ADVANCED TECHNOLOGY GROUP (ATG)

Accelerate with ATG Webinar

IBM Storage Ceph
S3 Object Storage Deep Dive

John Shubeck – ATG Storage Technical Specialist

Date: May 30, 2024

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- IBM Cloud Object Storage Test Drive - (VMware based)
- IBM Storage Protect Live Test Drive
- IBM Storage Ceph Test Drive - (VMware based)

Please reach out to your IBM Representative or Business Partner for more information.

***IMPORTANT* The ATG team serves clients and Business Partners in the Americas, concentrating on North America.**

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Registration Open!

Storage @ IBM TechXchange Conference 2024

October 21-24, 2024
Mandalay Bay | Las Vegas
#IBMTechXchange

Key Learnings

- Practical how-to advice
- Patterns and best practices
- Success stories, IBM PoV, proven techniques

Featured Products

IBM Storage Defender
IBM Storage Fusion
IBM Storage Scale + IBM Storage Ceph
IBM Tape + IBM SAN
IBM Storage FlashSystem + IBM Storage DS8000

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https://www.ibm.com/community/ibm-techxchange-conference/

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Accelerate with ATG Survey

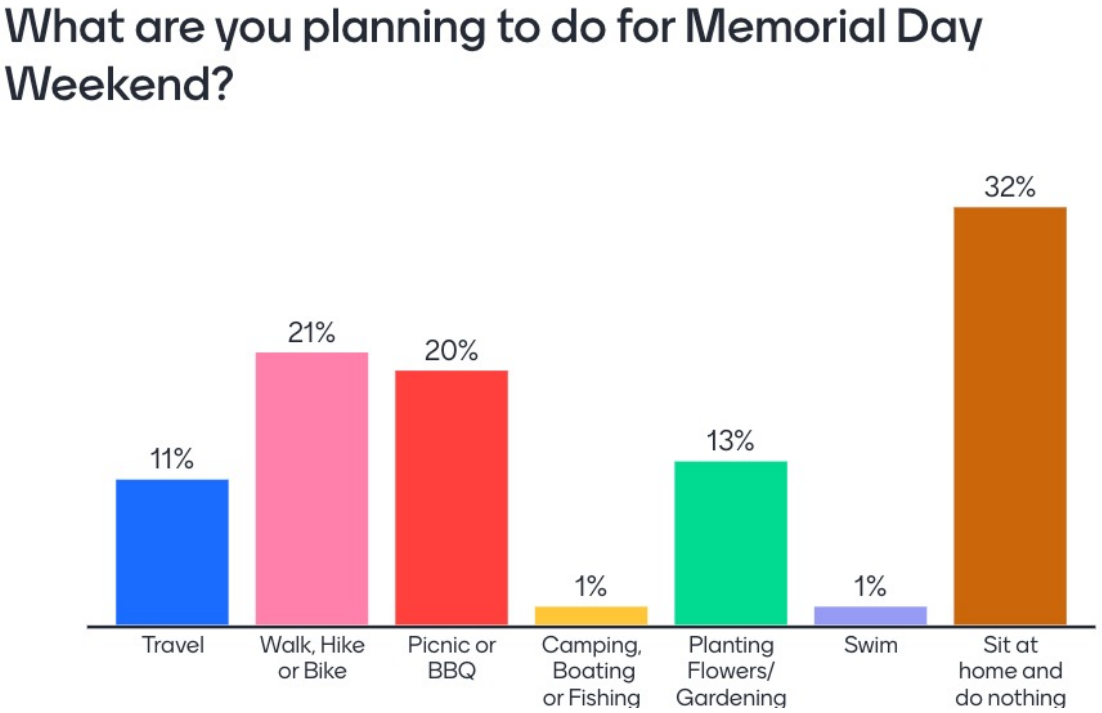
Please take a moment to share your feedback with our team!

You can access this 6-question survey via Menti.com with code 1708 6924 or

Direct link https://www.menti.com/alwhyze7z1gz

Or

QR Code



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IBM

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IBM

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About the Presenter

John Shubeck is an information technology professional with over 42 years of industry experience spanning both the customer and technology provider experience. John is currently serving as a Senior Storage Technical Specialist on IBM Object Storage platforms across all market segments in the Americas.

Introducing our panelists

Shu Mookerjee is a Level 2 Certified Technical Specialist with over twenty years at IBM, working in a variety of roles including sales, management and technology. For the last decade, he has focused exclusively on storage and has been the co-author of four (4) Redbooks. Currently, Shu is part of the Advanced Technology Group where he provides education, technical guidance, Proofs of Concept and Proofs of Technology to IBMers, business partners and clients.

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Introducing our panelists

Jerrod Carr is an IBM Principal Storage Technical Specialist in IBM Storage Solutions. Jerrod Carr has been in the Storage industry for over 21 years selling hardware and software for various large technology companies. With beginnings in the Cleversafe IBM team for 8 years providing expertise in Cloud Object Storage, the last 3 years working on the Americas SWAT team as a Senior Storage Specialist providing unstructured data experience to the various markets.

Todd Johnston is a proven applied technologist bringing decades in customer advocacy, technology implementations, service provider enablement, sales engineering, and solution architecture. Todd is especially focused on Ceph innovation and early adoption, technical agility, and disruptive technologies. Todd's expertise in lies storage software, virtualization, and container and hybrid cloud infrastructures. Todd joins us from the IBM SWAT practice in our cross functional team.

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Summary of topics

- Overview of the RADOS Gateway (RGW)
- Configuring the RGW Daemons, Users, Buckets
- Configuring SSL for secure S3 access
- Two site replication (Realm, Zone, Zonegroup)
- Data placement groups
- Multi tenancy introduction
- Configuring multiprotocol (i.e. S3 and NFS)
- Design considerations for POC and Production
- Exploring the S3 API compatibility and feature support

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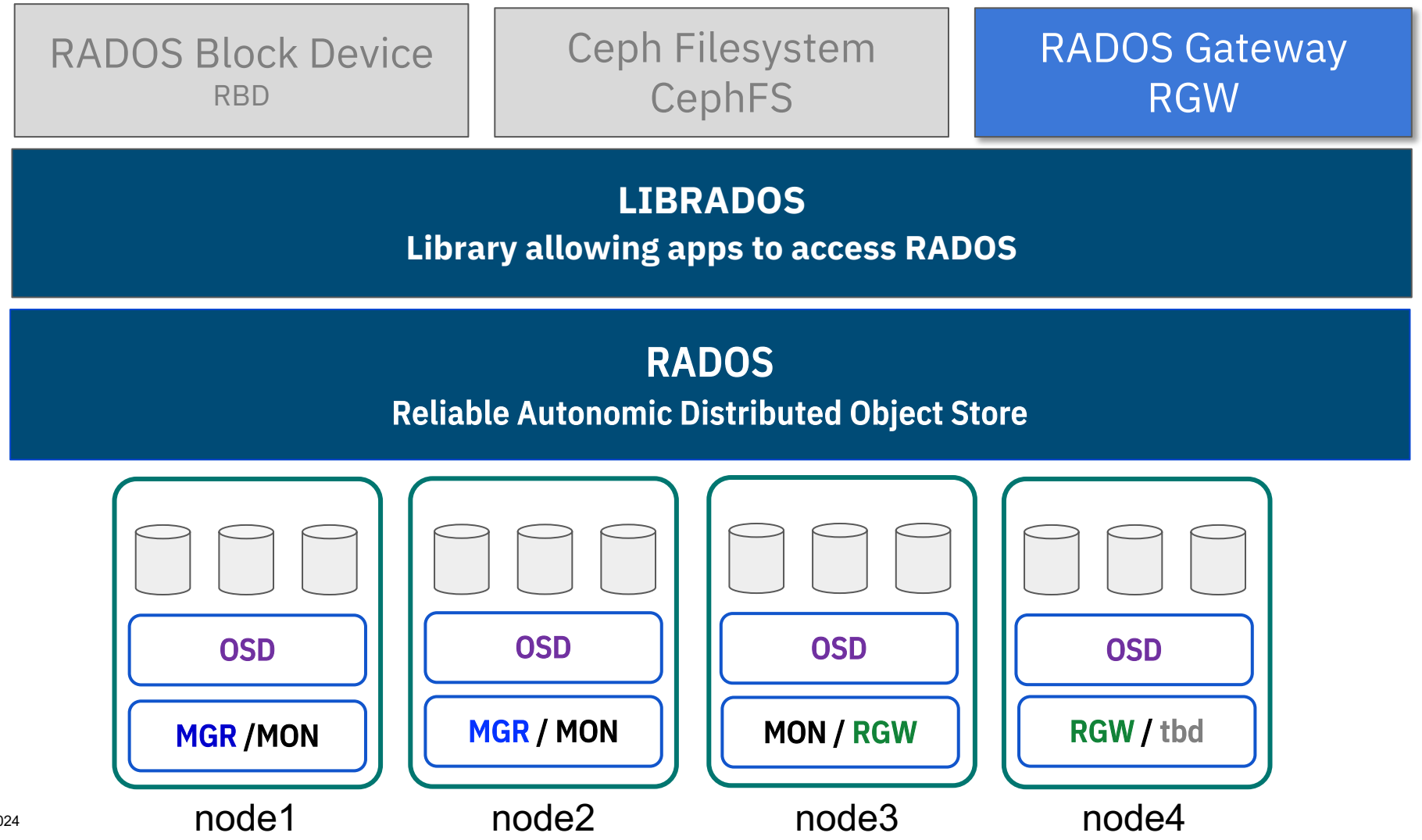
IBM Storage Ceph data access

Ceph Data Services (RBD, CephFS, RGW) for mainstream application use cases



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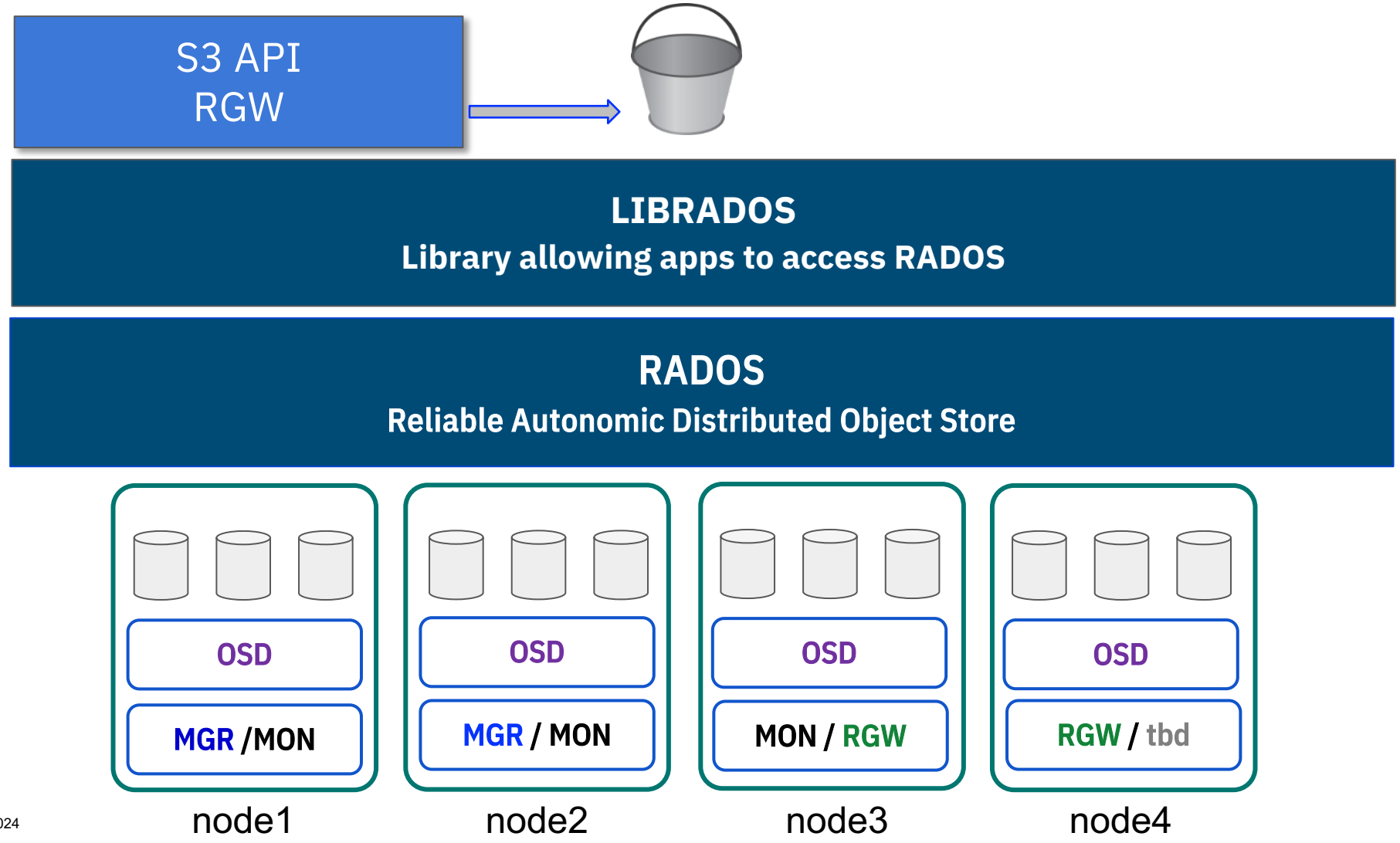
IBM Storage Ceph – Overview of the RADOS Gateway

RADOS Gateway (RGW) layout



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IBM Storage Ceph Administration

- Dashboard UI
- Command line
- Service specification file
- Performance visualization
- Multi tenancy

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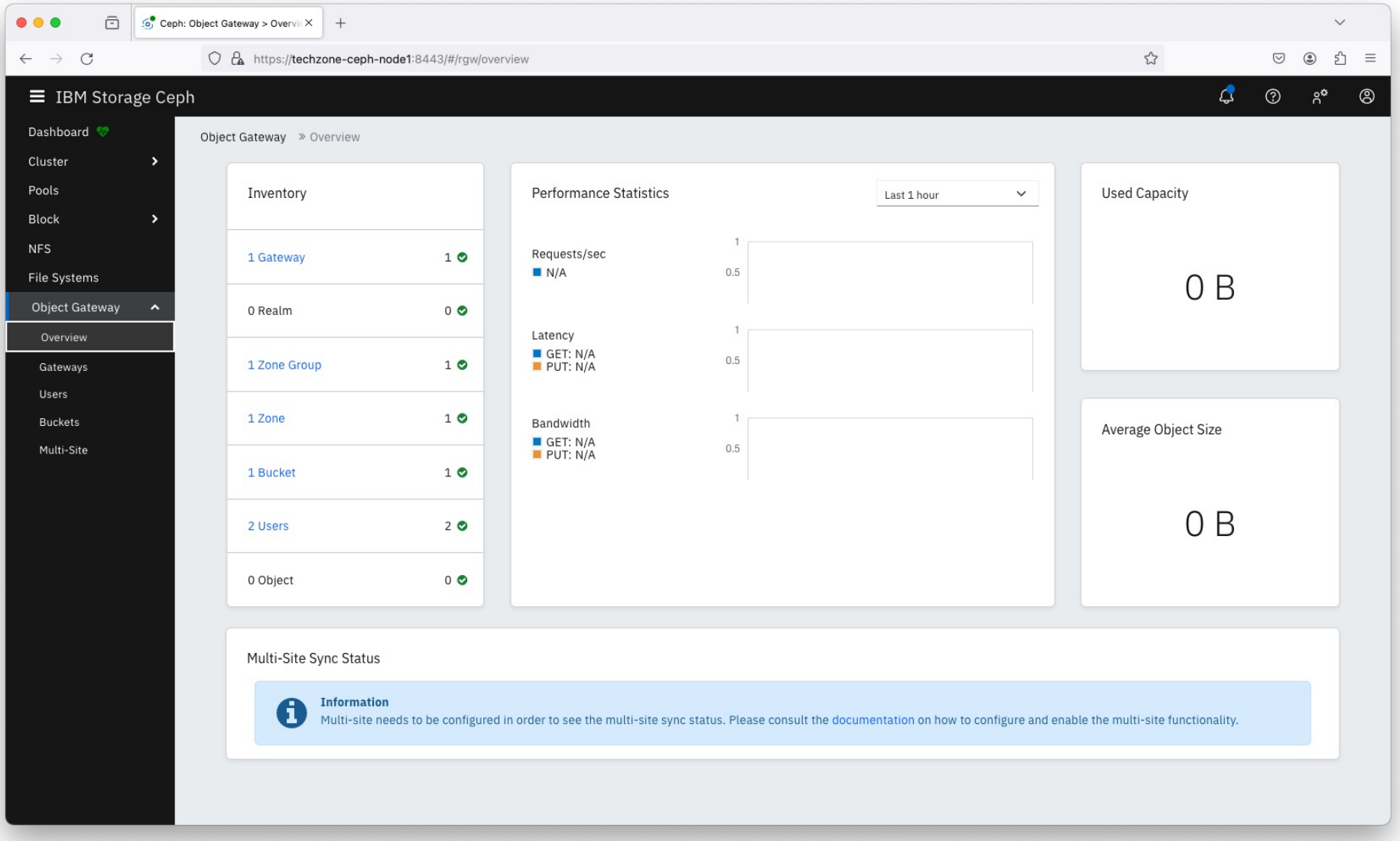
Dashboard UI -> simple control



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IBM Storage Ceph RGW configuration tasks

LIVE

Ceph Installation Tasks

dnf install Cephadm-ansible

Cephadm-ansible Preflight playbook

Bootstrap the cluster first Ceph node

Ceph Dashboard Health

Ceph orch add hosts (nodes)

Ceph orch Apply OSD all devices

GO

Deploy RADOS Gateway (RGW) daemons

Verify RGW daemon status

Create an RGW user

Create an S3 bucket with owning user

CONTINUE

S3 client access and object upload

S3 Client

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Ceph command line -> discrete control

```
[root@ceph-poc-node1 ~]# radosgw-admin user create --uid=jerrod \
--email="jcarr@us.ibm.com" \
--display-name=”Carr, Jerrod"

. . . output omitted . . .

keys": [
        {
            "user": ”jerrod",
            "access_key": "158FPSP3BTYBWTJXZ65N",
            "secret_key": "XXjdDUsAaBGE5UJpCqqW56OBOIrQ2AwmeKyAovgI"
        }
    ]

. . . output omitted .   .   .
```

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Service specification file – automated control

```
[root@ceph-poc-node1 ~]# cat radosgw.yml

service_type: rgw
service_id: s3service
service_name: rgw.s3service
placement:
  count: 2
  hosts:
  - ceph-poc-node3
  - ceph-poc-node4
spec:
  rgw_frontend_port: 80

[root@ceph-poc-node1 ~]# ceph orch apply -i radosgw.yml
```

https://www.ibm.com/docs/en/storage-ceph/7?topic=deployment-deploying-ceph-object-gateway-using-service-specification

