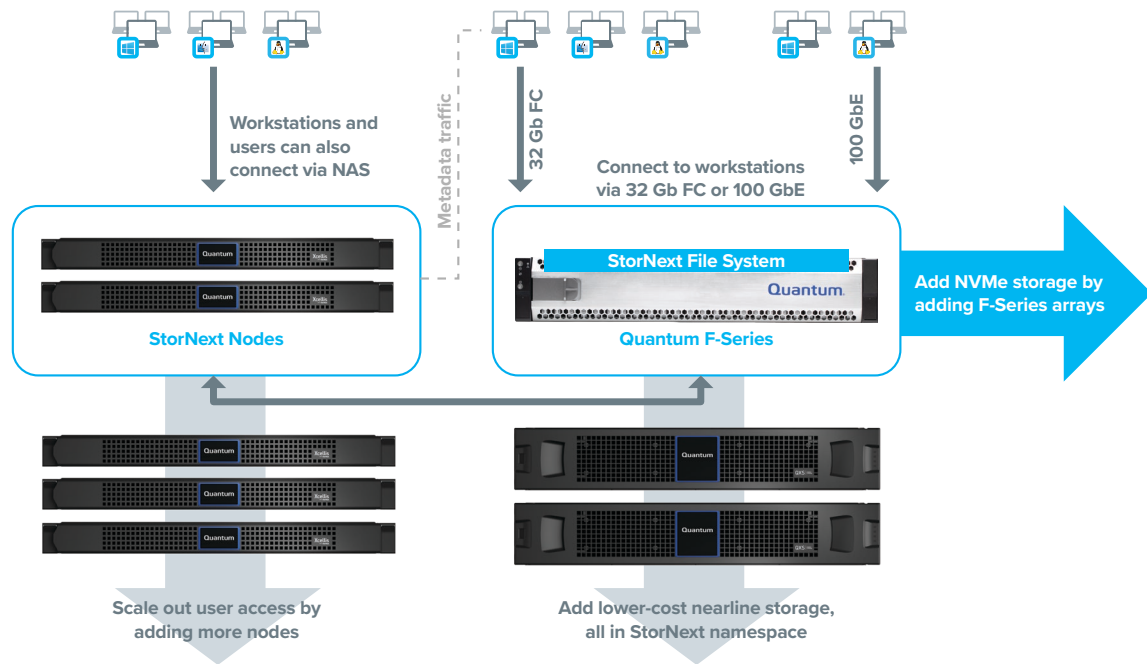

Figure 2 – Scaling Model

For environments where some ultra-fast NVMe storage is required in addition to lower-cost nearline storage, F-Series may be combined with less-expensive SAS SSD or HDD storage. StorNext presents a single namespace to users and applications, and its primary storage tiering capability may be used to move 'cold' files down to the nearline tier automatically.
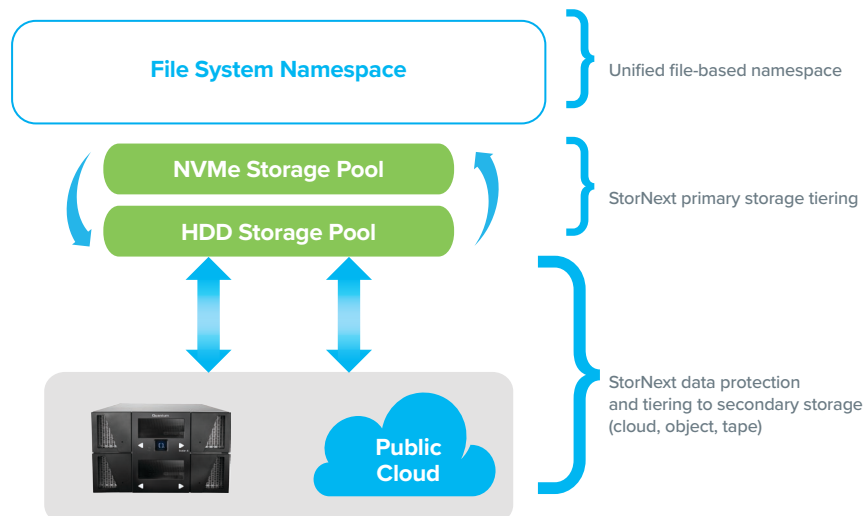

