



Migrating object-based storage from ONTAP S3 to StorageGRID

How to enable StorageGRID in your environment

NetApp
October 09, 2024

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Migrating object-based storage from ONTAP S3 to StorageGRID

Enabling enterprise-grade S3 by seamlessly migrating object-based storage from ONTAP S3 to StorageGRID

Enabling enterprise-grade S3 by seamlessly migrating object-based storage from ONTAP S3 to StorageGRID

Migration Demo

This is a demonstration on migrating users and buckets from ONTAP S3 to StorageGRID.

Enabling enterprise-grade S3 by seamlessly migrating object-based storage from ONTAP S3 to StorageGRID

Enabling enterprise-grade S3 by seamlessly migrating object-based storage from ONTAP S3 to StorageGRID

Preparing ONTAP

For demonstration purposes we will create an SVM object store server, user, group, group policy and buckets.

Create the Storage Virtual Machine

In ONTAP System Manager, navigate to Storage VM's and add a new storage VM.



Select the "Enable S3" and "Enable TLS" check boxes and configure the HTTP(S) ports. Define the IP, subnet mask and define the gateway and broadcast domain if not using the default or required in your environment.

Add storage VM



STORAGE VM NAME

svm_demo

Access protocol

SMB/CIFS, NFS, S3 iSCSI FC NVMe

Enable SMB/CIFS

Enable NFS

Enable S3

S3 SERVER NAME

s3portal.demo.netapp.com

Enable TLS

PORT

443

CERTIFICATE

Use system-generated certificate

Use external-CA signed certificate

Use HTTP (non-secure)

PORT

8080

DEFAULT LANGUAGE

c.utf_8

NETWORK INTERFACE

Use multiple network interfaces when client traffic is high.

onPrem-01

IP ADDRESS

192.168.0.200

SUBNET MASK

24

GATEWAY

Add optional gateway

BROADCAST DOMAIN AND PORT

Default

Storage VM administration

Enable maximum capacity limit
The maximum capacity that all volumes in this storage VM can allocate. [Learn More](#)

Manage administrator account

Save

Cancel

As part of the SVM creation a user will be created. Download the S3 keys for this user and close the window.


Added storage VM ✕

STORAGE VM
svm_demo


S3 SERVER NAME
s3portal.demo.netapp.com

User details

USER NAME
sm_s3_user

 The secret key won't be displayed again. Save this key for future use.

ACCESS KEY

34EH21411SMW1YOV3NQY

SECRET KEY
[Show secret key](#)

DownloadClose


Once the SVM has been created, edit the SVM and add the DNS settings.

Services

NIS

Not configured

Name service switch

Services lookup order 

HOSTS
Files, then DNS

GROUP
Files

NAME MAP
Files

NETGROUP
Files

DNS

Not configured

Define the DNS name and IP.

Add DNS domain ✕

DNS domains

demo.netapp.com

+ Add

Name servers

192.168.0.253

+ Add

Cancel

Cancel **Save**

Create SVM S3 User

Now we can configure the S3 users and group. Edit the S3 settings.

