

**Quantum**<sup>®</sup>

# Deploying StorNext with ActiveScale Object Storage and ActiveScale Cold Storage

WHITE PAPER



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## Introduction

Data storage technology is always advancing, but one thing remains constant. The newest, fastest storage is the most expensive per unit capacity. It's suitable for "hot data" and online workloads, but too pricey to be used for all data all the time. There is a parallel need for storage that still performs well but has a better cost profile. The modern trend to save more data, longer, only increases this need.

Today, hot data lives on SSDs or NVMe flash storage. Object storage hosted on-prem or in the public cloud has emerged as the platform of choice for warm data, and tape is the ideal cold storage medium. The task for organizations is to choose the right strategy to store data throughout its lifecycle that maximizes flexibility and value and doesn't require excessive time and effort to manage. This can be challenging, especially when multiple technologies and multiple vendors are involved.

The combination of the Quantum StorNext® high-performance file system and ActiveScale™ object storage (including ActiveScale Cold Storage) provides a flexible and scalable solution for all stages of the data lifecycle, from production to archive. This paper briefly outlines the capabilities and value of both StorNext and ActiveScale, and then shows step-by-step how to configure these two solutions to work together.

## StorNext Shared Storage File System

StorNext is high-speed shared file system software that's built to handle the unstructured data explosion. Supporting many types of storage technology within the same namespace, it's ideal for file-based workflows that have differing performance requirements at various stages. The highest performance NVMe or SSD flash may be needed for ingest or creative collaboration, with HDD storage used for review and distribution, and object, cloud, or tape for archive and long-term preservation of data assets.

A key value of StorNext is its flexibility. Use nearly any storage or combination of storage technologies. Deploy it as software on industry standard servers, on dedicated hardware appliances (including hyperconverged options), or as a fully managed, subscription-based service. Locate it on premises, in multiple locations, and in the cloud. And connect applications and data consumers to it via a wide range of block, file, and object protocols.

StorNext "speaks cloud," including cold storage APIs such as S3 Glacier class, making it a perfect complement to ActiveScale and ActiveScale Cold Storage.

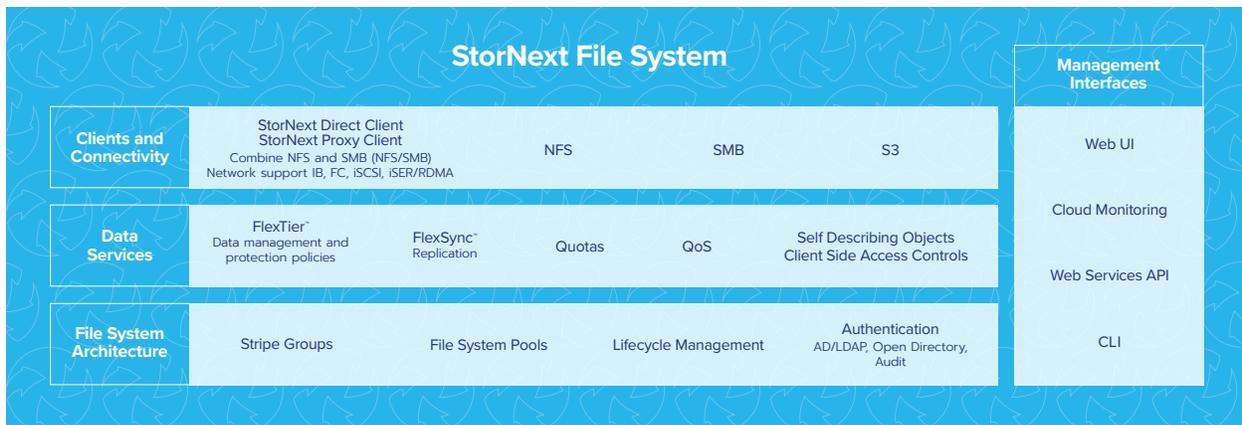


Figure 1 - StorNext High-Level Architecture

## ActiveScale Object Storage

ActiveScale is the industry’s only object storage software architected for storing both active and cold data, with the ability to reduce the cost of storing cold data up to 80% compared to traditional object storage systems. ActiveScale offers extreme data durability up to nineteen nines (99.9999999999999999%), unlimited scalability, constant availability, and simple management for billions of objects and exabytes of capacity. [Dynamic Data Placement](#) technology optimally places objects on the storage for high performance at any scale, with no hot spots and no rebalancing needed. [Dynamic Data Repair](#) actively fights against bit rot and corruption.

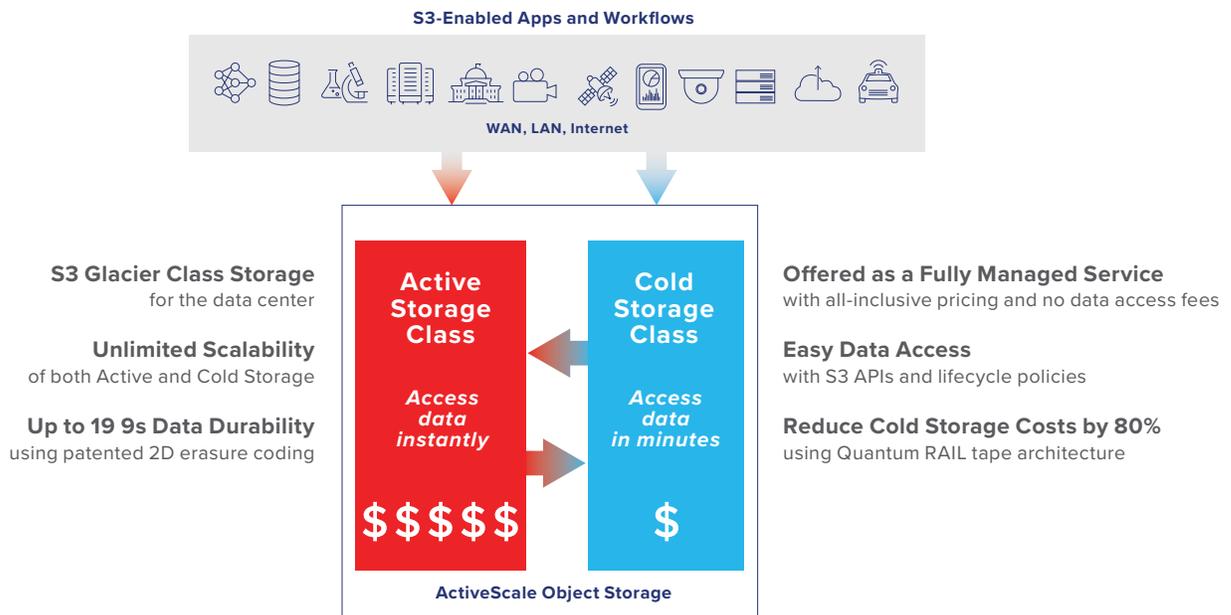


Figure 2 - ActiveScale Object Storage

ActiveScale Cold Storage (ASCS) accommodates cold data through native support for S3 Glacier class API calls and S3 storage lifecycle policies. After initially being written to HDD storage, objects destined for cold storage are written to LTO tape. Unlike simple object to tape gateways, ActiveScale cold storage maintains high durability and high performance by using

patented<sup>1</sup> [2-dimensional erasure coding \(2D EC\)](#) technology. Objects are protected from tape, library, and even site failures, and yet under normal conditions, only a single tape mount is required to restore any object back to disk.

Like StorNext, ActiveScale is flexible and software defined. It may be deployed as software on industry-standard servers, on preconfigured appliances, or consumed as a fully managed subscription-based service.

## Example Use Cases for StorNext with ActiveScale

The possible use case applications for a system that combines the StorNext high-performance file system with ActiveScale object storage are varied, spanning many industries. Though described with specifics, the examples that follow reflect broad themes in terms of data type, workflow, and lifecycle. They can be applied directly or with minor adjustments to a host of other use cases with similar characteristics. For help designing the appropriate architecture for a particular use case, including detailed sizing and configuration guidance, consult with a [Quantum Solution Architect](#) or qualified [Quantum channel partner](#).

### EXAMPLE 1: SCIENTIFIC RESEARCH

This example describes an architecture suitable for scientific research activity, scalable to serve small private labs, major government research institutions, and anything in between. Access to the file system is via friendly, familiar NAS interfaces. Data protection and tiering of data to geospread object storage is automatic, but the StorNext Offline File Manager (OFM) app may be used when manual staging or tiering of data sets is needed. The simple to use OFM app gives scientists and other data stewards visibility and control over StorNext tiering without requiring administrator access or IT intervention. The combination of StorNext automated policies with OFM ensures data is protected and provides the flexibility required by dynamic research environments. ActiveScale provides a low-cost, high-durability data repository that solidly protects data while keeping it available.