Figure 3 – StorNext Tiering

REFERENCE ARCHITECTURE DIAGRAMS

The following diagrams illustrate three deployment scenarios using Quantum F-Series storage: a Fibre-Channel (FC) environment, an all-Ethernet environment, and a mixed FC and Ethernet environment. Note that though F-Series may be deployed in a mixed environment, each F-Series system is configured at the factory as either an Ethernet-based or an FC-based system. Ethernet interfaces on the FC-based systems are for management only and cannot access the block storage.

There are a few important considerations that apply to all three deployment scenarios:

- The StorNext Pools feature (StorNext 6.3 and later) may be used to automatically tier colder data from F-Series storage to slower FC or iSCSI attached SAS SSD or HDD-based storage such as Quantum QXS™.

- Both F-Series storage and other storage may reside behind a single file system, transparent to users. If it is more appropriate, F-Series may be accessed via a separate file system.

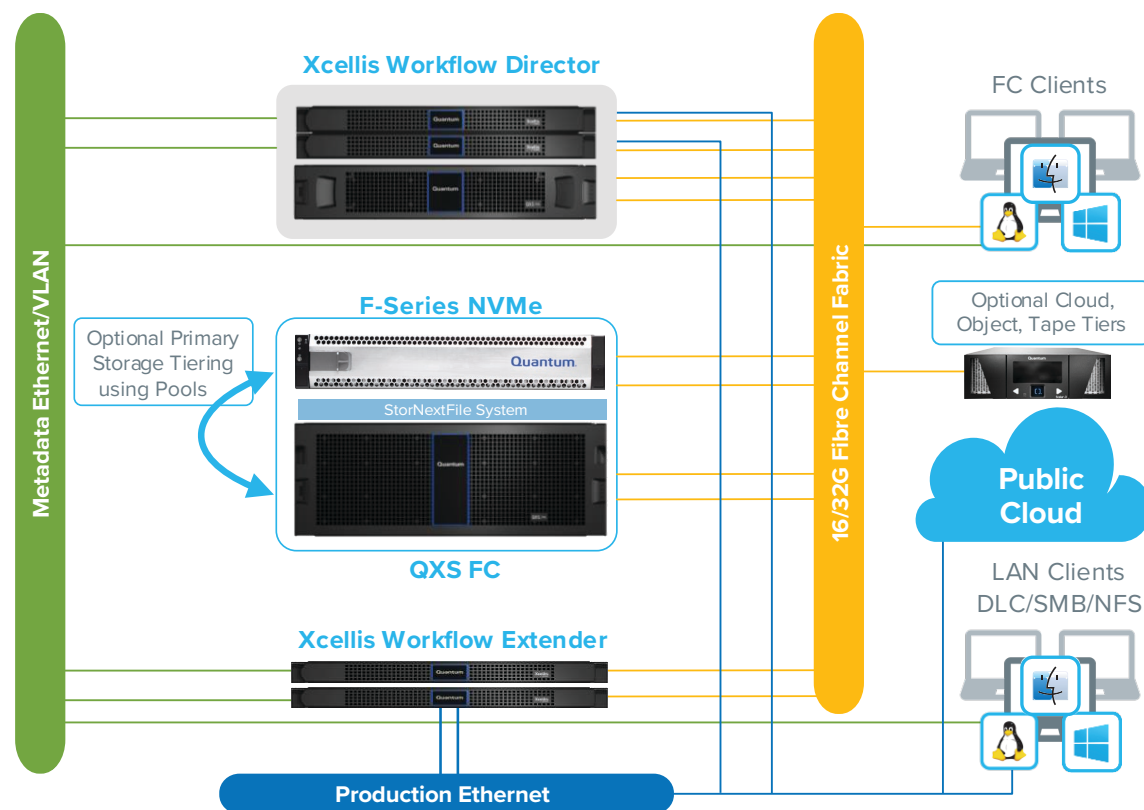## Deploying F-Series in a Fibre-Channel Environment