Protocols

NFS



Not configured

SMB/CIFS



Not configured

NVMe



Not configured

S3

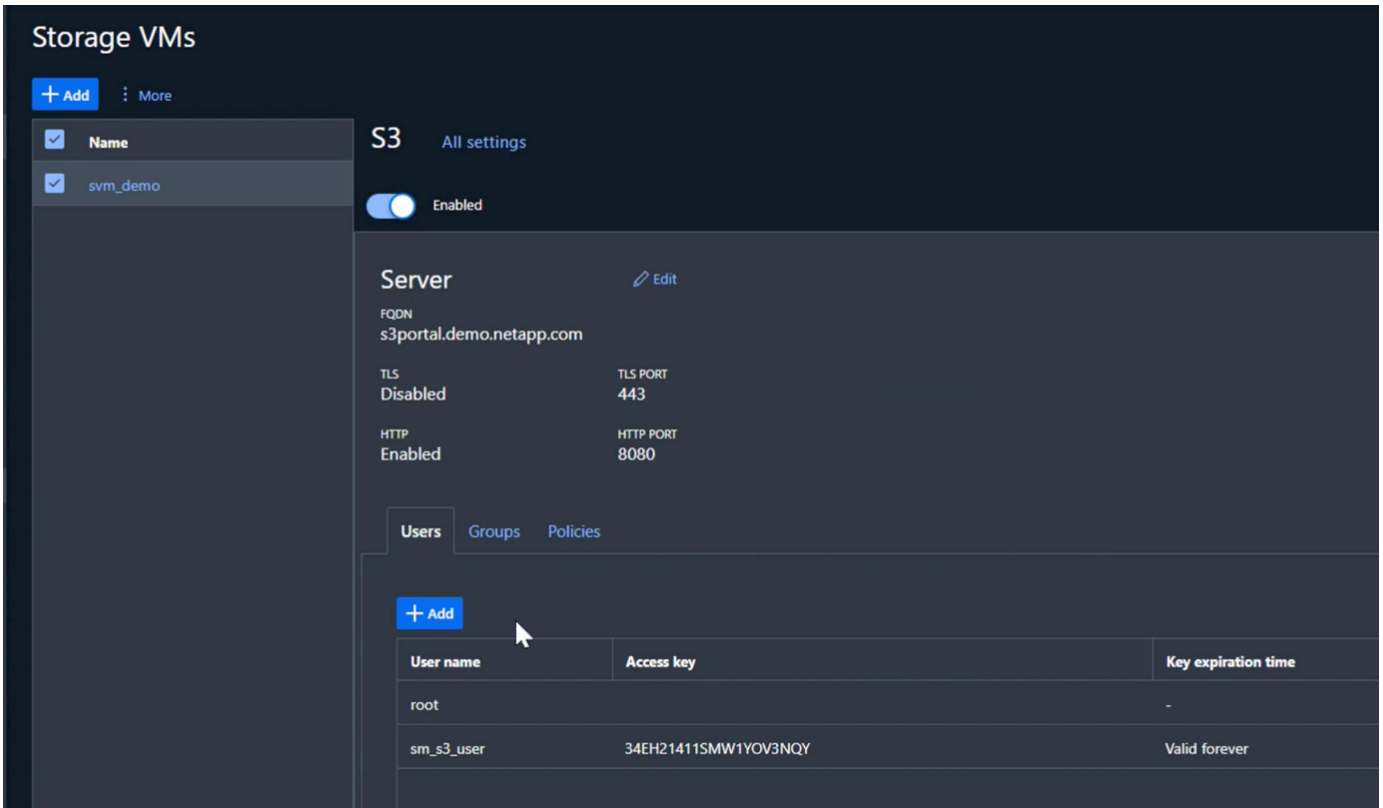


STATUS
✓ Enabled

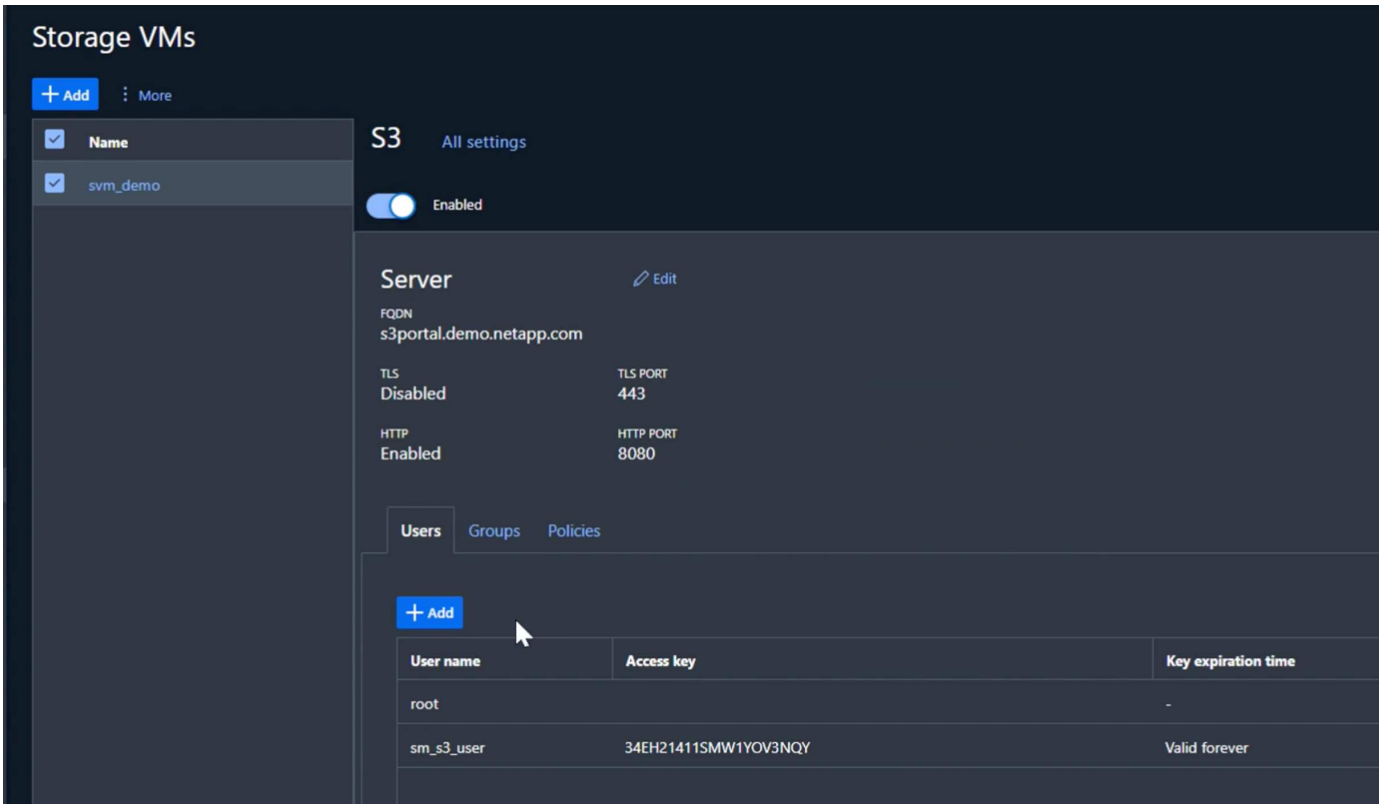
TLS
Disabled

HTTP
Enabled

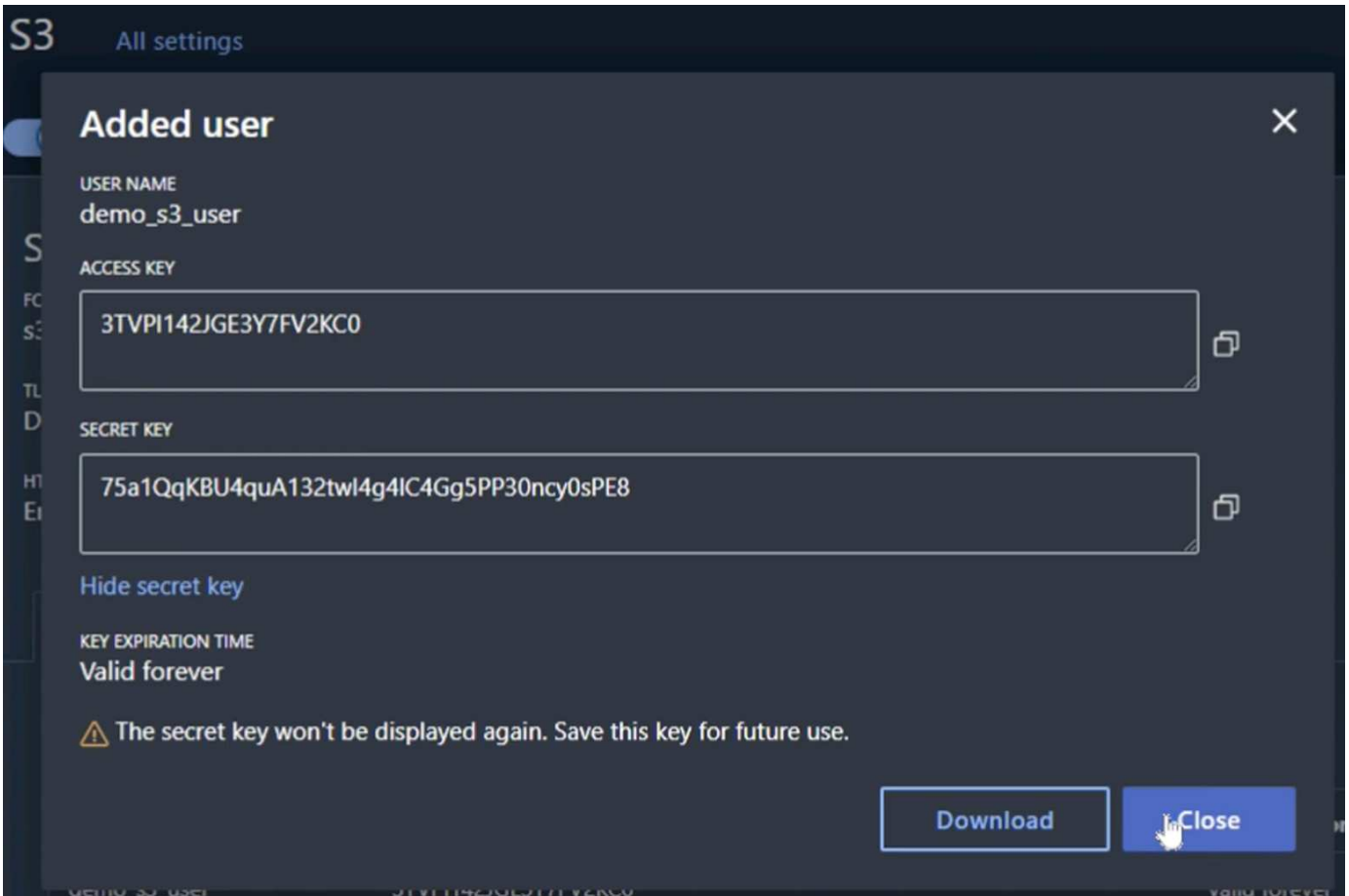
Add a new user.



Input the user name and key expiration.



Download the S3 keys for the new user.



Create SVM S3 group

On the Groups tab of the SVM S3 settings, add a new group with the user created above and FullAccess permissions.

Add group ✕

NAME

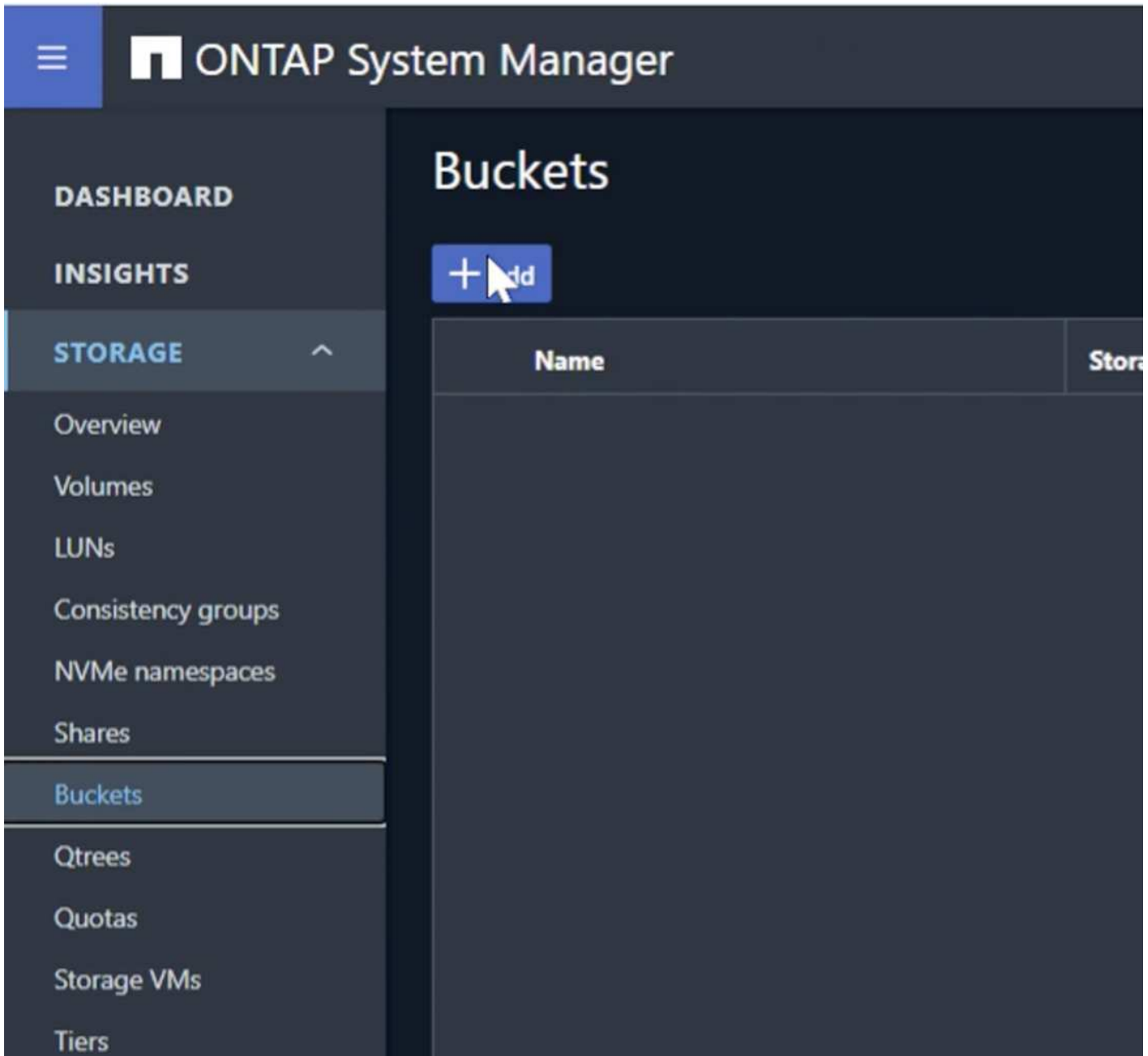
USERS

POLICIES

Cancel **Save**

Create SVM S3 buckets

Navigate to the Buckets section and click the "+Add" button.



Enter a name, capacity, and deselect the "Enable ListBucket access..." check box. and click on the "More options" button.

Add bucket ×

NAME

CAPACITY

100 GiB

Enable ListBucket access for all users on the storage VM "svm_demo".
Enabling this will allow users to access the bucket.

In the "More options" section select the enable versioning check box. and click the "Save" button.

Add bucket ×

NAME

FOLDER (OPTIONAL)

Specify the folder to map to this bucket. [Know more](#)

CAPACITY

Use for tiering
If you select this option, the system will try to select low-cost media with optimal performance for the tiered data.

Enable versioning
Versioning-enabled buckets allow you to recover objects that were accidentally deleted or overwritten. After versioning is enabled, it can't be disabled. However, you can suspend versioning.

PERFORMANCE SERVICE LEVEL

Not sure? [Get help selecting type](#)

Repeat the process and create a second bucket without versioning enabled. Enter a name, the same capacity as bucket one, and deselect the "Enable ListBucket access..." check box. and click on the "Save" button.

Add bucket ✕

NAME

ontap-dummy

CAPACITY

100 ▲▼ GiB ▼

Enable ListBucket access for all users on the storage VM "svm_demo".
Enabling this will allow users to access the bucket.