In addition to scientific research, this architecture is appropriate for architecture, engineering, and construction firms. In general, any department or organization performing project-based work with data sets containing varied file sizes that must be retained for decades will benefit from this arrangement.

### Solution Components

- H4000 Storage Appliance w/HDD
- StorNext 7 File System Software w/Clustered NAS interface
- StorNext Offline File Manager App
- ActiveScale P200 Object Storage System
- Optional Public Cloud Storage Subscription

<sup>1</sup>[U.S Patent #11,216,196](#)

## Solution Characteristics

- Familiar NFS / SMB access to data
- Scalable HDD tier for data capture and analysis
- Automated tiering from HDD to object storage to minimize TCO
- Geospread object storage for data protection and collaboration
- Public cloud connectivity to enable use of cloud data processing and analysis tools
- Extreme data durability – up to 19 nines
- Scalable from TB to PB of content
- Low TCO vs. single-tier solutions

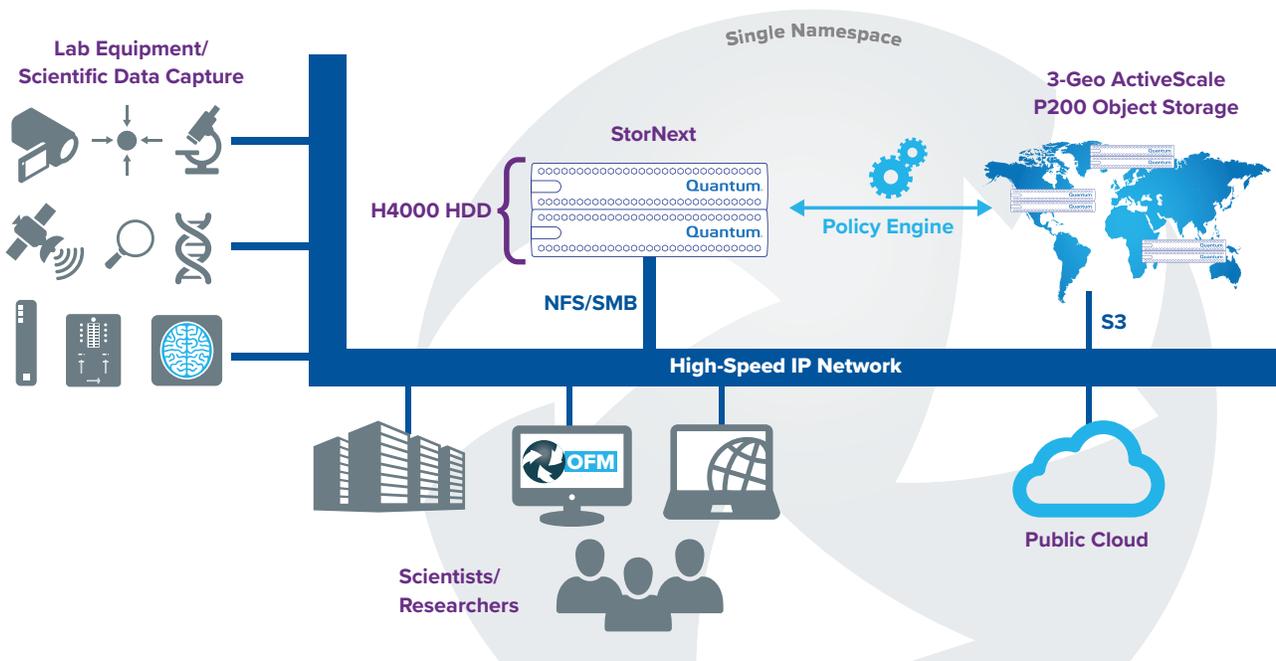


Figure 3 - Scientific Research Architecture

## EXAMPLE 2: VIDEO PRODUCTION

This example illustrates a typical video production configuration, with the ability to take projects from ingest and production on NVMe flash and HDD to archive on object storage. Outside the media & entertainment world, this architecture is applicable to any project-based workflow or pipeline requiring high-speed ingest and/or multi-stage processing of files (especially larger files), along with cost-effective long-term retention of data that never truly goes “cold.” Other example use cases include satellite and telemetry data processing and medical imaging.

## Solution Components

- H4000 Storage Appliance w/HDD
- F1000 NVMe Block Storage
- StorNext 7 File System Software
- ActiveScale P200 Object Storage System
- Optional - CatDV Media Asset Management Software

## Solution Characteristics

- High streaming performance with NVMe flash for rapid ingest and workflow processing
- HDD tier for warm data in active production
- Automated tiering between NVMe, HDD and object storage to accelerate project timelines and minimize TCO
- Extreme data durability – up to 19 nines
- Scalable from TB to PB of content
- Low TCO vs. single-tier solutions
- Single vendor, single point of support for the entire storage stack

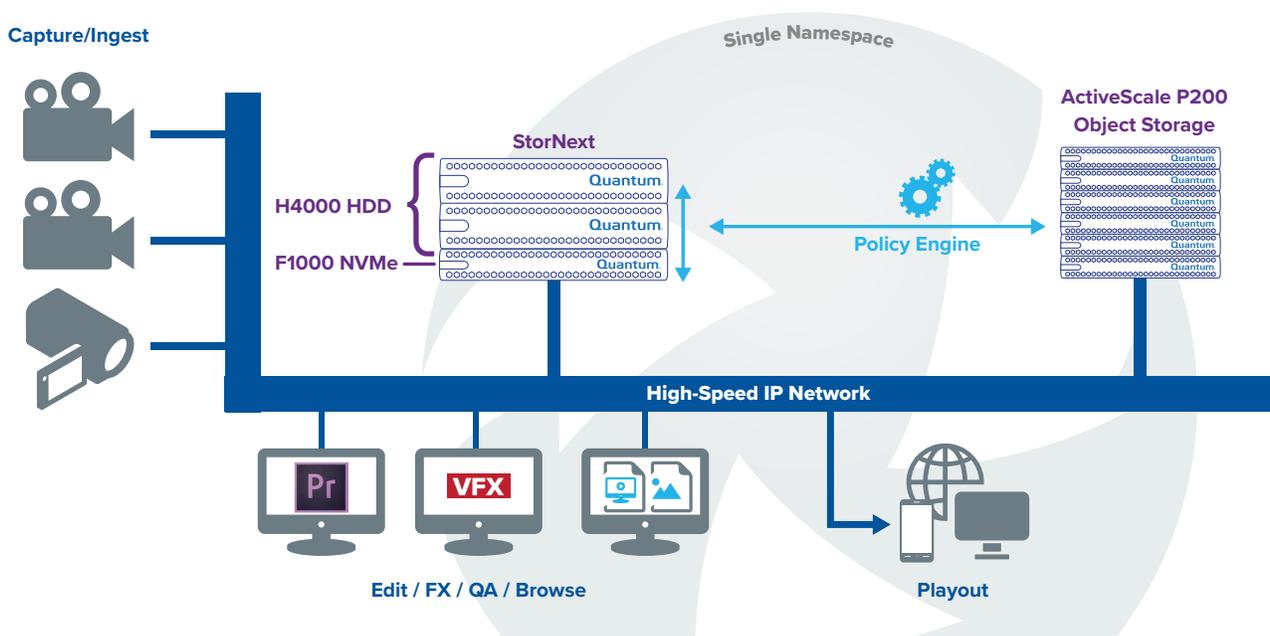


Figure 4 - Video Production Architecture

## EXAMPLE 3: AUTONOMOUS VEHICLE DEVELOPMENT

The automotive industry is going through a significant transformation, driven by the ultimate desire to produce fully autonomous vehicles. This massive R&D effort relies on collecting and processing extremely large amounts of unstructured data using machine learning algorithms.

This example shows a typical autonomous driving research architecture but is directly applicable to many other industries and use cases including autonomous smart farming, industrial robots, and drones.