Figure 4 – Fibre Channel Reference Architecture

As shown in figure 4, deployment of an F-Series array into a Fibre-Channel-based StorNext environment is straightforward. F-Series fits into the architecture identically to any other FC-attached array. There are several things to keep in mind, however:

- F-Series FC interfaces support 32G FC, as well as 16G and 8G. To take full advantage of the speed of the F-Series storage, the FC switch must support 32G FC. Depending on the specific workflow requirements, workstations and application servers may connect at 32G or slower speeds.

- For F2100, all 16 LUNs are visible on all eight interfaces, for a total of 128 paths. ALUA (Asymmetric Logical Unit Access) is enabled, and half of the paths are defined as "non-optimal."

- Multi-path drivers are highly recommended on all clients accessing the F-Series.

- As with any FC-based StorNext system, the FC fabric must be zoned so that all FC clients that need to use the F-Series storage (including Xcellis Workflow Extenders – WFEs) can connect to it. NAS and DLC clients access the storage through WFEs, and do not need direct access to the storage network.

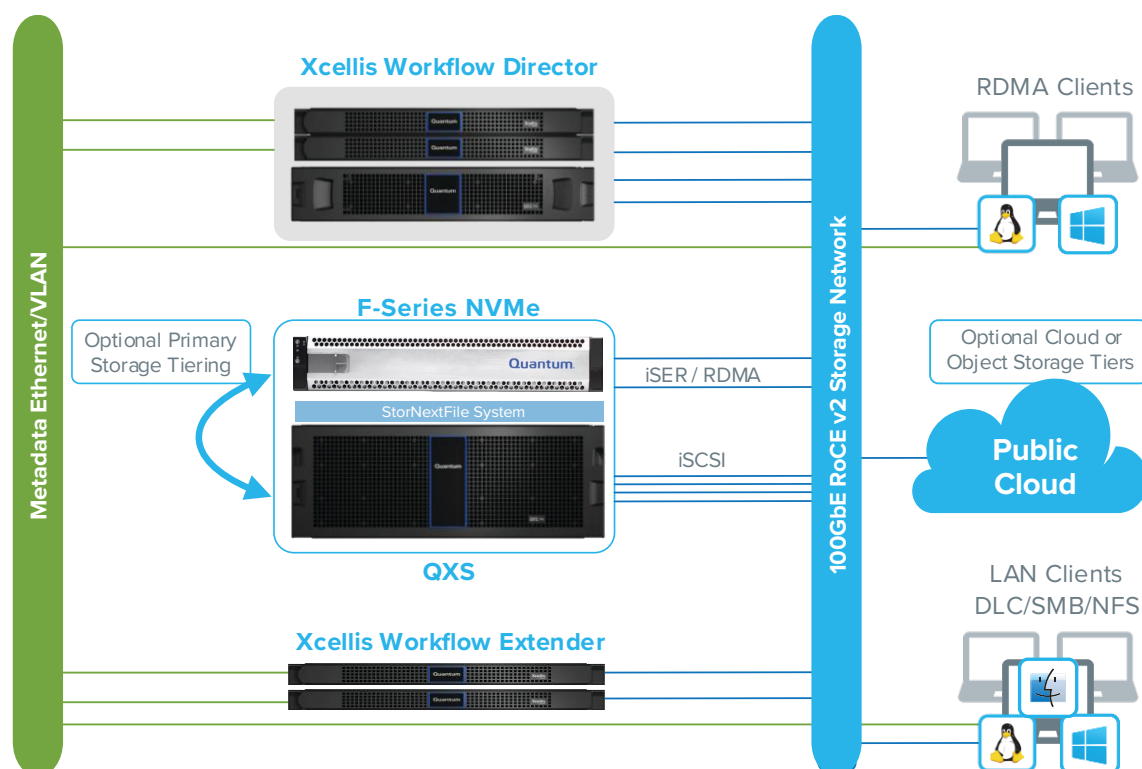## Deploying F-Series in an All-Ethernet Environment

Figure 5 – Ethernet Reference Architecture

Integrating F-Series storage into an all-Ethernet StorNext environment can seem more complex than FC due to some of the new technology involved. The level of effort required depends on how much of the networking infrastructure is already in place and the level of in-house expertise. Quantum Professional Services is available to help.

