



Oracle ZFS Storage Appliance

On-premise Object Storage Best Practices and Recommended Use Cases

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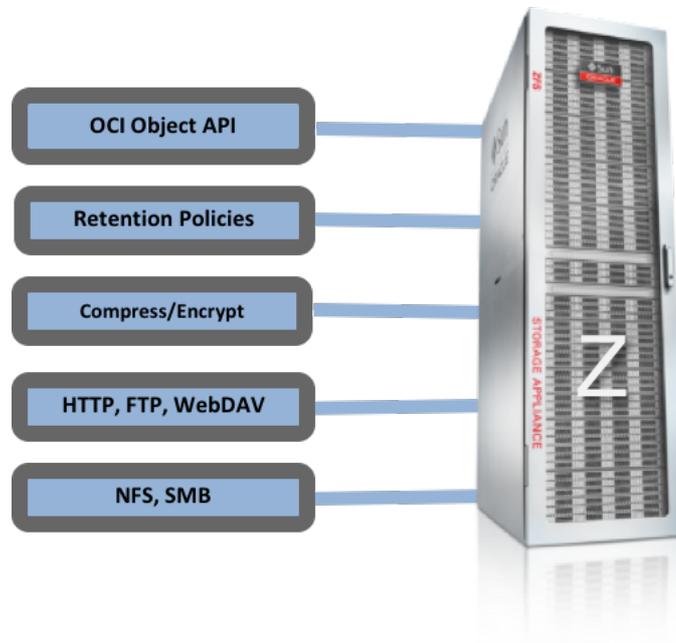
INTRODUCTION

The Oracle ZFS Storage Appliance provides the ability to migrate data to Oracle Cloud Infrastructure (OCI) object storage either to OCI (cloud) object storage or locally to an on-premise OCI object store. Oracle customers who already use OCI object storage and ZFS Storage now have the flexibility of storing object data directly on ZFS Storage in a hybrid cloud environment. An OCI object store API on ZFS Storage Appliance provides a consistent OCI object store experience for OCI application testing and local storage.

ZFS Storage is a highly scalable object store repository for your object API clients and applications:

- Object storage is a perfect match for large amounts of data
- Object APIs provide a fast and scalable object store repository that application developers can use to store blobs of data for easy
- Leverage all of ZFS data services and data integrity features

OCI Object API On-Premise



Oracle ZFS Storage Cloud Use Cases

Previous Oracle ZFS Storage releases provide integration with OCI with the following features:

- Cloud snapshot backups - Migrate data from Oracle ZFS Storage Appliance to OCI object storage either in the cloud or on-premise as described in [Configuring ZFS Storage for Cloud Snapshot Backups to OCI Object Store](#).
- OCI Object Storage - Create an on-premise OCI object store on an on-premise ZFS Storage Appliance for the following use cases:
 - Storing cloud snapshot backups or for general object storage as described in the above solution brief link.
 - Creating a long-term archive of RMAN backups from ZDLRA using the on-premise ZFS Storage object storage. For more information, see [Oracle Support Document 2761114.1 \(How to configure Zero Data Loss Recovery Appliance to use ZFS OCI Object Storage as a cloud repository\)](#).
 - Creating a stand-alone repository for storing large objects using OCI CLI, oci-curl or OCI SDK for storing or retrieving large objects for general purpose use cases.

Overview

This solution brief describes the on-premise OCI object storage features that are new in the OS8.8.36 release, such as implementing retention policies to retain data and how to copy objects from bucket to bucket.

This paper includes best practices and recommendations for configuring the Oracle ZFS Storage Appliance for optimal object store performance as well as step-by-step instructions for configuring object storage retention policies and long-term archival.

Recommended ZFS Storage Configuration

The following configuration parameters are recommended for best object storage performance.

- **ZS Storage Hardware**
 - Storage trays sized for needed capacity
 - Include write accelerators
 - Double parity (raidz2)
 - 25GbE or greater network connectivity
 - LACP active/active
- **Software – OS8.8.38**
 - Project/share is configured as an OCI object store bucket
 - OCI cloud service is enabled