### Solution Components

- R6000 Rugged Removable NVMe Storage
- Xcellis® Workflow Director / Metadata Controller Nodes
- Xcellis Workflow Extender / Gateway & Data Mover Nodes
- F2000 NVMe Block Storage Array
- QXS™-4 HDD Block Storage Array
- StorNext 7 File System Software
- ActiveScale X200 Object Storage System with Cold Storage Option
- Optional – Public Cloud Subscription

### Solution Characteristics

- Mobile data acquisition and pre-processing with in-vehicle, removable NVMe storage
- High streaming performance w/ NVMe flash for rapid offload and workflow processing
- RDMA connectivity
- HDD tier for warm data in active production
- Automated tiering between NVMe, HDD and object storage
- Extreme data durability – up to 19 nines
- Scalable from PB to EB of data
- Optional public cloud integration for cloud processing and collaboration
- Low TCO vs. single-tier solutions, traditional object storage, and public cloud
- Single vendor, single point of support

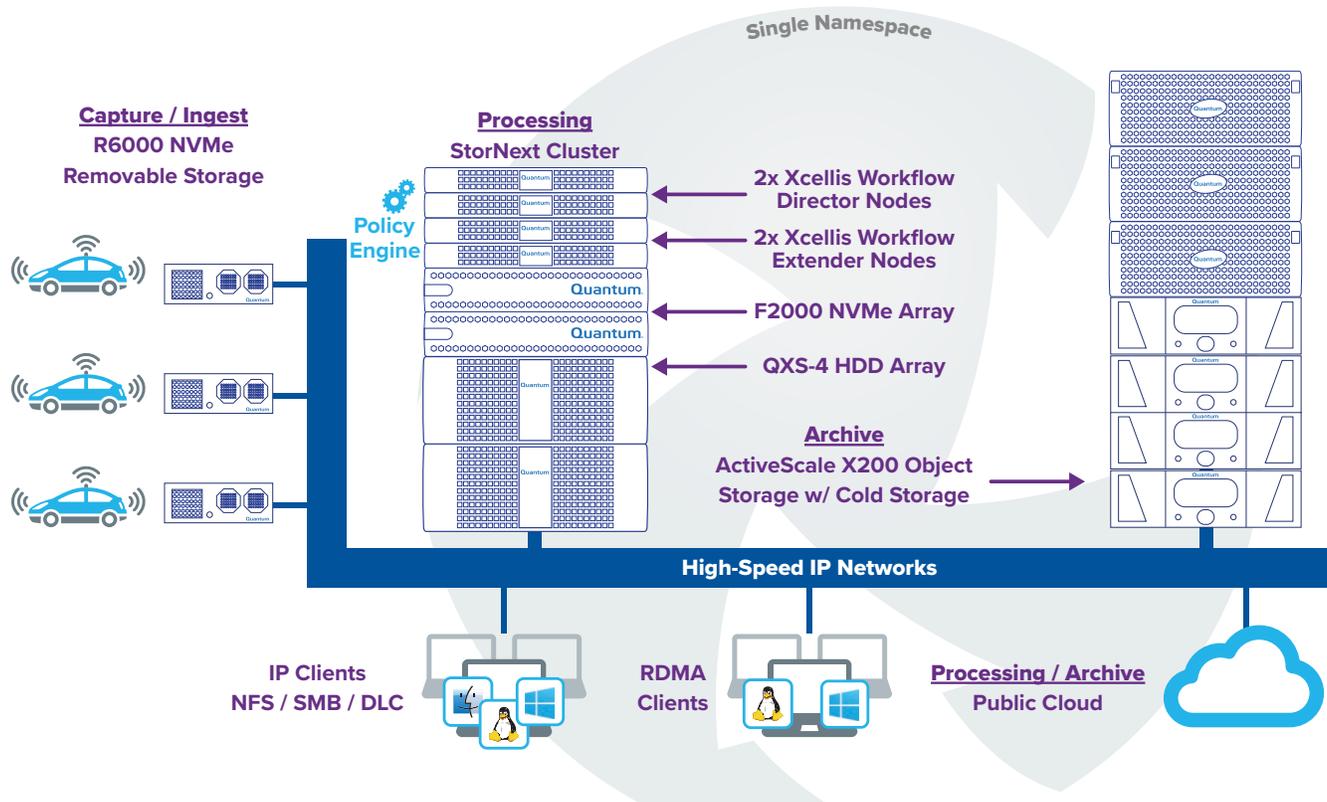


Figure 5 - Autonomous Vehicle Development Architecture

## Configuring StorNext with ActiveScale

This step-by-step example shows how to configure StorNext to tier data to an ActiveScale object storage system, including the ActiveScale Cold Storage option. The StorNext and ActiveScale GUIs were used for this example. Alternatively, the CLIs may be used, or the steps may be scripted.

Detailed instructions for configuring StorNext tiering with all types of secondary storage, including object storage, public cloud and tape, are contained in the [StorNext Documentation Center](#). Detailed instructions for configuring all aspects of ActiveScale are found in the [ActiveScale Documentation Center](#).

Once the steps below are complete, the system will behave as follows:

- When a new file lands in the archive directory, and has not been accessed for five minutes, a copy of the file will be made to ActiveScale. The file will be stored as an ActiveScale object in the AWS S3 Standard class resident on HDDs. This provides immediate data protection. According to the details of a storage lifecycle policy configured on ActiveScale, the object will transition to ActiveScale's Cold Storage class which is based on tape.
- Alternatively, StorNext may be configured to use AWS S3 Glacier class directly, in which case the object will be stored on tape by ActiveScale Cold Storage without residing in S3 Standard class first, and without the need to configure a storage lifecycle policy.

- If the primary disk file system fills up, the data blocks of the least-recently used files will be removed from the primary disk and reside only on ActiveScale. To applications and users all files still appear in the file system as normal, but when one of the older files is accessed, there is a short delay while the data blocks are copied back to primary disk from ActiveScale.

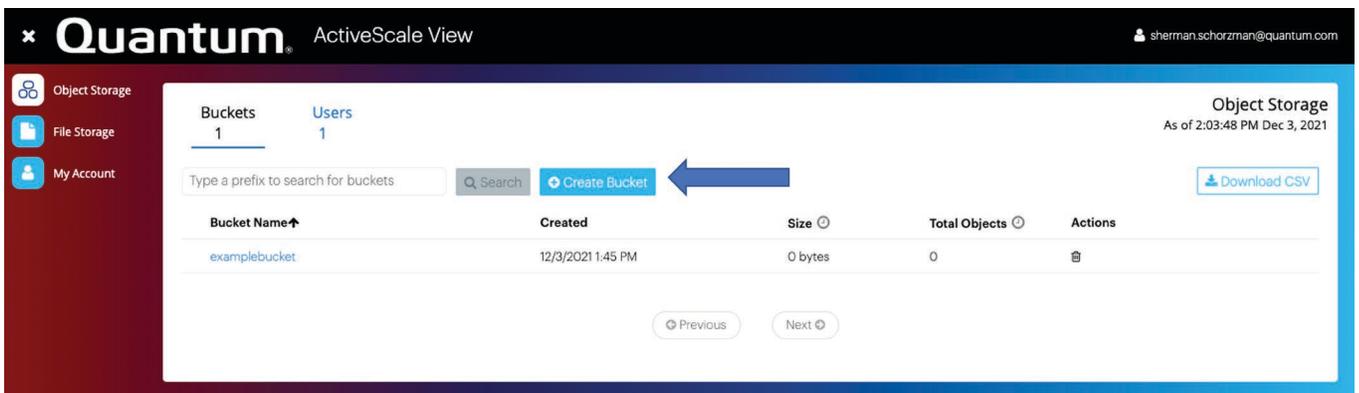
There are four major steps in the process to achieve this configuration:

- Create an ActiveScale bucket with an optional object lifecycle policy
- Configure StorNext to include ActiveScale as a storage destination
- Configure a StorNext storage policy to use the new storage destination
- Associate the storage policy with the storage destination

## Configuring a Bucket in ActiveScale

Follow the steps below to create an ActiveScale bucket with a lifecycle policy:

1. In the account self-management user interface (AS View), click **Create Bucket**.

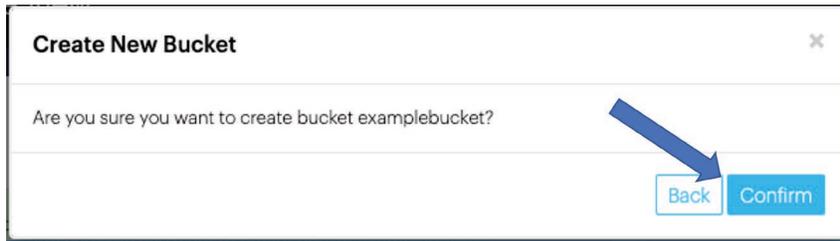


2. You will be presented with a Create New Bucket form. Assign the bucket a name and click **Create** to continue.

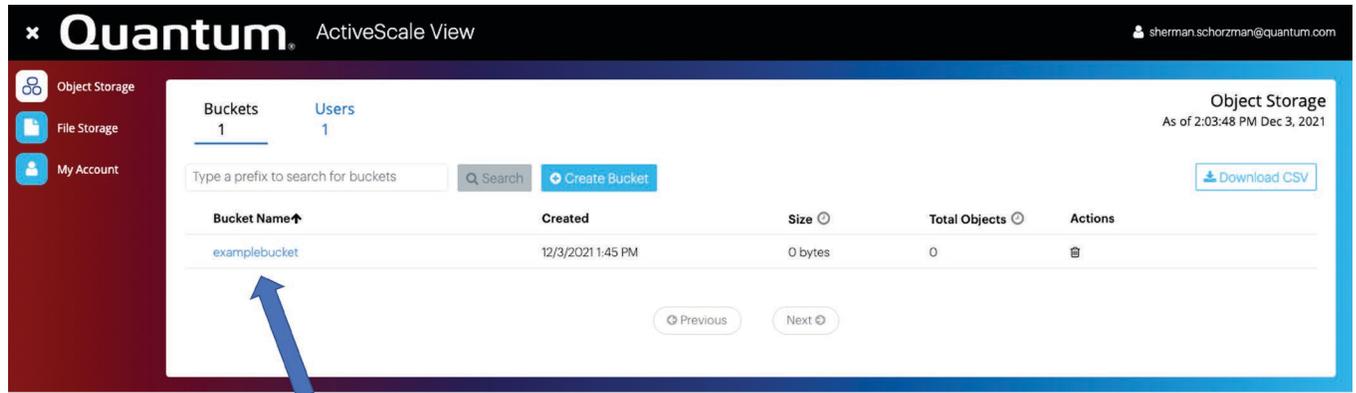
The 'Create New Bucket' form contains the following fields and options:

- Bucket Name**: A text input field containing 'examplebucket', with a blue arrow pointing to it.
- Versioning**: A section with a checkbox 'Keep multiple versions of an object in the same bucket'.
- Object Lock**: A section with a checkbox 'Allow objects in this bucket to be locked' (with a note 'Object lock requires bucket versioning to be enabled') and a 'Default retention period' section with input fields for '1' Year(s) and '0' Day(s).
- At the bottom right, there are 'Cancel' and 'Create' buttons, with a blue arrow pointing to the 'Create' button.

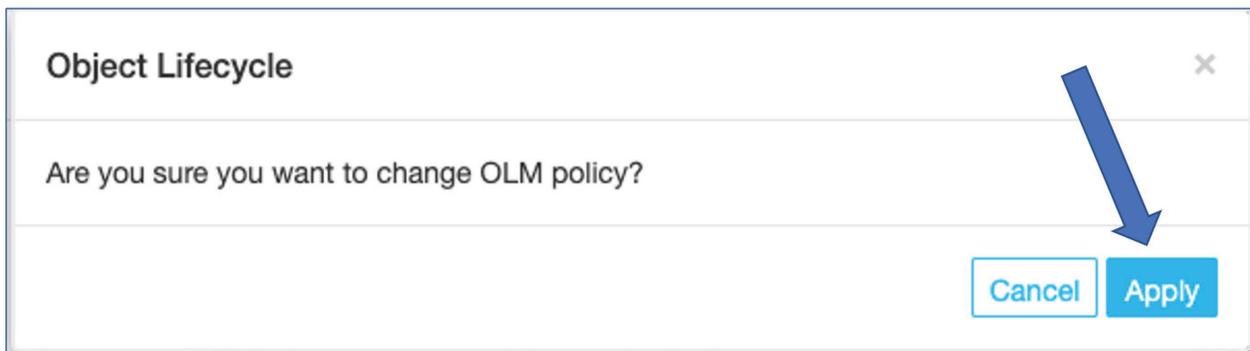
3. Click **Confirm** to create the bucket.



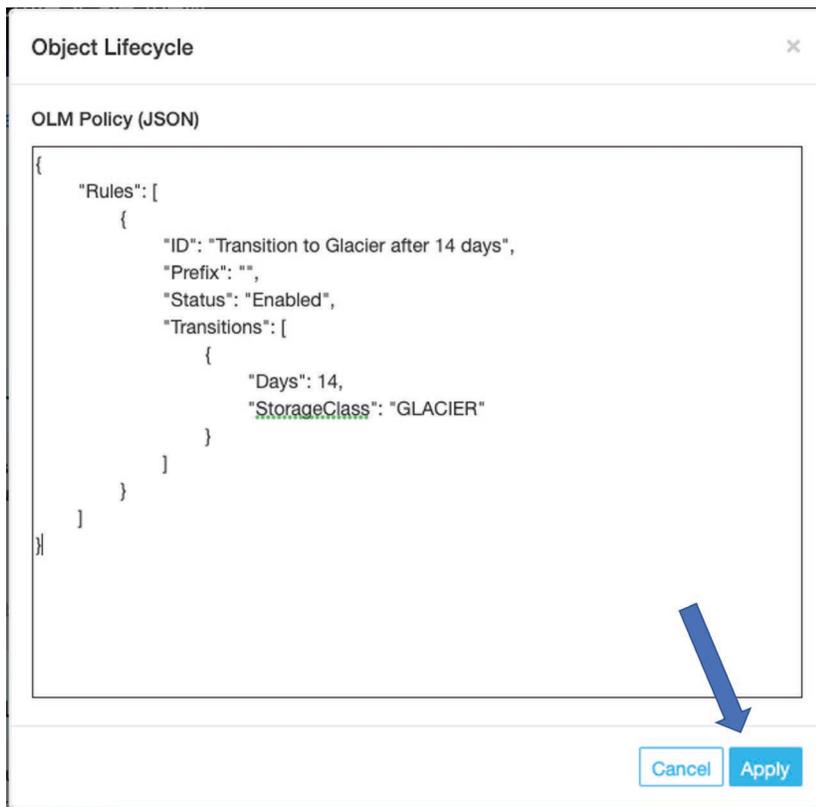
At the AS View Dashboard, click on the name of the bucket that was just created.



4. The bucket's details page will appear. Make sure you are viewing the **Properties** tab. Click on the **Object Lifecycle** panel. If you do not wish to configure an object lifecycle policy, click Cancel and skip to step 7.



5. The Object Lifecycle dialog box displays. This is where JSON formatted lifecycle definitions are added. Add the lifecycle and click **Apply** to continue.



Note: The following is an example of a lifecycle policy that will automatically transition objects to ActiveScale Cold Storage after 14 days.

```
{
  "Rules": [
    {
      "ID": "Transition to Glacier after 14 days",
      "Prefix": "",
      "Status": "Enabled",
      "Transitions": [
        {
          "Days": 14,
          "StorageClass": "GLACIER"
        }
      ]
    }
  ]
}
```