More options Cancel Save

By Rafael Guedes, and Aron Klein

Enabling enterprise-grade S3 by seamlessly migrating object-based storage from ONTAP S3 to StorageGRID

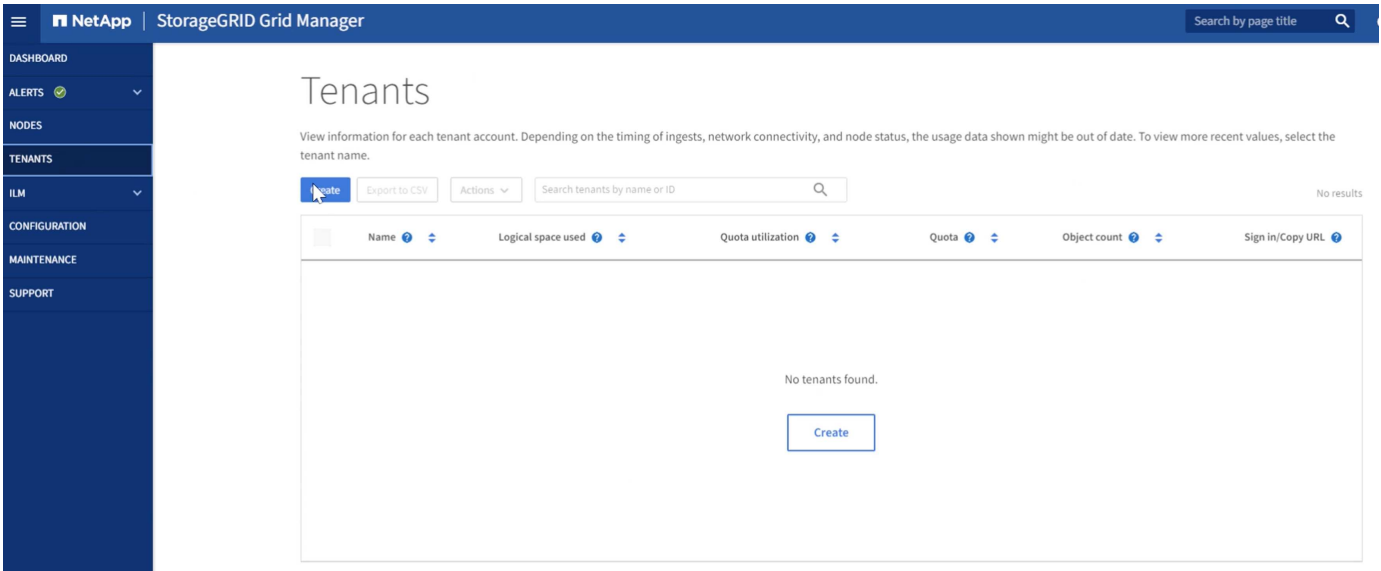
Enabling enterprise-grade S3 by seamlessly migrating object-based storage from ONTAP S3 to StorageGRID

Preparing StorageGRID

Continuing the configuration for this demo we will create a Tenant, user, security group, group policy, and bucket.

Create the tenant

Navigate to the "Tenants" tab and click on the "create" button

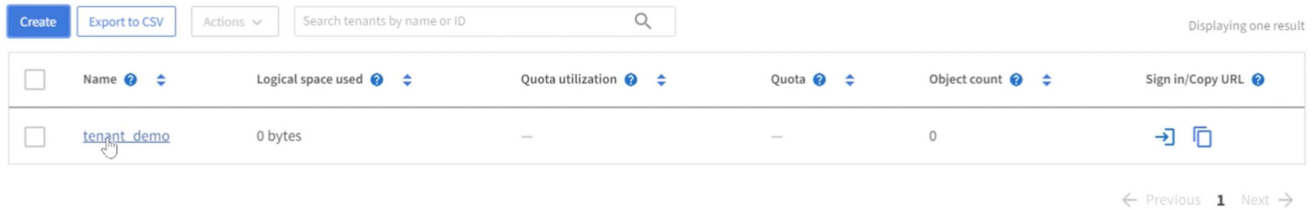


Fill in the details for the tenant providing a tenant name, select S3 for the client type, and no quota is required. No need to select platform services or allow S3 select. You can choose to use own Identity source if you choose. Set the root password and click on the finish button.

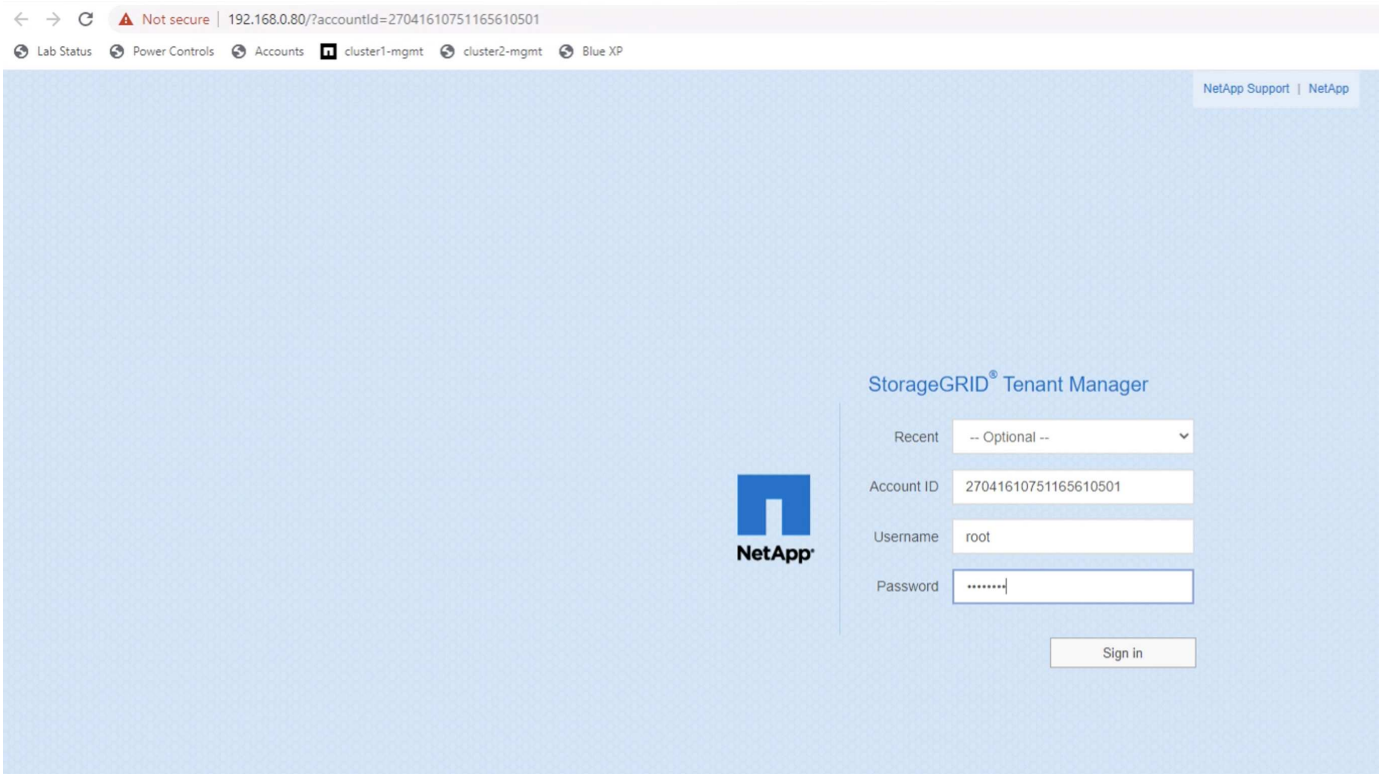
Click on the tenant name to view the tenant details. **You will need the tenant ID later so copy it off.** Click on the Sign in button. This will bring you to the tenant portal login. Save the URL for future use.

Tenants

View information for each tenant account. Depending on the timing of ingests, network connectivity, and node status, the usage data shown might be out of date. To view more recent values, select the tenant name.

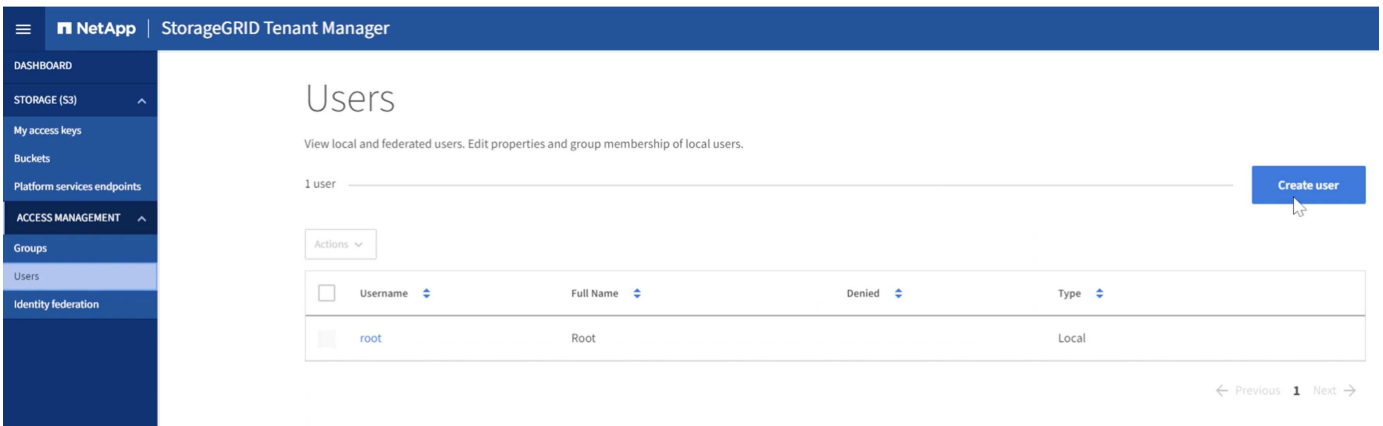


This will bring you to the tenant portal login. Save the URL for future use, and enter the root user credentials.



Create the user

Navigate to the Users tab and create a new user.



Enter user credentials

Create a new local user and configure user access.

Full name 

Must contain at least 1 and no more than 128 characters

Username 

Password

Must contain at least 8 and no more than 32 characters

Confirm password

Deny access

Do you want to prevent this user from signing in regardless of assigned group permissions?