New OCI Object Storage Features

- **Defined Tags** – Tagging allows you to add metadata to resources so that you can define keys and values and associate them with resources. You can use the tags to organize and list resources based on your business needs
- **Pre-authenticated requests** - Enables a user without access to the bucket to access the contents of the bucket to which the user has the PAR URI to. PAR can be created for a Bucket as a whole or to individual objects, the PAR URI can be created with following types of access: AnyObjectWrite, ObjectRead, ObjectReadWrite, ObjectWrite
- **Copy object across buckets** - allows object copy from one bucket to another, assuming the user has access to both buckets. You can also copy between compartments (shares) where the copy source and destination are on the same ZFS Storage Appliance. A copy operation must be triggered per object as a bulk copy is not possible.
- **Retention Policy support:**
 - Time-Bound
 - Indefinite
 - Retention Lock
- **Object versioning** - Object versioning can be enabled at the bucket level. Versioning means Object Storage automatically creates an object version each time a new object is uploaded, an existing object is overwritten, or when an object is deleted. You can enable object versioning at bucket creation time or later.
 - **Note:** Retention policies described in this paper cannot be created on a bucket that also has versioning enabled. If a bucket has a retention policy set, you cannot also enable versioning.
- **Difference between OS8.8.36 object store API and previous versions:**
 - The "export/" is removed from OCI command line, name-space component. For example: "object-share" is specified rather than the full path "export/object-share"
 - A complete OCI command line is as follows:

```
oci os object list --name-space object-share --bucket-name test-bucket --  
endpoint http://ZFSSA-name-or-IP/oci
```

```
{  
  "data": [  
    {  
      "archival-state": null,  
      "etag": "e6c5bb594a5df248d25b5ce005ad9696",  
    }  
  ]  
}
```

```

      "md5": "1B2M2Y8AsgTpgAmY7PhCfg==",
      "name": "myfile2",
      "size": 0,
      "storage-tier": "Standard",
      "time-created": "2021-07-08T15:10:06+00:00",
      "time-modified": "2021-07-08T15:10:06+00:00"
    }
  ],
  "prefixes": []
}

```

Object Storage Retention Policy Summary

OCI object storage retention rules can be applied to an on-premise ZFS Storage Appliance starting in the OS8.8.36 release.

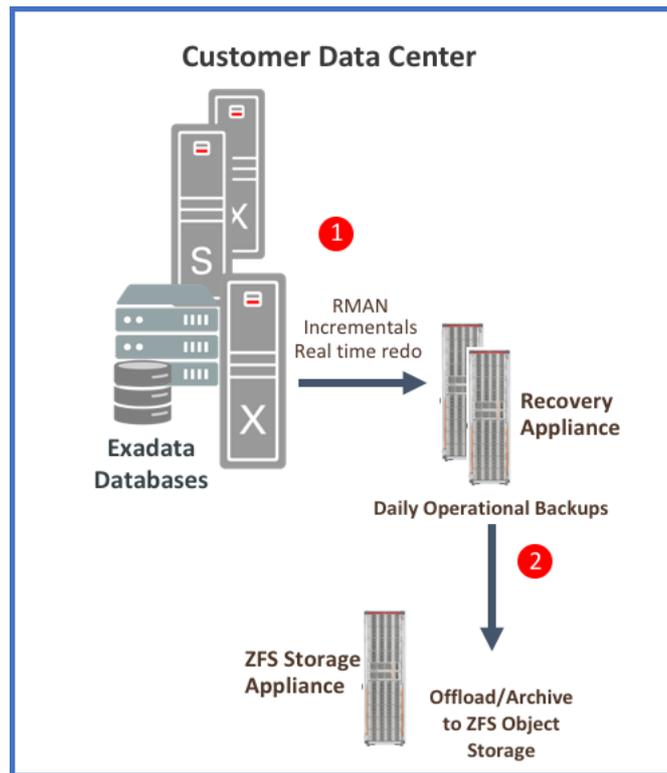
| POLICY | USE CASE | COMPLIANCE TYPE |
|--|--|-----------------|
| Time-bound – specify a time duration | <ul style="list-style-type: none"> Your industry might require data retention for a defined time duration Data retention regulations might also require locked retention settings Locked retention settings mean, the only change allowed is to increase the retention duration | Regulatory |
| Time-bound – specify a time duration that might change | <ul style="list-style-type: none"> Your internal business requirements might require data retention While data retention is required, that time period could change | Data Governance |
| Indefinite – object modification is prevented until retention rule is removed | <ul style="list-style-type: none"> Requirement is to preserve certain business data in response to potential or on-going litigation A legal hold does not have a defined retention period and remains in effect until removed | Legal Hold |
| Retention lock | <ul style="list-style-type: none"> Your company data retention regulations might also require that you lock the retention settings | Data Governance |

Testing Retention Rules and Impacts on Storage Capacity

This solution brief describes scenarios for implementing object retention rules that should thoroughly be tested before retention rules are locked. Carefully consider storage capacity requirements before locking retention rule locks that cannot be unlocked.

- **Indefinite retention rule** - Intended for a legal hold use case and can be removed.
- **Locked retention rule** - Cannot be removed after the retention period begins.
- There is a 14-day grace period before the rule is locked. This grace period allows you to test or modify the retention rule before it is permanently locked and provides an opportunity to adjust either the data to be retained or the storage capacity required to store the retained data.