6. Click **Apply** to confirm creation of the bucket's object lifecycle policy.

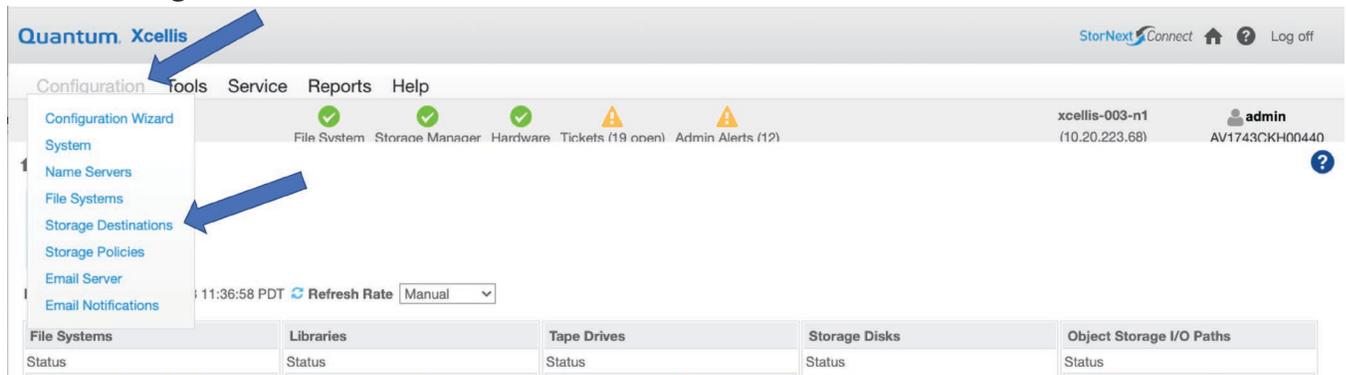


7. The bucket is now ready to be used as a storage target for StorNext.

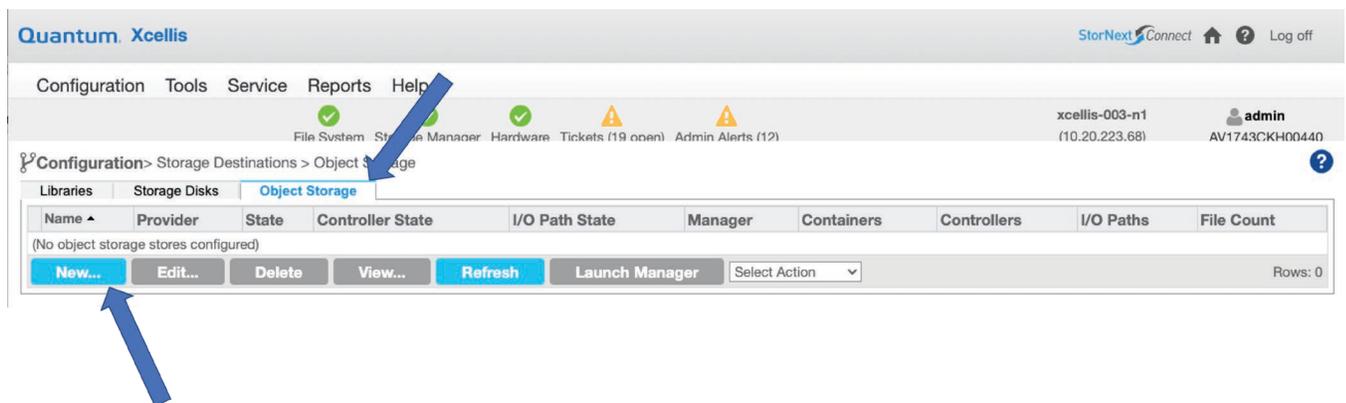
## Configuring the StorNext Storage Destination

Follow the steps below to define the newly created ActiveScale bucket as a storage target for StorNext.

1. From the Xcellis home screen, under the Configuration pull down menu, select **Storage Destinations**.



2. The Storage Destination screen will be displayed. Under the **Object Storage** tab, click **New**.



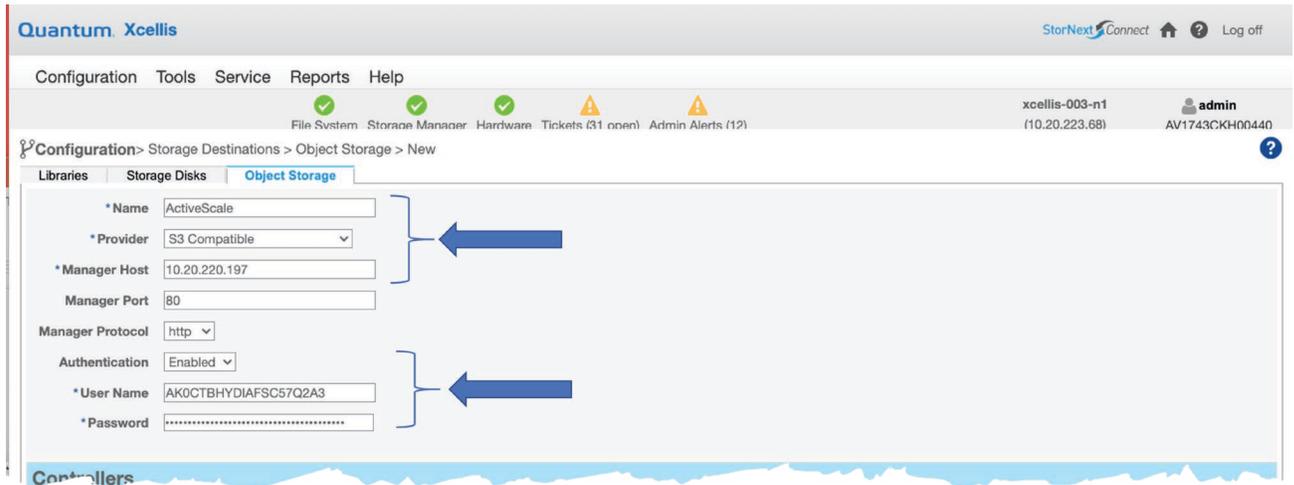
3. You will be presented the New Object Storage Target form. The form has 4 sections, follow the steps below to complete each section.

### a. Destination Definition

In the **Destination** definition section:

- i. Provide a name for the object storage destination
- ii. For the provider, select **S3 Compatible**

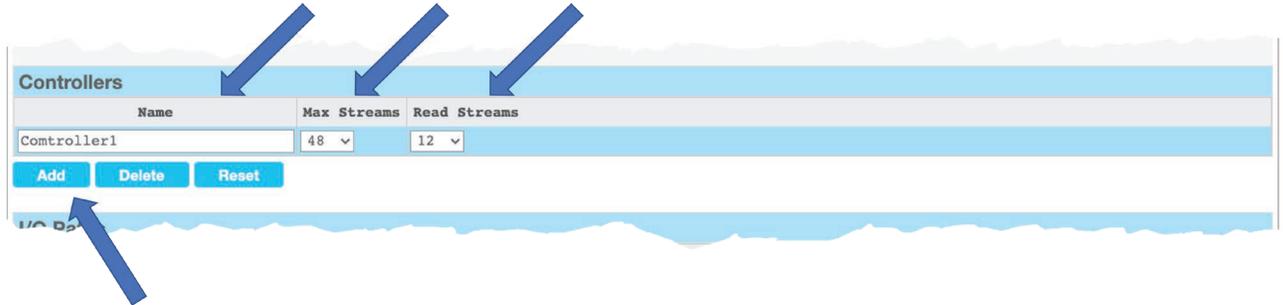
- iii. Use any ActiveScale public port name or IP address for the management host
- iv. Enable Authentication
- v. User Name is the ActiveScale access key
- vi. Password is the ActiveScale secret key



## b. Controller Definition

In the **Controllers** definition section:

- i. Click **Add**
- ii. Provide a name for the new controller
- iii. Define Max Streams and Read Streams. If the optimal number of streams is unknown, use 48 for Max and 12 for read. These numbers can be changed at any time.

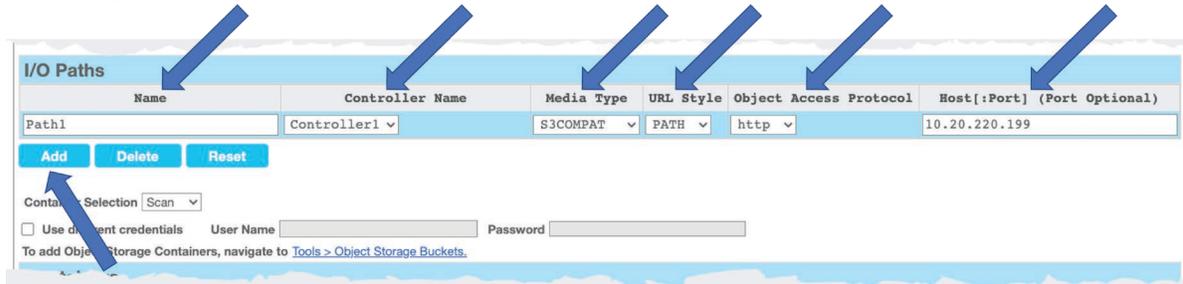


## c. I/O Path Definition

To define the I/O Path:

- i. Click **Add**
- ii. Provide a name for the new I/O path
- iii. Select the controller that was defined in the previous step

- iv. Select S3COMPAT (S3 Compatible) for the media type
- v. Select PATH for the URL style
- vi. Select the appropriate access protocol, HTTP in this example
- vii. Use any ActiveScale public port name or IP address for the host



#### d. Container Definition

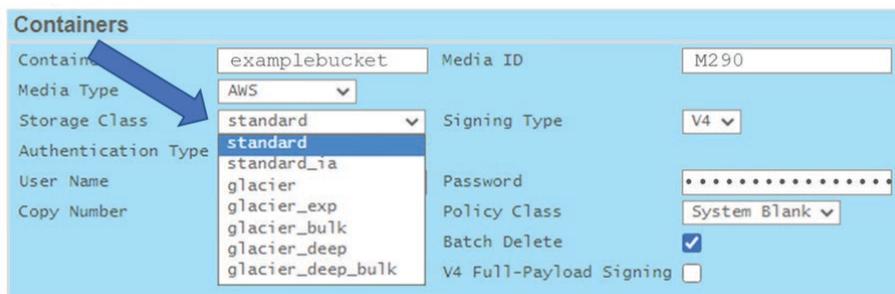
To define a container for the storage destination, in the **Containers** section:

- i. Click **Add**
- ii. For the container, select the ActiveScale bucket defined earlier
- iii. Select **S3COMPAT** for the media type
- iv. Select the **Storage Class** based on the requirements for object storage and retrieval.