Yes



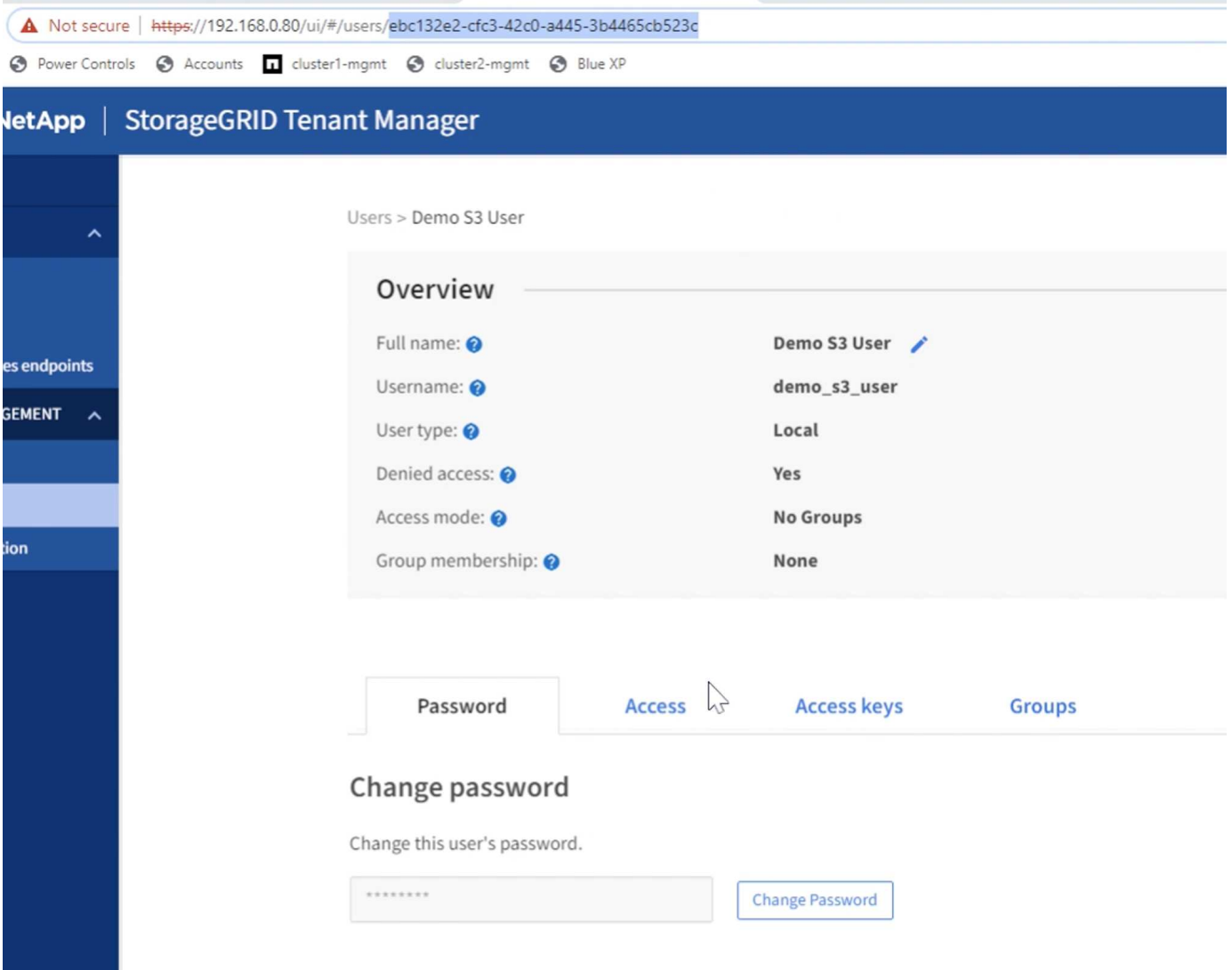
No

[Cancel](#)

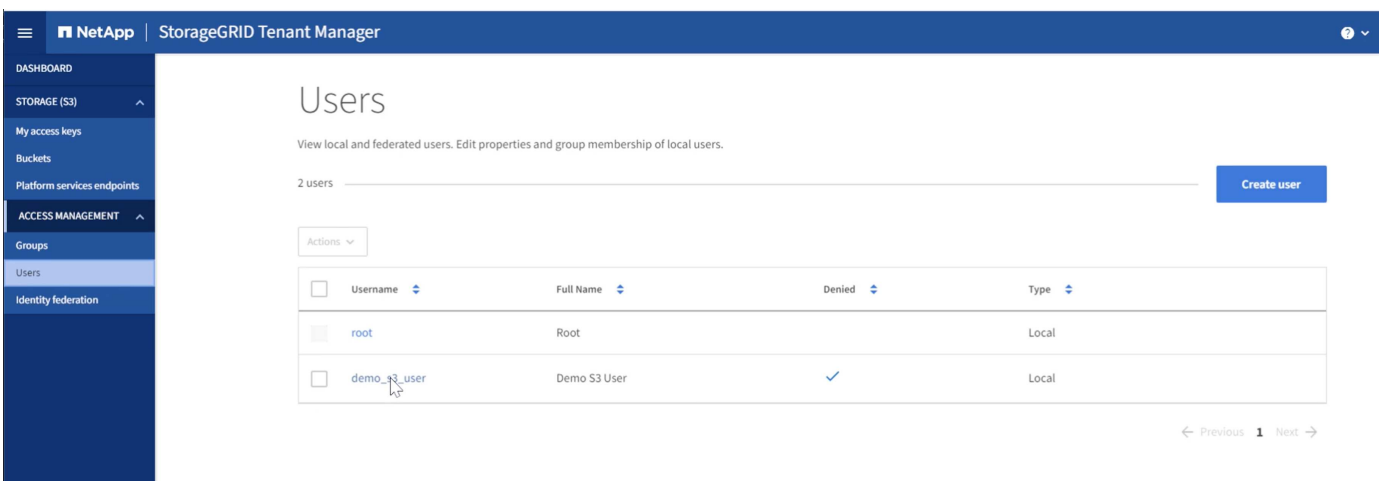
[Continue](#)

Now that the new user has been created, click on the users name to open the details of the user.

Copy the user ID from the URL to be used later.



To create the S3 keys click on the user name.



Select the "Access keys" tab and click on the "Create Key" button. There is no need to set an expiration time. Download the S3 keys as they cannot be retrieved again once the window is closed.

Create access key



1 Choose expiration time ————— 2 Download access key

Download access key

To save the keys for future reference, select **Download .csv**, or copy and paste the values to another location.

i You will not be able to view the Access key ID or Secret access key after you close this dialog.

Access key ID

7CT7L1X5MIO5091E86TR



Secret access key

RIJnC5N5FX9RSWgFdj6SQ7wMrFRZYu5bQLdNQT0c



 Download .csv

Finish

Create the security group

Now go to the Groups page and create a new group.

Create group ✕

1 Choose a group type — 2 Manage permissions — 3 Set S3 group policy — 4 Add users
Optional

Choose a group type ?

Create a new local group or import a group from the external identity source.

Local group **Federated group**

Create local groups to assign permissions to any local users you defined in StorageGRID.

Display name

Must contain at least 1 and no more than 32 characters

Unique name ?

[Cancel](#) [Continue](#)

Set the group permissions to Read-Only. This is the Tenant UI permissions, not the S3 permissions.



Choose a group type



Manage permissions



Set S3 group policy



Add users
Optional

Manage group permissions

Select an access mode for this group and select one or more permissions.

Access mode

Select whether users can change settings and perform operations or whether they can only view settings and features.

Read-write Read-only

Group permissions

Select the permissions you want to assign to this group.

Root access

Allows users to access all administration features. Root access permission supersedes all other permissions.

Manage all buckets

Allows users to change settings of all S3 buckets (or Swift containers) in this account.

Manage endpoints

Allows users to configure endpoints for platform services.

Manage your own S3 credentials

Allows users to create and delete their own S3 access keys.

[Previous](#)

[Continue](#)

S3 permissions are controlled with the group policy (IAM Policy). Set the Group policy to custom and paste the json policy in the box. This policy will allow users of this group to list the buckets of the tenant and perform any S3 operations in the bucket named "bucket" or sub-folders in the bucket named "bucket".

```

{
  "Statement": [
    {
      "Effect": "Allow",
      "Action": "s3:ListAllMyBuckets",
      "Resource": "arn:aws:s3:::*"
    },
    {
      "Effect": "Allow",
      "Action": "s3:*",
      "Resource": ["arn:aws:s3:::bucket", "arn:aws:s3:::bucket/*"]
    }
  ]
}

```

Create group ✕

✓ Choose a group type
✓ Manage permissions
3 Set S3 group policy
 4 Add users Optional

Set S3 group policy ?

An S3 group policy controls user access permissions to specific S3 resources, including buckets. Non-root users have no access by default.

No S3 Access

Read Only Access

Full Access

Custom
(Must be a valid JSON formatted string.)

```

"Effect": "Allow",
"Action": "s3:ListAllMyBuckets",
"Resource": "arn:aws:s3::*"
},
{
  "Effect": "Allow",
  "Action": "s3:*",
  "Resource": ["arn:aws:s3:::bucket", "arn:aws:s3:::bucket/*"]
}
]
}

```

Previous
Continue

Finally, add the user to the group and finish.

Create group

Choose a group type —
 Manage permissions —
 Set S3 group policy —
 4 Add users Optional

Add users

(This step is optional. If required, you can save this group and add users later.)

Select local users to add to the group **Demo S3 Group**.

<input checked="" type="checkbox"/>	Username ▾	Full Name ▾	Denied ▾
<input checked="" type="checkbox"/>	demo_s3_user	Demo S3 User	<input checked="" type="checkbox"/>

[Previous](#)
Create group

Create two buckets

Navigate to the buckets tab and click on the Create bucket button.

Define the bucket name and region.

Create bucket ✕

1 Enter details 2 Manage object settings
Optional

Enter bucket details

Enter the bucket's name and select the bucket's region.

Bucket name ?
bucket

Region ?
us-east-1 ▼

[Cancel](#) [Continue](#)

On this first bucket enable versioning.

Create bucket ✕

1 ✓ Enter details 2 Manage object settings
Optional

Manage object settings Optional

Object versioning

Enable object versioning if you want to store every version of each object in this bucket. You can then retrieve previous versions of an object as needed.

Enable object versioning

[Previous](#) [Create bucket](#)

Now create a second bucket without versioning enabled.

Create bucket ×

1 Enter details 2 Manage object settings
Optional

Enter bucket details

Enter the bucket's name and select the bucket's region.

Bucket name ?

Region ?

