



# CEPH DAYS SEATTLE

## Optimizing Ceph Object Storage

Intelligent Data Placement Using Embedded LUA in RGW

Steve Umbehocker  
CTO/CEO, OSNexus

# The Problem with Small Objects in EC Pools

## ➤ Performance Pitfalls

- Small objects written to EC pools often suffer from poor performance due to the overhead of encoding and decoding.

## ➤ Padding Waste

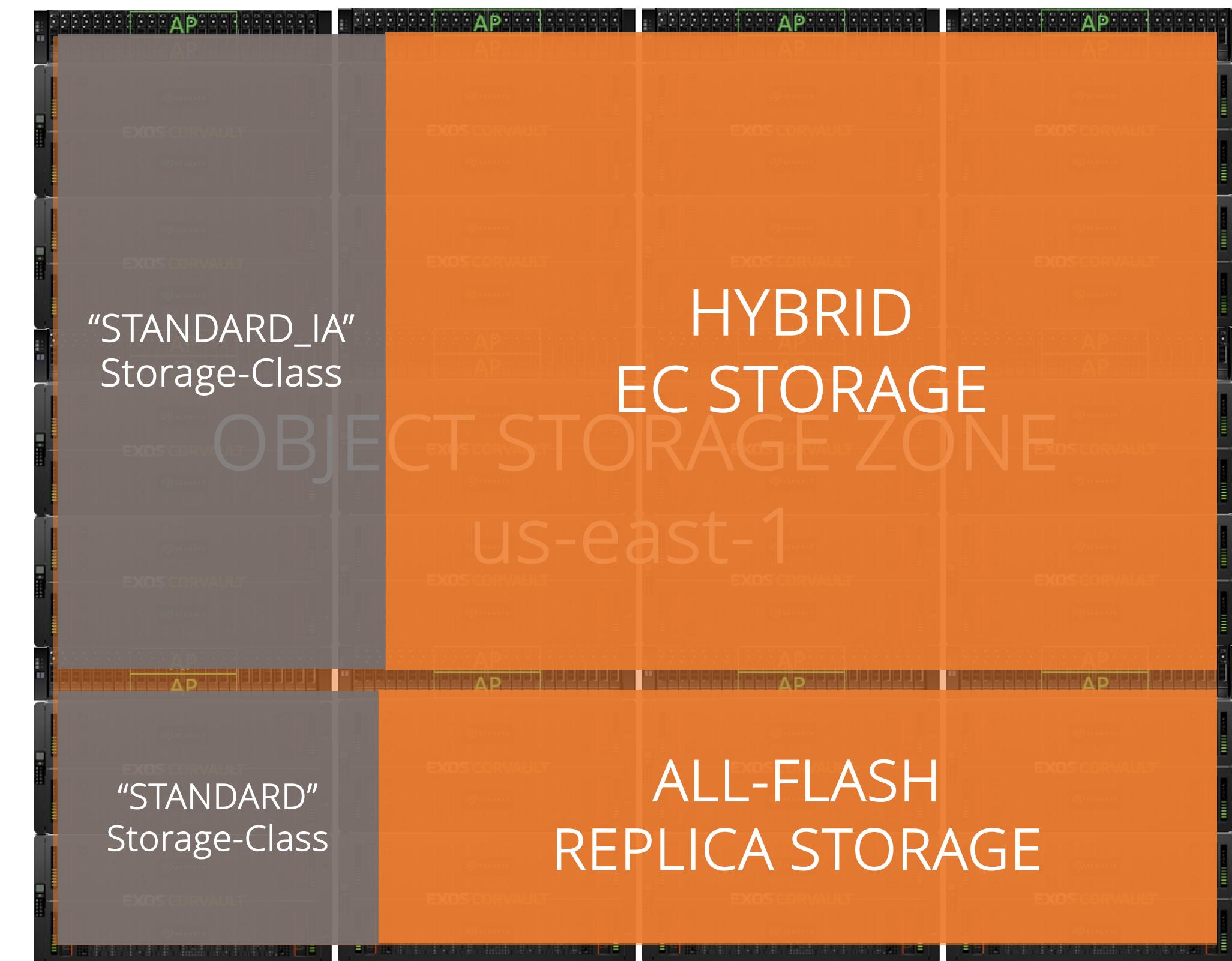
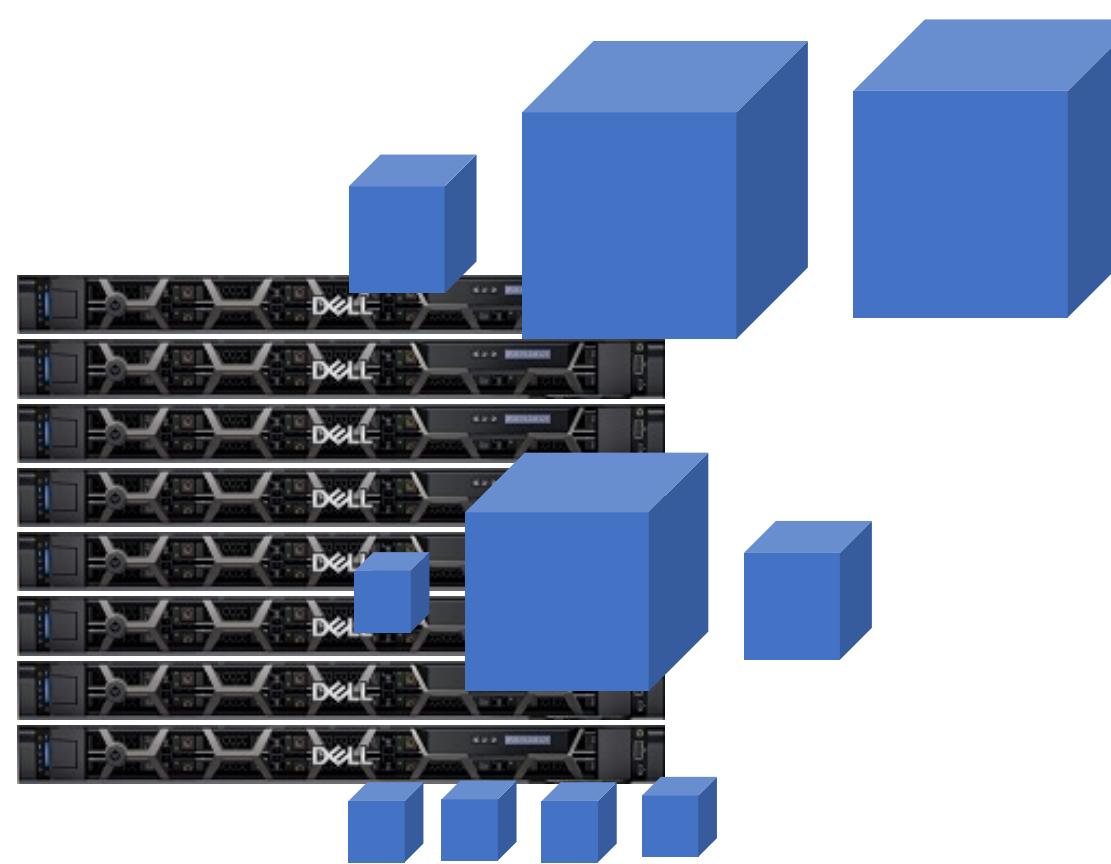
- EC stripe width causes objects to be padded, which can waste space and reduce effective capacity.