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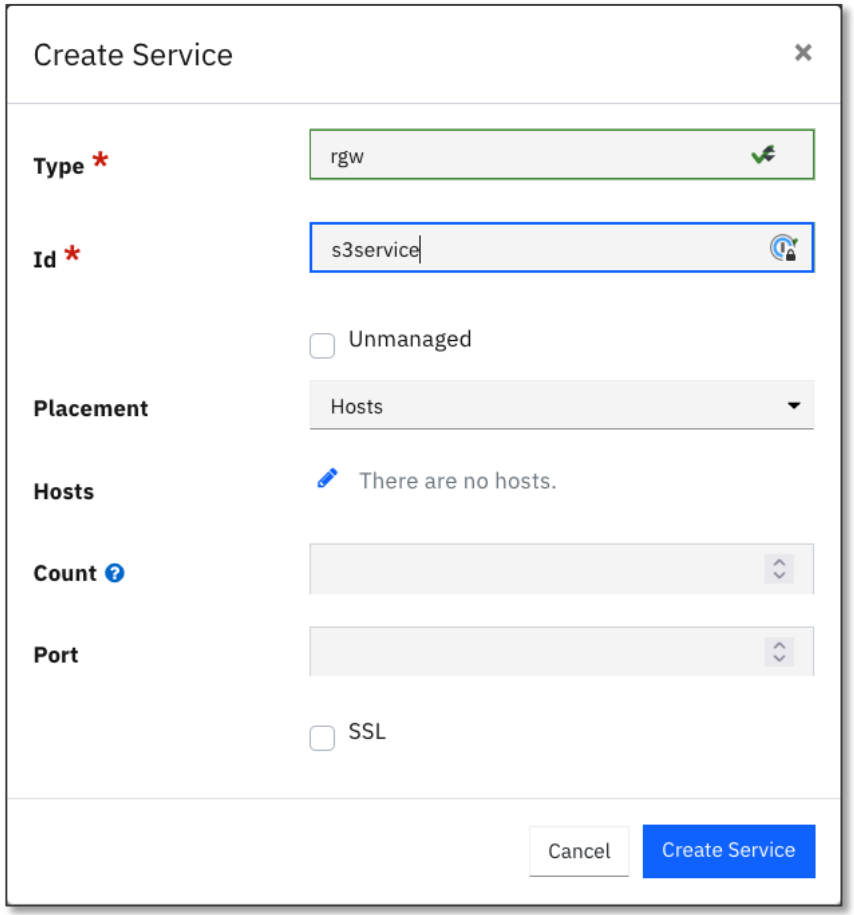
Simple RGW configuration in the Dashboard or command line




```
[root@ceph-poc-node1 ~]# ceph orch apply rgw s3service

[root@ceph-poc-node1 ~]# ceph orch ls

NAME                         PORTS        RUNNING
REFRESHED  AGE  PLACEMENT

. . . output omitted . . .

rgw.s3service    ?:80              2/2    83s ago
103s  count:2
```

https://www.ibm.com/docs/en/storage-ceph/7?topic=ceph-object-gateway

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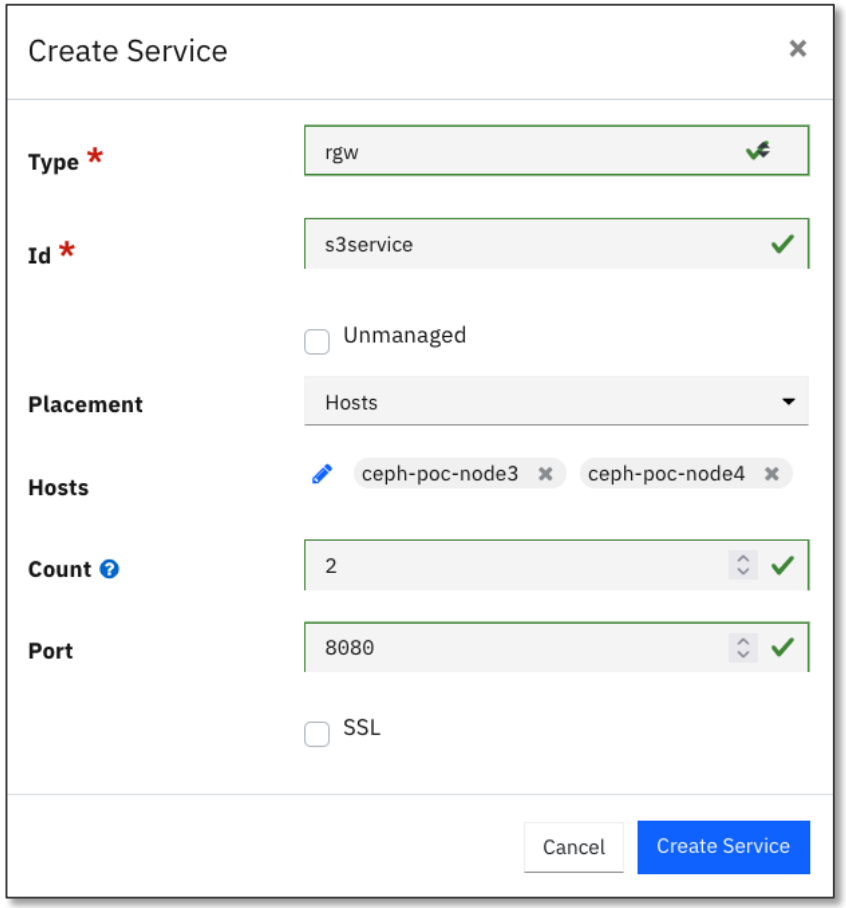
Controlled RGW configuration in the Dashboard or command line




```
[root@ceph-poc-node1 ~]# ceph orch apply rgw
s3service \
--placement="2 ceph-poc-node3 ceph-poc-node4" --
port=8080


[root@ceph-poc-node1 ~]# ceph orch ls -service-
type rgw

NAME                         PORTS                RUNNING
REFRESHED  AGE  PLACEMENT

rgw.s3service ?:8080     2/2      56s ago   72s
ceph-poc-node3;ceph-poc-node4;count:2
```

https://www.ibm.com/docs/en/storage-ceph/7?topic=ceph-object-gateway

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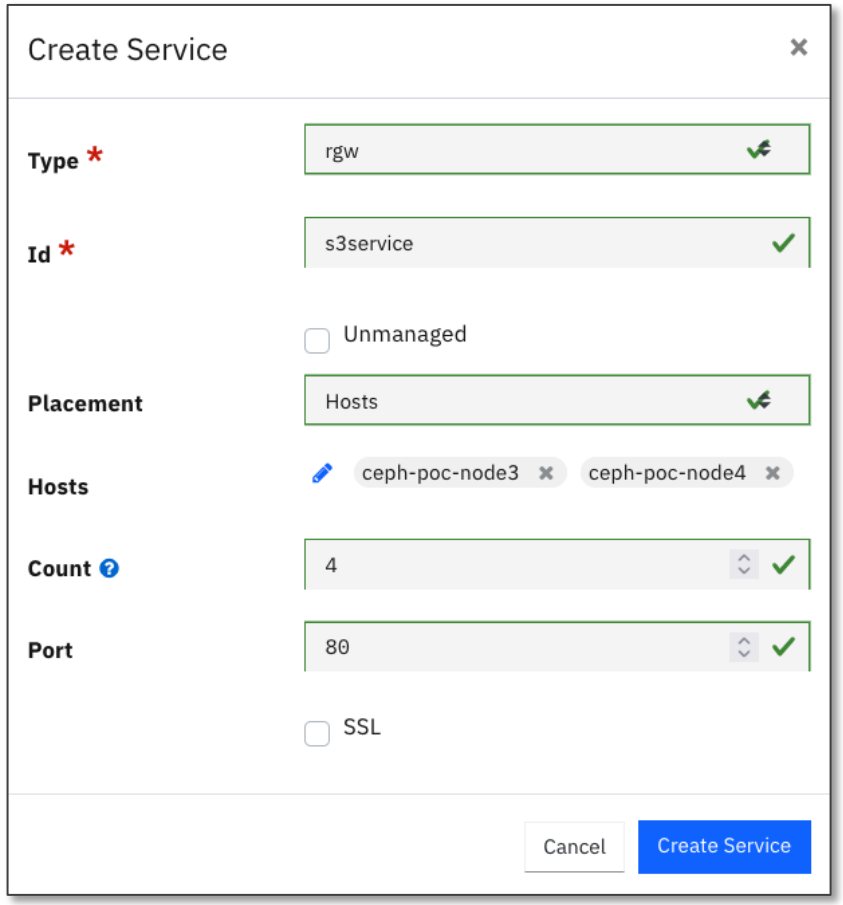
Controlled RGW configuration in the Dashboard or command line




```
[root@ceph-poc-node1 ~]# ceph orch apply rgw
s3service \
--placement="4 ceph-poc-node3 ceph-poc-node4" --
port=80


[root@ceph-poc-node1 ~]# ceph orch ls -service-
type rgw

NAME                         PORTS                RUNNING
REFRESHED   AGE    PLACEMENT

rgw.s3service ?:80           4/4      56s ago    72s
ceph-poc-node3;ceph-poc-node4;count:4
```

https://www.ibm.com/docs/en/storage-ceph/7?topic=ceph-object-gateway

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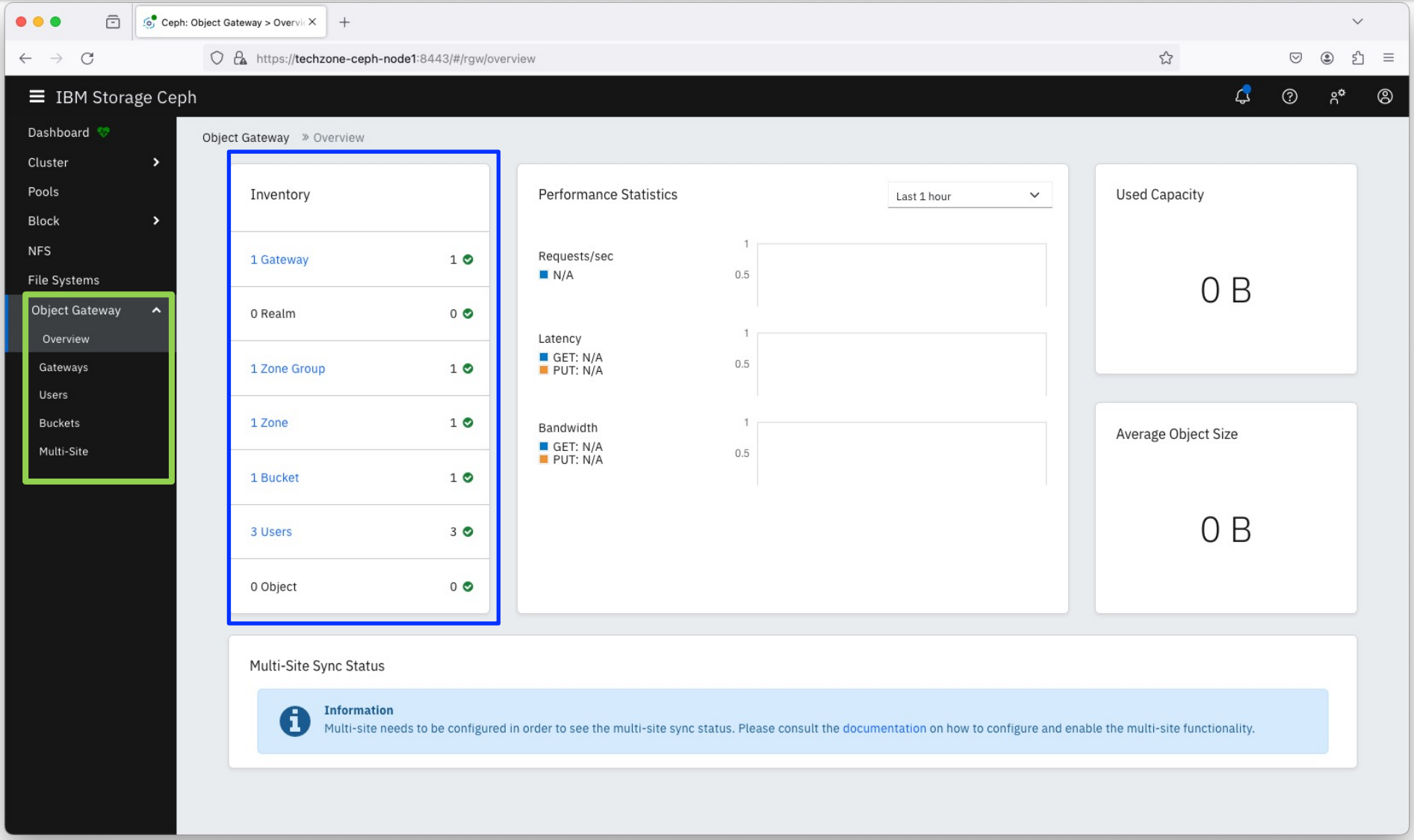
IBM Storage Ceph Dashboard for object storage services



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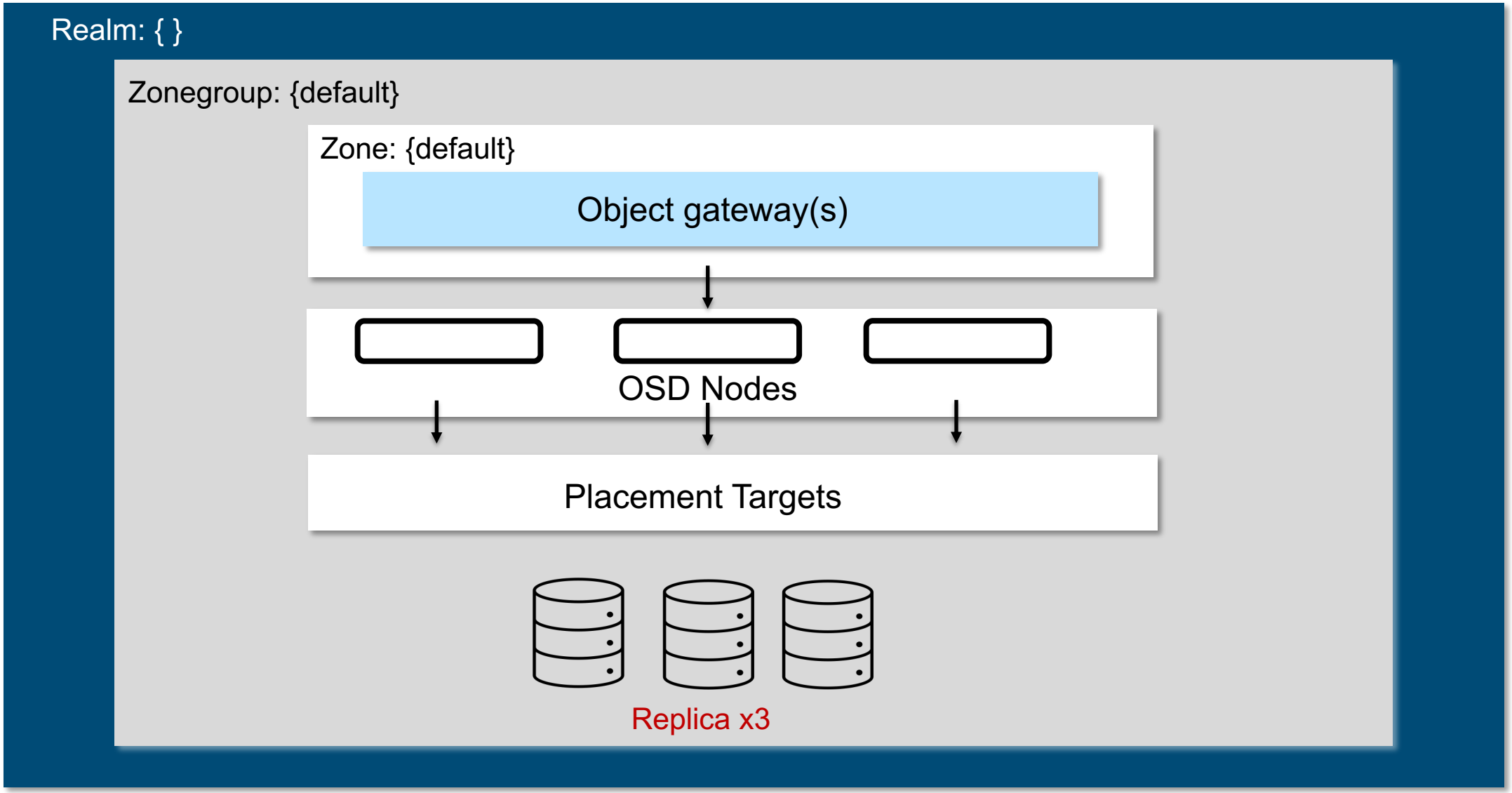
What do I get with a simple RGW configuration?