Oracle Engineered Systems Long Term Archival for RMAN Backup



Long-Term Archive Overview

- Leverage OCI features inside your data center
- Both Recovery Appliance and ZFS Storage provide OCI object storage API integration
- Incremental forever and real time redo to Recovery Appliance
- Archive backups from Recovery Appliance to ZFSSA over object storage API
- Provide longer retention of RMAN backups for compliance

General Overview of Creating On-Premise Object Storage with Retention Policies

A summary of the configuration steps are as follows:

» Part I: CLI installation and Certification Creation

- » Install CLI
- » Create certificates
- » Generate fingerprint for the certificate
- » Create configuration file

» Part II: ZFS Storage Appliance – OCI Account Creation

- » Create OCI account

» Part III: ZFS Storage Appliance – OCI Target Creation

- » Create a project and share for the target destination
- » Create the target and bucket
- » List the bucket

» Part VI: ZFS Storage Appliance – OCI Object Target Configuration with Retention Policy

- » Create buckets with different retention policies to match your retention use

PART I: CLI INSTALLATION AND CERTIFICATE CREATION

The Oracle ZFS Storage Appliance does not have a management interface for the OCI object API so this solution brief uses the OCI command line interface to perform basic tasks. In the steps that follow, the *managing system* is the system where the CLI is installed.

1. On the managing system, install the CLI.

Specific configuration steps and visibility into the OCI-compatible object store must be completed with the OCI command interface that are installed on a local system like a server or laptop.

The `oci` command line interface is installed on a local system, running at least python version 3.5+. The local system can be either Linux, Windows, or a Mac. The CLI can be downloaded manually or using an installer script. Depending on your network configuration, you might need to set the following parameter to successfully download this interface: `"export https_proxy=https://www-proxy.us.oracle.com:80"`

Once the environment variable has been defined as required, select one of the installation methods below.

a) Install CLI with installer script method.

```
term# bash -c "$(curl -L https://raw.githubusercontent.com/oracle/oci-cli/master/scripts/install/install.sh)"
```

See appendix A for sample dialog output of this command.

b) Install CLI with manual method.

The manual process will use `curl` to download the install script after which, the installer is run with the options noted.

```
term# curl -L -O https://raw.githubusercontent.com/oracle/oci-cli/master/scripts/install/install.sh
term# ./install.sh --accept-all-defaults
```

2. On the managing system, create public and private keys (`oci_api_key.pem` and `oci_api_key_public.pem`).

- If you have a free cloud trial account set up and you want to create an OCI cloud target on a ZFS Storage Appliance, you would use the certificates that are accessible from the user profile section of your cloud account.
- If you are creating an OCI-compatible object store target on a ZFS Storage Appliance, you will need to create the certificates as described below.

Recall that PEM is a X.509 certificate (whose structure is defined using ASN.1), encoded using the ASN.1 DER (distinguished encoding rules), then run through Base64 encoding and stuck between plain-text anchor lines (BEGIN CERTIFICATE and END CERTIFICATE). The example below is in the context of the root account. Note that any account may be used although the default location of the bin, lib, and other support directories are relative to the account creating the certificates.

- To generate the private and public keys, see this link: <https://docs.cloud.oracle.com/iaas/Content/API/Concepts/apisigningkey.htm#How>
- General info can be found [here](#).

Steps:

- a) Change to the `/root` directory.
 - `term# cd /root`
- b) Create the `.oci` directory.
 - `term# mkdir .oci`
- c) Generate the private key with or without passphrase.
 - `term# openssl genrsa -out /root/.oci/oci_api_key.pem -aes128 2048`
 - `term# openssl genrsa -out /root/.oci/oci_api_key.pem 2048`
- d) Reduce permissions on the private key.

- term# `chmod go-rwx /root/.oci/oci_api_key.pem`
- e) Generate the public key.
- term# `openssl rsa -pubout -in /root/.oci/oci_api_key.pem -out /root/.oci/oci_api_key_public.pem`

3. On the managing system, generate a fingerprint of the public key.

```
term# openssl rsa -pubout -outform DER -in /root/.oci/oci_api_key.pem | openssl md5 -c
Enter pass phrase for /root/.oci/oci_api_key.pem:
writing RSA key
(stdin)= your-fingerprint
```