## ➤ Real-World Impact

- Slower ingest rates
- Higher latency
- Suboptimal storage utilization

# Data Placement Matters

- **Goal:** Minimize performance impact and storage overhead by intelligently routing small vs large object writes.
- **Why EC Still Matters:** Critical for reducing cost at scale—just not ideal for every object.



# QuantaStor's Approach / How We Solved It

## ➤ Intelligent Data Placement Rules

- Uses LUA script embedded into RGW instances combined with rules configuration files
- User specified rules are deployed across all RGW nodes to enforce smart data placement

## ➤ Multiple Storage Classes

- Replicated 'STANDARD' storage-class for small objects (typically all-flash)
- EC 'STANDARD\_IA' storage-class for large objects (typically hybrid)

## ➤ Example LUA Code

- Early example of LUA code used in QuantaStor available on GitHub  
(<https://github.com/OSNEXUS/rgw-autotier>)

# Demo / Intelligent Data Placement

## ➤ QuantaStor Community Edition

- Free, ISO and OVA available from <https://osnexus.com/downloads>
- Community Edition limited to 4 nodes, 400TB
- QuantaStor uses standard Ubuntu Linux 22.04 + Ceph packages

## ➤ Links

- <https://ceph.io/en/news/blog/2024/auto-tiering-ceph-object-storage-part-1/>
- <https://ceph.io/en/news/blog/2024/auto-tiering-ceph-object-storage-part-2/>

# Demo / Intelligent Data Placement

**OSNEXUS QuantaStor Manager**

The screenshot displays the OSNEXUS QuantaStor Manager web interface. At the top, there's a navigation bar with links for Grid Dashboard, Storage Management, Security, Remote Replication, Cloud Integration, Scale-out Storage Configuration, Multitenancy, Welcome, admin, Logout, About, and Help.

The main area features several monitoring and management sections:

- Storage System:** Includes License Manager, Modify, Upgrade Manager, Alert Manager, Getting Started, Recovery Manager, Send Support Logs, and Health Checker.
- Network Port:** Includes Create Virtual Port, Create VLAN Port, Create Bonded Port, Modify, Online, Delete Virtual Port, Delete VLAN Port, Delete Bonded Port, Rescan All, Offline, Create Grid, Modify Grid, Add System, Delete Grid, Set Grid Master, Remove System, and Active Directory.
- System Configuration [cephdays-grid : cephdays-190]:** Shows a tree view of the storage grid with nodes: cephdays-grid, cephdays-190, cephdays-191, cephdays-192, and cephdays-193. A large green arrow points from the title to this section.
- Storage System Dashboard (cephdays-190):** Contains three performance charts: CPU, Network, and Memory.
- Network Ports (cephdays-190):** Lists network ports: ens192 (Normal, Link Up, 10Gb/sec, IP 10.0.8.190) and ens224 (Offline, Disabled, 10Gb/sec).
- Tasks [5] / Alerts [22]:** Shows a table of recent tasks and alerts.



# Demo / Intelligent Data Placement

The screenshot shows the OSNEXUS QuantaStor Manager web interface. The main navigation bar includes links for Grid Dashboard, Storage Management, Security, Remote Replication, Cloud Integration, High-availability VIF Management, Scale-out Storage Configuration, and Multitenancy. The user 'admin' is logged in at the top right.

The central panel displays the 'Getting Started / Configuration Guide' titled 'Getting Started'. It features a 'Configuration Workflows' sidebar with sections for Initial Setup, Pool Setup, Provisioning Setup, and Misc Setup, each containing several configuration steps. The 'Initial Setup' section includes 'System Setup', 'Storage Grid Setup', and 'Security Setup'. The 'Pool Setup' section includes 'Setup Scale-up Storage Pool', 'Setup Scale-out Object Pool', 'Setup Scale-out File Pool', and 'Setup Scale-out Block Pool'. The 'Provisioning Setup' section includes 'Provision File Storage', 'Provision Block Storage', and 'Provision Object Storage'. The 'Misc Setup' section includes 'Setup Remote-Replication' and 'Setup Cloud Integration'.

The main content area of the guide provides a step-by-step 'Setup Scale-out Object Pool' process:

- Step 1:** Create Cluster - Scale-out storage clusters can simultaneously deliver file, block and object storage and must be comprised of at least three (3) or more Storage Systems.
- Step 2:** Create OSDs & Journals - Devices must be assigned to the cluster before storage pools can be provisioned. Systems using HDDs must also have some SSDs in each system to accelerate write performance and metadata access via Journal Groups.
- Step 3:** Create Object Pool Group - An Object Pool Group must be created before S3C storage buckets can be provisioned.
- Step 4:** Add Object Gateway - Select the storage cluster nodes to deploy new Object Gateways services instances onto. Users will be able to access their object storage buckets via these nodes and it is recommended to deploy Object Gateways on all nodes for best performance.
- Step 5:** Create Object User - Create one or more Object User (each contains an 'access key' and 'secret key') for accessing S3C Buckets.
- Step 6:** Create Object Bucket - Create one or more buckets for writing object storage via the S3C protocol.

At the bottom of the guide, there are buttons for Previous, Next, OK, and Cancel. The status bar at the bottom shows 'Connected' and includes 'Clear Tasks' and 'Dismiss Alerts' buttons.



# Demo – Create Cluster

The screenshot shows the OSNEXUS QuantaStor Manager web interface. At the top, there's a navigation bar with links like Grid Dashboard, Storage Management, Security, Remote Replication, Cloud Integration, High Availability, Scale-out Storage Configuration, Multitenancy, Welcome, admin, Logout, About, and Help.

In the main area, there's a 'Scale-out Cluster Management' section with buttons for Create Cluster, Add Member, Modify Cluster, Adjust Clocks, Delete Cluster, Remove Member, and Cluster Import. Below this is a 'System Configuration [cephdays-grid : cephdays-190]' section showing 'Scale-out Storage Clusters' with a message: 'No Ceph Cluster was detected.'

A large green arrow points from the top left towards the 'Create Cluster' button in the main menu. Another green arrow points from the bottom left towards the 'Select Ceph Cluster Interfaces' table. A third green arrow points from the bottom right towards the 'OK' button in the configuration dialog.

The central part of the screen displays a 'Create Ceph Cluster Configuration' dialog. It has tabs for General, Encryption, and Advanced Settings. Under General, there's a text input for 'Name' containing 'cephdays-cluster'. Under Select Ceph Cluster Interfaces, there's a table with columns for System, Client Interface, and Backend Interface. Five interfaces are listed: cephdays-190, cephdays-191, cephdays-192, cephdays-193, and System. All interfaces have their Client and Backend interfaces set to '10.0.8.190 (10Gb/sec)'. Under the table, there are checkboxes for 'Enable Compression' (checked) and 'Enable Encryption' (unchecked). At the bottom of the dialog are 'OK' and 'Cancel' buttons.