When StorNext is used with ActiveScale without the ActiveScale Cold Storage option, only the S3 Standard class options (shown in the screen capture below) may be used. These options will result in StorNext writing objects to ActiveScale in S3 Standard class, and these objects will reside on ActiveScale HDD storage.

When ActiveScale with the ActiveScale Cold Storage option is available, both the S3 Standard class options may be used (with the behavior described above), as well as the S3 Glacier class options shown below. Choosing one of the S3 Glacier class options will result in StorNext writing objects to ActiveScale in S3 Glacier class. These objects briefly land on ActiveScale HDD storage and are then moved to ActiveScale's tape storage.

It is also possible to write objects to ActiveScale using the S3 Standard class options but configure a lifecycle policy on ActiveScale to later transition some or all these objects to S3 Glacier class, at which point they are moved to ActiveScale's tape storage.



AWS S3 Storage Class	Retrieval Option	StorNext GUI Label
S3 Standard	N/A	standard
S3 Standard Infrequent Access	N/A	standard_ia
S3 Glacier Flexible Retrieval	Standard	glacier
S3 Glacier Flexible Retrieval	Expedited	glacier_exp
S3 Glacier Flexible Retrieval	Bulk	glacier_bulk
S3 Glacier Deep Archive	Standard	glacier_deep
S3 Glacier Deep Archive	Bulk	glacier_deep_bulk

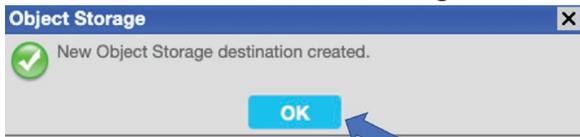
- v. The media ID can be a random number or name, but must be unique
- vi. User Name is the ActiveScale access key
- vii. Password is the ActiveScale secret key

4. Once all four sections are complete, click **Apply**.

5. You will be asked to confirm creation of the storage destination, click **Yes** to continue.



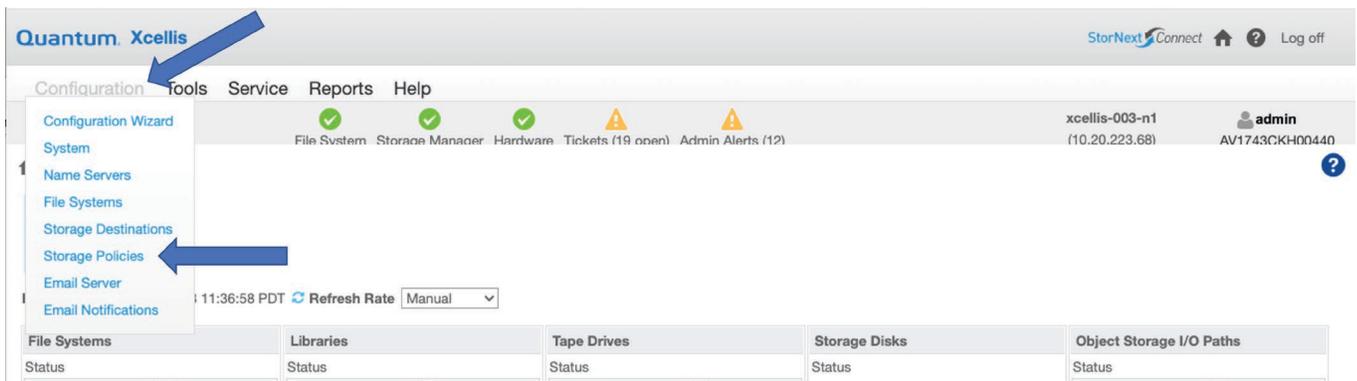
You will be informed the storage destination was created, click **OK** to continue.



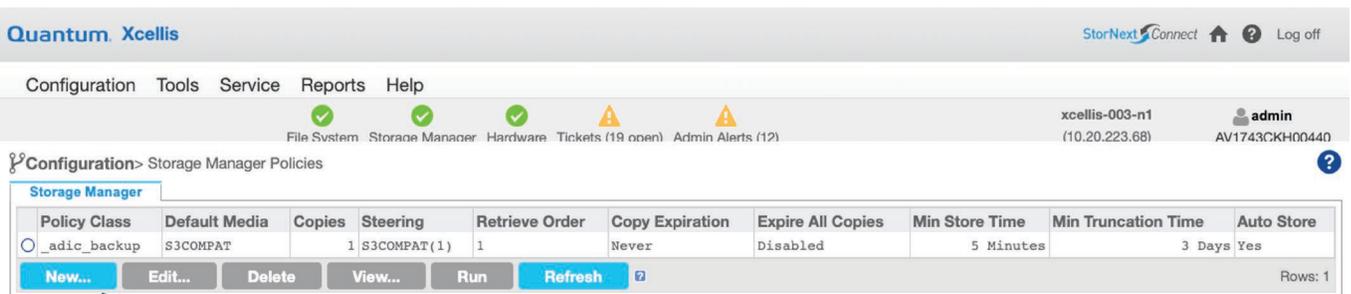
## Configuring the Storage Policy

Follow the steps below to define the storage policy. The storage policy will be associated to a directory in the StorNext File System. That directory will be the StorNext File System mount point for the newly created storage destination.

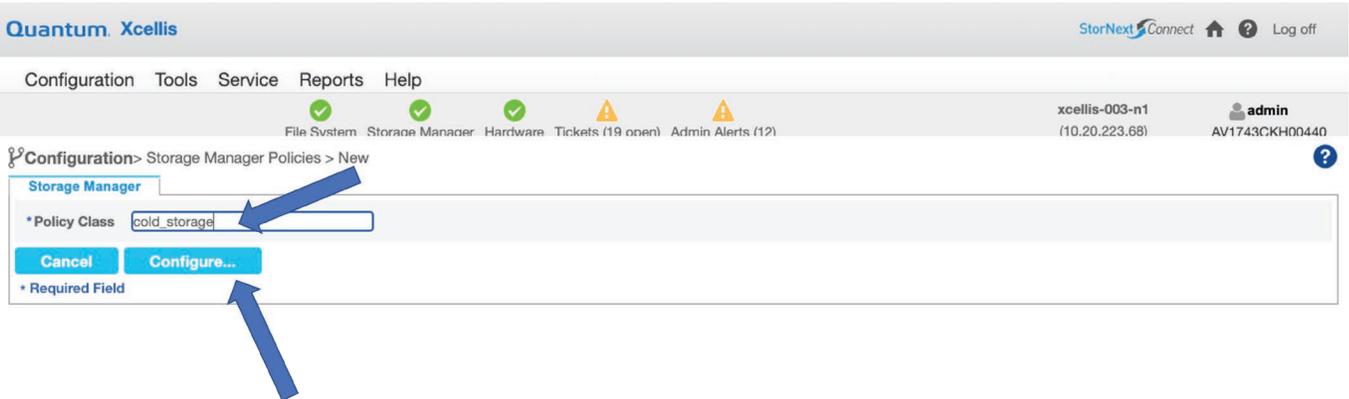
1. From the Xcellis home screen, under the **Configuration** pull down menu, select **Storage Policies**.