4. On the managing system, create the configuration file that will be used to create the target.

5. Using the information from the above steps, create a `.oci/config` file similar to the following:

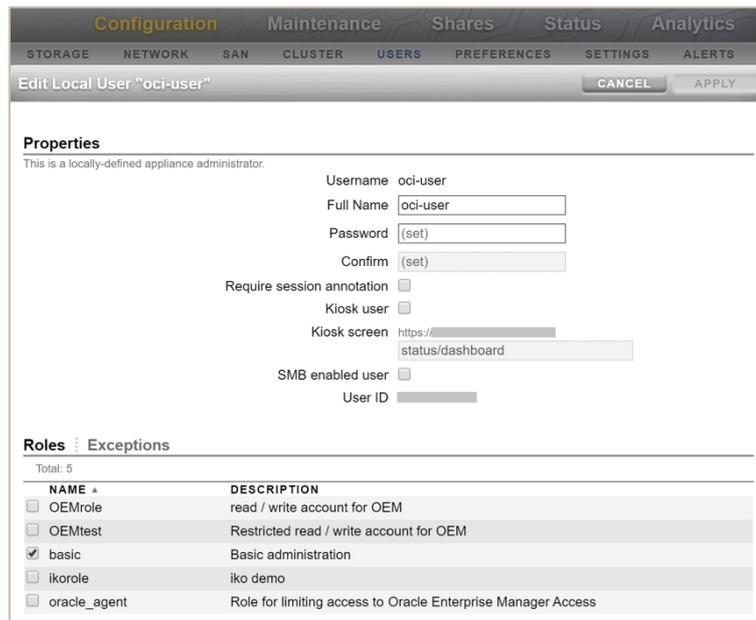
```
[DEFAULT]
user=user-OCID
fingerprint=your-fingerprint
key_file=/root/.oci/oci_api_key.pem
tenancy=tenancy-OCID
region=us-ashburn-1
```

For information on customizing the config file so that using the `oci` command line can be simplified, see [Configuring ZFS Storage for Cloud Snapshot Backups to OCI Object Store](#).

PART II: ZFS STORAGE APPLIANCE – OCI ACCOUNT CREATION

1. On the source appliance, create the `oci-user` account with the basic admin role.

- Go to Configuration → Users to create your `oci-user` account with selected “basic” role.



PART III: MANAGING SYSTEM AND ZFS STORAGE APPLIANCE – OCI TARGET CREATION

1. On the appliance, create a project for the share that will become the OCI-compatible object storage target. For example, Object.

Create Project [CANCEL] [APPLY]

Name

Encryption

Inherit key

Key Local OKM

2. On the appliance, modify the project “General” settings to apply any data services such as encryption or compression.

Configuration Maintenance **Shares** Status Analytics

SHARES PROJECTS ENCRYPTION SCHEMA

► Object | Shares **General** Protocols Access Snapshots Replication

Pool01/local/Object [REVERT] [APPLY]

Space Usage

DATA Quota 0 G Reservation 0 G

USERS & GROUPS Default user quota 0 G Default group quota 0 G

User or Group [Show All]

Usage none

Bandwidth

PROJECT Read limit 0 G/s Write limit 0 G/s

SHARES Default read limit 0 G/s Default write limit 0 G/s

Inherited Properties

Mountpoint

Read only

Update access time on read

Non-blocking mandatory locking

Data deduplication (warning)

Data compression LZJB (Fastest)

Checksum Fletcher4 (Standard)

Cache device usage All data and metadata

Synchronous write bias Latency

Database record size 128K

Additional replication Normal (Single Copy)

Virus scan

Prevent destruction

Restrict ownership change

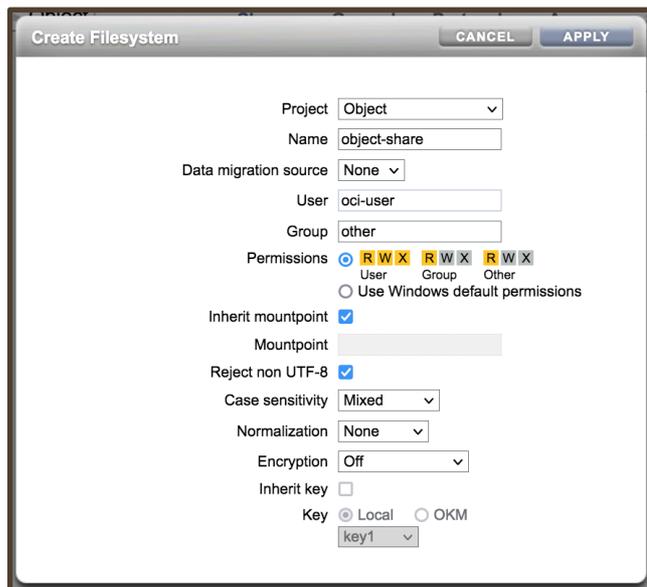
Default Settings

FILESYSTEMS User Group

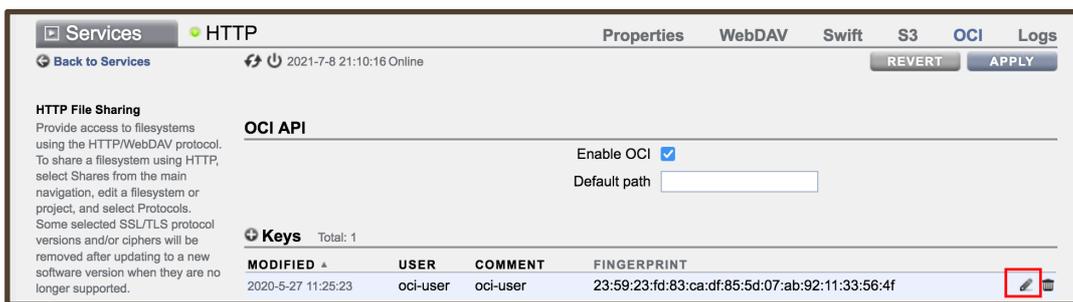
Permissions **R W X** **R W X** **R W X**
 User Group Other