At the bottom of the screen, there's a 'Tasks [5]' section showing two completed tasks: 'Joining Node to Grid' and 'Activating License Key', both with a status of 'Completed' and a progress of '100% complete'. There's also a 'Connected' status indicator and buttons for 'Clear Tasks' and 'Dismiss Alerts'.

# Demo – Created Cluster

**OSNEXUS QuantaStor Manager**

Welcome, admin | Logout | About |  

Grid Dashboard | Storage Management | Security | Remote Replication | Cloud Integration | High-availability VIF Management | Scale-out Storage Configuration | Multitenancy

**Scale-out Cluster Management**

- Create Cluster
- Add Member
- Modify Cluster
- Adjust Clocks
- Delete Cluster
- Remove Member
- Cluster Import

**Service Management**

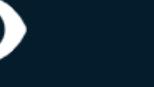
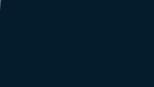
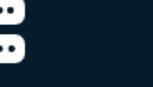
- Add Monitor
- Add MDS
- Add Object Gateway
- Remove Monitor
- Remove MDS
- Remove Object Gateway

**System Configuration [cephdays-grid : cephdays-190]**

**Scale-out Storage Clusters**

- cephdays-cluster
  - cephdays-190
  - cephdays-191
  - cephdays-192
  - cephdays-193

**Ceph Cluster Dashboard (cephdays-cluster)**

 <b>HEALTH_WARN</b> Health	 <b>0/0</b> OSDs Up	 <b>3/3</b> MONs in Quorum	 <b>0/0</b> Pools Online	 <b>0/0</b> Object Gateways	 <b>0/0</b> Metadata Servers	 <b>0/0</b> Load Balancers
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Health Details | Cluster Members | Cluster Monitors | Object Gateways | File System Metadata Server | Load Balancer

Name	Status	OSDs Up	Monitor Status	Object Gateway ...	Domain Suffix	Client Interface	Client Interface State	Backend Interface	Backend Interface State
cephdays-190 (manager)	Normal	0/0	Normal	[unconfigured]	osnexus.net	10.0.8.190	Normal	10.0.8.190	Normal
cephdays-191	Normal	0/0	Normal	[unconfigured]	osnexus.net	10.0.8.191	Normal	10.0.8.191	Normal
cephdays-192	Normal	0/0	Normal	[unconfigured]	osnexus.net	10.0.8.192	Normal	10.0.8.192	Normal
cephdays-193	Normal	0/0	[unconfigured]	[unconfigured]	osnexus.net	10.0.8.193	Normal	10.0.8.193	Normal

**Data & Journal Devices**

**Scale-out Storage Pools**

**Tasks [6] | Alerts [24]**

Start Time	Task	Status	Detail	Storage System	User	Progress
Thu May 15 00:52:42 GMT-700...	Create Scale-out Storage Cluster (Cep...	Completed	Ceph Cluster creation completed.	cephdays-190	admin	100% complete
Thu May 15 00:39:01 GMT-700...	Joining Node to Grid	Completed	Adding local Storage System node 'cephdays-193' to Storage Grid 'cephdays-grid'	cephdays-193	admin	100% complete

Connected |  Clear Tasks |  Dismiss Alerts

# Demo – Create OSDs

The screenshot shows the OSNEXUS QuantaStor Manager web interface. The main menu at the top includes 'Grid Dashboard', 'Storage Management', 'Security', 'Remote Replication', 'Cloud Integration', 'High-availability VIF Management', 'Scale-out Storage Configuration', and 'Multitenancy'. The 'Welcome, admin' message is displayed in the top right.

The central area is titled 'Data & Journal Devices' and contains a sub-menu for 'Create OSDs & Journals'. The 'System Configuration [cephdays-grid]' section shows a Ceph Cluster named 'cephdays-cluster'. On the left, there's a tree view under 'Data & Journal Devices' with nodes like 'cephdays-cluster', 'cephdays-190', 'cephdays-191', 'cephdays-192', and 'cephdays-193'. Below this is a 'Scale-out Storage Pools' section.

A large modal window titled 'Create OSDs & Journals' is open in the center. It contains a table of available devices (e.g., 'cephdays-190' with multiple drives) and a configuration section for 'OSD Optimization via Journal Groups'. This section includes checkboxes for 'Auto-create Write-ahead Log (WAL) devices' (set to 2 GB), 'Auto-create Meta-data Offload (MDB) devices' (set to 60 GB), 'Allow provisioning from pre-existing Journal Groups', 'Block creation of external WAL/MDB for SSD based OSDs', and 'Enable Dynamic Incremental Re-weighting'. At the bottom of the modal is an 'Auto Config' button, which is highlighted with a green arrow.

The bottom of the screen shows a 'Tasks [6]' and 'Alerts [24]' section, and a status bar indicating 'Connected'.



# Demo – Created OSDs

**OSNEXUS QuantaStor Manager**

Welcome, admin | Logout | About | ☰ | 🌐

Grid Dashboard | Storage Management | Security | Remote Replication | Cloud Integration | High-availability VIF Management | Scale-out Storage Configuration | Multitenancy

**Data & Journal Devices**

- Create OSDs & Journals
- Create Journal Group
- Modify OSD
- Replace Prepare OSD
- Multi-Delete OSD
- Delete Journal Group
- Service OSD
- Replace OSD

**System Configuration [cephdays-grid : cephdays-190]**

**Ceph Cluster Dashboard (cephdays-cluster)**

HEALTH_OK	16/16 OSDs Up	3/3 MONs in Quorum	0/0 Pools Online	0/0 Object Gateways	0/0 Metadata Servers	0/0 Load Balancers
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**Data & Journal Devices**

- cephdays-cluster
  - cephdays-190
    - journal-group-vg-efc8da8d
    - osd.0
    - osd.1
    - osd.2
    - osd.3
  - cephdays-191
    - journal-group-vg-f5b0b20c
    - osd.11
    - osd.14
    - osd.6
    - osd.9
  - cephdays-192
    - journal-group-vg-6a4593f9
    - osd.10
    - osd.13
    - osd.4
    - osd.7
  - cephdays-193