[Cancel](#) [Continue](#)

Do not enable versioning on this second bucket.

Create bucket ×

✓ Enter details 2 Manage object settings
Optional

Manage object settings Optional

Object versioning

Enable object versioning if you want to store every version of each object in this bucket. You can then retrieve previous versions of an object as needed.

Enable object versioning

[Previous](#) [Create bucket](#)

By Rafael Guedes, and Aron Klein

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Populate the Source Bucket

Lets put some objects in the source ONTAP bucket. We will use S3Browser for this demo but you could use any tool you are comfortable with.

Using the ONTAP user s3 keys created above, configure S3Browser to connect to your ontap system.

Add New Account — □ ×

 **Add New Account** [online help](#)

Enter new account details and click Add new account

Display name:

Assign any name to your account.

Account type:

Choose the storage you want to work with. Default is Amazon S3 Storage.

REST Endpoint:

Specify S3-compatible API endpoint. It can be found in storage documentation. Example: rest.server.com:8080

Access Key ID:

Required to sign the requests you send to Amazon S3, see more details at <https://s3browser.com/keys>

Secret Access Key:

Required to sign the requests you send to Amazon S3, see more details at <https://s3browser.com/keys>

Encrypt Access Keys with a password:

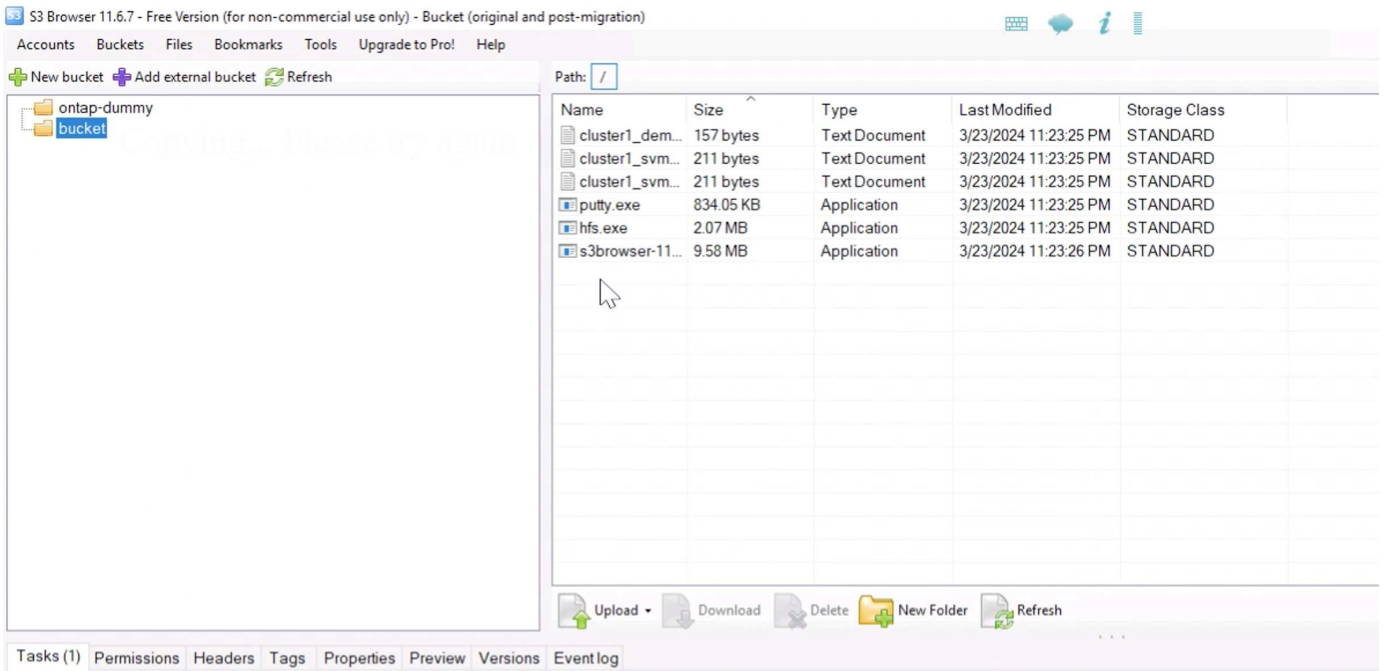
Turn this option on if you want to protect your Access Keys with a master password.

Use secure transfer (SSL/TLS)

If checked, all communications with the storage will go through encrypted SSL/TLS channel

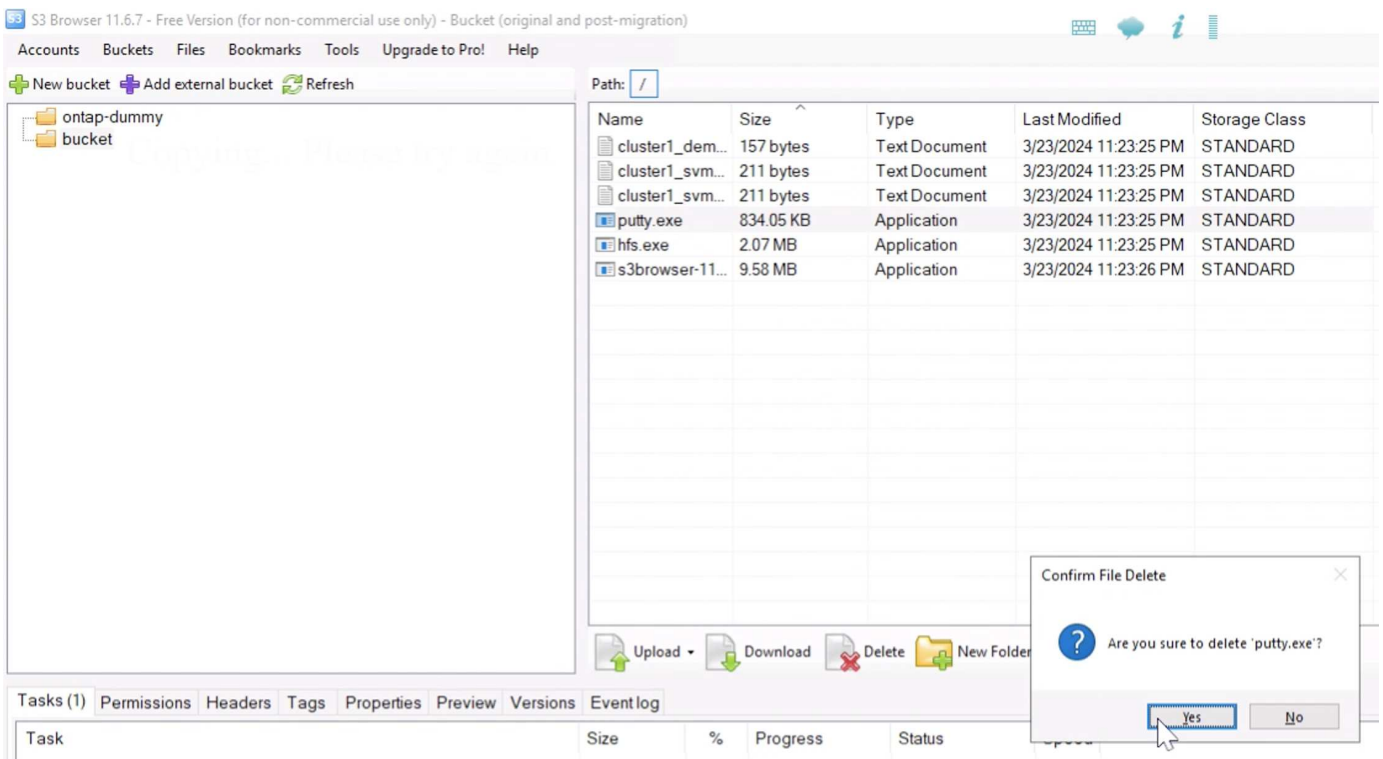
[advanced settings..](#)

Now lets upload some files to the versioning enabled bucket.

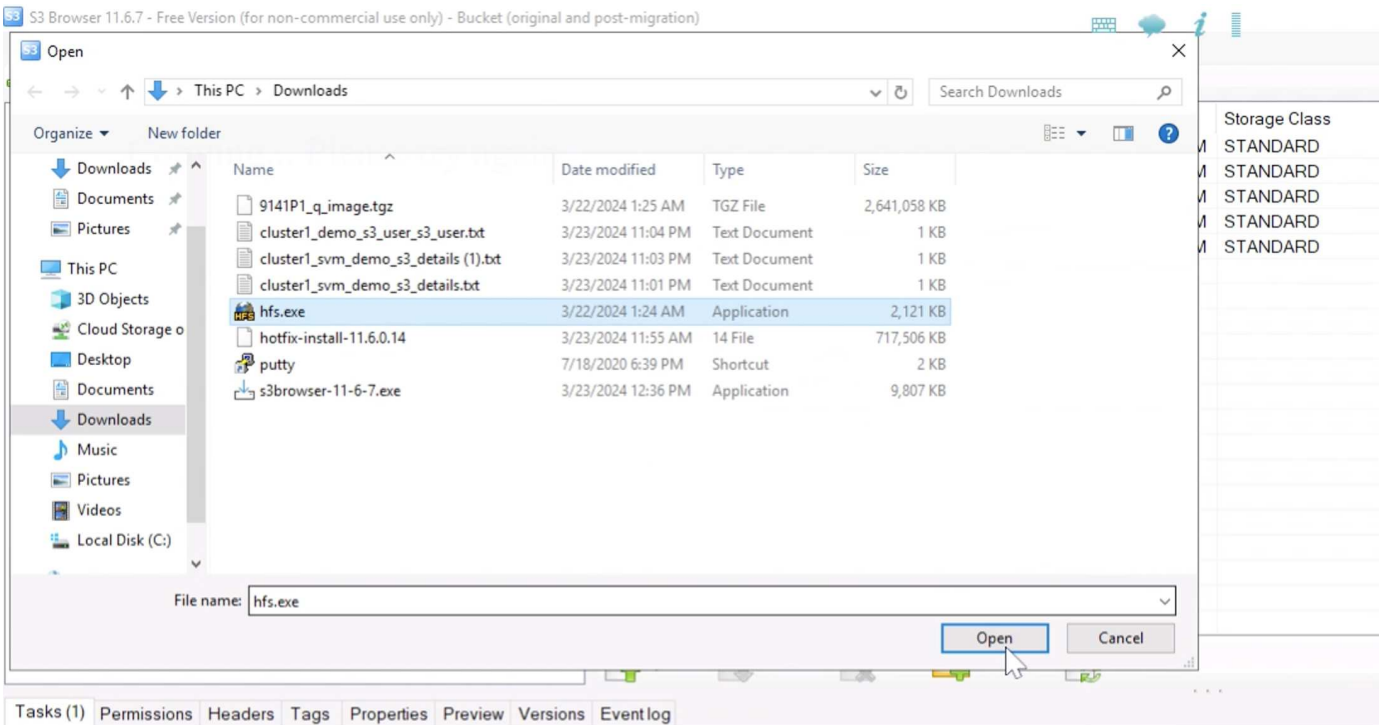


Now lets create some object versions in the bucket.