LUNS Volume size G Thin provisioned Volume block size 8K

3. On the appliance, create the share that will become an OCI-compatible object storage target. For example, object-share.
 - a) From the Object project screen, select + Filesystems to create the share.
 - b) Name the object storage target (i.e. object-share)
 - c) Select user access (i.e. oci-user)
 - d) Click Apply.



4. On the appliance, modify the project "Protocols" settings to enable the share's OCI API mode.
 - Set "OCI API Mode" to Read/Write under "Edit Share" Protocols tab under HTTP section
 - Give access to the OCI client user under "Edit Share" Access tab by Permissions or Root Dir ACL
5. On the appliance, configure the HTTP service.



- a) Select Configuration→Services→HTTP.
- b) Select the OCI tab.
- c) Select Enable OCI.
- d) Add the Default path that identifies the target/bucket location. This path identifies the share that was created previously. For example: /export/object-share
- e) Add your public key. Define the key by providing the username and public key under HTTP/OCI setting
- f) Click Add.

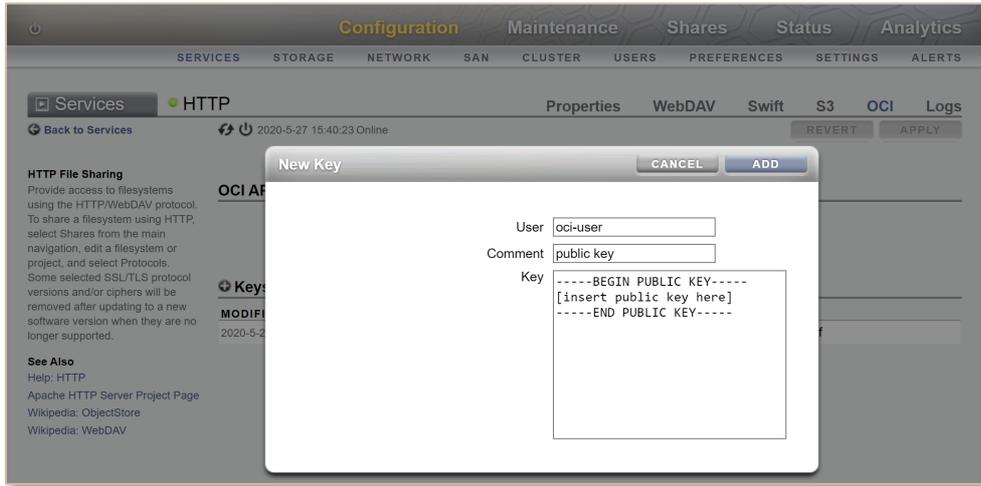
6. Create the actual bucket for either the appliance or for an OCI cloud target.

- a) On the managing system, use syntax similar to the following for the target system:

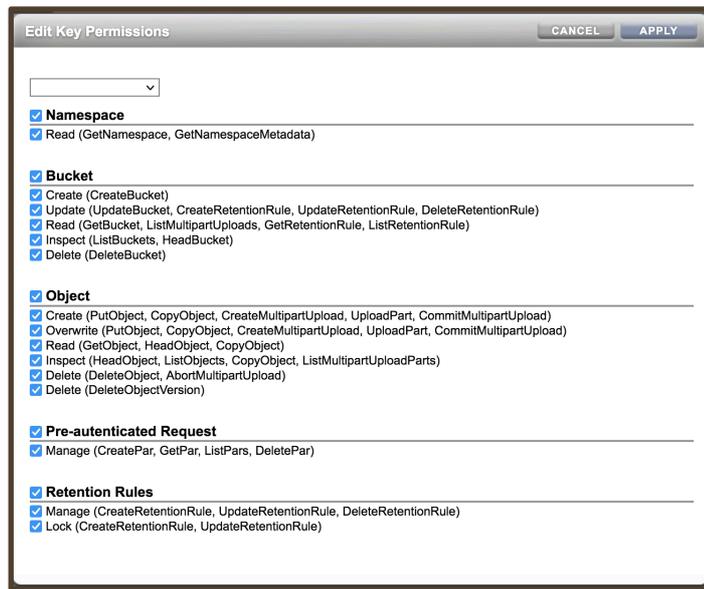
```
term# oci os bucket create --endpoint http://ZFSSA-name-or-IP/oci -ns
"object-share" --config-file /root/.oci/config --name bucket --
compartment-id object-share
```

- b) On the managing system, list the bucket to confirm the bucket creation.

```
term# oci os object list -ns object-share -bn bucket --endpoint
http://ZFSSA-name-or-IP/oci
```



g) Edit the oci user key to add or remove authorizations.