**Scale-out Storage Clusters**

**Data Devices/OSDs (cephdays-cluster)**

Name	State	Status	Size	Free Space	Utilized Space	% Utilized	Weight	Storage System	Storage Device	Journal Device (WA...)	Journal Device (DB)
osd.0	Normal	exists;up	10.52GB (9.79G...)	10.48GB (9.76G...)	40MB (38MiB)	0% Utilized	0.01	cephdays-190	sdd (scsi-36000c29...)	wal-lv-e316e5b4	mdb-lv-6da87bb1
osd.1	Normal	exists;up	10.52GB (9.79G...)	10.48GB (9.76G...)	40MB (38MiB)	0% Utilized	0.01	cephdays-190	sdg (scsi-36000c29f...)	wal-lv-481e7888	mdb-lv-5de8caf6
osd.10	Normal	exists;up	10.52GB (9.79G...)	10.48GB (9.76G...)	40MB (38MiB)	0% Utilized	0.01	cephdays-192	sde (scsi-36000c29...)	wal-lv-b63bb7aa	mdb-lv-2d2b3fee
osd.11	Normal	exists;up	10.52GB (9.79G...)	10.47GB (9.76G...)	41MB (39MiB)	0% Utilized	0.01	cephdays-191	sdf (scsi-36000c294...)	wal-lv-9a92a207	mdb-lv-de29c79c
osd.12	Normal	exists;up	10.52GB (9.79G...)	10.48GB (9.76G...)	40MB (38MiB)	0% Utilized	0.01	cephdays-193	sdg (scsi-36000c29...)	wal-lv-286cc3fc	mdb-lv-49ca9149
osd.14	Normal	exists;up	10.52GB (9.79G...)	10.48GB (9.76G...)	40MB (38MiB)	0% Utilized	0.01	cephdays-191	sde (scsi-36000c29...)	wal-lv-a282ebab	mdb-lv-bf62a6a9
osd.15	Normal	exists;up	10.52GB (9.79G...)	10.47GB (9.76G...)	41MB (39MiB)	0% Utilized	0.01	cephdays-193	sdd (scsi-36000c29...)	wal-lv-33b099a6	mdb-lv-1d2c8e1c
osd.4	Normal	exists;up	10.52GB (9.79G...)	10.48GB (9.76G...)	40MB (38MiB)	0% Utilized	0.01	cephdays-192	sdd (scsi-36000c29...)	wal-lv-107ed973	mdb-lv-419aa91d
osd.5	Normal	exists;up	10.52GB (9.79G...)	10.48GB (9.76G...)	40MB (38MiB)	0% Utilized	0.01	cephdays-193	sde (scsi-36000c29...)	wal-lv-1a891d87	mdb-lv-a8b04051
osd.6	Normal	exists;up	10.52GB (9.79G...)	10.48GB (9.76G...)	40MB (38MiB)	0% Utilized	0.01	cephdays-191	sdg (scsi-36000c29...)	wal-lv-c4ccc80e	mdb-lv-47a8dea3
osd.7	Normal	exists;up	10.52GB (9.79G...)	10.48GB (9.76G...)	40MB (38MiB)	0% Utilized	0.01	cephdays-192	sdg (scsi-36000c29f...)	wal-lv-b8ee6b59	mdb-lv-1587d1ff
osd.8	Normal	exists;up	10.52GB (9.79G...)	10.48GB (9.76G...)	41MB (39MiB)	0% Utilized	0.01	cephdays-193	sdf (scsi-36000c29...)	wal-lv-09cdd8f2	mdb-lv-21bdde24

Displaying 1 - 16 of 16

**Tasks [59] Alerts [25]**

Start Time	Task	Status	Detail	Storage System	User	Progress
Thu May 15 01:11:32 GMT-700...	Create Ceph Journal Device	Completed	Provisioning mirrored Ceph Metadata-Offload of size '3 GB' from Journal Group 'journal-group-vg-276c4ee6'.	cephdays-193	admin	100% complete
Thu May 15 01:11:32 GMT-700...	Create Ceph Journal Device	Completed	Provisioning mirrored Ceph Metadata-Offload of size '3 GB' from Journal Group 'journal-group-vg-f5b0b20c'.	cephdays-191	admin	100% complete

Connected # Clear Tasks | Dismiss Alerts

# Demo – Create Object Pool Group (Zone)

The screenshot shows the OSNEXUS QuantaStor Manager interface. At the top, there is a navigation bar with links for Grid Dashboard, Storage Management, Security, Remote Replication, Cloud Integration, High-availability VIF Management, Scale-out Storage Configuration, and Multiitenancy. The Scale-out Storage Configuration tab is active.

The main area is divided into several sections:

- EC Profiles & Rules**: Create EC Pool Profile, Create Redundancy Rule, Delete EC Pool Profile, Delete Redundancy Rule.
- Block Storage**: Create Object Pool Group, Add Object Gateway, Delete Object Pool Group, Remove Object Gateway.
- Object Storage**: Setup Multi-Site Object Storage, Modify Object Pool Group, Unconfigure Multi-Site Object Storage.
- File Storage**: Add MDS, Create File Storage Pool, Modify File Storage Pool, Create Object Storage Class, Remove MDS, Delete File Storage Pool.

A large green arrow points from the left towards the "Create Object Pool Group" button in the Block Storage section.

The central part of the interface is the "Ceph Cluster Dashboard (cephdays-cluster)". It displays various cluster status metrics and components:
 

- Health: HEALING
- Gateways: 0/0
- Metadata Servers: 0/0
- Load Balancers: 0/0
- Free Space: 156.17GiB (76.49%)
- Utilized Space: 48.01GiB (23.51%)

A modal window titled "Create Object Pool Group" is open in the center. It has tabs for General and Advanced Settings, with General selected. The General tab contains fields for Ceph Cluster (set to "cephdays-cluster"), Description, Zone Settings (Zone: us-east-1, Realm/Zone Group: us), and Data Pool Layout (Type: Replica-3 (Triple-Mirror)). The Data Pool Layout section includes options for Set Manually (Data Chunks (K): 2, Code Chunks (M): 2) or Use Profile (default), and a Scaling Factor (%) slider set to 50. A checkbox for "Force (Required for Erasure M=1)" is also present. A large green arrow points from the left towards this modal window.

At the bottom right of the modal window, there are "OK" and "Cancel" buttons. A final large green arrow points from the bottom right towards the "OK" button.

At the bottom of the interface, there is a "Tasks [59]" section listing completed tasks related to Ceph Journal Device provisioning, and an "Alerts [25]" section.

# Demo – Created Object Pool Group (Zone)

**OSNEXUS QuantaStor Manager**

Welcome, admin | Logout | About | Help | Print

Grid Dashboard | Storage Management | Security | Remote Replication | Cloud Integration | High-availability VIF Management | Scale-out Storage Configuration | Multitenancy

EC Profiles & Rules | Block Storage | Object Storage | File Storage

Create EC Pool Profile | Create Redundancy Rule | Create Block Storage Pool | Create Object Pool Group | Setup Multi-Site Object Storage | Add MDS | Create File Storage Pool | Modify EC Pool Profile | Delete Redundancy Rule | Delete Block Storage Pool | Delete Object Pool Group | Remove Object Gateway | Unconfigure Multi-Site Object Storage | Remove MDS | Create Object Storage Class | Modify File Storage Pool

System Configuration [cephdays-grid : cephdays-190] | Ceph Cluster Dashboard (cephdays-cluster)

Scale-out Storage Clusters | Data & Journal Devices | Scale-out Storage Pools

cephdays-cluster | us-east-1 [Object Pool Group] | .rgw.root | us [Realm/Zone Group] | us-east-1 [Local Zone, Master] | STANDARD [Storage-Class] | us-east-1.rgw.buckets.data | us-east-1.rgw.buckets.index