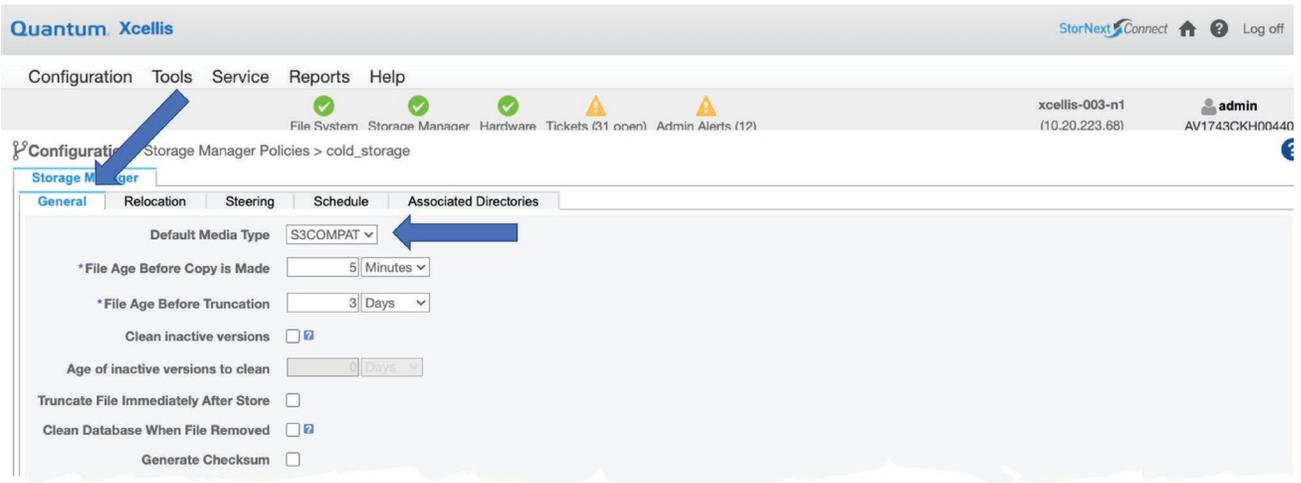
2. The Storage Policies screen will be displayed. Click **New**.



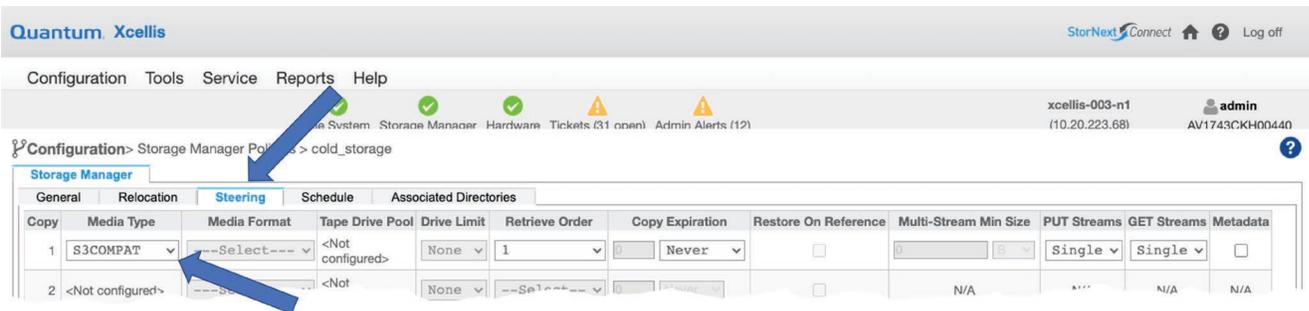
- The new policy configuration wizard will begin. Assign the policy a name and click **Configure**.



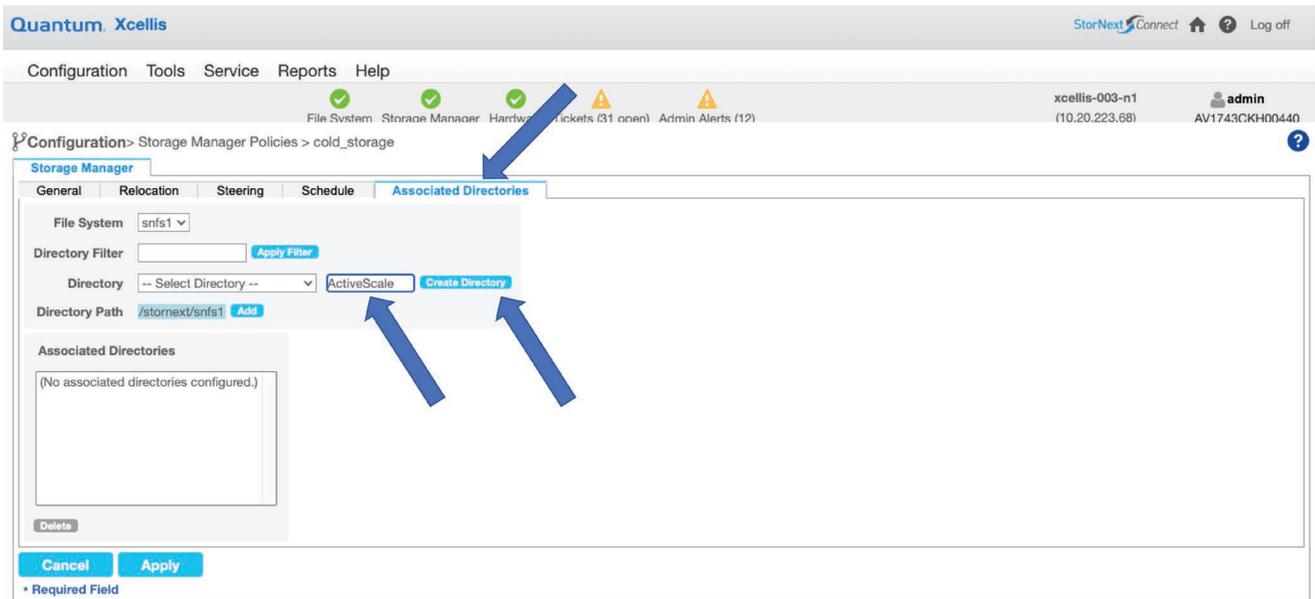
- You will be presented a policy configuration form. Under the **General** tab, make sure the Default Media Type is set to **S3COMPAT**.



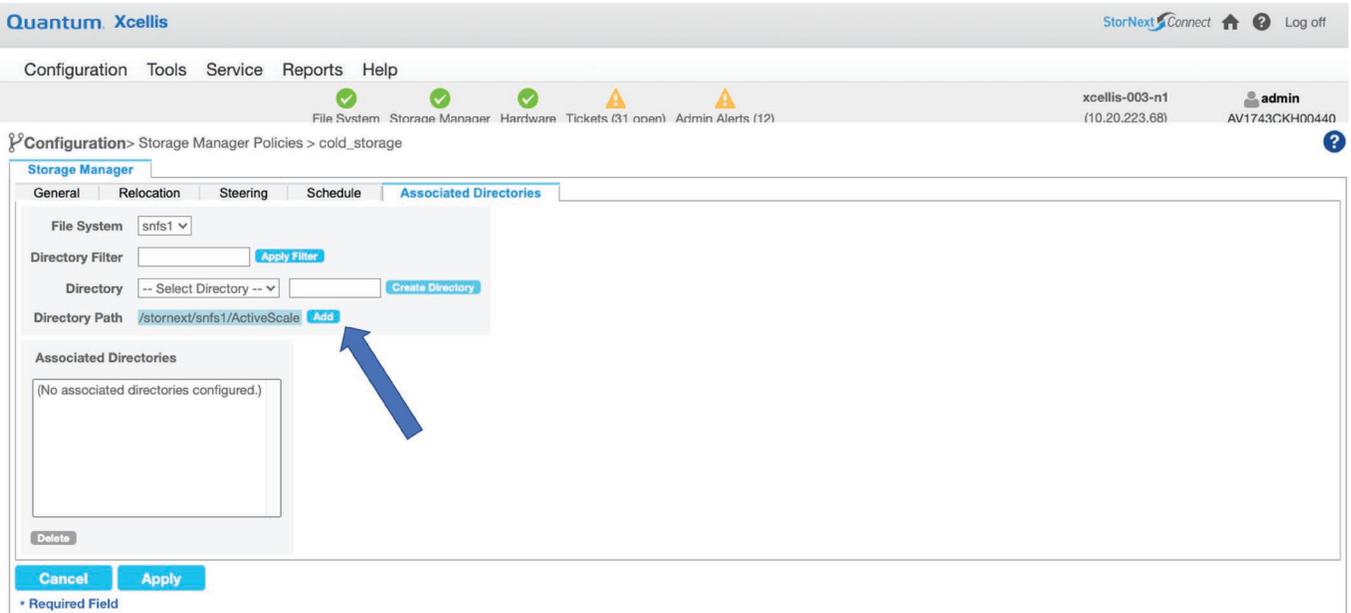
- Under the **Steering** tab, make sure the media type is set to **S3COMPAT**.