PART IV: OCI OBJECT STORAGE WITH RETENTION POLICIES

The following section describes a customer scenario with different types of data that needs to be retained for a period of time.

Company Ares: Retention Scenario Summary

| Scenario | Data | Compliance Type | Bucket Name |
|--|--|-----------------|-------------------------|
| HR Dept - One-year or two-year retention for job application data | Job applications (not hired) | Data Governance | HR-Ret1YR and HR-Ret2YR |
| Application Development Dept – Test data from last two years | Test data in support of patent filings | Data Governance | TD-RetFY20, TD-RetFY21 |
| Finance Dept - Company must retain financial data for 3 or 6 years | DB Backups – financial data | Regulatory | Fin-Ret3YR, Fin-Ret6YR |
| Finance Dept – Company must retain data indefinitely for ongoing litigation | DB Backups – financial data | Legal Hold | Fin-LH20, Fin-LH21 |

How to Create a Time-Bound Retention Policy

Company Ares wants to have separate retention time period, between (1 year or 2 years) for HR employee applications (not hired). This example also illustrates that data can be copied from bucket to bucket.

1. Create HR-Ret1YR and HR-Ret2Yr buckets.

```
term# oci os bucket create --endpoint http://zfssa-name-or-IP/oci -ns object-share
--compartment-id object-share --name HR-Ret1YR --config-file ~/.oci/config
```

```
term# oci os bucket create --endpoint http://zfssa-name-or-IP /oci -ns object-share
--compartment-id object-share --name HR-Ret2YR --config-file ~/.oci/config
```

2. Add data to the HR-Ret1YR bucket.

```
term# oci os object put -ns object-share -bn HR-Ret1YR --name userApp23 --file
userApp23 --endpoint http://zfssa-name-or-IP/oci --config-file ~/.oci/config
```

3. Add retention policies to the HR retention buckets.

```
term# oci os retention-rule create --namespace object-share --config-file
~/.oci/config --endpoint http://zfssa-name-or-IP/oci --bucket-name HR-Ret1YR --
time-amount 1 --time-unit years
```

```
{
  "data": {
    "display-name": "RetentionRule20210614201737",
    "duration": {
      "time-amount": 1,
      "time-unit": "YEARS"
    },
    "etag": "ef2b68d28e7a5ce4802052e16c50f4f5",
    "id": "ef2b68d28e7a5ce4802052e16c50f4f5",
    "time-created": "2021-06-14T20:17:37+00:00",
    "time-modified": "2021-06-14T20:17:37+00:00",
    "time-rule-locked": null
  }
}
```

```
term# oci os retention-rule create --namespace object-share --config-file
~/.oci/config --endpoint http://zfssa-name-or-IP/oci --bucket-name HR-Ret2YR --
time-amount 2 --time-unit years
```

```
{
  "data": {
    "display-name": "RetentionRule20210614201758",
    "duration": {
      "time-amount": 2,
      "time-unit": "YEARS"
    },
    "etag": "259400da28ff071d13f8eab07ae20fee",
    "id": "259400da28ff071d13f8eab07ae20fee",
    "time-created": "2021-06-14T20:17:58+00:00",
    "time-modified": "2021-06-14T20:17:58+00:00",
    "time-rule-locked": null
  }
}
```

4. Copy object from HR-Ret1YR bucket to HR-Ret2YR bucket.

```
term# oci os object copy --bucket-name HR-Ret1YR --destination-bucket HR-Ret2YR --
source-object-name userApp23 --config-file ~/.oci/config --endpoint http://zfssa-
name-or-IP/oci -ns object-share --destination-object-name userApp23 --destination-
namespace object-share --destination-region http://zfssa-name-or-IP/oci
```

5. Confirm object is moved.

```
term# oci os object list -ns object-share -bn HR-Ret2YR --fields
name,size,timeCreated --output table --query
'data[*].{"Name":"name","Size":"size","Time created":"time-created"}'
```

How to Create and Update a Time-Bound Retention Policy

Company Ares originally specified that application team's test data in support of potential patent filings from FY20 should be kept for 90 days. They decided to shorten the retention time to 60 days for FY20 test data, after no patent filings for FY20 were made.