Things to know about deploying F-Series in an Ethernet-based storage network:

- F-Series storage networking interfaces support 100 GbE, which is required for the best performance. These interfaces can connect at 50/40/25 and 10 Gb if needed, but performance will be limited by the slower interfaces.

- As with any StorNext system, the storage network must be configured so that all clients that need access to the F-Series storage (including Xcellis Workflow Extenders) can connect to it. NAS and DLC clients access the storage through WFEs, and do not need direct access to the storage network.

- The storage network (both switches and NICs) must support RDMA over Converged Ethernet v2 (RoCE v2) and the iSER protocol (iSCSI Extensions for RDMA). iSER is not compatible with iSCSI, but may co-exist on the same network with iSCSI. iSER uses iSCSI semantics for command and control, but data flows direct using RDMA, allowing the extreme performance potential of NVMe flash storage to be shared over a network. RoCE v2 and iSER are supported by most, if not all, high-speed Ethernet switches and NICs, but may need to be enabled.

- Other RDMA transports such as iWARP, Infiniband, and TCP are not supported at this time.

- The Ethernet network running RoCE v2 must be configured as a lossless network using Global Pause, Priority Flow Control, or Differentiated Services. More details on these technologies and how to configure them will be contained in a future deployment notes document.

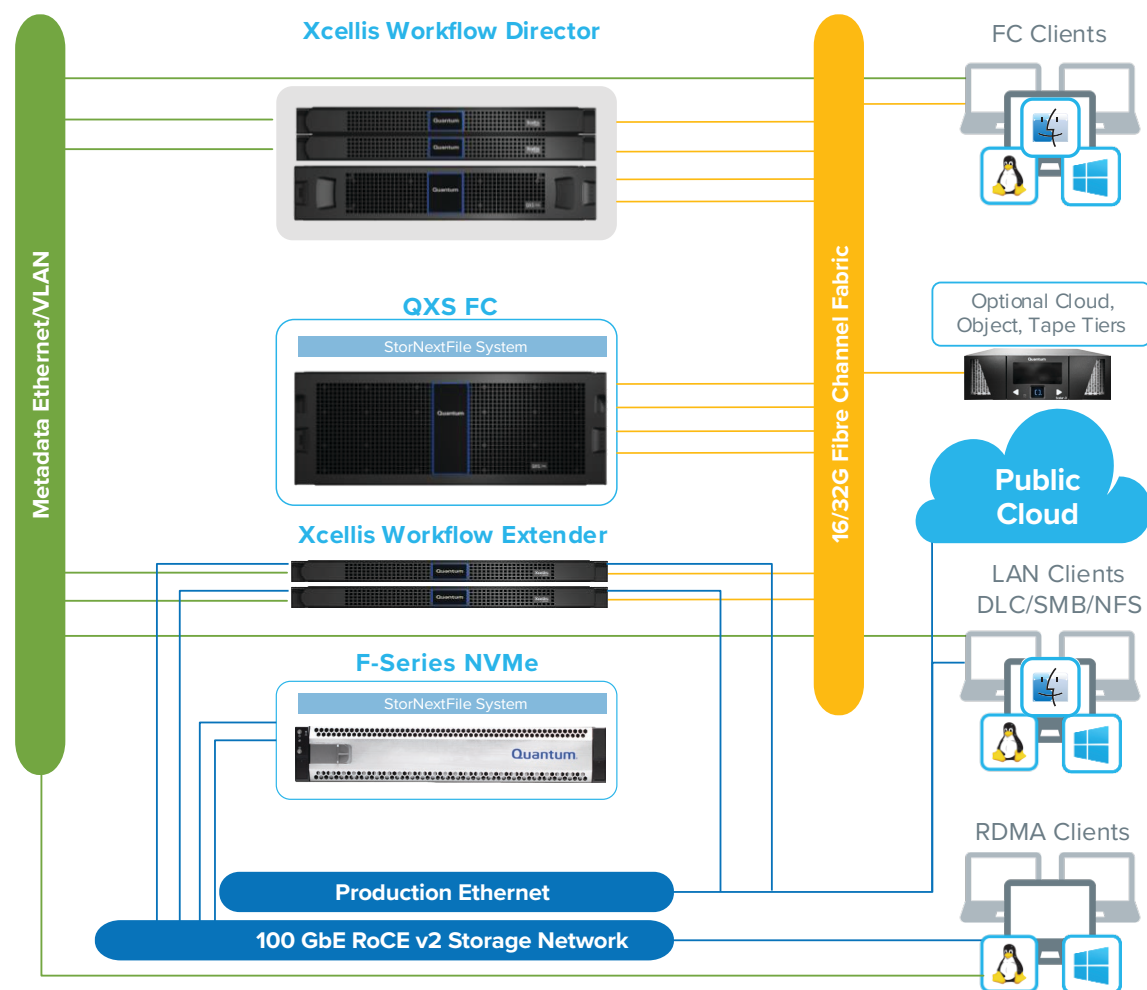## Deploying F-Series in a Mixed FC & Ethernet Environment