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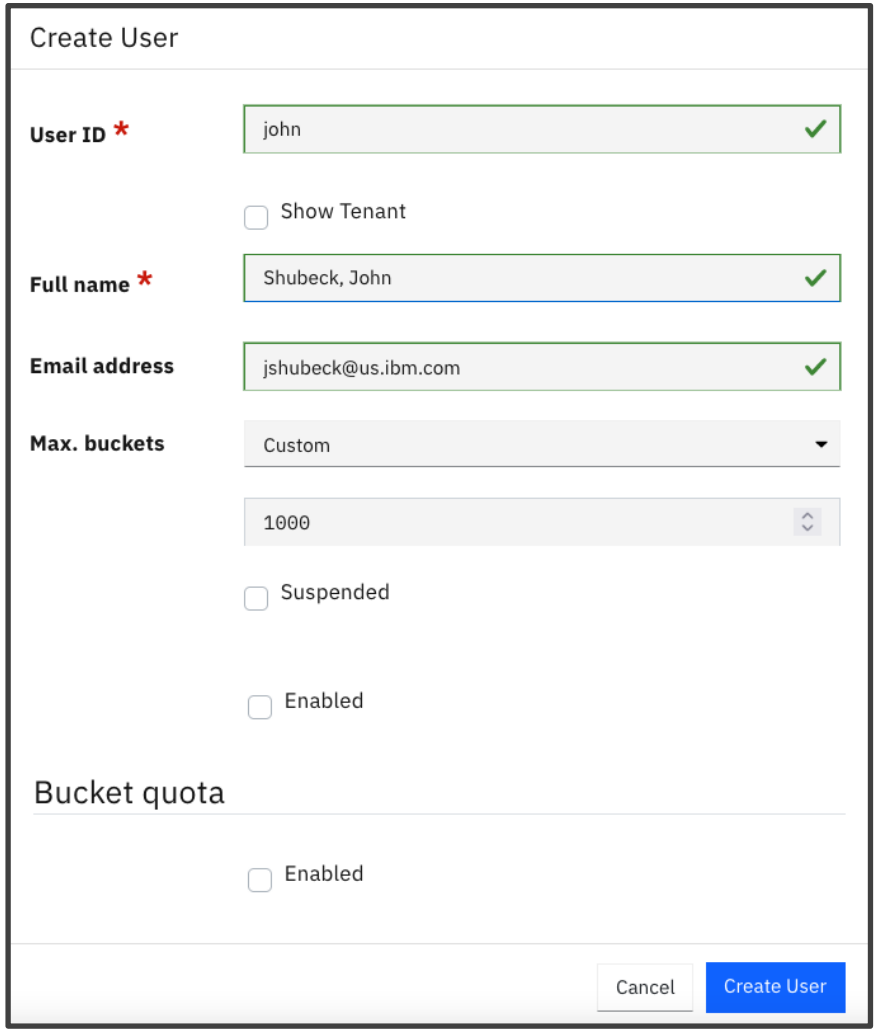
Create an RGW storage account in the Dashboard or command line

LIVE




```
[root@ceph-poc-node1 ~]# radosgw-admin user create
--uid=john \
--email="jshubeck@us.ibm.com" \
--display-name=”Shubeck, John"

. . . output omitted . . .

keys": [
        {
            "user": ”john",
            "access_key": "158FPSP3BTYBWTJXZ65N",
            "secret_key":
"XXjdDUsAaBGE5UJpCqqW56OBOIrQ2AwmeKyAovgI"
        }
    ]

. . . output omitted .   .   .
```

https://www.ibm.com/docs/en/storage-ceph/7?topic=ceph-object-gateway

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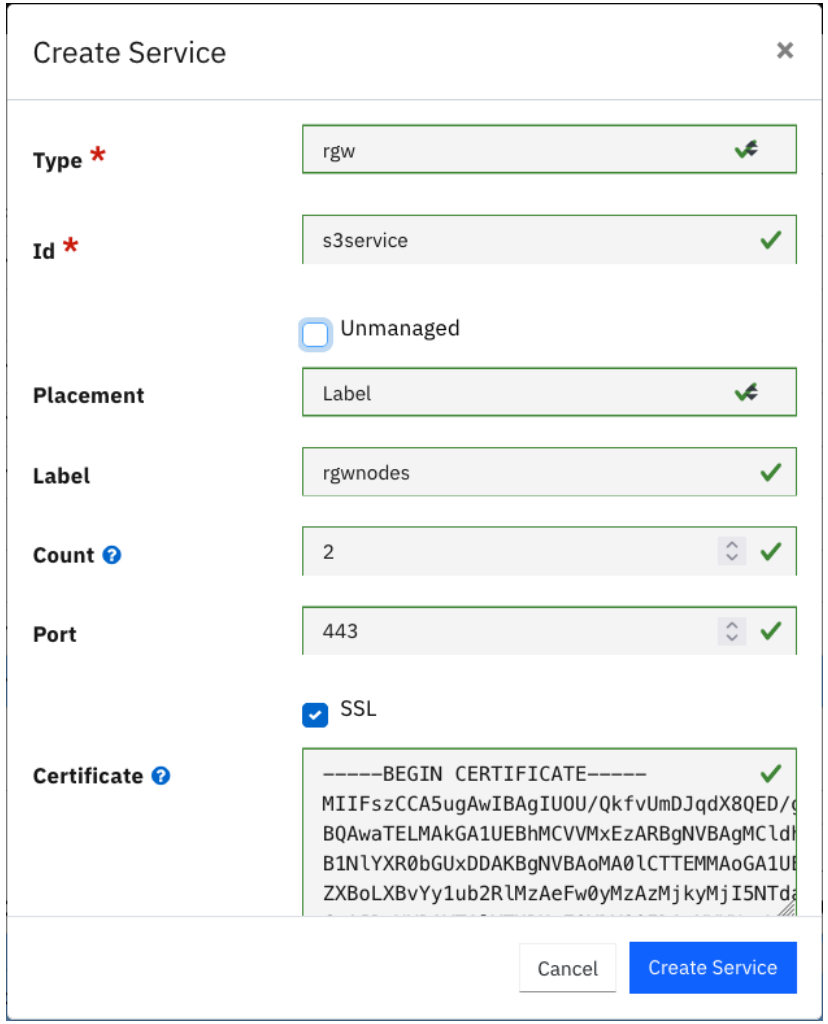
Configuring HTTPS in the object gateway




```
[root@ceph-poc-node4 ~]# openssl req -x509 -newkey
rsa:4096 -keyout key.pem -out cert.pem -sha256 -
days 365 -nodes

. . . Output omitted


[root@ceph-poc-node4 ~]# copy/paste from cert.pem
and key.pem into the “Certificate” text box in the
Dashboard UI
```

https://www.ibm.com/docs/en/storage-ceph/7?topic=ceph-object-gateway

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Configuring HTTPS in the object gateway using a specification file

```
[root@ceph-poc-node4 ~]# cat <<EOF >> /root/rgw-config.yml
service_type: rgw
service_id: s3ssl
service_name: rgw.s3ssl
placement:
  hosts:
  - ceph-poc-node4
spec:
  ssl: true
  rgw_frontend_ssl_certificate: |
  rgw_realm: default
  rgw_zone: default
  rgw_zonegroup: default
  ssl: true
  rgw_frontend_port: 443
  rgw_frontend_type: beast
  rgw_frontend_ssl_certificate: |
     -----BEGIN CERTIFICATE-----
$( cat /root/cert.pem | grep -v CERTIFICATE | awk '{$1="     "$1}1' )
     -----END CERTIFICATE-----
     -----BEGIN RSA PRIVATE KEY-----
$( cat /root/key.pem | grep -v PRIVATE | awk '{$1="     "$1}1' )
     -----END RSA PRIVATE KEY-----
EOF
[root@ceph-poc-node4 ~]# ceph orch apply -i /root/rgw-config.yml
```

RADOS Gateway Multi Site

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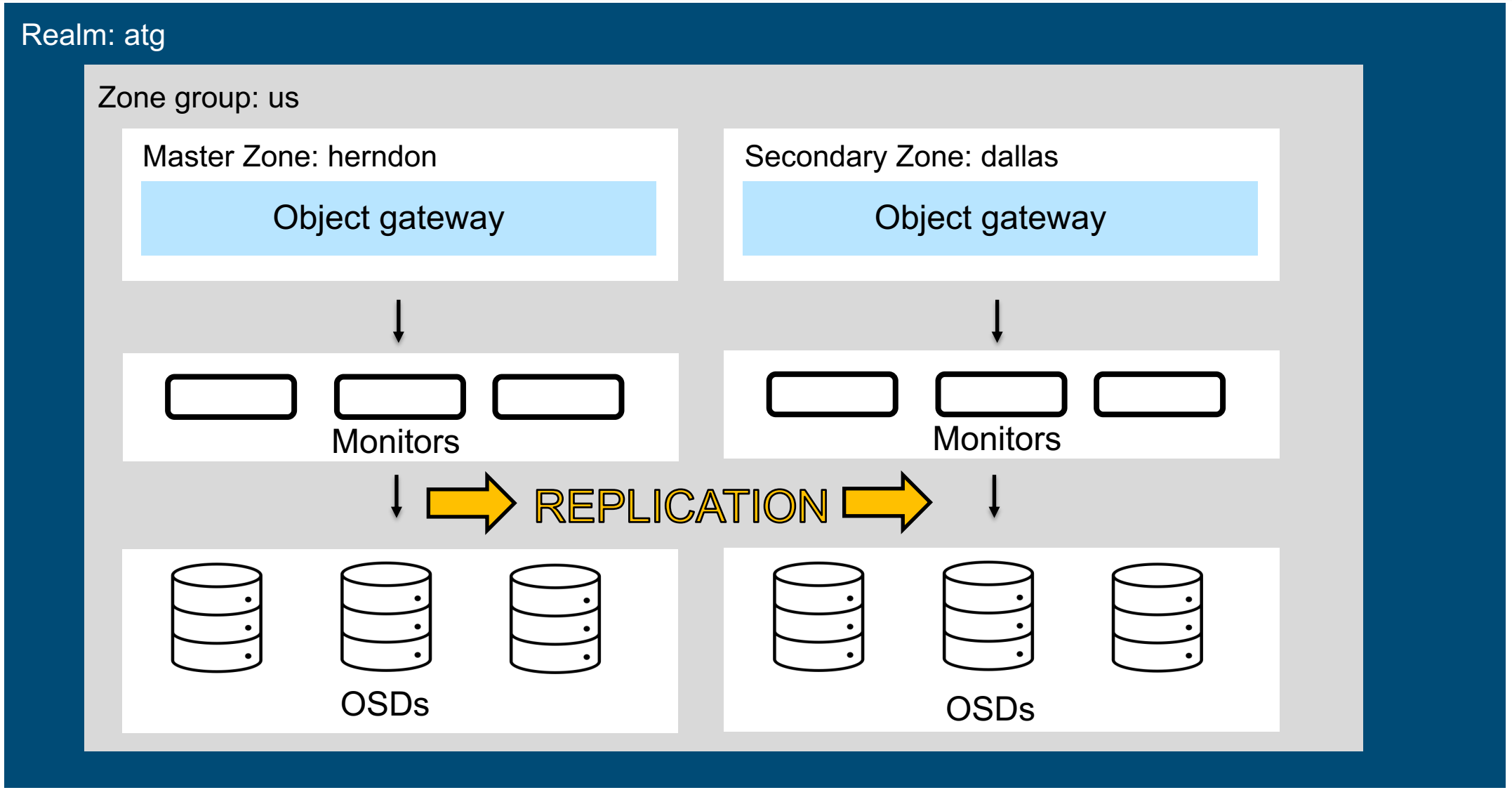
RADOS Gateway Multi Site Configuration (SAMPLE)



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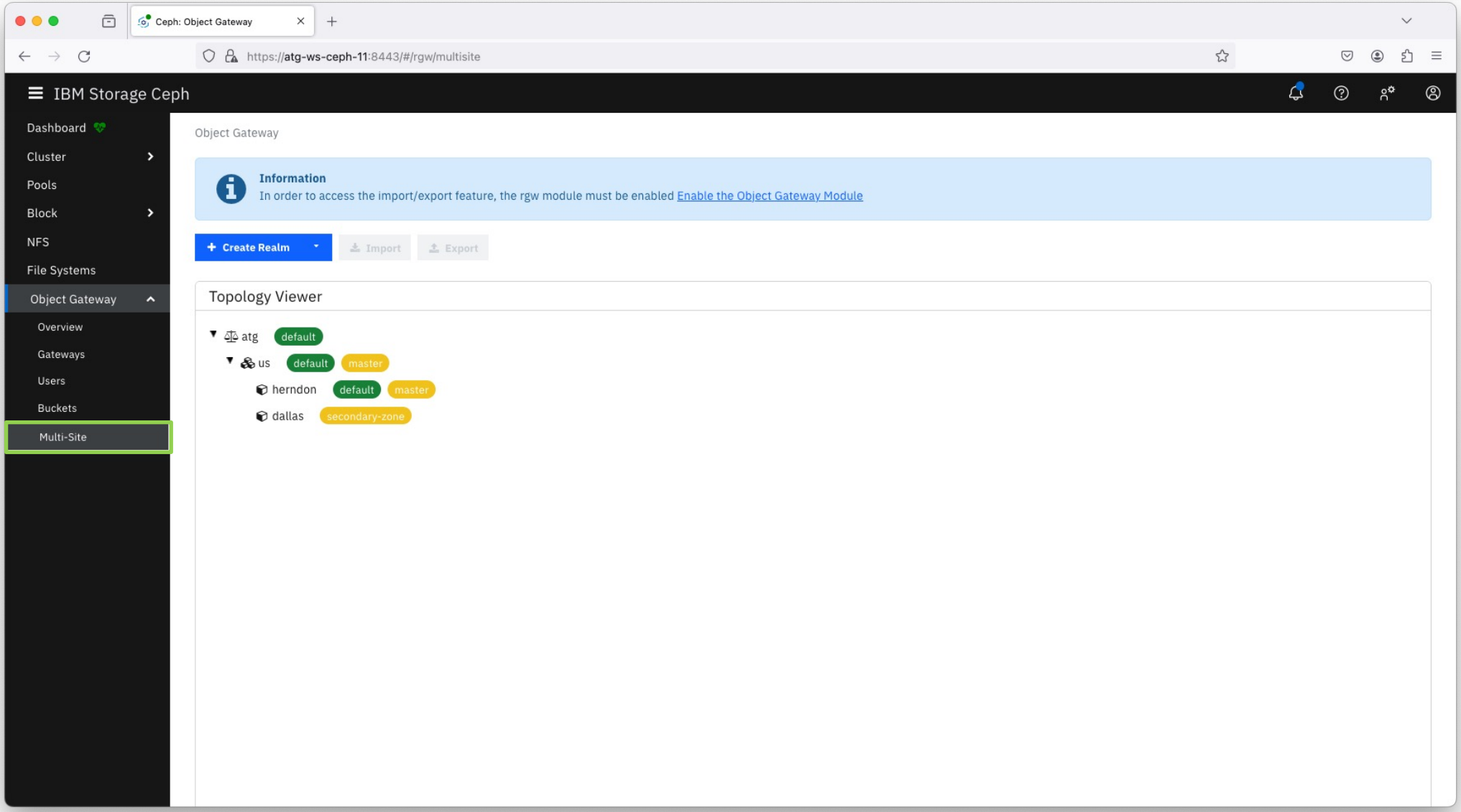
IBM Storage Ceph Dashboard for multi site topology view



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RADOS Gateway storage class and placement target

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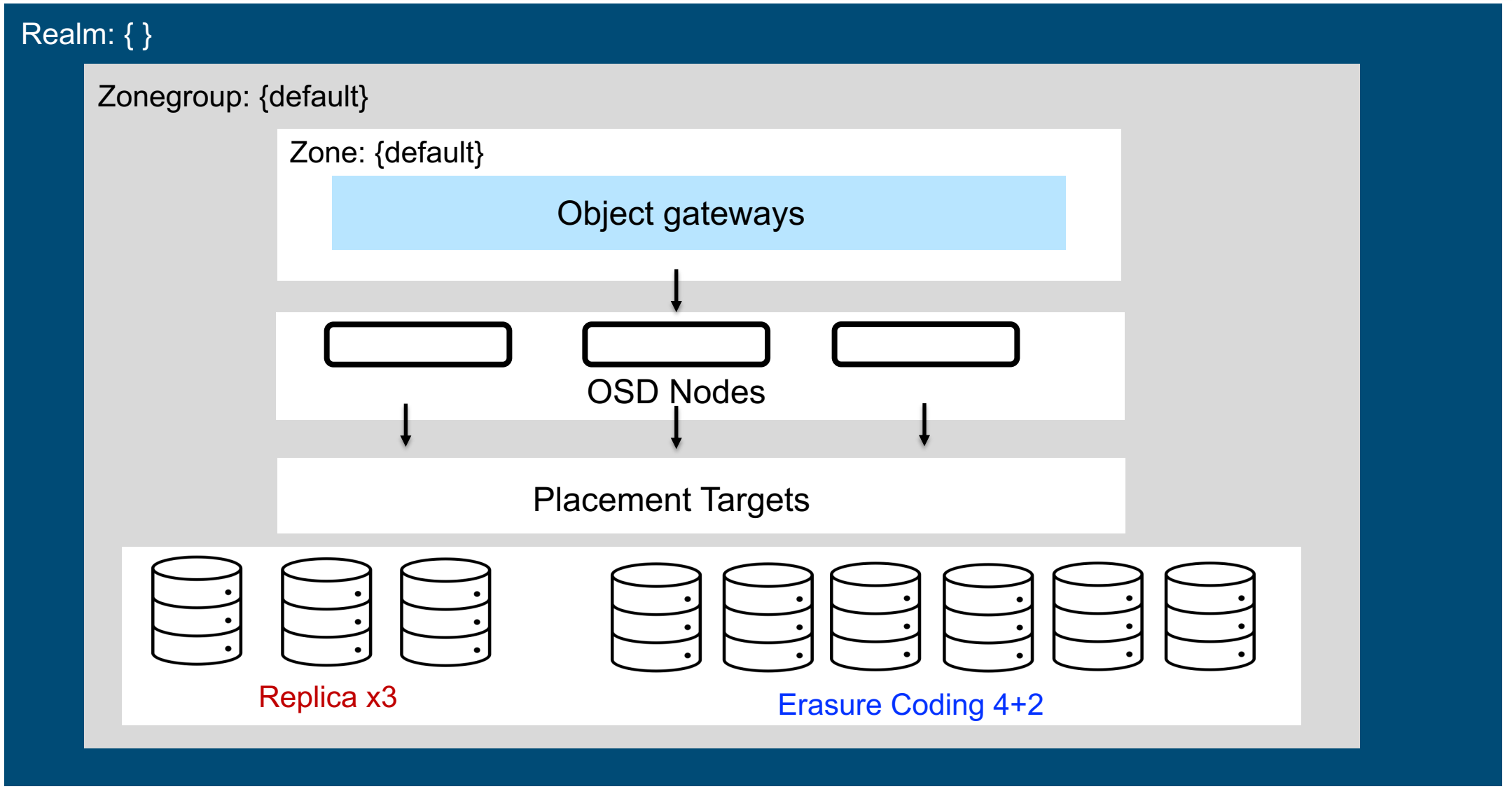
RADOS Gateway - Storage class and placement target



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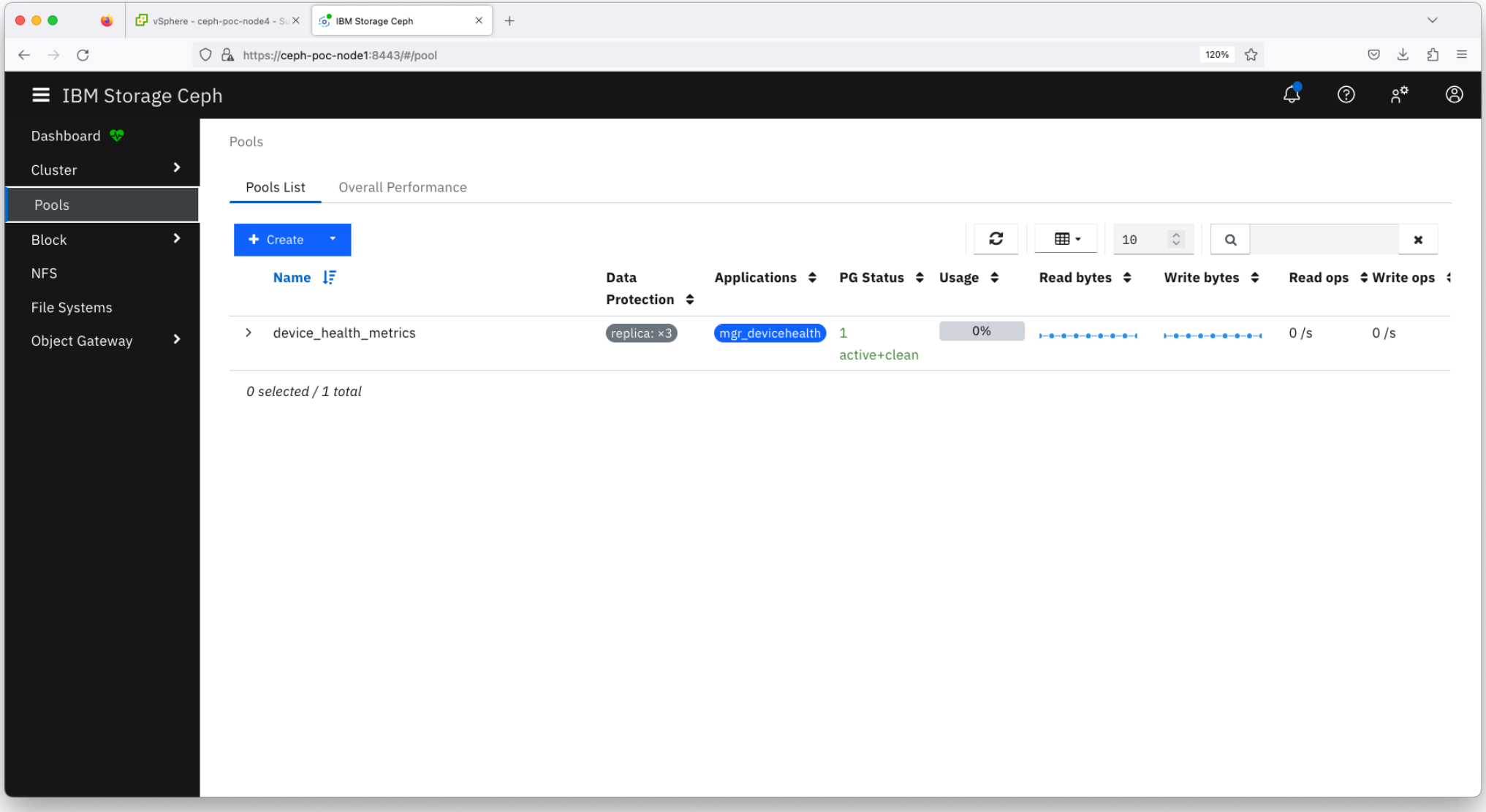
RADOS Gateway storage pools – Ceph baseline pool