1. Create the TD-RetFY20 bucket.

```
term# oci os bucket create --endpoint http://zfssa-name-or-IP/oci -ns object-share
--compartment-id object-share --name TD-RetFY20 --config-file ~/.oci/config
{
  "data": {
    "approximate-count": null,
    "approximate-size": null,
    "auto-tiering": null,
    "compartment-id": "object-share",
    "created-by": "oci-user",
    "defined-tags": null,
    "etag": "b85bace963e06558cd474af32fbb71eb",
    "freeform-tags": null,
    "id": null,
    "is-read-only": null,
    "kms-key-id": null,
    "metadata": null,
    "name": "TD-RetFY20",
    "namespace": "object-share",
    "object-events-enabled": null,
    "object-lifecycle-policy-etag": null,
    "public-access-type": "NoPublicAccess",
    "replication-enabled": null,
    "storage-tier": "Standard",
    "time-created": "2021-06-14T17:53:34+00:00",
    "versioning": "Disabled"
  },
  "etag": "b85bace963e06558cd474af32fbb71eb"
}
```

2. Add data to the TD-RetFY20 bucket.

```
term# oci os object put -ns object-share -bn TD-RetFY20 --name TD3 --file TD3 --
endpoint http://zfssa-name-or-IP/oci --config-file ~/.oci/config
{
  "etag": "c0daa6b0682eb93d655f528436d0f489",
  "last-modified": "2021-06-14T17:55:44.000Z",
  "opc-content-md5": "1B2M2Y8AsgTpgAmY7PhCfg=="
}
```

3. Create a retention rule for the TD-RetFY20 bucket for 90 days.

```
term# oci os retention-rule create --namespace object-share --config-file
~/.oci/config --endpoint http://zfssa-name-or-IP/oci --bucket-name TD-RetFY20 --
time-amount 90 --time-unit days
{
  "data": {
    "display-name": "RetentionRule20210614175852",
    "duration": {
      "time-amount": 90,
      "time-unit": "DAYS"
    },
    "etag": "49e0388874f532113321c2ffbb36a91a",
    "id": "49e0388874f532113321c2ffbb36a91a",
    "time-created": "2021-06-14T17:58:52+00:00",
    "time-modified": "2021-06-14T17:58:52+00:00",
    "time-rule-locked": null
  }
}
```

4. Test the retention rule by attempting to delete a file.

```
term# oci os object delete -ns object-share -bn TD-RetFY20 --name TD3 --endpoint
http://zfssa-name-or-IP/oci --config-file ~/.oci/config
Are you sure you want to delete this resource? [y/N]: y
ServiceError:
{
  "code": "Forbidden",
  "message": "Access denied (The operation was blocked by a retention rule)",
  "opc-request-id": "txfba59156237c480e8a1ee-0060c79923",
  "status": 403
}
```

5. Change retention time, if needed.

```
term# oci os retention-rule update --namespace object-share --config-file
~/.oci/config --endpoint http://zfssa-name-or-IP/oci --bucket-name TD-RetFY20 --
time-amount 60 --time-unit days --retention-rule-id
49e0388874f532113321c2ffbb36a91a
{
}
```

```

    "data": {
      "display-name": "RetentionRule20210614175852",
      "duration": {
        "time-amount": 60,
        "time-unit": "DAYS"
      },
      "etag": "49e0388874f532113321c2ffbb36a91a",
      "id": "49e0388874f532113321c2ffbb36a91a",
      "time-created": "2021-06-14T17:58:52+00:00",
      "time-modified": "2021-06-14T18:01:17+00:00",
      "time-rule-locked": null
    }
  }
}

```

How to Retain Data Indefinitely for Legal Hold

Company Ares requires a retention rule for legal hold purposes. The following example describes how to create a bucket and a retention rule for a legal hold scenario, where data is held indefinitely.

1. Create the Fin-LH21 bucket.

```
term# oci os bucket create --endpoint http://zfssa-name-or-IP/oci --ns object-share --name Fin-LH21 --config-file ~/.oci/config
```

2. Add data to the Fin-LH21 bucket.

```
term# oci os object put -ns object-share -bn Fin-LH21 --name Finance123 --file Finance123 --endpoint http://zfssa-name-or-IP/oci --config-file ~/.oci/config
```

3. Create an indefinite retention policy.

```
term# oci os retention-rule create --namespace object-share --bucket-name Fin-LH21 --display-name LegalHold --config-file ~/.oci/config --endpoint http://zfssa-name-or-IP/oci
{
  "data": {
    "display-name": "LegalHold",
    "duration": null,
    "etag": "a638b7c859a207848a6f0b4d0e8f7819",
    "id": "a638b7c859a207848a6f0b4d0e8f7819",
    "time-created": "2021-06-14T20:26:30+00:00",
    "time-modified": "2021-06-14T20:26:30+00:00",
    "time-rule-locked": null
  }
}