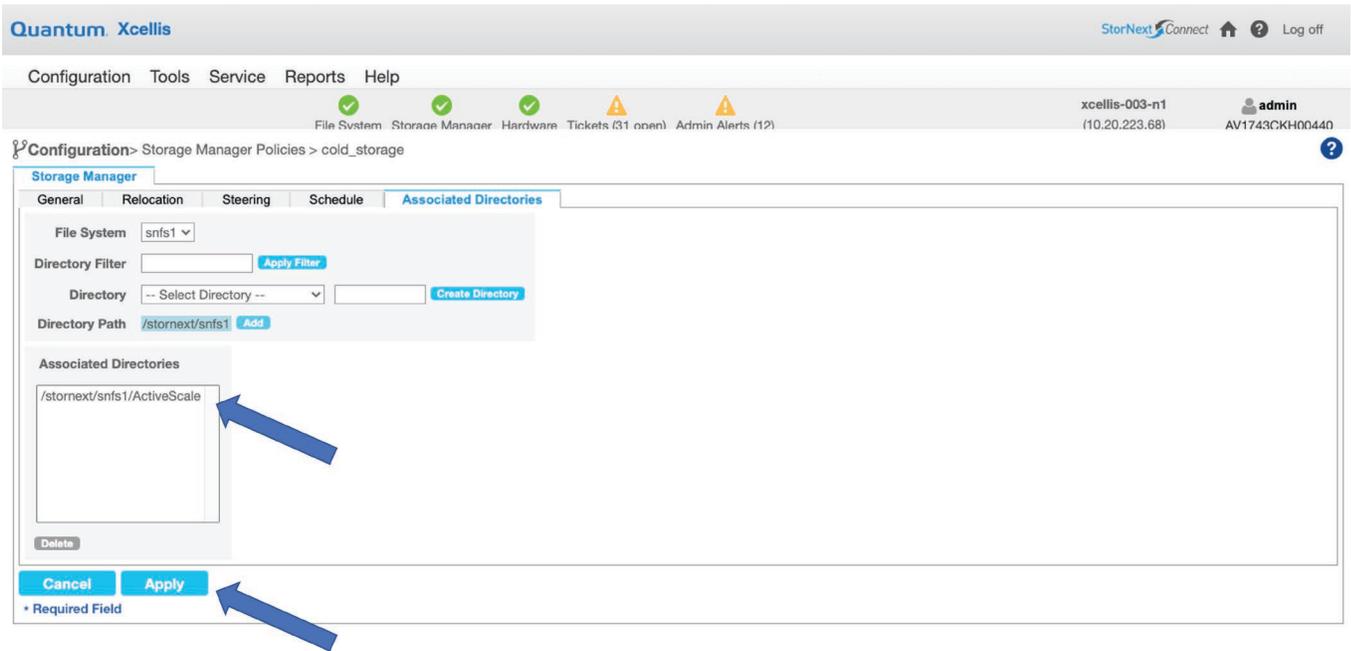
6. Under the **Associated Directories** tab, enter the name of a directory that will be associated with the ActiveScale storage destination, then click **Create Directory**. Alternatively, if the directory already exists, select it from the dropdown.



7. The path to be associated with the ActiveScale storage destination will be displayed. Click **Add** to insert that path to the associated directories list.



- Once the path has been added to the associated directories list, click **Apply** to complete the configuration of the storage policy.



- You will be notified of the storage policy creation. Click **OK** to continue.



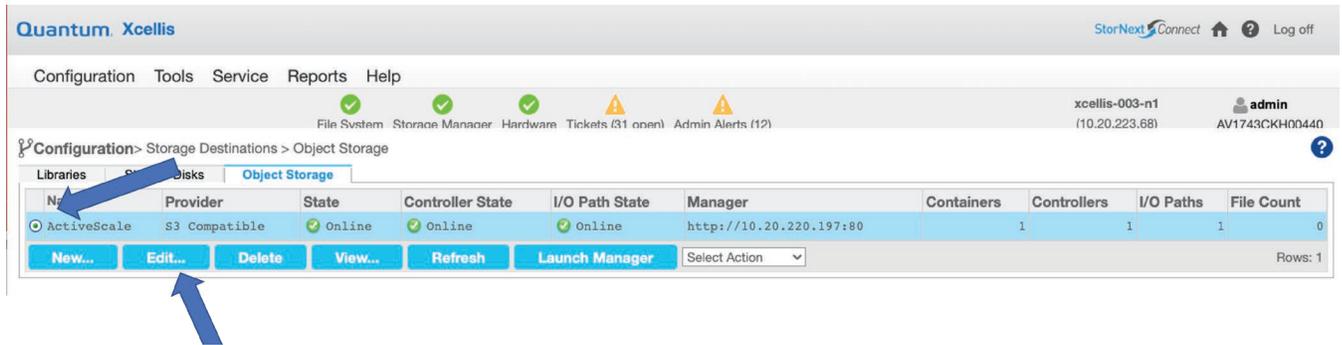
## Associate the Storage Policy with the Storage Destination

Follow the steps below to associate the newly created storage policy with the newly created storage destination.

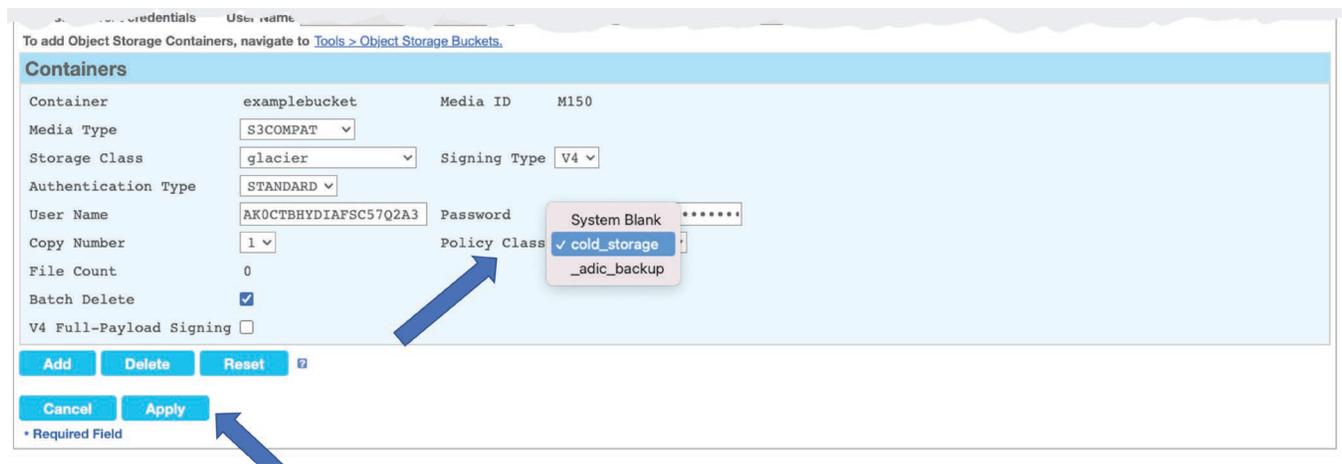
- From the Xcellis home screen, under the **Configuration** pull down menu, select **Storage Destinations**.



2. Select the newly created storage destination and click **Edit**.



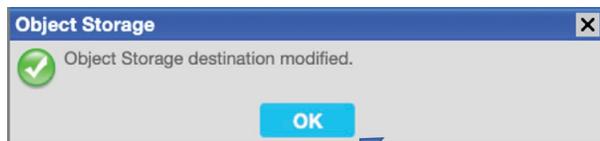
3. On the **Containers** section, for **Policy Class**, select the newly created storage policy, then click **Apply** to continue.



4. You will be prompted to confirm modification to the storage destination. Click **Yes** to continue.



5. You will be informed the storage destination was modified, click **OK** to continue.



This completes the setup of StorNext to use ActiveScale as a storage destination. Files written to associated path in the StorNext File System will be stored on ActiveScale on HDD or on tape, depending on the configuration chosen.

## For More Information

### ActiveScale

Web Page:

<https://www.quantum.com/en/products/object-storage/>

Data Sheet:

<https://cdn.allbound.com/iq-ab/2020/11/ActiveScale-DS00546A.pdf>

White Paper:

[ActiveScale Erasure Coding and Self-Protecting Technologies](#)

Documentation Center:

<https://qsupport.quantum.com/kb/flare/Content/ActiveScale/Software/Default.htm>

## StorNext

Web Page:

<https://www.quantum.com/en/products/file-system/stornext/>

Data Sheet:

<https://cdn.allbound.com/iq-ab/2020/02/StorNext-Scale-out-Storage-Datasheet-DS00469A.pdf>

White Paper:

[StorNext Architecture, Features, and Differentiators](#)

Documentation Center:

[https://qsupport.quantum.com/kb/flare/Content/stornext/SNS\\_DocSite/Default.htm](https://qsupport.quantum.com/kb/flare/Content/stornext/SNS_DocSite/Default.htm)



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