Health: HEALTH\_OK | OSDs Up: 16/16 | MONs in Quorum: 3/3 | Pools Online: 3/3 | Object Gateways: 0/0 | Metadata Servers: 0/0 | Load Balancers: 0/0

Placement Groups Health: 100% | Cluster Storage Capacity: 23.51% Utilized (48.01GiB, 23.51%) | 76.49% Free (156.17GiB, 76.49%)

Scale-out Storage Pools | Ceph File System | EC Profiles | Redundancy Rules | Object Pool Groups

Name	Managed By	Pool Group	State	Free Space	Utilized Space	% Utilized	Object Count	Placement Groups	Pool Type	Min Replicas	M
.rgw.root	cephdays-190	us-east-1	Normal	52.23GB (4...	0B (0B)	0% Utilized	13	32	replicated	2	3
us-east-1.rgw.buckets.data	cephdays-190	us-east-1	Normal	52.23GB (4...	0B (0B)	0% Utilized	1	256	replicated	2	3
us-east-1.rgw.buckets.index	cephdays-190	us-east-1	Normal	52.23GB (4...	0B (0B)	0% Utilized	1	8	replicated	2	3

Tasks [60] | Alerts [25]

Start Time	Task	Status	Detail	Storage System	User	Progress
Thu May 15 01:17:42 GMT-700...	Creating Ceph (S3) Object Storage Zone	Completed	Completed auto configuring NFS services for all nodes in Ceph Cluster 'cephdays-cluster'.	cephdays-190	admin	100% complete
Thu May 15 01:11:32 GMT-700...	Create Ceph Journal Device	Completed	Provisioning mirrored Ceph Metadata-Offload of size '3 GB' from Journal Group 'journal-group-vg-276c4ee6'.	cephdays-193	admin	100% complete

Connected | Clear Tasks | Dismiss Alerts



# Demo – Create RGW & Load-Balancer Instances

**OSNEXUS QuantaStor Manager**

Welcome, admin | Logout | About | Help | Print

**EC Profiles & Rules**

- Create EC Pool Profile
- Create Redundancy Rule
- Delete EC Pool Profile
- Delete Redundancy Rule

**Block Storage**

- Create Block Storage Pool
- Create Object
- Delete Block Storage Pool
- Delete Object

**System Configuration [cephdays-grid : cephdays-190]**

**Scale-out Storage Clusters**

**Data & Journal Devices**

**Scale-out Storage Pools**

- cephdays-cluster
  - us-east-1 [Object Pool Group]
    - .rgw.root
  - us [Realm/Zone Group]
    - us-east-1 [Local Zone, Master]
      - STANDARD [Storage-Class]
        - us-east-1.rgw.buckets.data
        - us-east-1.rgw.buckets.index
        - us-east-1.rgw.log

**Ceph Cluster Dashboard (cephdays-grid : cephdays-190)**

HEALTH\_WARN

Placeholders

88.04%

**Add Object Gateway**

General Advanced Settings

Select the storage cluster nodes to deploy new Object Gateways services instances onto. Users will be able to access their object storage buckets via these nodes and it is recommended to deploy Object Gateways on all nodes for best performance.

Ceph Cluster: cephdays-cluster

Certificate (PEM):

Object Gateway Deployment Settings

Ceph Cluster Member	Network Port
cephdays-190	10.0.8.190 (10Gb/sec)
cephdays-191	10.0.8.191 (10Gb/sec)
cephdays-192	10.0.8.192 (10Gb/sec)
cephdays-193	10.0.8.193 (10Gb/sec)

**File Storage**

- Add MDS
- Create File Storage Pool
- Modify File Storage Pool
- Remove MDS
- Delete File Storage Pool

**Object Gateways** 0/0

**Metadata Servers** 0/0

**Load Balancers** 0/0

**Storage Capacity**

- Free (156.17GiB, 76.49%)
- Utilized (48.01GiB, 23.51%)

**Utilized Object Count Placement Groups Pool Type Min Replicas Max Replicas**

% Utilized	13	32	replicated	2
% Utilized	1	256	replicated	2
% Utilized	1	8	replicated	2
% Utilized	0	0	replicated	0

**Tasks [60] Alerts [25]**

Start Time	Task	Status	Detail
Thu May 15 01:17:42 GMT-700...	Creating Ceph (S3) Object Storage Zone	Completed	Completed auto-configuring NFS services for all nodes in Ceph Cluster 'cephdays-cluster'.
Thu May 15 01:11:32 GMT-700...	Create Ceph Journal Device	Completed	Provisioning mirrored Ceph Metadata-Offload of size '3 GB' from Journal Group 'journal-group-vg-276c4ee6'.

Connected | Clear Tasks | Dismiss Alerts

# Demo – Create RGW & Load-Balancer Instances

**OSNEXUS QuantaStor Manager**

Welcome, admin | Logout | About | ☰ | 📈

**Scale-out Cluster Management**

- Create Cluster
- Add Member
- Modify Cluster
- Adjust Clocks
- Delete Cluster
- Remove Member
- Cluster Import

**Service Management**

- Add Monitor
- Add MDS
- Add Object Gateway
- Remove Monitor
- Remove MDS
- Remove Object Gateway

**System Configuration [cephdays-grid : cephdays-190]**

**Ceph Cluster Dashboard (cephdays-cluster)**

**Scale-out Storage Clusters**

- cephdays-cluster
  - cephdays-190
    - load-balancer.cephdays-190 (haproxy)
    - mon.cephdays-190
    - rgw.cephdays-190
  - cephdays-191
    - load-balancer.cephdays-191 (haproxy)
    - mon.cephdays-191
    - rgw.cephdays-191
  - cephdays-192
    - load-balancer.cephdays-192 (haproxy)
    - mon.cephdays-192
    - rgw.cephdays-192
  - cephdays-193
    - load-balancer.cephdays-193 (haproxy)
    - rgw.cephdays-193

**Placement Groups Health**

**Cluster Storage Capacity**

**Health Details** | **Cluster Members** | Cluster Monitors | Object Gateways | File System Metadata Server | Load Balancer

Name	Status	OSDs Up	Monitor Status	Object Gateway ...	Domain Suffix	Client Interface	Client Interface State	Backend Interface	Backend Interface State
cephdays-cluster									
cephdays-190 (manager)	Normal	4/4	Normal	Normal	osnexus.net	10.0.8.190	Normal	10.0.8.190	Normal
cephdays-191	Normal	4/4	Normal	Normal	osnexus.net	10.0.8.191	Normal	10.0.8.191	Normal
cephdays-192	Normal	4/4	Normal	Normal	osnexus.net	10.0.8.192	Normal	10.0.8.192	Normal
cephdays-193	Normal	4/4	[unconfigured]	Normal	osnexus.net	10.0.8.193	Normal	10.0.8.193	Normal