LIVE



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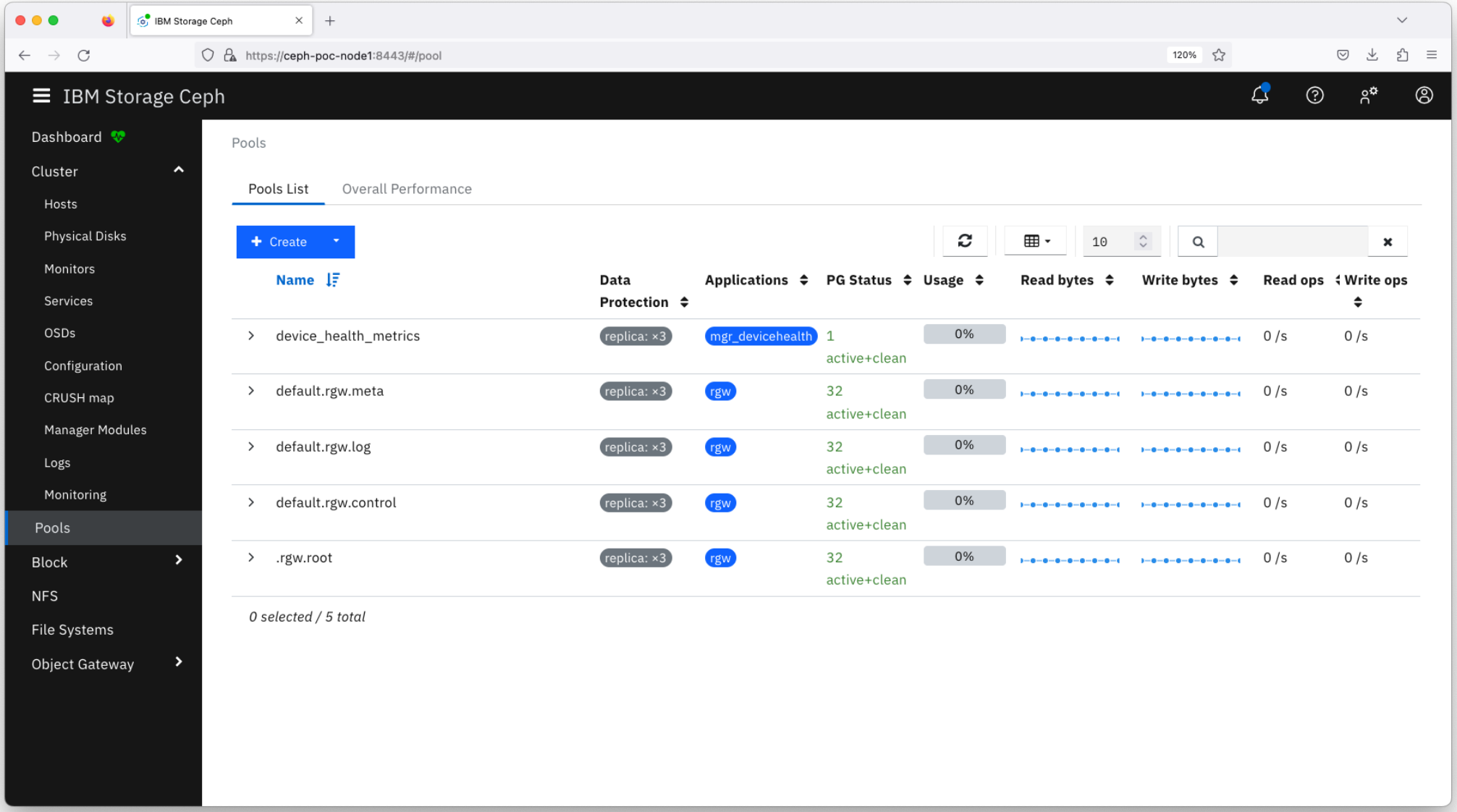
RADOS Gateway default storage pools – First RGW service instance



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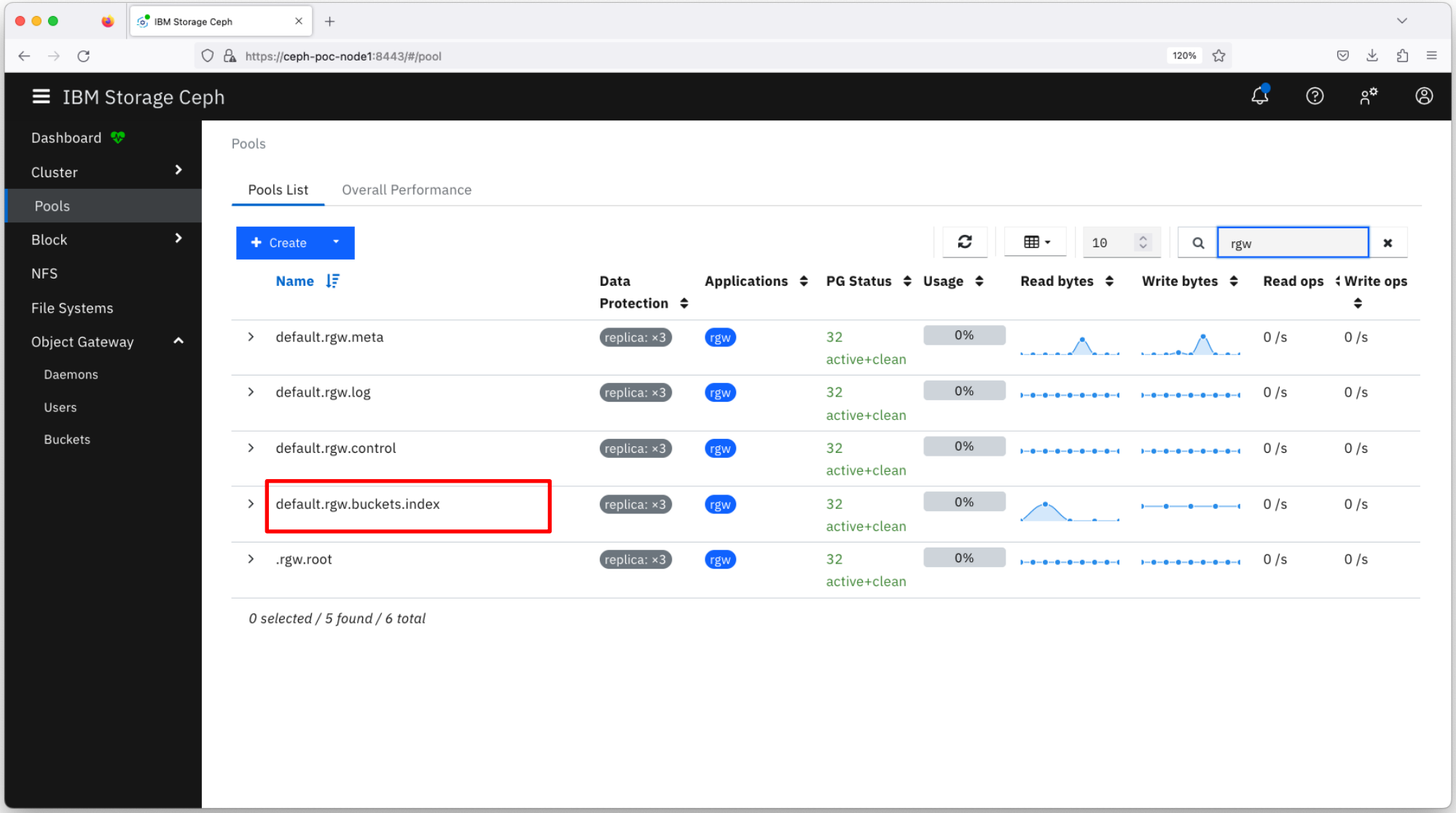
RADOS Gateway default storage pools – First bucket created



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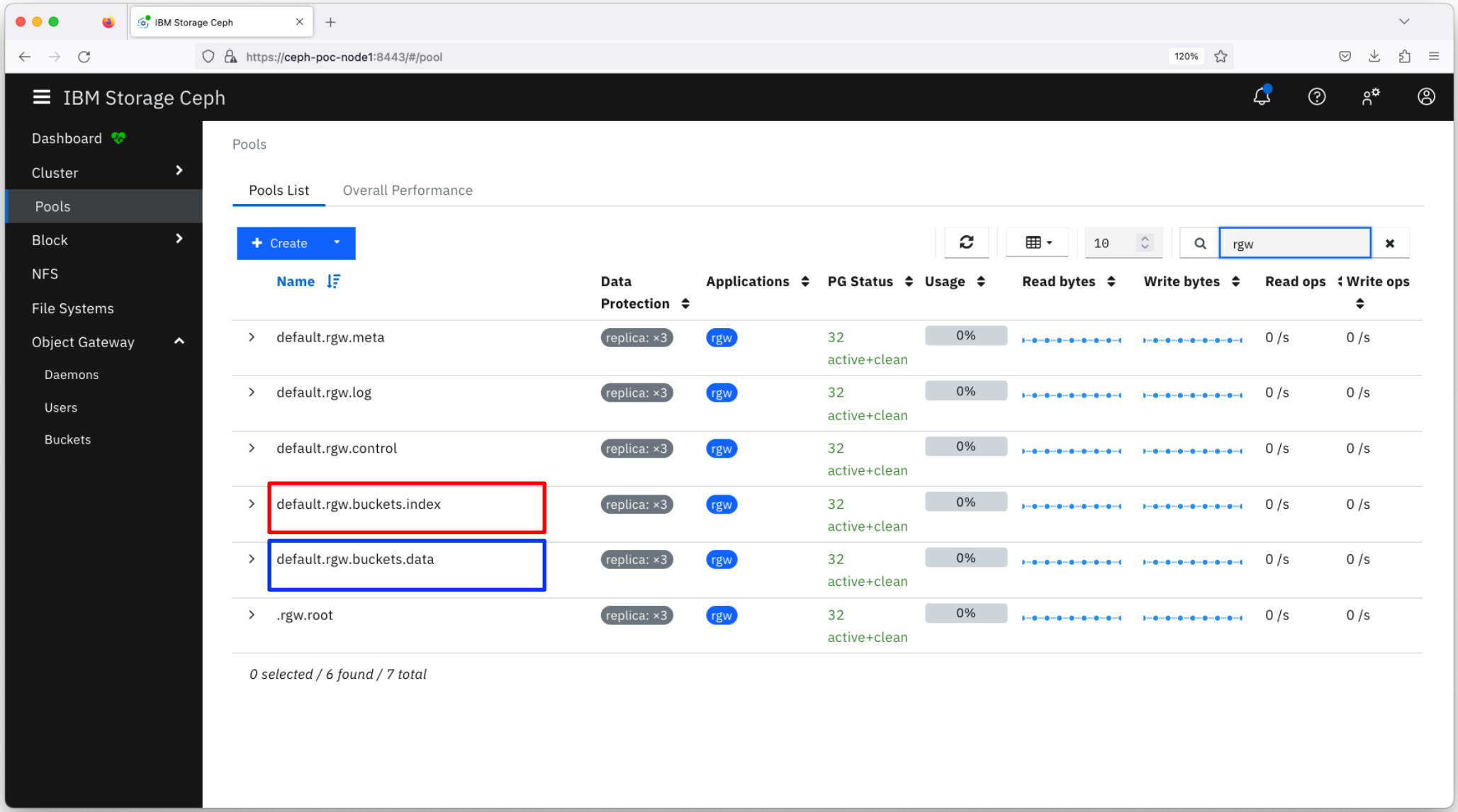
RADOS Gateway default storage pools – First object stored



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Storage Class and Placement Target

```
[root@ceph-poc-node1 ~]# radosgw-admin zonegroup get

"placement_targets": [
    {
        "name": "default-placement",
        "tags": [ ],
        "storage_classes": [
            "STANDARD"
        ]
    }
]
```

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Storage Class and Placement Target

```
[root@ceph-poc-node1 ~]# radosgw-admin zone get
"placement_pools": [
    {
        "key": "default-placement",
        "val": {
            "index_pool": "default.rgw.buckets.index",
            "storage_classes": {
                "STANDARD": {
                    "data_pool": "default.rgw.buckets.data"
                }
            },
            "data_extra_pool": "default.rgw.buckets.non-ec",
            "index_type": 0
        }
    }
]
```

?

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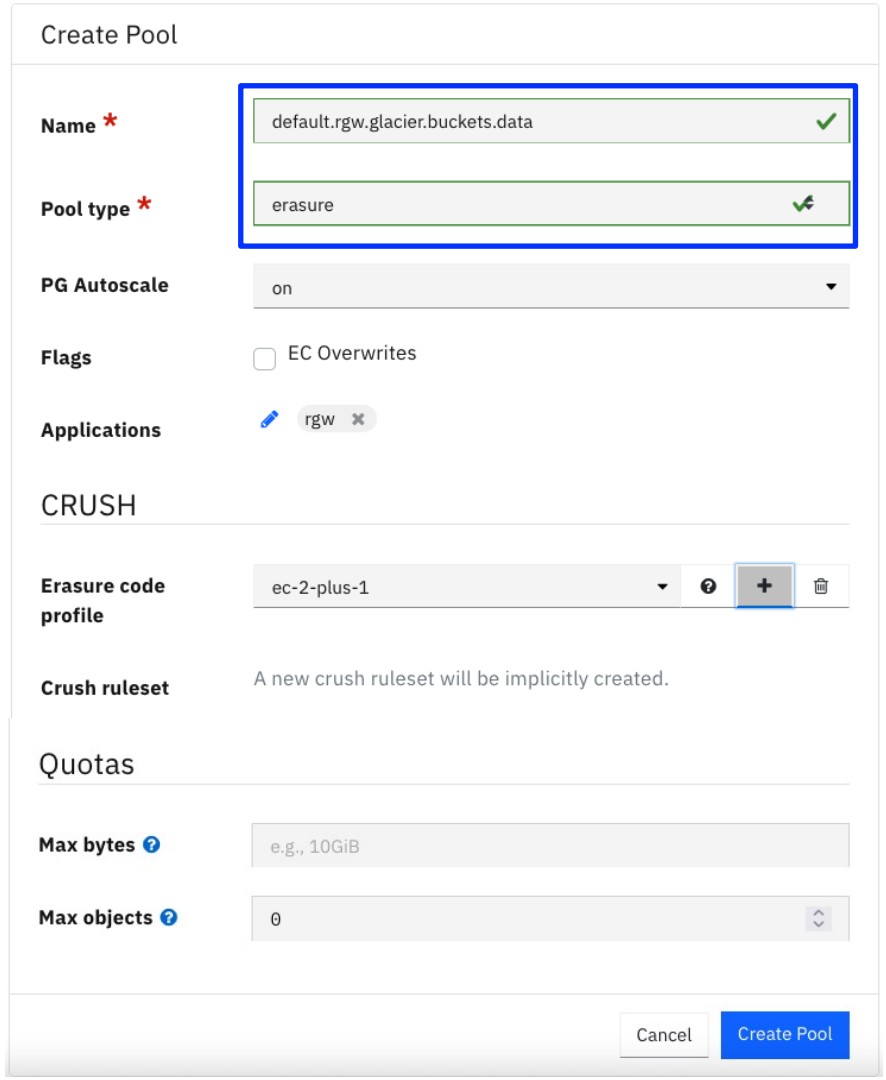
New pool for custom placement bucket data




```
[root@ceph-poc-node1 ~]# ceph osd pool create \
default.rgw.glacier.data erasure ec-2-plus-1

[root@ceph-poc-node1 ~]# ceph osd pool application
enable \
default.rgw.glacier.data rgw
```