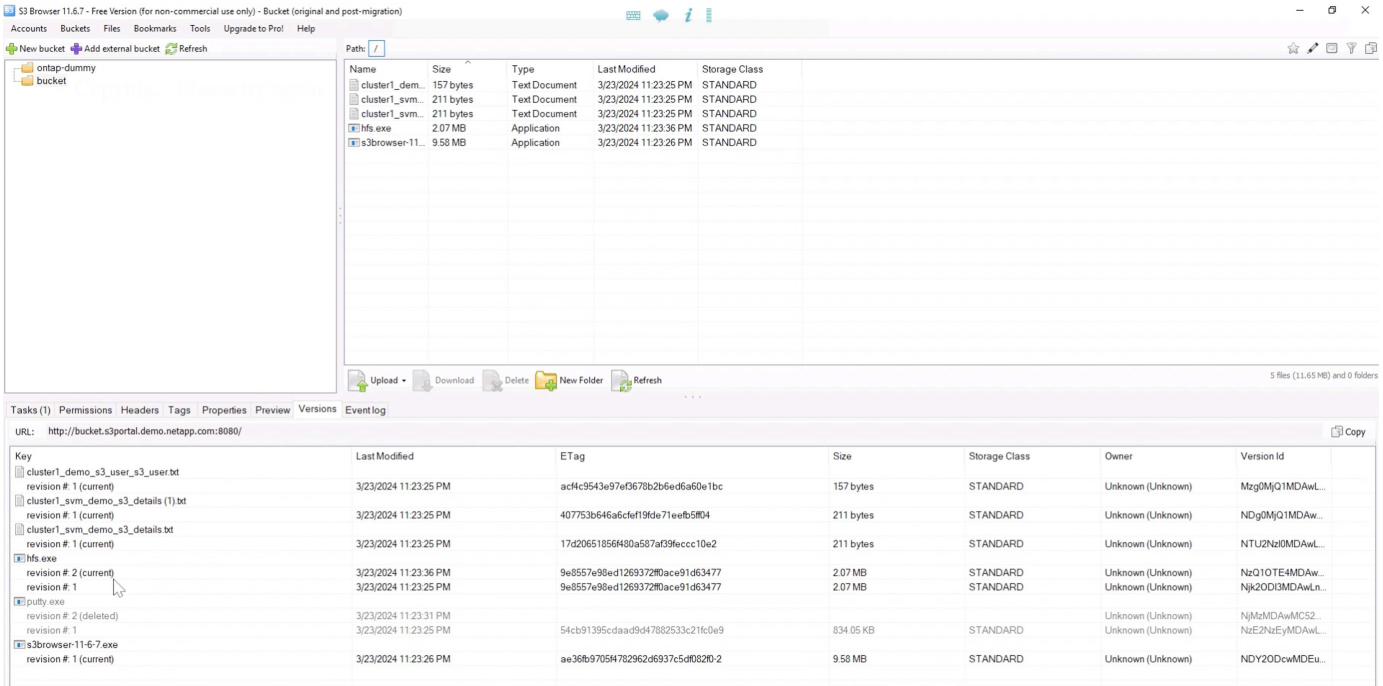
Delete a file.



Upload a file that already exists in the bucket to copy the file over itself and create a new version of it.



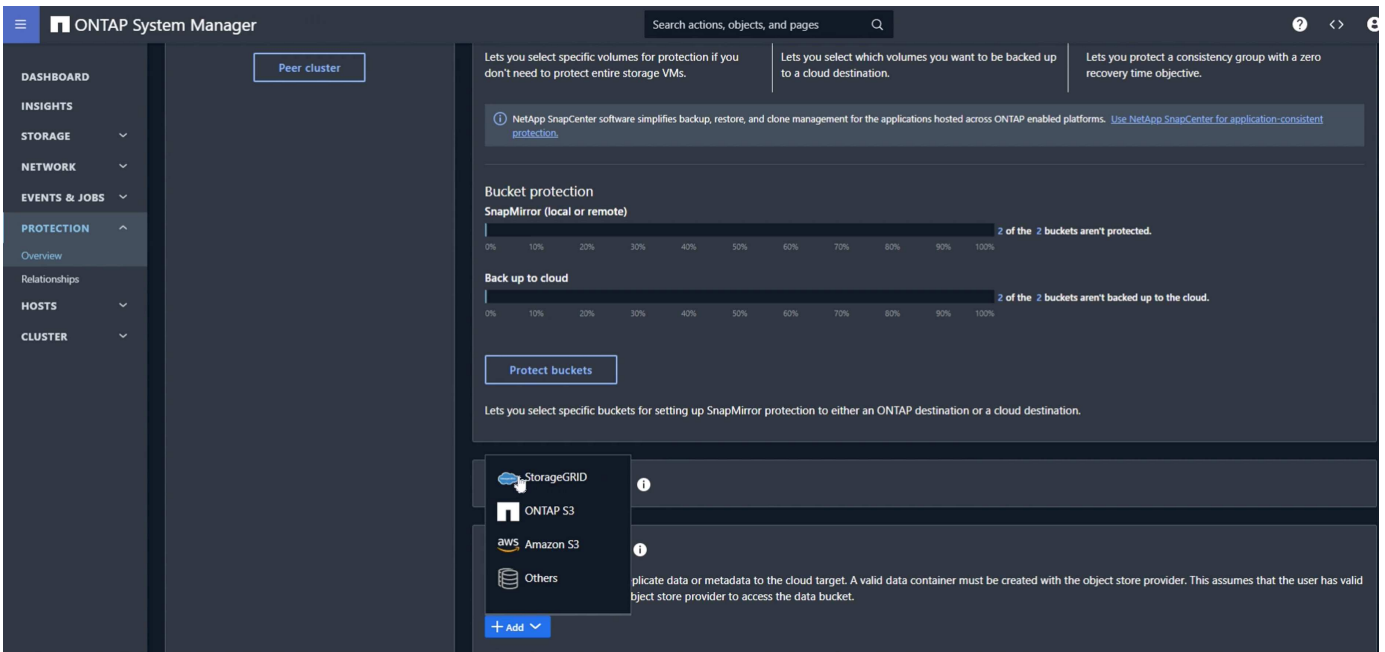
In S3Browser we can view the versions of the objects we just created.



Establish the replication relationship

Lets start sending data from ONTAP to StorageGRID.

In ONTAP System Manager navigate to "Protection/Overview". Scroll down to "Cloud object stores". and click the "Add" button and select "StorageGRID".



Input the StorageGRID information by providing a name, URL style (for this demo we will use Path-styl URLs). Set the object store scope to "Storage VM".

Add cloud object store

NAME

URL STYLE

OBJECT STORE SCOPE

Cluster
 Storage VM

USE BY ⓘ

SnapMirror
 ONTAP S3 SnapMirror

SERVER NAME (FQDN)

If you are using SSL, set the load balancer endpoint port and copy in the StorageGRID endpoint certificate

here. otherwise uncheck the SSL box and input the HTTP endpoint port here.

Input the StorageGRID user S3 keys and bucket name from the StorageGRID configuration above for the destination.

ACCESS KEY
7CT7L1X5MIO5091E86TR

SECRET KEY
.....

CONTAINER NAME ⓘ
bucket

Network for cloud object store

NODE	IP ADDRESS	SUBNET MASK	BROADCAST DOMAIN	GATEWAY	Considerations
onPrem-01	192.168.0.113	24	Default	192.168.0.1	

Use HTTP proxy

Save Cancel

Now that we have a destination target configured, we can configure the policy settings for the target. Expand "Local policy settings" and select "continuous".

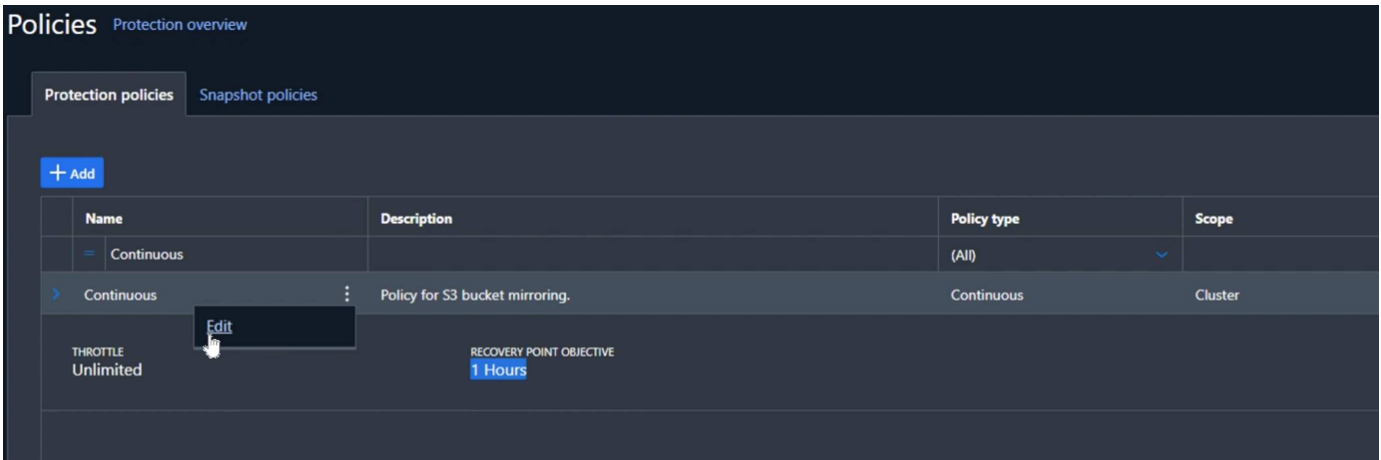
ONTAP System Manager

Back up to cloud
0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
2 of the 2 buckets aren't backed up to the cloud.
Protect buckets
Lets you select specific buckets for setting up SnapMirror protection to either an ONTAP destination or a cloud destination.