**Tasks [64]** | **Alerts [25]**

Start Time	Task	Status	Detail	Storage System	User	Progress
Thu May 15 01:22:25 GMT-700...	Add Ceph Object (RADOS) Gateway	Completed	S3 (RADOS) Gateway setup completed successfully for cluster 'cephdays-cluster'.	cephdays-193	admin	100% complete
Thu May 15 01:22:25 GMT-700...	Add Ceph Object (RADOS) Gateway	Completed	S3 (RADOS) Gateway setup completed successfully for cluster 'cephdays-cluster'.	cephdays-191	admin	100% complete

Connected | Clear Tasks | Dismiss Alerts

# Demo – Create EC Pool / Storage Class STANDARD\_IA

**OSNEXUS QuantaStor Manager**

Welcome, admin | Logout | About | Help | Print

**EC Profiles & Rules**

**Block Storage**

**Object Storage**

**File Storage**

**System Configuration [cephdays-grid : cephdays-190]**

**Scale-out Storage Clusters**

**Data & Journal Devices**

**Scale-out Storage Pools**

- cephdays-cluster
  - us-east-1 [Object Pool Group]
    - .rgw.root
    - us-east-1.rgw.buckets
    - us-east-1.rgw.buckets.data
    - us-east-1.rgw.buckets.index
    - us-east-1.rgw.control
    - us-east-1.rgw.log
    - us-east-1.rgw.meta
  - us [Realm/Zone Group]
    - us-east-1 [Local Zone, Master]
      - STANDARD [Storage-Class]
        - us-east-1.rgw.buckets.data
    - us-east-1.rgw.log
    - us-east-1.rgw.meta

**Create Object Storage Class**

Specify name and pool configuration settings for the new object storage class.

Ceph Cluster: cephdays-cluster

Object Pool Groups: us-east-1

Storage Class Name:

Use S3 Name: STANDARD\_IA

Set Manually:

Data Pool Name: us-east-1.rgw.buckets.standard\_ia.data

Erasure

Set Manually: Data Chunks (K): 2 | Code Chunks (M): 2

Use Profile: default

Scaling Factor (%): 50

Force (Required for Erasure M=1)

OK | Cancel

**Tasks [64] | Alerts [25]**

Start Time	Task	Status	Detail	Storage System	User	Progress
Thu May 15 01:22:25 GMT-700...	Add Ceph Object (RADOS) Gateway	Completed	S3 (RADOS) Gateway setup completed successfully for cluster 'cephdays-cluster'.	cephdays-193	admin	100% complete
Thu May 15 01:22:25 GMT-700...	Add Ceph Object (RADOS) Gateway	Completed	S3 (RADOS) Gateway setup completed successfully for cluster 'cephdays-cluster'.	cephdays-191	admin	100% complete

Connected | Clear Tasks | Dismiss Alerts

# Demo – Create Data Placement Rule(s)

**OSNEXUS QuantaStor Manager**

Grid Dashboard Storage Management Security Remote Replication Cloud Integration High-availability VIF Management Scale-out Storage Configuration Multitenancy

Welcome, admin Logout About

**EC Profiles & Rules**

- Create EC Pool Profile
- Create Redundancy Rule
- Delete EC Pool Profile
- Delete Redundancy Rule

**Block Storage**

- Create Block Storage Pool
- Create Object Pool Group
- Add Object Gateway
- Delete Block Storage Pool
- Delete Object Pool Group
- Remove Object Gateway

**Object Storage**

- Setup Multi-Site Object Storage
- Modify Object Pool Group
- Unconfigure Multi-Site Object Storage
- Create Object Storage Class

**File Storage**

- Add MDS
- Create File Storage Pool
- Modify File Storage Pool
- Remove MDS
- Delete File Storage Pool

**System Configuration [cephdays-grid : cephdays-190]**

**Scale-out Storage Clusters**

**Data & Journal Devices**

**Scale-out Storage Pools**

cephdays-cluster

- .rgw.root (cephdays-190, us-east-1, Normal, 52.23GB (4...), 0B (0B), 0% Utilized, 13 objects, 32 placement groups, replicated pool type, 2 min replicas)
- us-east-1.rgw.buckets.data (cephdays-190, us-east-1, Normal, 52.23GB (4...), 0B (0B), 0% Utilized, 1 objects, 256 placement groups, replicated pool type, 2 min replicas)
- us-east-1.rgw.buckets.index (cephdays-190, us-east-1, Normal, 52.23GB (4...), 0B (0B), 0% Utilized, 1 objects, 8 placement groups, replicated pool type, 2 min replicas)
- us-east-1.rgw.buckets.standard\_ia.data (cephdays-190, us-east-1, Initializing, 0B (0B), 0B (0B), 0% Utilized, 0 objects, 128 placement groups, erasure pool type, N/A min replicas)
- us-east-1.rgw.control (cephdays-190, us-east-1, Normal, 52.21GB (4...), 0B (0B), 0% Utilized, 8 objects, 32 placement groups, replicated pool type, 2 min replicas)
- us-east-1.rgw.log (cephdays-190, us-east-1, Normal, 52.23GB (4...), 0B (0B), 0% Utilized, 2795 objects, 32 placement groups, replicated pool type, 2 min replicas)
- us-east-1.rgw.meta (cephdays-190, us-east-1, Normal, 52.21GB (4...), 0B (0B), 0% Utilized, 0 objects, 32 placement groups, replicated pool type, 2 min replicas)

**Tasks [65] Alerts [25]**

Start Time	Task	Status	Detail	Storage System	User	Progress
Thu May 15 01:27:32 GMT-700...	Creating Storage Class and data pool f...	Completed	Creation of storage class 'STANDARD_IA' successful	cephdays-190	admin	100% complete
Thu May 15 01:22:25 GMT-700...	Add Ceph Object (RADOS) Gateway	Completed	S3 (RADOS) Gateway setup completed successfully for cluster 'cephdays-cluster'.	cephdays-193	admin	100% complete

Connected Clear Tasks Dismiss Alerts

# Demo – Create Data Placement Rule(s)

**OSNEXUS QuantaStor Manager**

Welcome, admin | Logout | About | Help

Grid Dashboard | Storage Management | Security | Remote Replication | Cloud Integration | High-availability VIF Management | Scale-out Storage Configuration | Multitenancy

EC Profiles & Rules | Block Storage | Object Storage | File Storage

Create EC Pool Profile | Create Redundancy Rule | Create Block Storage Pool | Create Object Pool Group | Add Object Gateway | Setup Multi-Site Object Storage | Modify Object Pool Group | Add MDS | Create File Storage Pool | Modify File Storage Pool

Delete EC Pool Profile | Delete Redundancy Rule | Delete Block Storage Pool | Delete Object Pool Group | Remove Object Gateway | Unconfigure Multi-Site Object Storage | Create Object Storage Class | Remove MDS | Delete File Storage Pool

System Configuration [cephdays-grid : cephdays-190]