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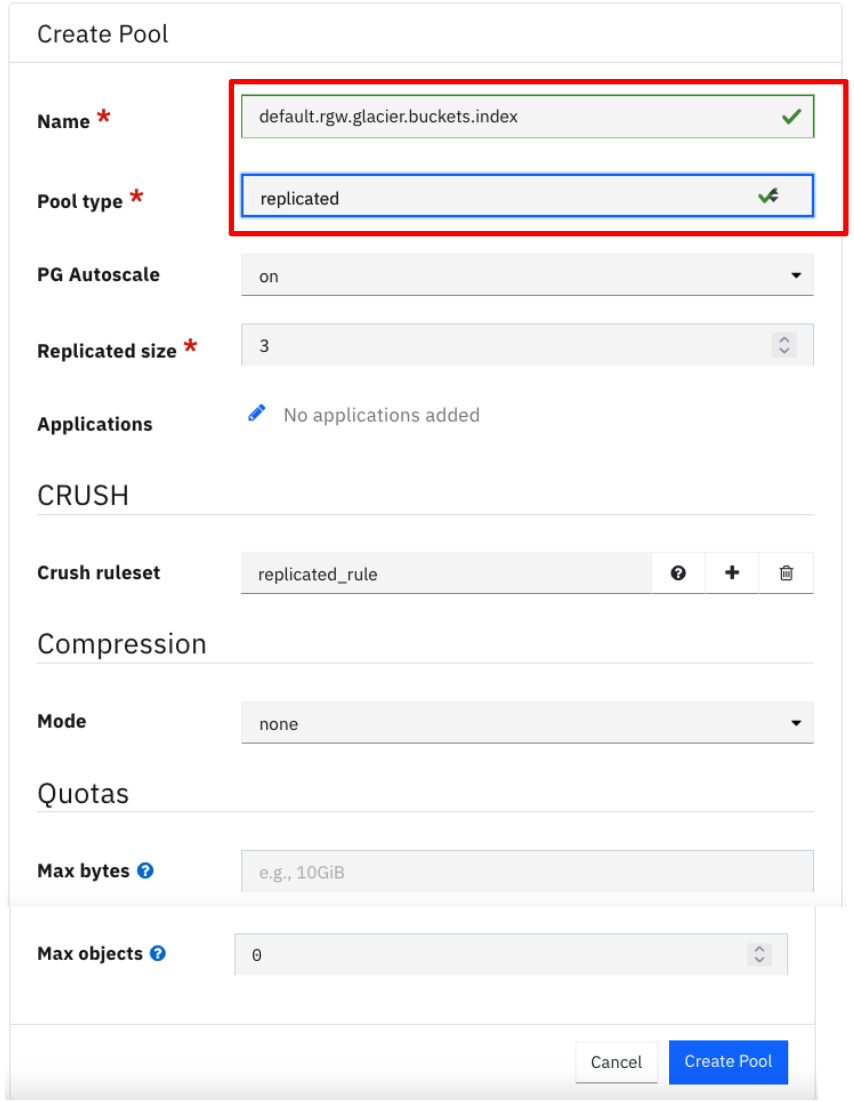
New pool for custom placement bucket index




```
[root@ceph-poc-node1 ~]# ceph osd pool create \
default.rgw.glacier.buckets.index replicated

[root@ceph-poc-node1 ~]# ceph osd pool application
\
enable default.rgw.clacier.buckets.index rgw
```

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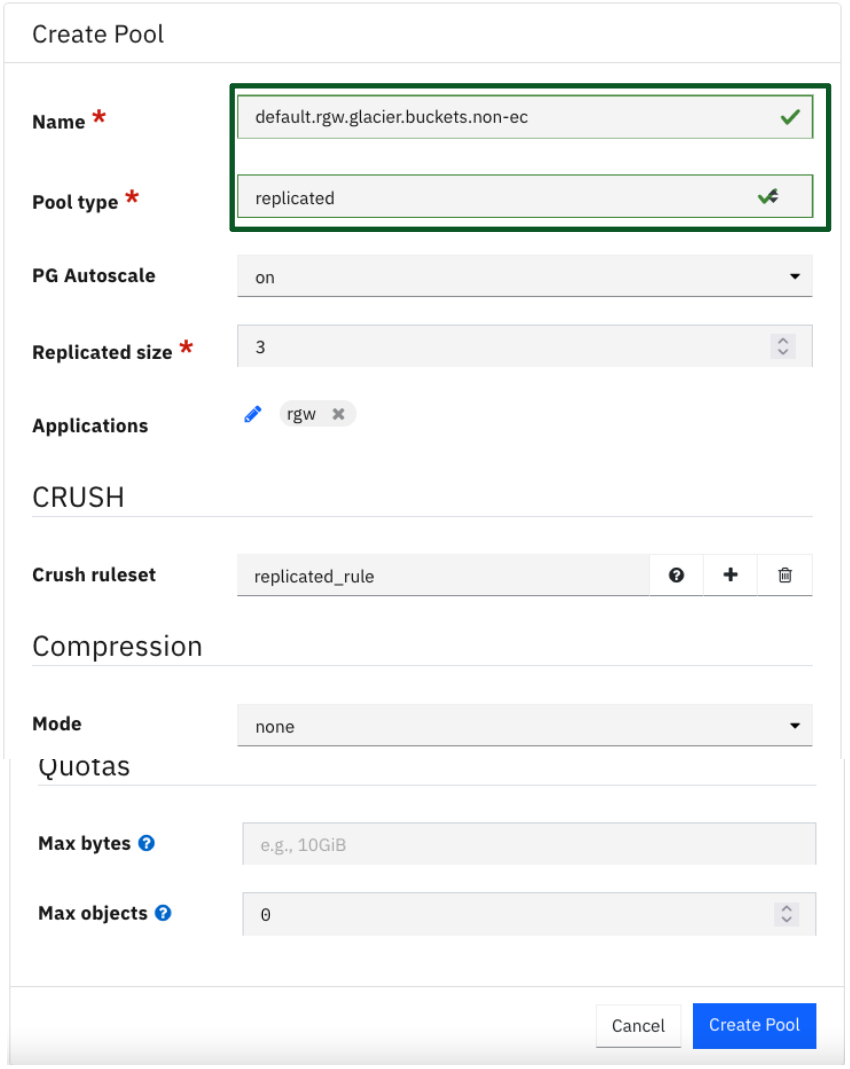
New pool for custom placement bucket Extra Pool (Multi-part upload)




```
[root@ceph-poc-node1 ~]# ceph osd pool create \
default.rgw.glacier.buckets.non-ec replicated


[root@ceph-poc-node1 ~]# ceph osd pool application
\
enable default.rgw.clacier.buckets.non-ec rgw
```

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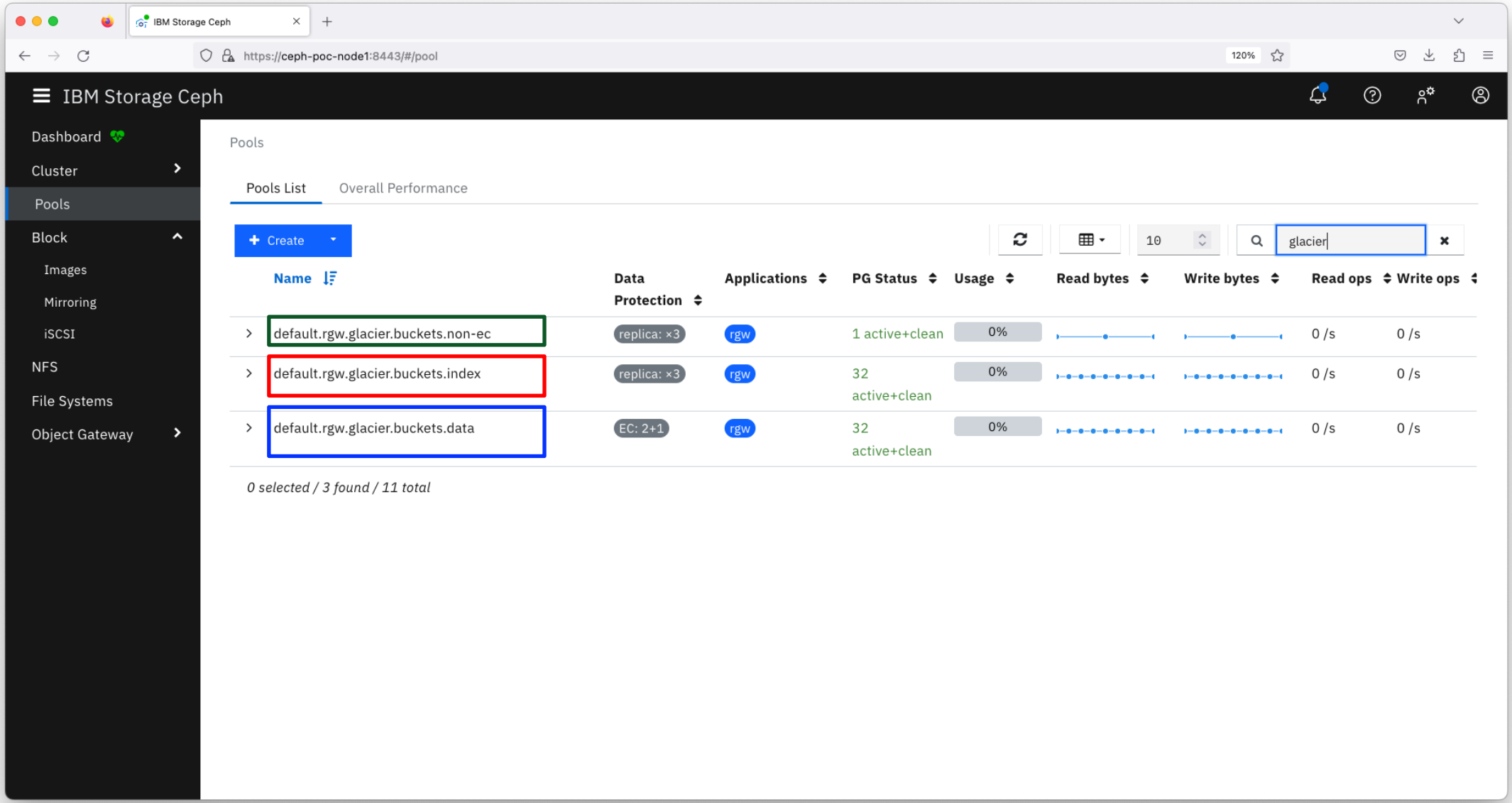
RADOS Gateway custom storage pools



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Add the a new Placement ID and Storage Class

```
[root@ceph-poc-node1 ~]# radosgw-admin zonegroup placement add \
--rgw-zonegroup default \
--placement-id glacier \
--storage-class GLACIER

[root@ceph-poc-node1 ~]# radosgw-admin zone placement add \
--rgw-zone default \
--placement-id glacier \
--storage-class GLACIER \
--data-pool default.rgw.glacier.data  \
--index-pool default.rgw.glacier.index \
--data-extra-pool default.rgw.glacier.non-ec
```

1 https://www.ibm.com/docs/en/storage-ceph/7?topic=administration-creating-storage-policies

? https://docs.ceph.com/en/latest/radosgw/placement/

? https://access.redhat.com/documentation/en-us/red_hat_ceph_storage/5/html/object_gateway_guide/administration#creating-storage-policies-rgw

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Storage Class and Placement Target

```
[root@ceph-poc-node1 ~]# radosgw-admin zonegroup placement add \
--rgw-zonegroup default \
--placement-id glacier \
--storage-class GLACIER

[root@ceph-poc-node1 ~]# radosgw-admin zone placement add \
--rgw-zone default \
--placement-id glacier \
--storage-class GLACIER \
--index-pool default.rgw.glacier.index \
--data-extra-pool default.rgw.glacier.non-ec \
--data-pool default.rgw.glacier.data --compression lz4
```

1 https://www.ibm.com/docs/en/storage-ceph/7?topic=administration-creating-storage-policies

? https://docs.ceph.com/en/latest/radosgw/placement/

? https://access.redhat.com/documentation/en-us/red_hat_ceph_storage/5/html/object_gateway_guide/administration#creating-storage-policies-rgw

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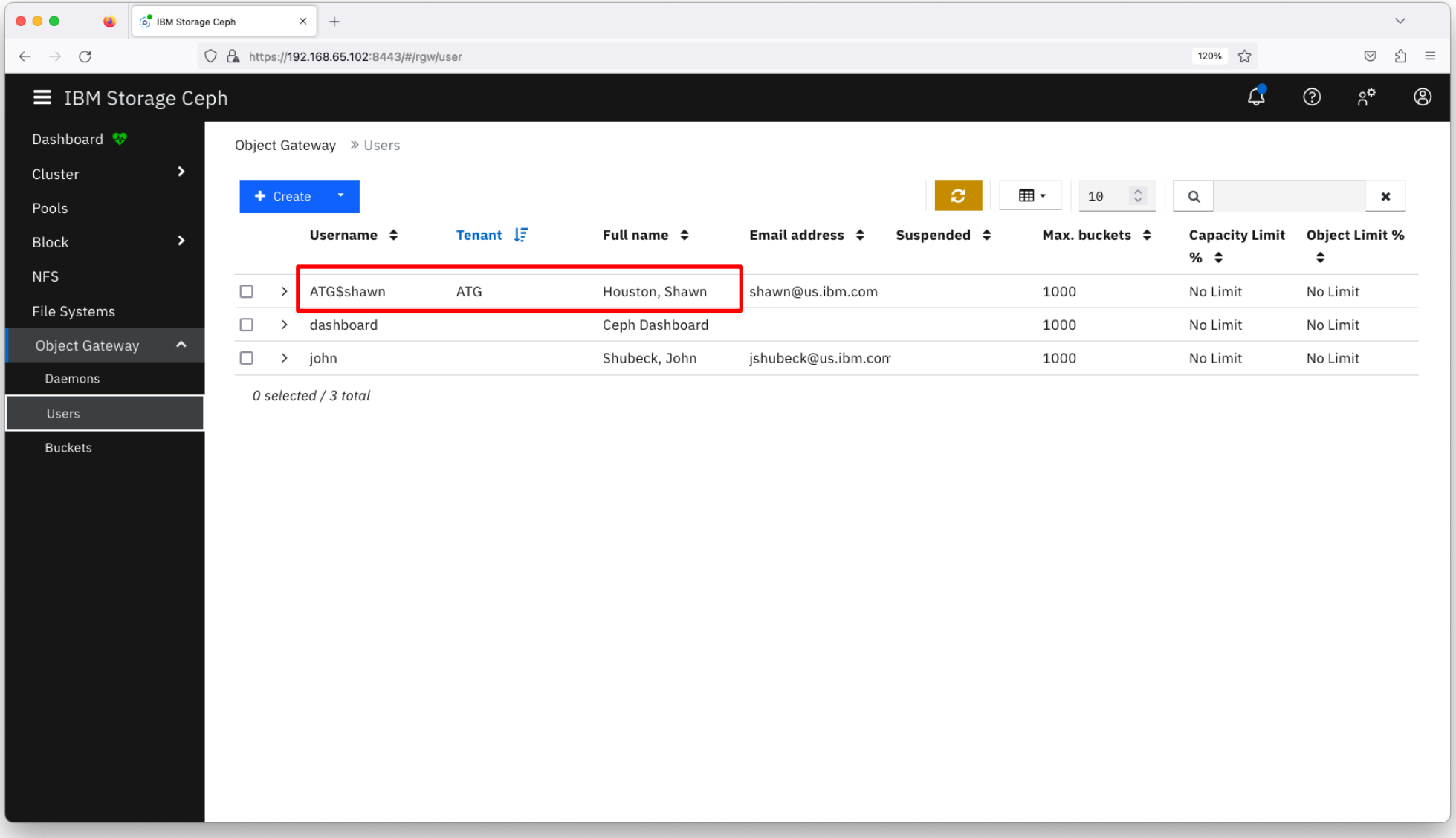
RADOS Gateway – Multi tenancy

LIVE



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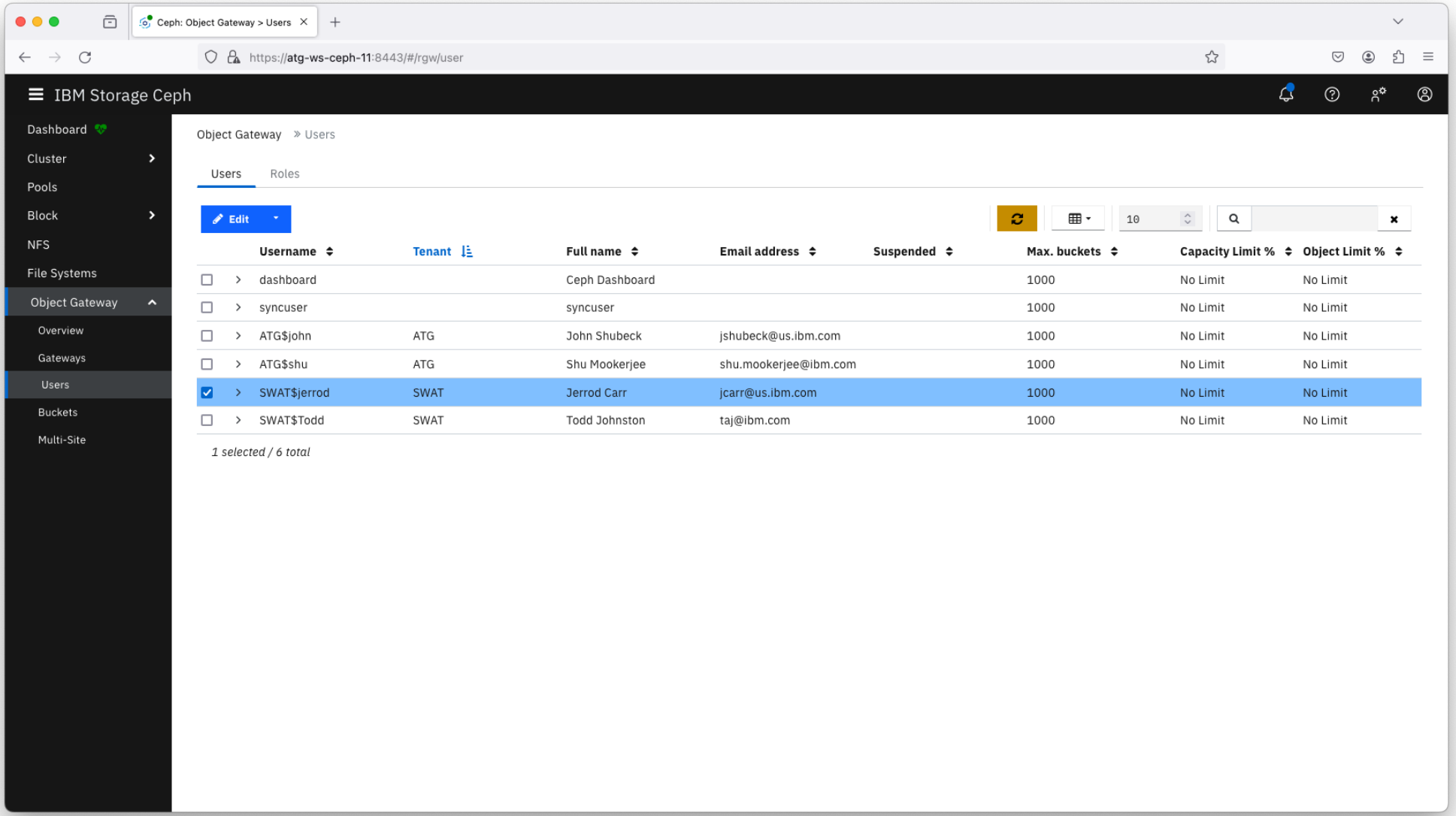
Multi Tenancy