Local policy settings ⓘ

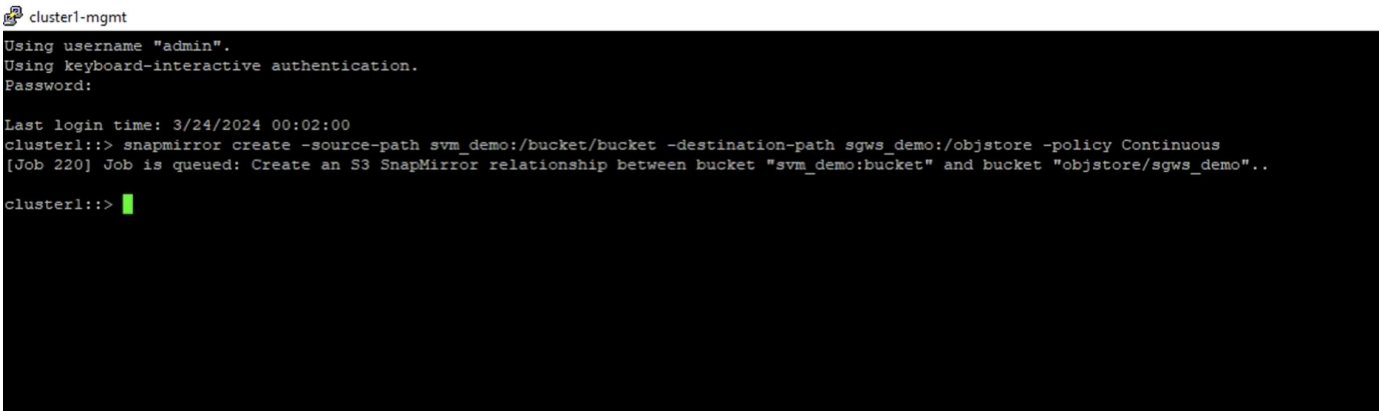
- Protection policies →
Applicable when this cluster is the destination
Asynchronous
At 5 minutes past the hour, every hour
Automated failover
No schedules
CloudBackupDefault
No schedules
Continuous
No schedules
- Snapshot policies →
Applicable when this cluster is the source or wh...
default
3 Schedules
default-1weekly
3 Schedules
none
No schedules
- Schedules →
5min
At 0, 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, and 55 minutes past the hour, every hour
6-hourly
At 12:15 AM, 06:15 AM, 12:15 PM and 06:15 PM, every day
8hour
At 02:15 AM, 10:15 AM and 06:15 PM, every day
10min
At 0, 10, 20, 30, 40, and 50 minutes past the hour, every hour
12-hourly

Edit the continuous policy and change the "Recovery point objective" from "1 Hours" to "3 Seconds".



Now we can configure snapmirror to replicate the bucket.

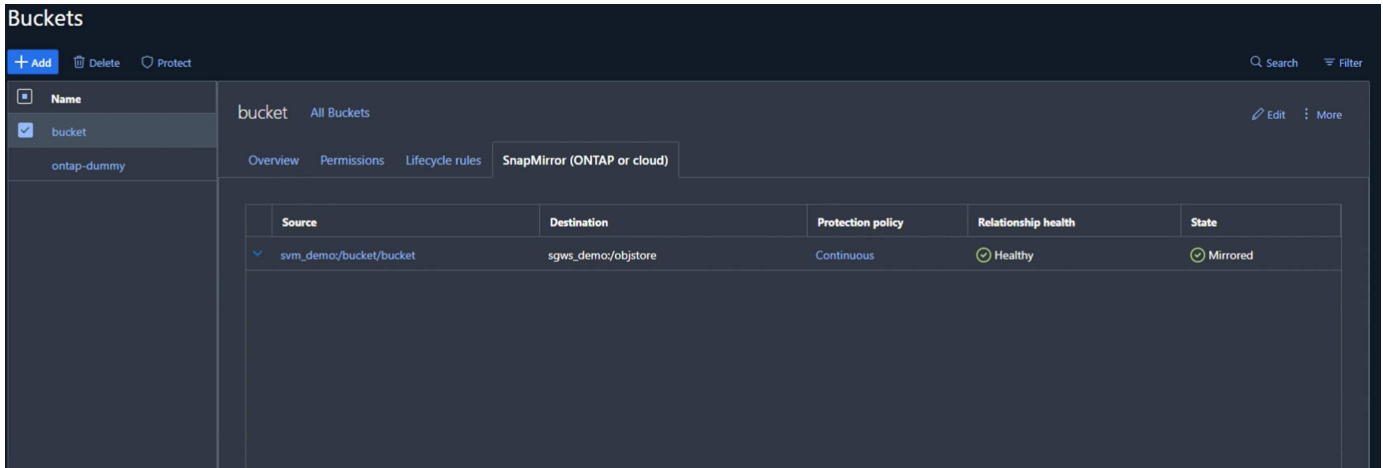
```
snapmirror create -source-path sv_demo: /bucket/bucket -destination-path sgws_demo: /objstore -policy Continuous
```



The bucket will now show a cloud symbol in the bucket list under protection.

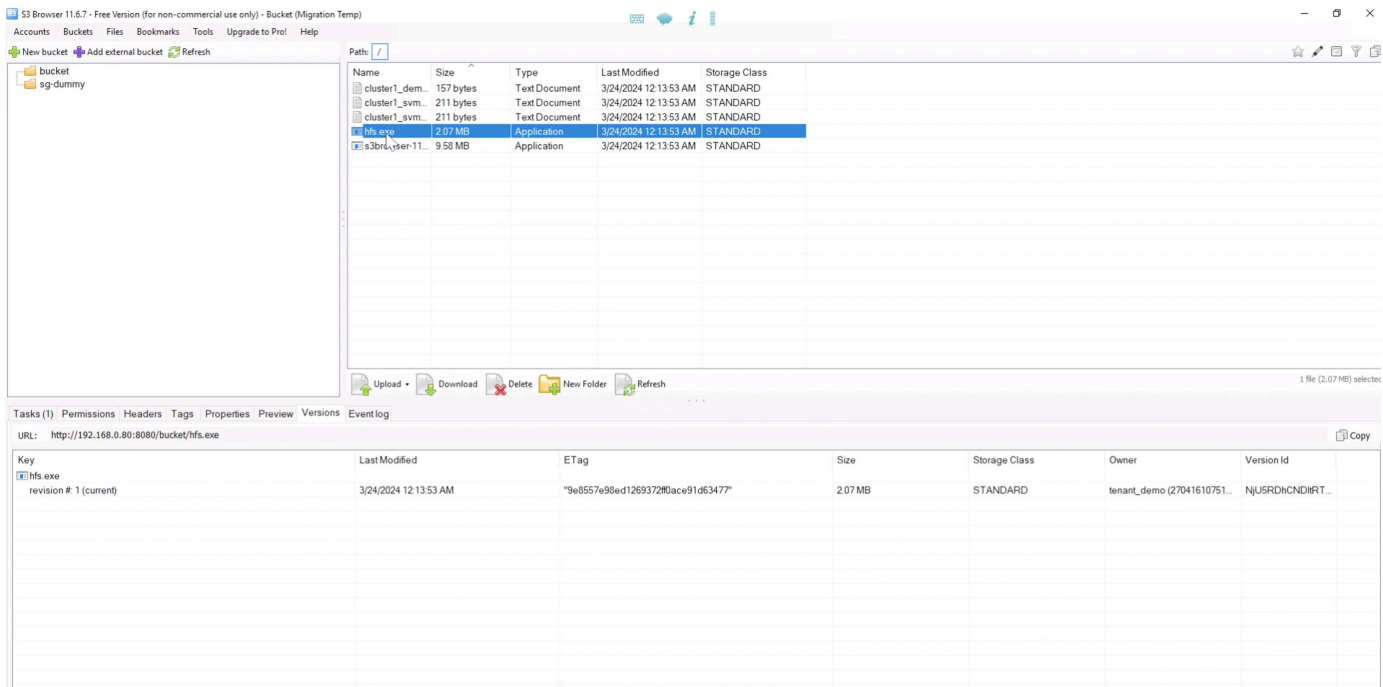


If we select the bucket and go to the "SnapMirror (ONTAP or Cloud)" tab we will see the snapmirror relationship status.



The replication details

We now have a successfully replicating bucket from ONTAP to StorageGRID. But what is actually replicating? Our source and destination are both versioned buckets. Do the previous versions also replicate to the destination? If we look at our StorageGRID bucket with S3Browser we see that the existing versions did not replicate and our deleted object does not exist, nor does a delete marker for that object. Our duplicated object only has 1 version in the StorageGRID bucket.



In our ONTAP bucket, let's add a new version to our same object that we used previously and see how it replicates.