Scale-out Storage Clusters | Data & Journal Devices | Scale-out Storage Pools

cephdays-cluster

Name	Managed By	Pool Group	State	Free Space	Utilized Space	% Utilized	Object Count	Placement Groups	Pool Type	Min Replicas	Max Replicas
.rgw.root	cephdays-190	us-east-1	Normal	52.23GB (4...)	0B (0B)	0% Utilized	13	32	replicated	2	3
us-east-1.rgw.buckets.data	cephdays-190	us-east-1	Normal	52.23GB (4...)	0B (0B)	0% Utilized	1	256	replicated	2	3
us-east-1.rgw.buckets.index	cephdays-190	us-east-1	Normal	52.23GB (4...)	0B (0B)	0% Utilized	1	8	replicated	2	3
us-east-1.rgw.buckets.standard_ia.data	cephdays-190	us-east-1	Normal	78.32GB (7...)	0B (0B)	0% Utilized	1	128	erasure	k2+m2	k3
control	cephdays-190	us-east-1	Normal	52.21GB (4...)	0B (0B)	0% Utilized	8	32	replicated	2	3
STANDALONE	cephdays-190	us-east-1	Normal	52.23GB (4...)	0B (0B)	0% Utilized	2795	32	replicated	2	3
Properties...											
us-east-1.rgw.buckets.usd											
STANDARD_IA [Storage-Class]											
us-east-1.rgw.buckets.standard_ia.data											
us-east-1.rgw.buckets.index											
us-east-1.rgw.control											
us-east-1.rgw.log											
us-east-1.rgw.meta											

Right-click

Tasks [65] | Alerts [25]

Start Time	Task	Status	Detail	Storage System	User	Progress
Thu May 15 01:27:32 GMT-700...	Creating Storage Class and data pool f...	Completed	Creation of storage class 'STANDARD_IA' successful	cephdays-190	admin	100% complete
Thu May 15 01:22:25 GMT-700...	Add Ceph Object (RADOS) Gateway	Completed	S3 (RADOS) Gateway setup completed successfully for cluster 'cephdays-cluster'.	cephdays-193	admin	100% complete

Connected | Clear Tasks | Dismiss Alerts



# Demo – Create Data Placement Rule(s)

**OSNEXUS QuantaStor Manager**

Welcome, admin | Logout | About | Help | OSNEXUS

**Add/Remove Storage Class Auto-Tiering Rules**

Storage Class Auto-Tiering Rules enable one to dynamically tag objects as S3C PUT operations are received to categorize objects into specific Storage Classes and thereby specific data pools. Object S3C PUT operations already tagged with a specific Storage Class are not modified unless the 'Force' option is specified. 'Standard' rules are always active whereas 'Overflow' rules are only active when a specified media type reaches a specified utilization threshold.

Ceph Cluster: cephdays-cluster

**Add New Storage Class Auto-Tiering Rule**

**Rule Type**: Standard

**Standard Rules**

- Storage Class: STANDARD\_IA
- Pattern Mode: Quick (no regex)
- Pattern Match (\* = all): \*
- Capacity Operator: >
- Capacity Threshold (0 = all): 32 KiB
- Override User Specified Storage Class: Force
- Capacity Utilization Overflow Rules
- Overflow Rule Activation %: 90
- Overflow Protects Media Type: nvme

**Selected Storage Class Auto-Tiering Rules**

**Overflow Storage Class Auto-Tiering Rules**

Storage Class	Is Forced?	Overflow Activat...	Overflow Protects M...	Pattern Match	Capacity Operator	Capacity Threshold
STANDARD_IA	true	*	nvme	*	>	32KiB

**Standard Storage Class Auto-Tiering Rules**

Storage Class	Is Forced?	Pattern Match	Capacity Operator	Capacity Threshold
STANDARD_IA	true	*	>	32KiB

**Tasks [65]**

Start Time: Thu May 15 01:27:32 GM

Thu May 15 01:22:25 GMT-700... Add Ceph Object (RADOS) Gateway Completed S3 (RADOS) Gateway setup completed successfully for cluster 'cephdays-cluster'. cephdays-193 admin 100% complete

Connected

Clear Tasks | Dismiss Alerts

# Demo – Create Object User

The screenshot shows the OSNEXUS QuantaStor Manager web interface. A green arrow points from the top-left towards the 'Object Users & Tenants' section. Inside this section, another green arrow points from the 'Create Object User' button to the 'Create Object User' dialog box. The dialog box is titled 'Create Object User' and contains fields for 'Ceph Cluster' (set to 'cephdays-cluster'), 'Username' (set to 'steve'), 'Display Name', 'Email Address', 'Max Buckets' (set to '100000'), and 'Auto-generate Access and Secret Key' (checked). The 'OK' button at the bottom right of the dialog is highlighted with a large green arrow.

# Demo – Get Access/Secret Keys

**OSNEXUS QuantaStor Manager**

Welcome, admin | Logout | About | 🌐 | 📁

Grid Dashboard | Storage Management | Security | Remote Replication | Cloud Integration | High-availability VIF Management | Scale-out Storage Configuration | Multitenancy

Object Users & Tenants

- Create Object User | Enable Object User | Modify Object User | Create Object Tenant
- Multi-Delete | Disable Object User | Key Manager | Delete Object Tenant

System Configuration [cephdays-grid : cephdays-190]

Management Users | Management Groups | Management Roles | Object Users & Tenants

us-east-1 [cephdays-cluster]

steve

Right-click

Object User Access Key Manager

Add/Remove Object User Access Keys.

Ceph Cluster: cephdays-cluster

Object User: steve

Object User Access Keys

Object User	State	Storage System	Access Key	Secret Key
steve	Normal	cephdays-190	*****	*****

Add Key... | Remove Key... | Copy to Clipboard | Close

Page 1 of 1 | Sort All | Set Page Size 400 | Set Page Size 1000 | C | Displaying 1 - 1 of 1

Scale-out File & Block Keyrings | Key Server Profiles

Tasks [67] | Alerts [25]

Start Time	Task	Status	Detail	Storage System	User	Progress
Thu May 15 01:35:25 GMT-700...	Create Ceph Object Storage User Acc...	Completed	Creating Object User (1 of 1) in Ceph Cluster 'cephdays-cluster' with name 'steve'.	cephdays-190	admin	100% complete
Thu May 15 01:32:55 GMT-700...	Updating Object Storage-Class Auto-ti...	Completed	Updating/applying (1) object storage-class rule(s) to cluster 'cephdays-cluster'.	cephdays-190	admin	100% complete

Connected | Clear Tasks | Dismiss Alerts

# Demo - Done!

**OSNEXUS QuantaStor Manager**

Welcome, admin | Logout | About | Help | Support

Grid Dashboard | Storage Management | Security | Remote Replication | Cloud Integration | High-availability VIF Management | Scale-out Storage Configuration | Multitenancy

**Scale-out Cluster Management**

- Create Cluster
- Add Member
- Modify Cluster
- Adjust Clocks
- Delete Cluster
- Remove Member
- Cluster Import

**Service Management**

- Add Monitor
- Add MDS
- Add Object Gateway
- Remove Monitor
- Remove MDS
- Remove Object Gateway

**System Configuration [cephdays-grid : cephdays-190]**

**Ceph Cluster Dashboard (cephdays-cluster)**

**Scale-out Storage Clusters**

- cephdays-cluster
  - cephdays-190
  - cephdays-191
  - cephdays-192
  - cephdays-193