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Multi protocol access

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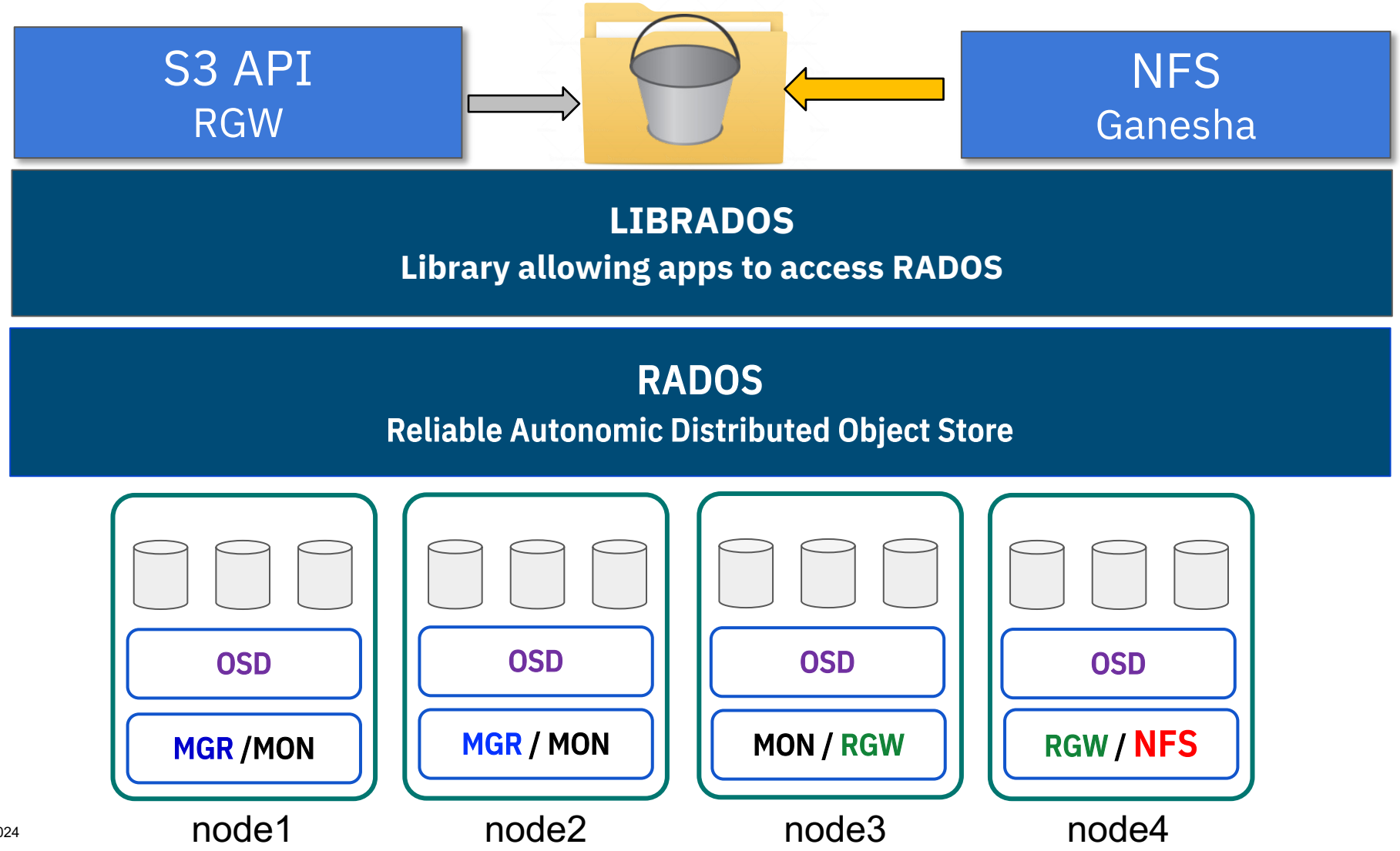
IBM Storage Ceph – Overview of the RADOS Gateway

RADOS Gateway (RGW) layout



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IBM Storage Ceph multiprotocol configuration tasks

LIVE

Ceph Installation Tasks

Cephadm bootstrap first node

Ceph orch add hosts (nodes)

Ceph orch apply OSD all devices

Deploy RGW Service

Create RGW user

Create RGW bucket for owning user

GO

Store objects into the S3 bucket

Verify an existing RGW Bucket

Deploy an NFS-RGW Service

Create an NFS Export

CONTINUE

NFS client access and file upload

S3 and NFS Client

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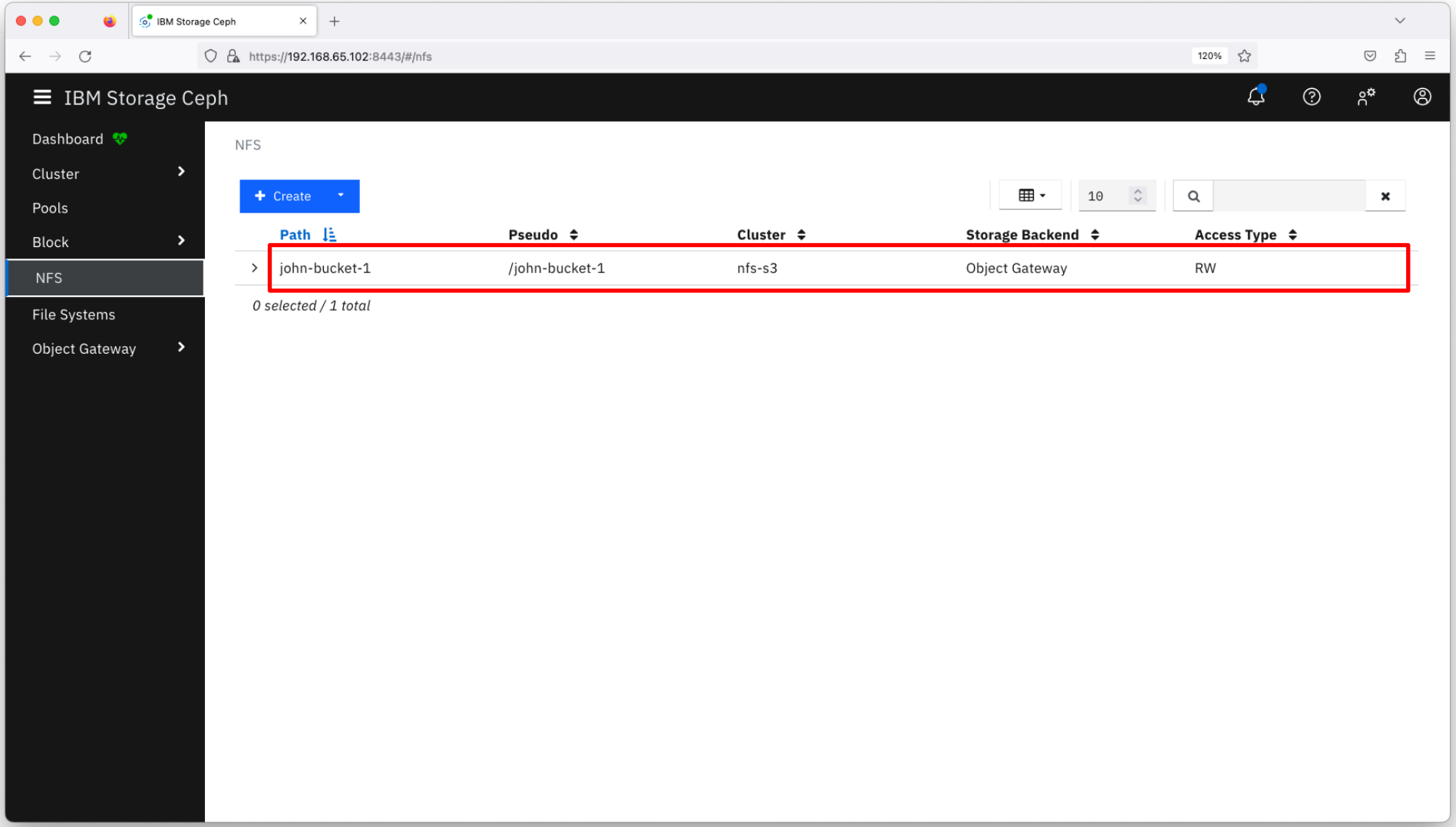
RADOS Gateway – Multiprotocol



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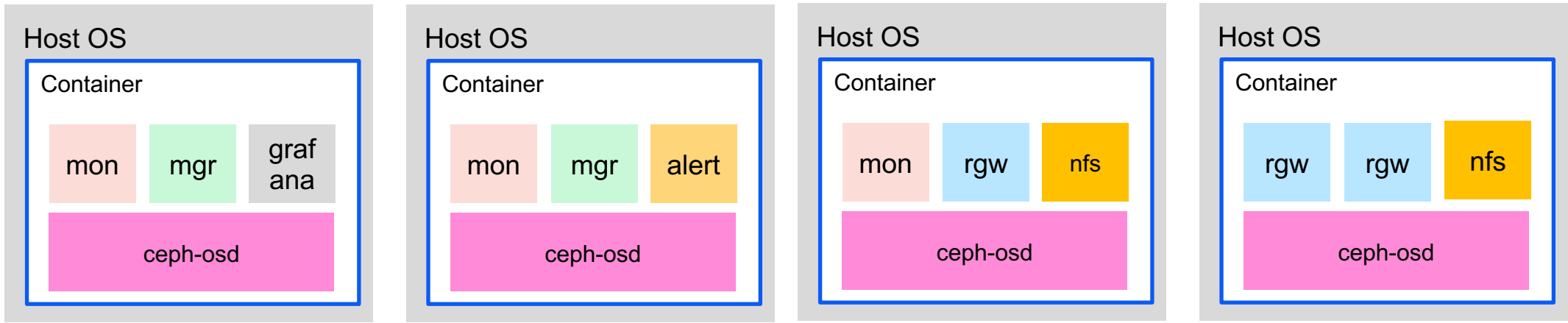
IBM Storage Ceph deployment – colocated daemons



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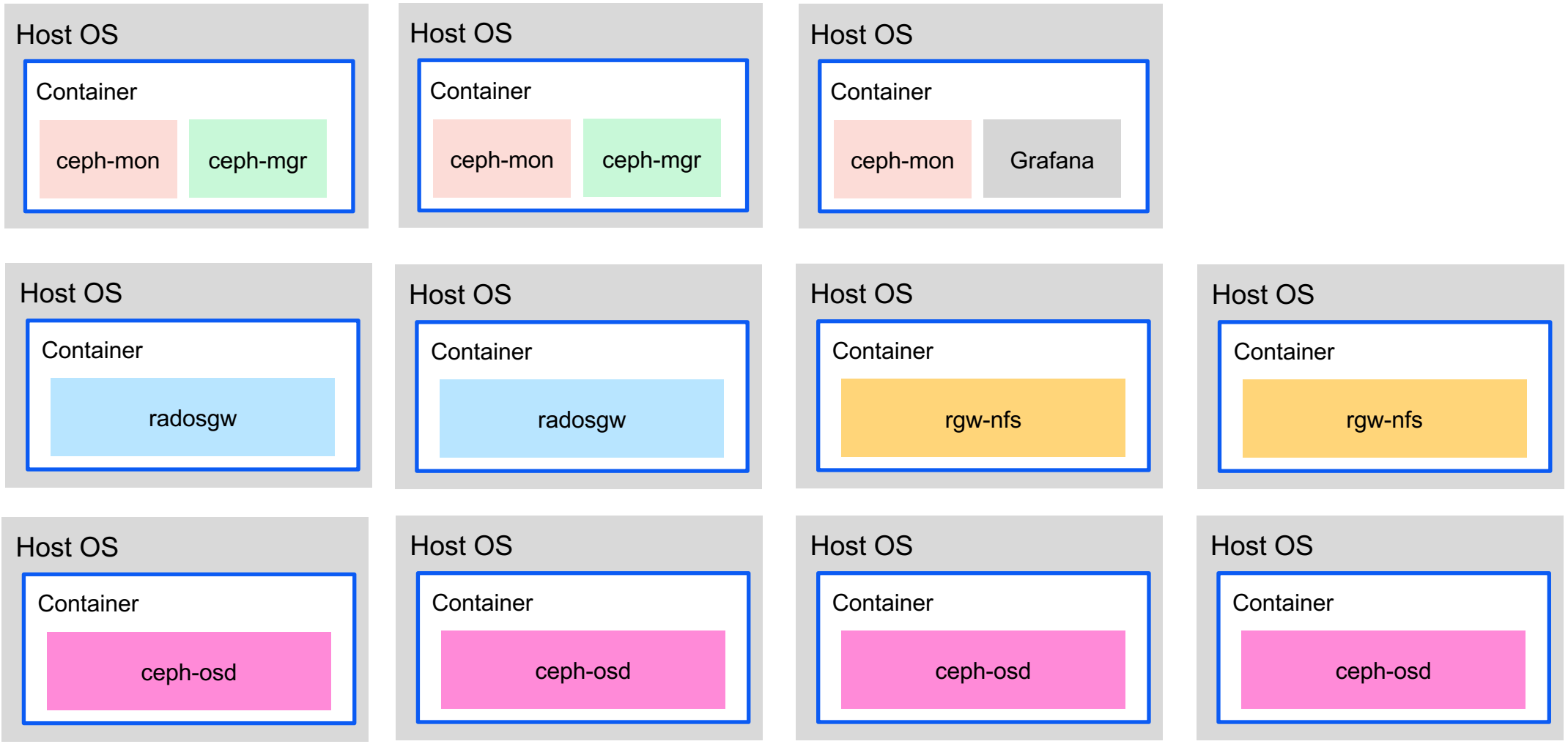
IBM Storage Ceph deployment – non colocated daemons



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S3 API command set and fidelity

IBM Storage Ceph delivers support for the S3 API that is mature and complete

Bucket Operations
PUT/GET/HEAD/DELETE

- Bucket
- Bucket ACL
- Bucket CORS
- Bucket Lifecycle
- Bucket Location
- Bucket Notification
- Bucket Policy
- Bucket Request Payment
- Bucket Status
- Bucket Website
- Bucket Versioning

Object Operations
PUT/GET/HEAD/COPY/DELETE

- Object
- Object Tagging
- Object ACL
- Object Legal Hold
- Object Lock
- Object Retention

Multipart Operations
PUT/GET/POST/DELETE

- Abort Multipart Upload
- Complete Multipart Upload
- Initiate Multipart Upload
- List Multipart Uploads
- List Parts
- Upload Part
- Upload Part Copy

Advanced Operations

- S3 Object Lock
- Secure Token Service (STS)
- Bucket quotas
- Bucket notifications
- Storage glass, Placement target
- Server Side Encryption (SSE-S3)

Data and AI Operations

- Policy based rate limiting ingest
- Granular bucket replication
- Policy based tiering to cloud (AWS, Azure, IBM)
- S3 Select
- Policy based tiering to tape (future)

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IBM Storage Ceph 6 and Storage Ceph 7 updates for RADOS Gateway

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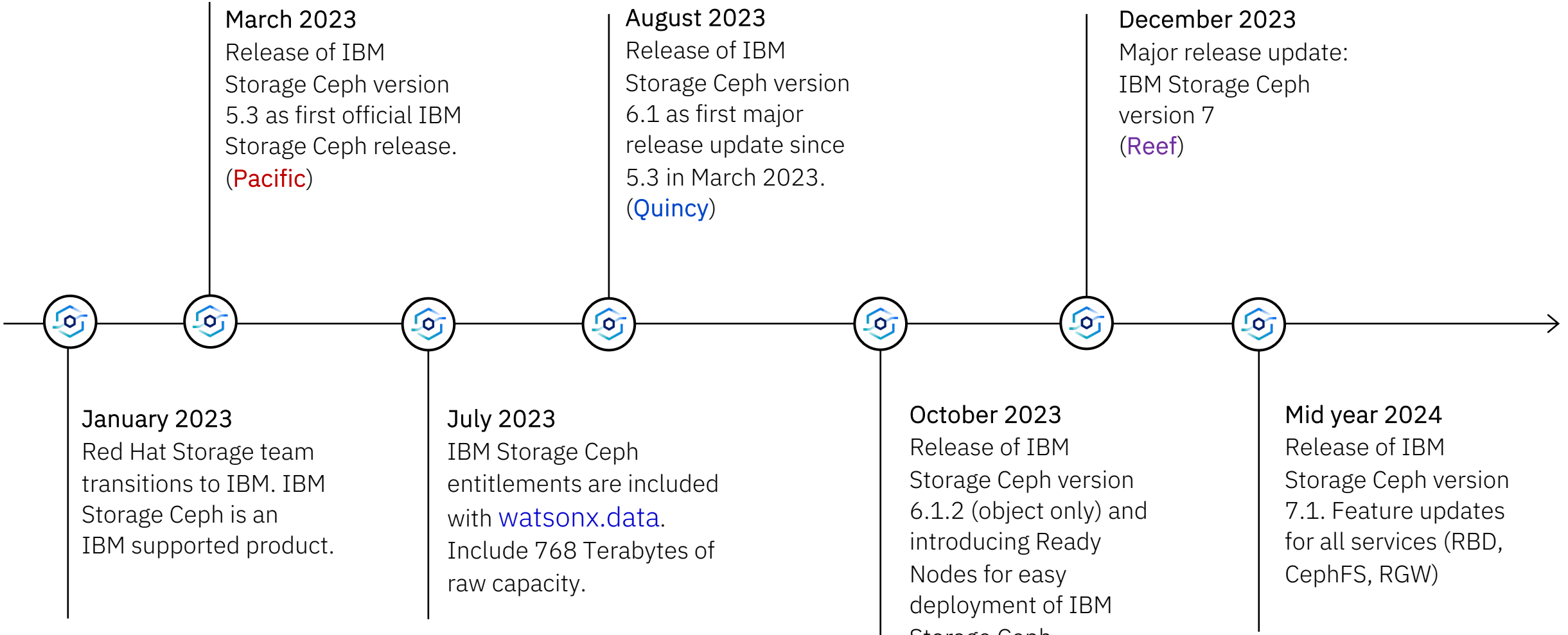
IBM Storage Ceph 2023 - 2024 timeline



IBM Storage Ceph updates

IBM Storage Ceph 6 - Ceph release 17 (Quincy)

GA: August 2023

Block (RBD)	• SSD Write-back cache (GA)
File (CephFS)	• NFS for CephFS [Tech Preview]
Object (RGW)	• Policy based data archiving to AWS(GA)/Azure(TP) • Policy based Bucket Granularity Replication(GA)
Management	• Day-2 management UI enhancements in the dashboard • N+2 Upgrades
Deployment	• Support for deploying Ceph on VMware

IBM Storage Ceph updates

IBM Storage Ceph 7.0 – Ceph release 18 (Reef)

GA: December 2023

Block (RBD)	• NVMe over TCP (NVMe/TCP) protocol support [Tech Preview]
File (CephFS)	• NFS for CephFS (GA)
Object (RGW)	• Object Lock Worm Certification • Archive Zone GA support • S3-Select GA support CSV, Parquet File Formats. • Erasure Coding on just 4 nodes
Management	• RGW Management Enhancements • Enhanced CephFS Volume Management