Xcellis Workflow Director

QXS FC

StorNextFile System

Xcellis Workflow Extender

F-Series NVMe

StorNextFile System

Production Ethernet

100 GbE RoCE v2 Storage Network

Metadata Ethernet/VLAN

16/32G Fibre Channel Fabric

FC Clients

Optional Cloud, Object, Tape Tiers

Public Cloud

LAN Clients DLC/SMB/NFS

RDMA Clients

Figure 6 – Mixed Fibre Channel & Ethernet Reference Architecture

A mixed FC and Ethernet environment is common where an existing FC-based StorNext system is in place, but there is a desire to move away from FC going forward. StorNext makes it easy to transition from older to newer storage technology. Assuming a pre-existing FC-based StorNext system, take note of the following when adding F-Series storage running on an Ethernet network:

- All the notes in the all-Ethernet deployment section apply. Network requirements apply only to the segment or VLAN serving as the Ethernet storage network.

- To minimize disruption to the existing system and minimize connectivity requirements, F-Series is typically configured as a separate file system, though this is not required.

- Clients, including WFEs, that need to utilize both the existing FC storage and the new F-Series storage directly (i.e., not via NAS or DLC) must have network connectivity to both the FC SAN and the Ethernet storage network where the F-Series storage resides.

RELATED DOCUMENTS & LINKS

More information on Quantum F-Series storage, StorNext software, and Xcellis storage appliances, including compatibility and detailed information on features, is available via the following links.

F-Series

Product Page: www.quantum.com/f-series

Documentation Center: www.quantum.com/documentation

StorNext

Product Page: www.quantum.com/stornext

Documentation Center: www.quantum.com/snsdocs

Xcellis

Product Page: www.quantum.com/xcellis

Documentation Center: www.quantum.com/documentation

Quantum.

Quantum technology, software, and services provide the solutions that today's organizations need to make video and other unstructured data smarter — so their data works for them and not the other way around. With over 40 years of innovation, Quantum's end-to-end platform is uniquely equipped to orchestrate, protect, and enrich data across its lifecycle, providing enhanced intelligence and actionable insights. Leading organizations in cloud services, entertainment, government, research, education, transportation, and enterprise IT trust Quantum to bring their data to life, because data makes life better, safer, and smarter. Quantum is listed on Nasdaq (QMCO) and the Russell 2000® Index. For more information visit www.quantum.com.

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