**Placement Groups Health**

**Cluster Storage Capacity**

**Object Gateways**

Name	State	Storage System	IP Address	Storage URL	Load Balancer	Service Engine Type	Service Engine Mode
rgw.cephdays-190	Normal	cephdays-190	10.0.8.190	http://10.0.8.190:7480	https://*:8580	beast	http
rgw.cephdays-191	Normal	cephdays-191	10.0.8.191	http://10.0.8.191:7480	https://*:8580	beast	http
rgw.cephdays-192	Normal	cephdays-192	10.0.8.192	http://10.0.8.192:7480	https://*:8580	beast	http
rgw.cephdays-193	Normal	cephdays-193	10.0.8.193	http://10.0.8.193:7480	https://*:8580	beast	http

**Data & Journal Devices**

**Scale-out Storage Pools**

**Tasks [67] Alerts [25]**

Start Time	Task	Status	Detail	Storage System	User	Progress
Thu May 15 01:35:25 GMT-700...	Create Ceph Object Storage User Acc...	Completed	Creating Object User (1 of 1) in Ceph Cluster 'cephdays-cluster' with name 'steve'.	cephdays-190	admin	100% complete
Thu May 15 01:32:55 GMT-700...	Updating Object Storage-Class Auto-ti...	Completed	Updating/applying (1) object storage-class rule(s) to cluster 'cephdays-cluster'.	cephdays-190	admin	100% complete

Connected | Clear Tasks | Dismiss Alerts

# Demo – Done!

**OSNEXUS QuantaStor Manager**

Welcome, admin | Logout | About | 🌐 | 📁

Grid Dashboard | Storage Management | Security | Remote Replication | Cloud Integration | High-availability VIF Management | Scale-out Storage Configuration | Multitenancy

Object Users & Tenants

- Create Object User | Enable Object User | Modify Object User | Create Object Tenant
- Multi-Delete | Disable Object User | Key Manager | Delete Object Tenant

System Configuration [cephdays-grid : cephdays-190]

Management Users | Object Users & Tenants

Name	Display Name	Object Pool Group	Object Tenant	Space Utilized	Bucket Count	Object Count	Email Address	Access
steve	steve	us-east-1		0B	0	0		false

Create Object Bucket

General Settings | Advanced Settings

Specify the Ceph Cluster, Bucket Name, access credentials and the permission for the object store.

Ceph Cluster: cephdays-cluster  
Bucket Name: test-bucket  
Object User: steve  
Estimated Objects: Auto/Dynamic  
Permissions: Private  
 Enable NFS Access  
Batch Create: 1

OK | Cancel

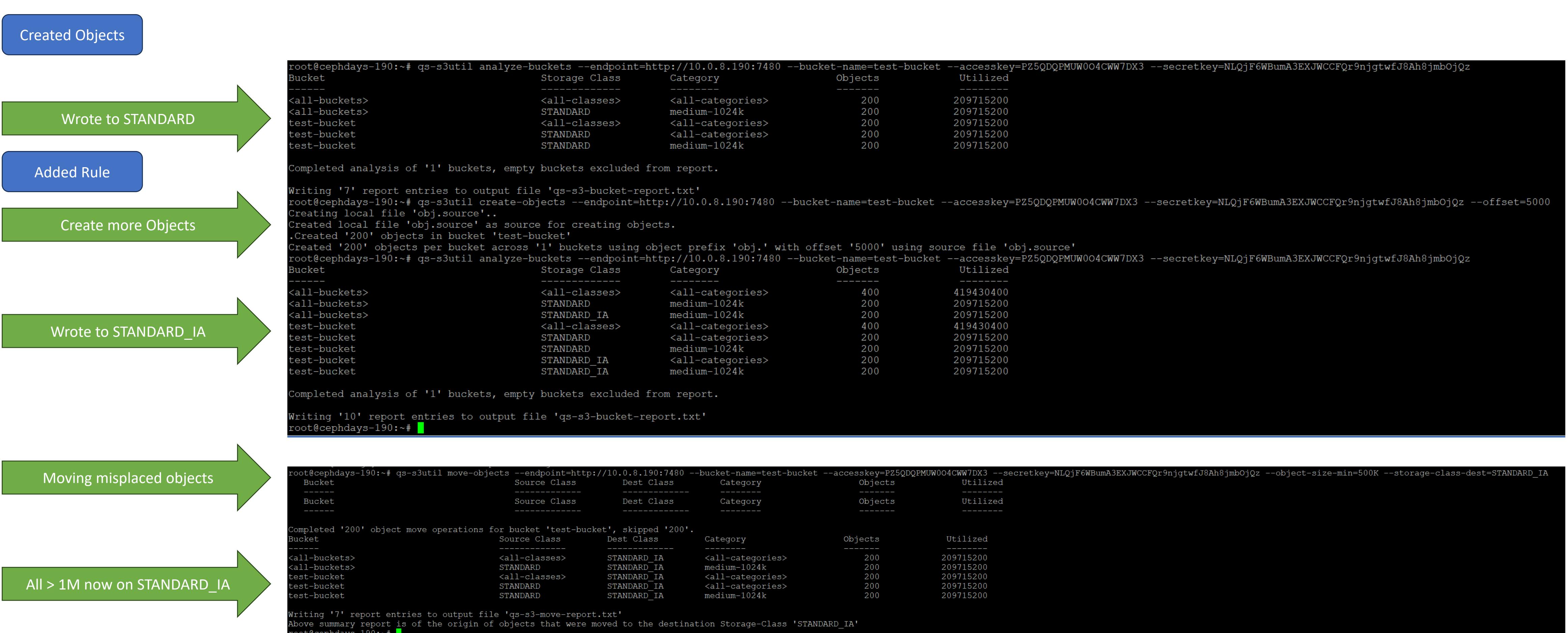
Page 1 of 1 | Sort All | Set Page Size 400 | Set Page Size 1000 | C | Displaying 1 - 1 of 1

Tasks [67] | Alerts [25]

Start Time	Task	Status	Detail	Storage System	User	Progress
Thu May 15 01:35:25 GMT-700...	Create Ceph Object Storage User Acc...	Completed	Creating Object User (1 of 1) in Ceph Cluster 'cephdays-cluster' with name 'steve'.	cephdays-190	admin	100% complete
Thu May 15 01:32:55 GMT-700...	Updating Object Storage-Class Auto-ti...	Completed	Updating/applying (1) object storage-class rule(s) to cluster 'cephdays-cluster'.	cephdays-190	admin	100% complete

Connected | Clear Tasks | Dismiss Alerts

# Testing the Data Placement Rules



# Q&A

## ➤ **QuantaStor Community Edition**

- <https://osnexus.com/downloads>

## ➤ **Links**

- <https://ceph.io/en/news/blog/2024/auto-tiering-ceph-object-storage-part-1/>
- <https://ceph.io/en/news/blog/2024/auto-tiering-ceph-object-storage-part-2/>

## ➤ **Contact Info**

- info@osnexus.com