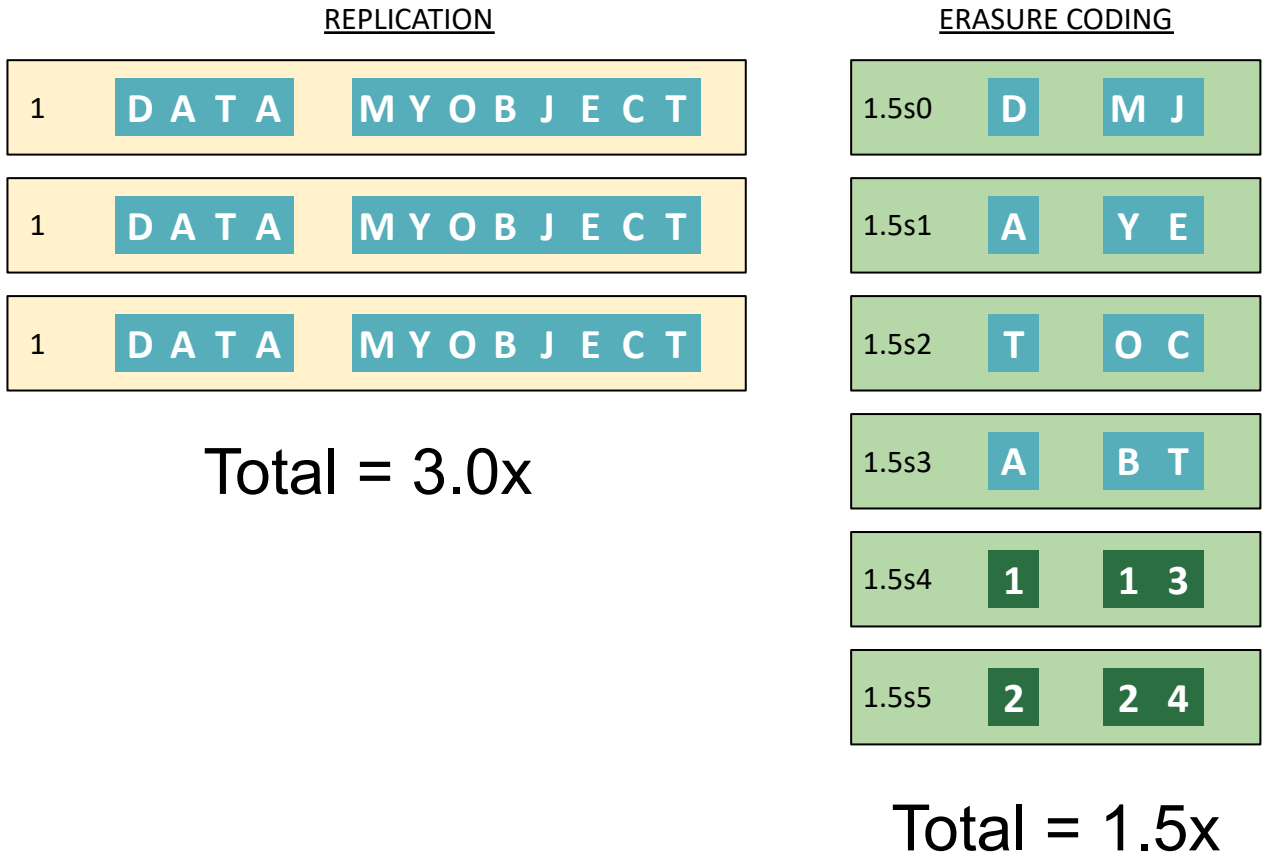
Replication and Erasure Coding

Replicas

- Replica 2x (SSD pool): min 3 nodes
- Replica 3x (HDD pool): min 4 nodes
- **Replica 4x (Metro cluster)**

Erasure Coding (EC Profiles)

- EC 4+2 : minimum 7 nodes
- EC 8+3 : minimum 12 nodes
- EC 8+4 : minimum 13 nodes
- **EC 2+2 : minimum 4 nodes**



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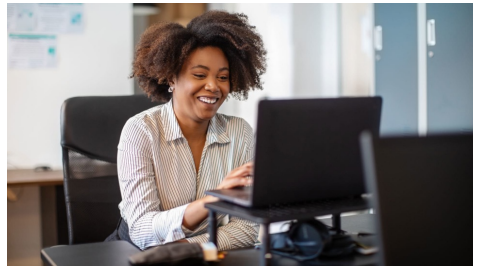
IBM Storage Ceph buying and delivery options

1. Software only

IBM Storage Ceph

2. Ready Node HDD

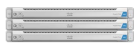


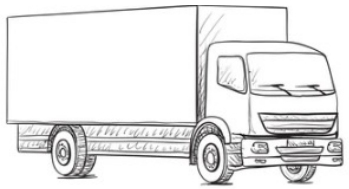
IBM Storage Ceph System

3. Ready Node NVMe

Future - *exploring…*

4. Appliance





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IBM Storage Ready Node with NVMe

Descriptions	Specifications
CPU	2 x Intel® Xeon® Gold 6438N 2G, 32C/64T, 16GT/s, 60M Cache, Turbo, HT (205W) DDR5-4800
Memory	16 x 32GB RDIMM (512GB)
OS Disks	BOSS-N1 controller card + with 2 M.2 480GB (RAID 1)
NVMe Device Density	3.84TB, 7.68, 15.36TB NVMe
NVMe Device Quantity	8, 16, or 24 Disks
Network	2 x 10GbE (SFP+ Optical Transceivers Included)
Network	2 x 100GbE (QSFP28 Optical Transceivers Included)
Dimensions	3.41" H x 18.97" W x 29.85" D (2U Rack Height)
Software Support	IBM Storage Ceph 7

More advanced features for the next Accelerate with ATG

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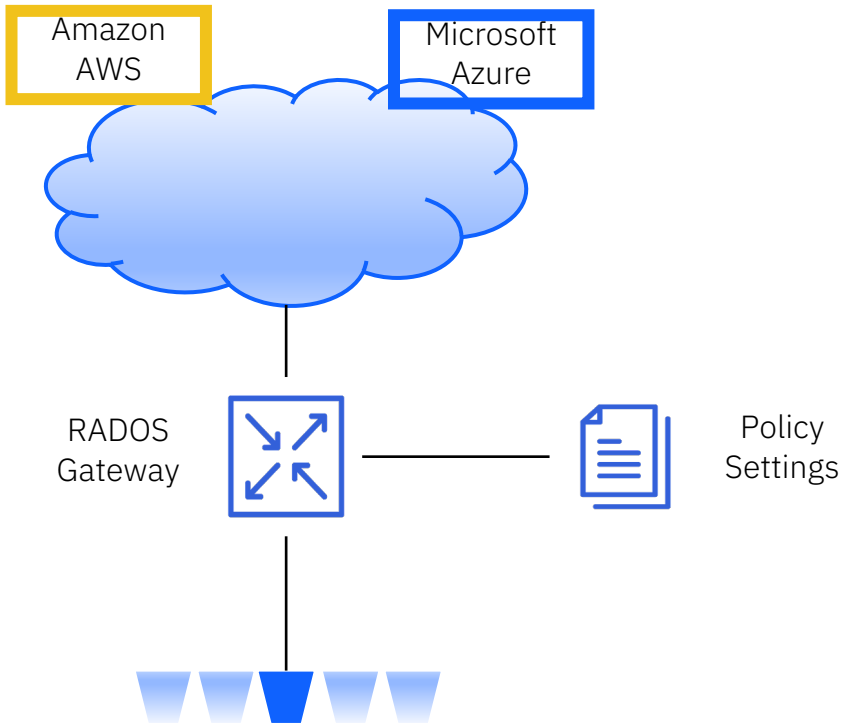
Functionality

RGW policy-based data transition to public cloud



Archive or migrate

Object lifecycle transition into AWS compatible S3 cloud endpoints.

Data lifecyle

Extends current lifecycle transition and storage class model

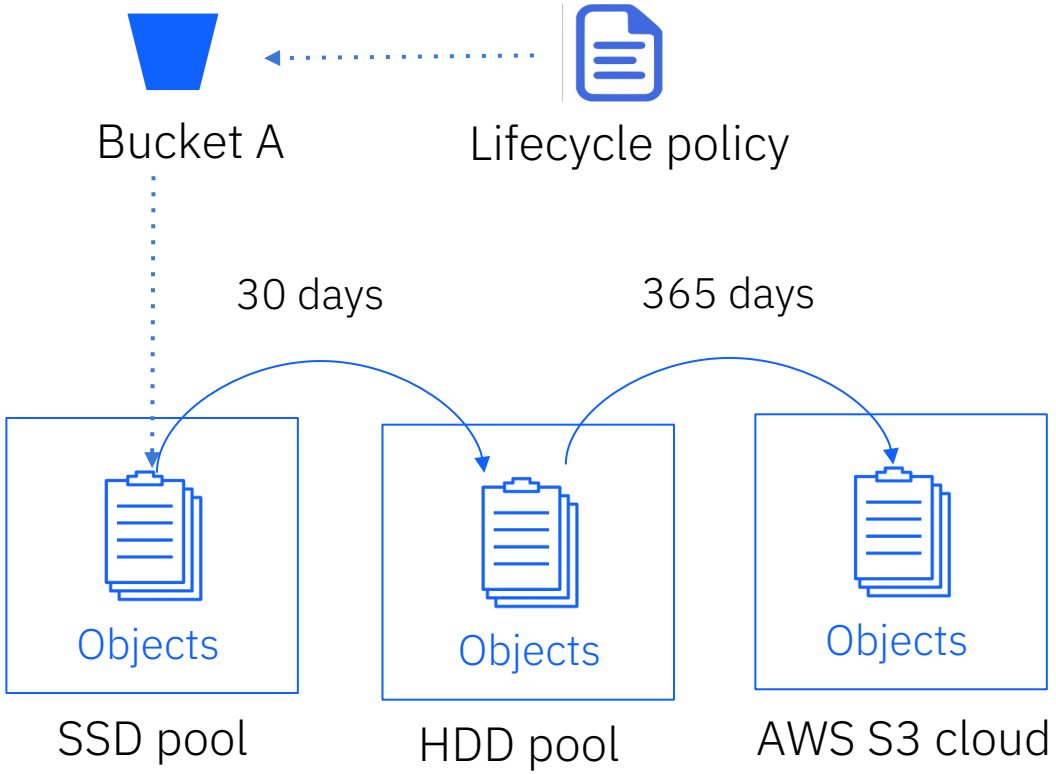
Policy-based

Move data which meets policy criteria to an AWS compatible S3 bucket for archive, for cost, and manageability reasons

In overall

Cloud archiving provides a cost-effective, scalable, secure, and accessible way to store and preserve data

IBM Storage Ceph Object S3 Lifecycle Management



Lifecycle management

Ability for transitioning and/or expiration of objects.

Example policy:
Transition object to cold tier after 30 days.
Delete after 365 days

Granular object filtering

Granularly filter which objects in a bucket are susceptible of lifecycle management by object prefix or tags.

S3 Lifecycle Transition

Can be defined between arbitrary storage classes(tiers) in a cluster or to other S3 compatible endpoints (Including AWS),

Transition to cloud is a one-way only process.

S3 Lifecycle Expiration

Includes:

Current/Non-current
Delete Marker Expiration
Abort MultiPart Upload

Object storage for ML/analytics: S3select

S3select support general available

Support for all three defined S3select data formats:

- CSV
- JSON
- Parquet

Data analytics apps consume object

The data analytics market is a heavy consumer of object storage.

IBM Storage Ceph is first-class citizen in on-premise data analytics object Storage solutions.

Achieve reduced query times

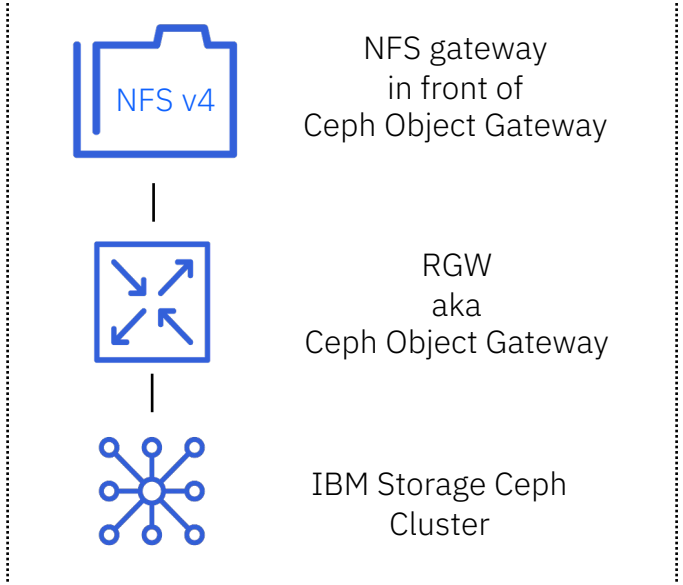
IBM Storage Ceph keeps improving its features and integrations with market-leading tools like Presto, Trino and other apps.

Analytical tools use Parquet.

IBM Storage Ceph provides improved performance for these tools pushing down the queries into the RGWs.

Functionality

NFS to RGW backend Tech Preview



IBM Storage Ceph RGW NFS gateway

NFS with RGW backend integration.

Allows for object access through NFS protocol.

This can be useful for easy ingests of object data from legacy applications which do not support the S3 object API.

Use case examples for Data Scientists

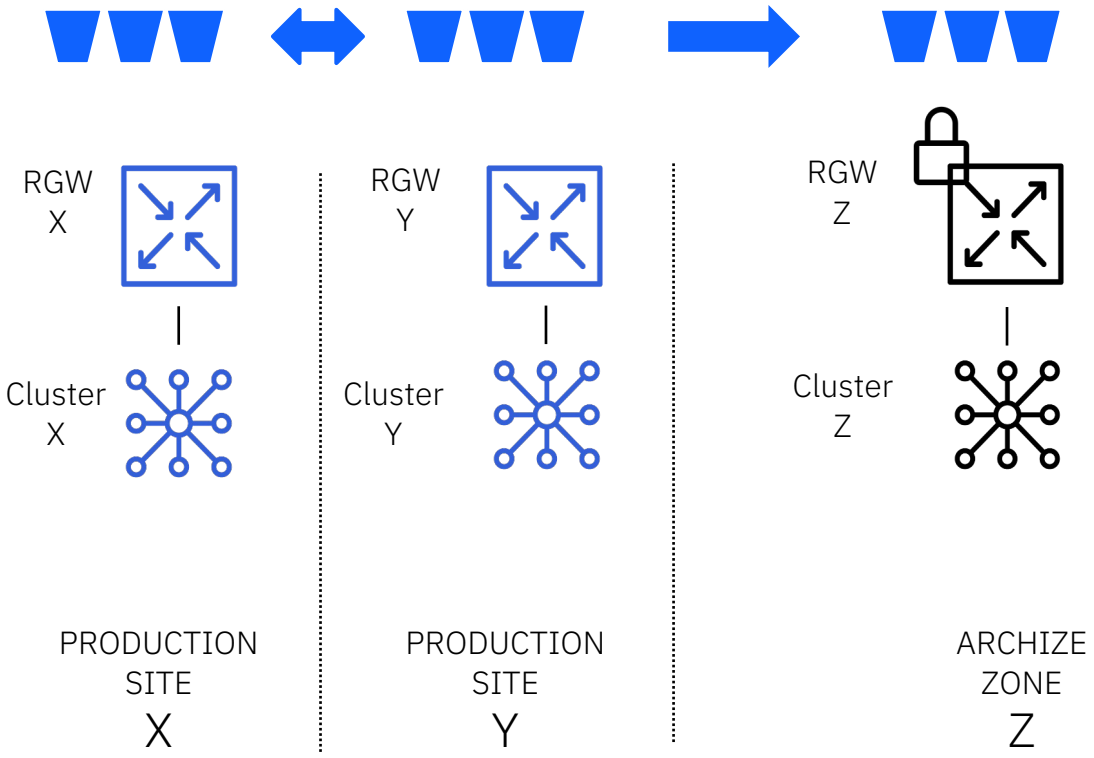
A method to easily ingest existing business data from Windows and Linux clients into the Ceph object store.

An easy way to export results from analytics jobs and share results

Specifically, to users or applications that are unable to use the S3 API natively.

Functionality

Object archive zone Tech Preview



IBM Storage Ceph archive zone

The archive zone receives all objects from the production zones.

It keeps every version for every object, providing the user with an object catalogue that contains the full history of the object.

Archive zone provides immutable objects that cannot be deleted nor modified from RGW endpoints.

Archive zone purpose and benefit

Ability to recover data from the archive zone.

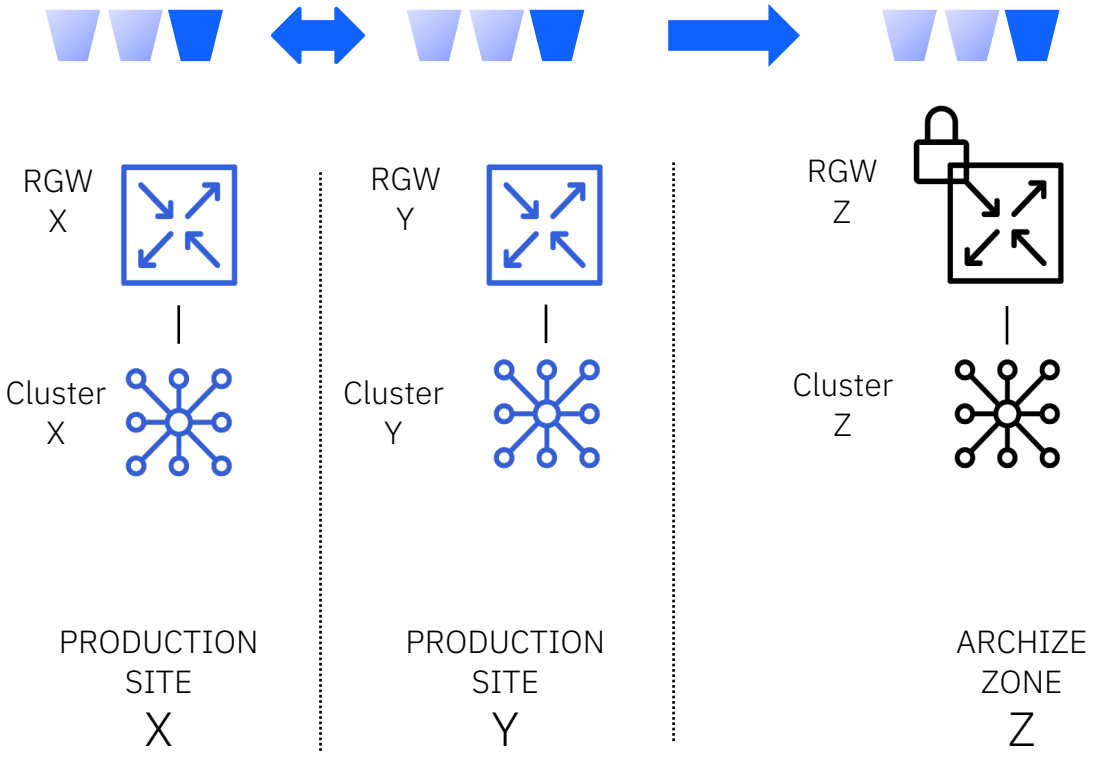
Enables for recovery of any version of any object that existed on production sites.

In case of data loss, ransomware or disaster recovery, still all valid versions of all objects can be recovered easily.

Also suitable for compliancy related use cases.

Functionality

Object archive zone with bucket granularity



Object archive zone bucket granularity

Allows clients to enable or disable replication to the archive zone on a per object bucket case.

Distinctions can be made based on a single bucket granular level.