S3 Browser 11.6.7 - Free Version (for non-commercial use only) - Bucket (original and post-migration)

Accounts Buckets Files Bookmarks Tools Upgrade to Pro! Help

New bucket Add external bucket Refresh

Path: /

Name	Size	Type	Last Modified	Storage Class
cluster1_demo	157 bytes	Text Document	3/23/2024 11:23:25 PM	STANDARD
cluster1_svm	211 bytes	Text Document	3/23/2024 11:23:25 PM	STANDARD
cluster1_svm	211 bytes	Text Document	3/23/2024 11:23:25 PM	STANDARD
putty.exe	834.05 KB	Application	3/23/2024 11:23:25 PM	STANDARD
hfs.exe	2.07 MB	Application	3/24/2024 12:14:52 AM	STANDARD
s3browser-11...	9.58 MB	Application	3/23/2024 11:23:26 PM	STANDARD

6 files (12.46 MB) and 0 folders

Tasks (1) Permissions Headers Tags Properties Preview Versions Event log

URL: http://bucket.s3portal.demo.netapp.com:8080/

Key	Last Modified	ETag	Size	Storage Class	Owner	Version Id
cluster1_demo_s3_user_s3_user.txt						
revision # 1 (current)	3/23/2024 11:23:25 PM	ac4c9543e97ef0678b2b6ed6a60e1bc	157 bytes	STANDARD	Unknown (Unknown)	Mzg0MjQ1MDAwL...
cluster1_svm_demo_s3_details (1).txt						
revision # 1 (current)	3/23/2024 11:23:25 PM	407753b646a6c6ef19de71eebf5f04	211 bytes	STANDARD	Unknown (Unknown)	NDg0MjQ1MDAwL...
cluster1_svm_demo_s3_details.txt						
revision # 1 (current)	3/23/2024 11:23:25 PM	17d206518566490a587af39eccc10e2	211 bytes	STANDARD	Unknown (Unknown)	NTU2Nz00MDAwL...
hfs.exe						
revision # 3 (current)	3/24/2024 12:14:52 AM	9e8557e98ed1269372f0ace91d63477	2.07 MB	STANDARD	Unknown (Unknown)	NTY0NDg0MDAwL...
revision # 2	3/23/2024 11:23:36 PM	9e8557e98ed1269372f0ace91d63477	2.07 MB	STANDARD	Unknown (Unknown)	NzQ1OTI0MDAwL...
revision # 1	3/23/2024 11:23:25 PM	9e8557e98ed1269372f0ace91d63477	2.07 MB	STANDARD	Unknown (Unknown)	Njk2ODI3MDAwL...
putty.exe						
revision # 1 (current)	3/23/2024 11:23:25 PM	54cb91395cdaad947882533211c0e9	834.05 KB	STANDARD	Unknown (Unknown)	NzE2NzEyMDAwL...
s3browser-11-6-7.exe						
revision # 1 (current)	3/23/2024 11:23:26 PM	ae36b97054782962d6937c5d0820-2	9.58 MB	STANDARD	Unknown (Unknown)	NDY2ODcwMDEu...

If we look on the StorageGRID side we see that a new version has been created in this bucket too, but is missing the initial version from before the snapmirror relationship.

S3 Browser 11.6.7 - Free Version (for non-commercial use only) - Bucket (Migration Temp)

Accounts Buckets Files Bookmarks Tools Upgrade to Pro! Help

New bucket Add external bucket Refresh

Path: /

Name	Size	Type	Last Modified	Storage Class
cluster1_demo	157 bytes	Text Document	3/24/2024 12:13:53 AM	STANDARD
cluster1_svm	211 bytes	Text Document	3/24/2024 12:13:53 AM	STANDARD
cluster1_svm	211 bytes	Text Document	3/24/2024 12:13:53 AM	STANDARD
putty.exe	834.05 KB	Application	3/24/2024 12:14:28 AM	STANDARD
hfs.exe	2.07 MB	Application	3/24/2024 12:14:56 AM	STANDARD
s3browser-11...	9.58 MB	Application	3/24/2024 12:13:53 AM	STANDARD

1 file (2.07 MB)

Tasks (1) Permissions Headers Tags Properties Preview Versions Event log

URL: http://192.168.0.80:8080/bucket/hfs.exe

Key	Last Modified	ETag	Size	Storage Class	Owner	Version Id
hfs.exe						
revision # 2 (current)	3/24/2024 12:14:56 AM	"9e8557e98ed1269372f0ace91d63477"	2.07 MB	STANDARD	tenant_demo (27041610751)	OE4RyY4NDgRT...
revision # 1	3/24/2024 12:13:53 AM	"9e8557e98ed1269372f0ace91d63477"	2.07 MB	STANDARD	tenant_demo (27041610751)	NjU5RDhCNDRIR...

This is because the ONTAP SnapMirror S3 process only replicates the current version of the object. This is why we created a versioned bucket on the StorageGRID side to be the destination. This way StorageGRID can maintain a version history of the objects.

By Rafael Guedes, and Aron Klein

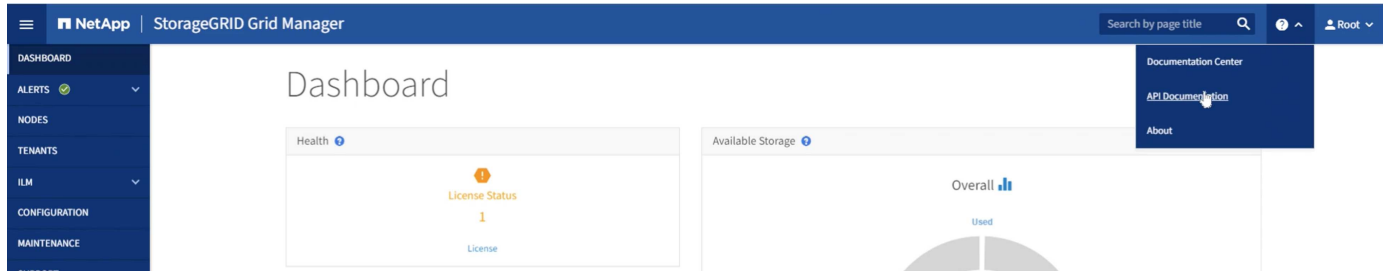
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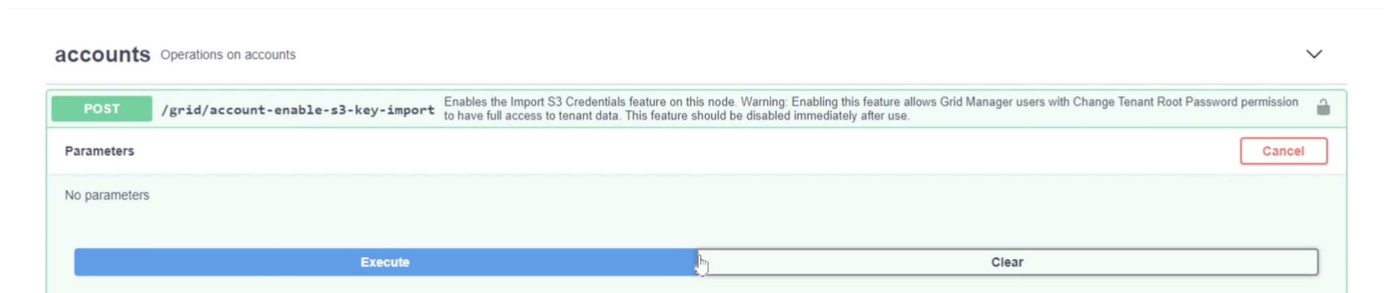
Migrate S3 Keys

For a migration, most of the time you will want to migrate the credentials for the users rather than generate new credentials on the destination side. StorageGRID provides api's to allow s3 keys to be imported to a user.

Logging into the StorageGRID management UI (not the tenant manager UI) open the API Documentation swagger page.



Expand the "accounts" section, select the "POST /grid/account-enable-s3-key-import", click the "Try it out" button, then click on the execute button.



Now scroll down still under "accounts" to "POST /grid/accounts/{id}/users/{user_id}/s3-access-keys"

Here is where we are going to input the tenant ID and user account ID we collected earlier. fill in the fields and the keys from our ONTAP user in the json box. you can set the expiration of the keys, or remove the "expires": "123456789" and click on execute.

POST /grid/accounts/{id}/users/{user_id}/s3-access-keys Imports S3 credentials for a given user in a tenant account

Parameters

Name	Description
id * required string (path)	ID of Storage Tenant Account <input type="text" value="27041610751165610501"/>
user_id * required string (path)	ID of user in tenant account. <input type="text" value="ebc132e2-cfc3-42c0-a445-3b4465cb523c"/>
body * required (body)	Edit Value Model <pre>{ "accessKey": "3TVPI142JGE3Y7FV2KC0", "secretAccessKey": "75a1QqKBU4quA132twI4g41C4Gg5PP30ncy0sPE8" }</pre>

Once you have completed all of your user key imports you should disable the key import function in "accounts" "POST /grid/account-disable-s3-key-import"

POST /grid/account-disable-s3-key-import Disables the Import S3 Credentials feature on this node.

Parameters Cancel


No parameters

Execute

Responses Response content type: application/json

If we look at the user account in the tenant manager UI, we can see the new key has been added.

Overview

Full name: ?	Demo S3 User 
Username: ?	demo_s3_user
User type: ?	Local
Denied access: ?	Yes
Access mode: ?	Read-only
Group membership: ?	Demo S3 Group

[Password](#) [Access](#) **Access keys** [Groups](#)

Manage access keys

Add or delete access keys for this user.

[Create key](#) Actions ▾

<input type="checkbox"/>	Access key ID 	Expiration time 
<input type="checkbox"/>	*****86TR	None
<input type="checkbox"/>	*****2KC0	None

The final cut-over

If the intention is to have a perpetually replicating bucket from ONTAP to StorageGRID, you can end here. If this is a migration from ONTAP S3 to StorageGRID, then its time to put an end to it and cut over.

Inside ONTAP system manager, edit the S3 group and set it to "ReadOnlyAccess". This will prevent the users from writing to the ONTAP S3 bucket anymore.

Edit group ×

NAME

USERS

POLICIES

Cancel Save

All that is left to do is configure DNS to point from the ONTAP cluster to the StorageGRID endpoint. Make sure your endpoint certificate is correct and if you need virtual hosted style requests then add the endpoint domain names in storageGRID

Endpoint Domain Names

Virtual Hosted-Style Requests

Enable support of S3 virtual hosted-style requests by specifying API endpoint domain names. Support is disabled if this list is empty. Examples: s3.example.com, s3.example.co.uk, s3-east.example.com

Endpoint 1 +

Your clients will either need to wait for the TTL to expire, or flush DNS to resolve to the new system so you can test that everything is working. All that is left is to clean up the initial temporary S3 keys we used to test the StorageGRID data access (NOT the imported keys), remove the snapmirror relationships, and remove the ONTAP data.

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