```

4. Test the retention rule by attempting to remove data.

```
term# oci os object delete -ns object-share -bn Fin-LH21 --name Finance123 --endpoint http://zfssa-name-or-IP/oci --config-file ~/.oci/config
Are you sure you want to delete this resource? [y/N]: y
ServiceError:
{
  "code": "Forbidden",
  "message": "Access denied (The operation was blocked by a retention rule)",
  "opc-request-id": "txfc0a1c17f7674eab81b6d-0060c7bbd2",
  "status": 403
}

```

5. Remove the indefinite retention rule when the legal hold is released.

```
term# oci os retention-rule delete -ns object-share -bn Fin-LH21 --name Finance123 --endpoint http://zfssa-name-or-IP/oci --config-file ~/.oci/config --retention-rule-id a638b7c859a207848a6f0b4d0e8f7819
```

How to Create a Time-bound Locked Retention Rule

Company Ares is required to keep some financial data for 3 to 6 years for regulatory purposes. This example describes how to set a retention rule so that data in the Fin-Ret3YR bucket is retained for 3 years and also how to lock the retention rule.

1. Create the Fin-Ret3YR bucket.

```
term# oci os bucket create --endpoint http://zfssa-name-or-IP/oci -ns object-share --name Fin-Ret3YR --config-file ~/.oci/config
{
  "data": {
    "approximate-count": null,
    "approximate-size": null,
    "auto-tiering": null,
    "compartment-id": "object-share",
    "created-by": "oci-user",
    "defined-tags": null,
    "etag": "bf6f7ca73cf12bba07307da9b717e254",
    "freeform-tags": null,
    "id": null,
    "is-read-only": null,

```

```

"kms-key-id": null,
"metadata": null,
"name": "Fin-Ret3YR",
"namespace": "object-share",
"object-events-enabled": null,
"object-lifecycle-policy-etag": null,
"public-access-type": "NoPublicAccess",
  "replication-enabled": null,
  "storage-tier": "Standard",
  "time-created": "2021-06-28T18:32:26+00:00",
  "versioning": "Disabled"
},
"etag": "bf6f7ca73cf12bba07307da9b717e254"
}

```

2. Create a locked Time-bound retention rule.

The following syntax creates a retention rule for 3 years and the retention lock starts in 30 days.

```

term# oci os retention-rule create --namespace object-share --config-file
~/oci/config --endpoint http://zfssa-name-or-IP/oci --bucket-name Fin-Ret3YR --
time-amount 3 --time-unit years --time-rule-locked 2021-07-31

```

```

{
  "data": {
    "display-name": "RetentionRule20210628183401",
    "duration": {
      "time-amount": 3,
      "time-unit": "YEARS"
    },
  },
  "etag": "51d8e99e3a38275b9d617ba5603ca499",
  "id": "51d8e99e3a38275b9d617ba5603ca499",
  "time-created": "2021-06-28T18:34:01+00:00",
  "time-modified": "2021-06-28T18:34:01+00:00",
  "time-rule-locked": "2021-07-31T00:00:00+00:00"
}
}

```

3. Modify the locked Time-bound retention rule.

Retention time can be modify before the specified lock date. After the specified lock date is reached, only the retention duration can be extended.

```

term# oci os retention-rule update --namespace object-share --config-file
~/oci/config --endpoint http://zfssa-name-or-IP/oci --bucket-name Fin-Ret3YR
-retention-rule 51d8e99e3a38275b9d617ba5603ca499 --time-amount 4 --time-unit years
--time-rule-locked 2021-07-31

```

LONG TERM ARCHIVE FOR RMAN BACKUPS (ZDLRA TO ZFS STORAGE)

Prerequisites:

- Review ZFS Storage configuration recommendations
- Confirm ZDLRA Version 19.2.1.1.2 or later
- Confirm ZFS Storage micro 36 release

Recommended ZFS Storage Configuration

- **ZS Storage Hardware**
 - Storage trays sized for needed capacity
 - Include read/write accelerators
 - Double parity (raidz2)
 - 25GbE network connectivity
 - LACP active/active
- **Software – OS8.8.36**
 - Project/share is configured as an OCI object store bucket
 - OCI cloud service is enabled

The general process has three primary steps:

1. **Configure Credentials on the ZFS Storage Appliance. For more information see: [Part I: CLI Installation and Certificate Creation](#) and [Part III: Managing System and ZFS Storage Appliance – OCI target creation](#).**
2. **Configure Oracle Key Vault.**
3. **Configure ZDRLA.**

Step-by-step configuration is in the following document: Oracle Support Document 2761114.1 (How to configure Zero Data Loss Recovery Appliance to use ZFS OCI Object Storage as a cloud repository) can be found at: <https://support.oracle.com/epmos/faces/DocumentDisplay?id=2761114.1>.

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ZFS Storage Appliance Object Storage Best Practices and Recommended Use Cases

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