Object archive zone granular choice

Goal is to reduce data storage in the archive zone.

In example, a set of test/development buckets are probably non-business critical.

System administrators may than decide to disable replication to the archive zone for these types of object data buckets.

Learning resources

IBM Storage Ceph resources

IBM website

IBM Storage Ceph enterprise downstream
https://www.ibm.com/products/ceph

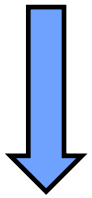
IBM Seismic

Ceph
Sales Kit on Seismic
http://seismic.ceph.blue

Cohasset Inc. Report

Ceph Object Lock (WORM) certification

Report download link



https://www.ibm.com/downloads/cas/PJZN8VE3

IBM Ceph easy demo videos

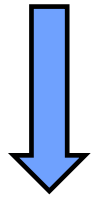
IBM Storage Ceph video demos
http://easy.ceph.blue

IBM Storage Ceph

IBM Storage Ceph Documentation
http://docs.ceph.blue

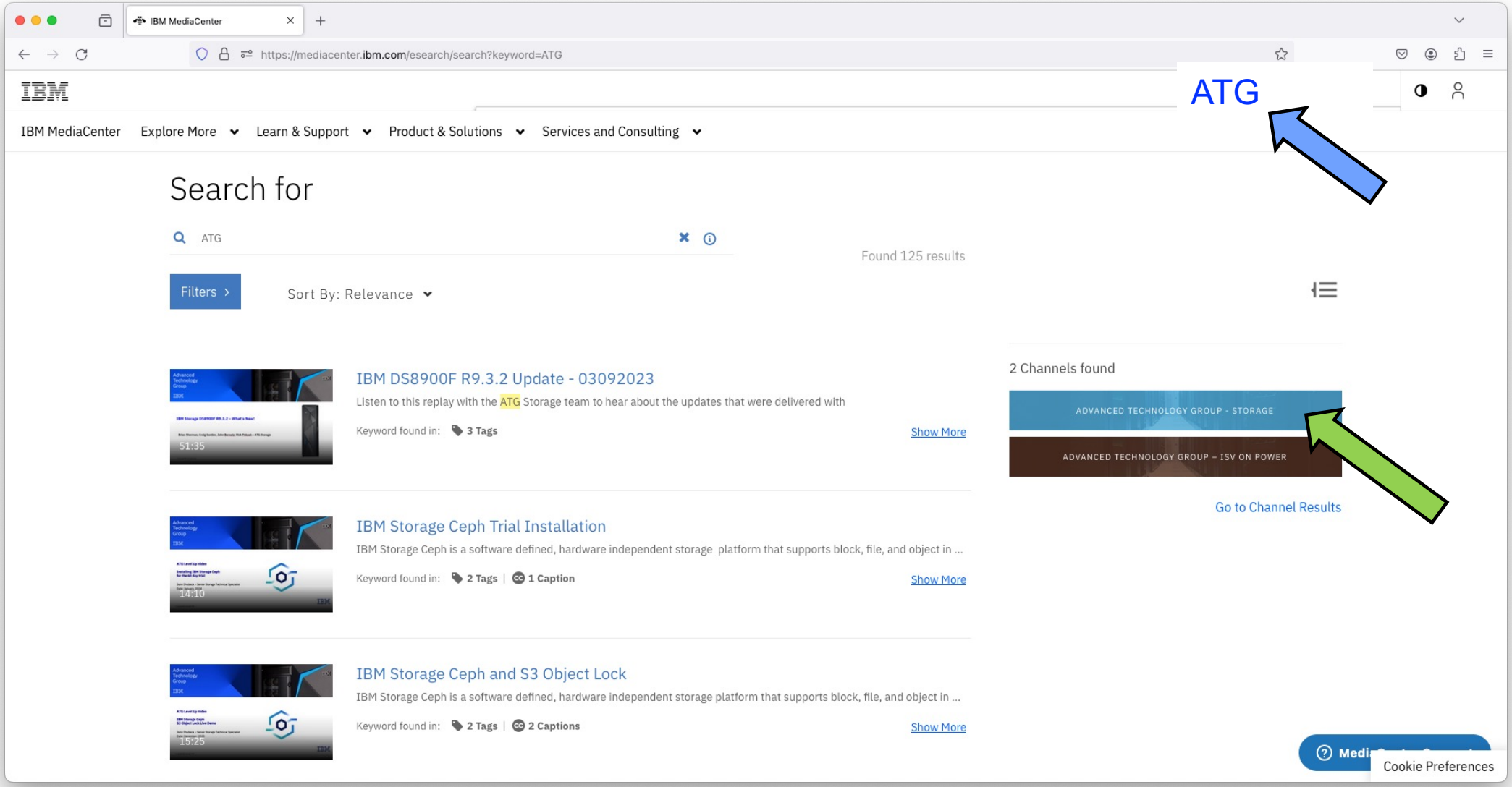
IBM Community Blog

Blogpost about IBM Storage Ceph 7.0
Link to blogpost



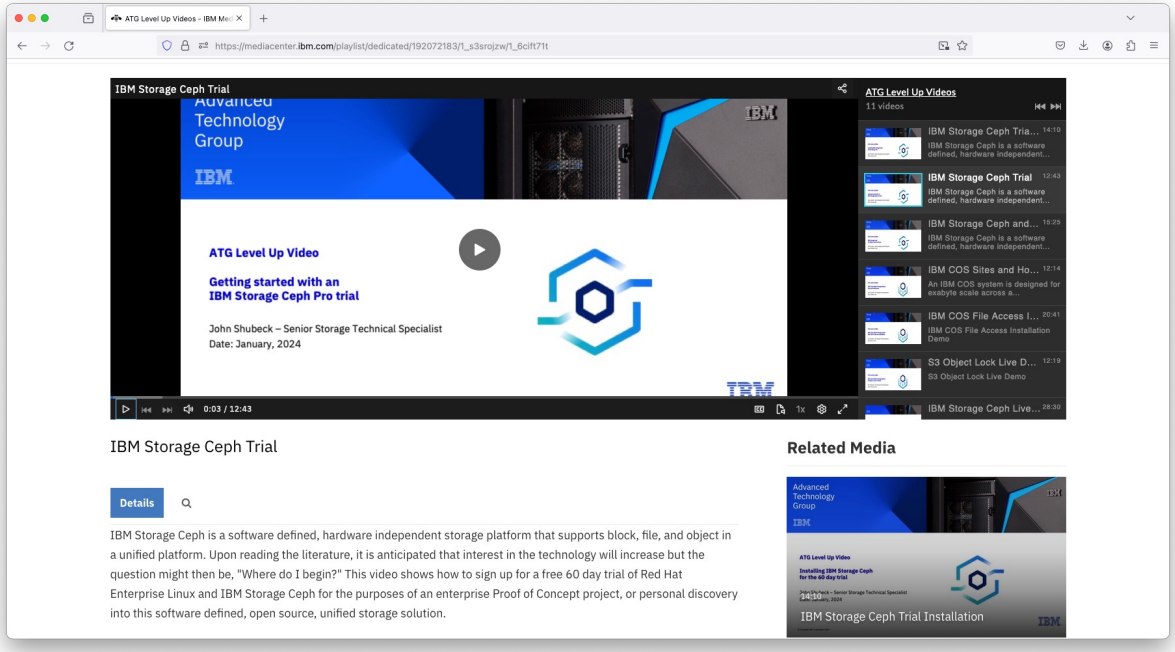
https://community.ibm.com

IBM Storage Ceph Videos at https://mediacenter.ibm.com



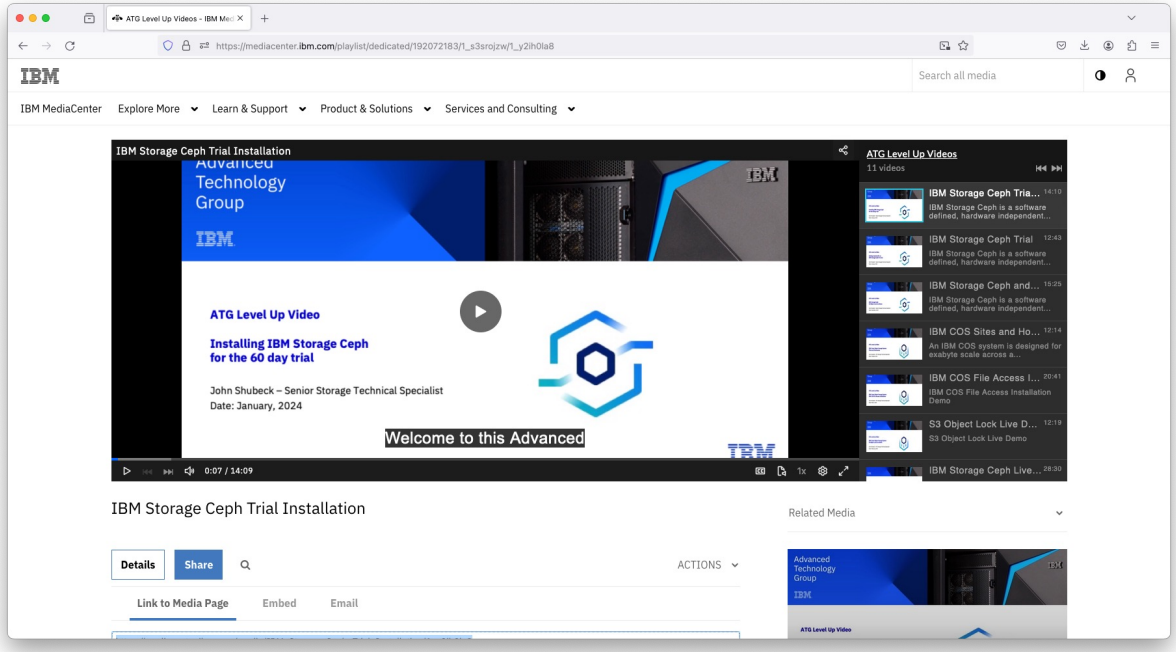
IBM Storage Ceph Trial videos

How to sign up and get subscriptions



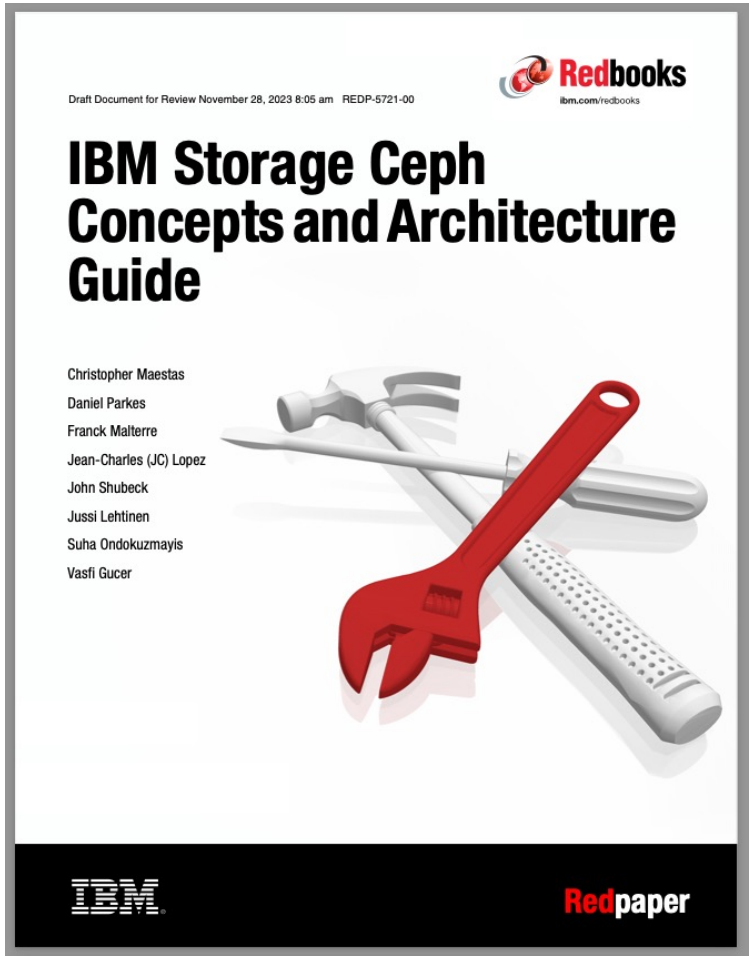
https://mediacenter.ibm.com/media/IBM+Storage+Ceph+Trial/1_6cift71t

How to install a POC cluster

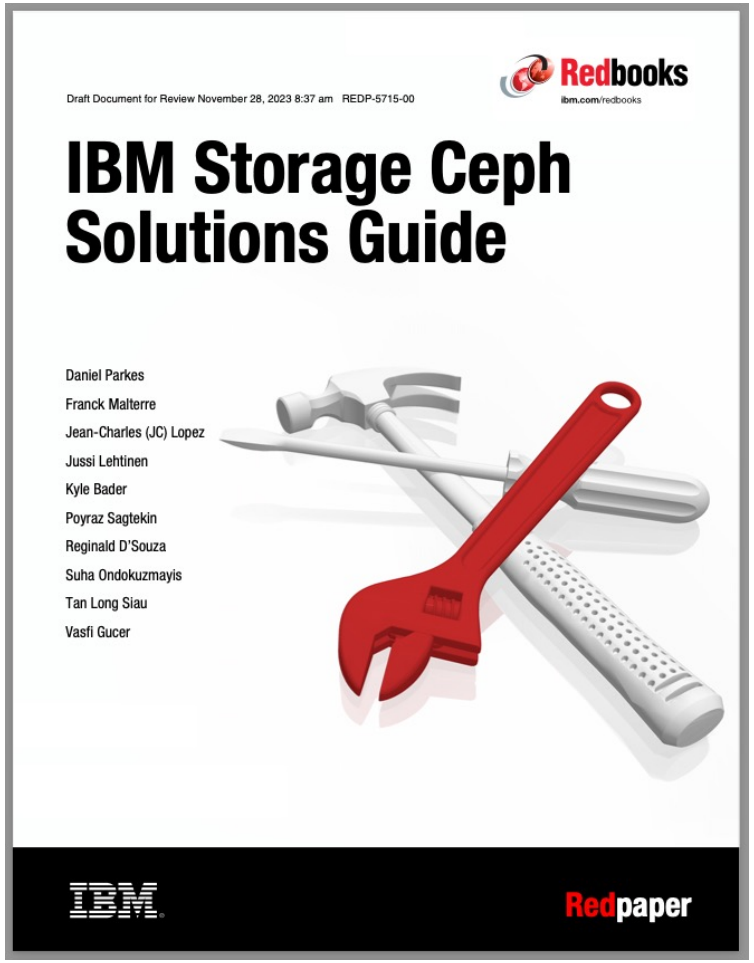


https://mediacenter.ibm.com/media/IBM+Storage+Ceph+Trial+Installation/1_y2ih0la8

IBM Storage Ceph Redbooks

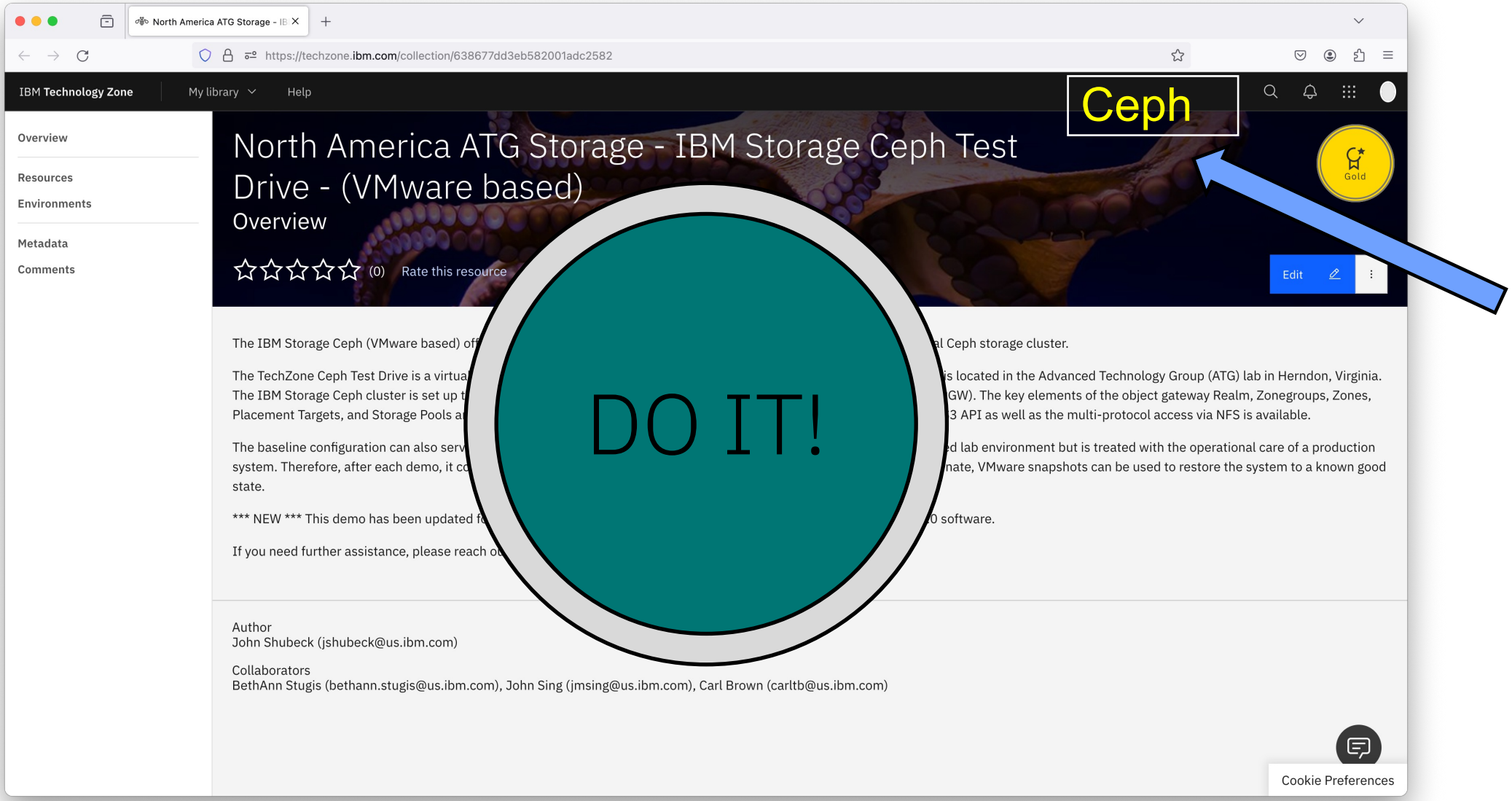


https://www.redbooks.ibm.com/abstracts/redp5721.html



https://www.redbooks.ibm.com/abstracts/redp5715.html

IBM TechZone for IBM Storage Ceph Test Drive



Accelerate with ATG Survey

Please take a moment to share your feedback with our team!

You can access this 6-question survey via Menti.com with code 1708 6924 or

Direct link https://www.menti.com/alwhyze7z1gz

Or

QR Code