Ceph 101: Store and Retrieve an Object

Overview

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1. Clone the git repository

- Go to wherever you want your git repo to be (i.e. your home directory) and clone the repository:

```
[lflores@folio01 ~]$ git clone https://github.com/ceph/ceph.git --depth 1
```

- Navigate to your ceph repository:

```
[lflores@folio01 ~]$ cd ceph
[lflores@folio01 ceph]$ pwd
/home/lflores/ceph
```

2. Set up dev environment

- Install dependencies:

```
[lflores@folio01 ceph]$ ./install-deps.sh
```

- Run build directory script:

```
[lflores@folio01 ceph]$ ./do_cmake.sh -DCMAKE_BUILD_TYPE=RelWithDebInfo
```

- Compile the code:

```
[lflores@folio01 build]$ ninja vstart-base cephfs cython_cephfs cython_rbd
```

3. Set up a test cluster

- Run the vstart script:

```
[lflores@folio01 build]$ RGW=0 MDS=0 ../src/vstart.sh --debug --new -x --localhost --bluestore --without-dashboard
```

- Check cluster health. This is like the "home page" of the cluster:

```
[lflores@folio01 build]$ ./bin/ceph -s
*** DEVELOPER MODE: setting PATH, PYTHONPATH and LD_LIBRARY_PATH ***
2024-09-17T00:21:12.867+0000 7f617193e640 -1 WARNING: all dangerous and experimental features are enabled.
2024-09-17T00:21:12.872+0000 7f617193e640 -1 WARNING: all dangerous and experimental features are enabled.
  cluster:
    id:     87c188ff-724a-4c80-b841-c0f061bc20dd
    health: HEALTH_OK

  services:
    mon: 3 daemons, quorum a,b,c (age 2m)
    mgr: x(active, since 2m)
    osd: 3 osds: 3 up (since 100s), 3 in (since 113s)

  data:
    pools:   1 pools, 1 pgs
    objects: 2 objects, 449 KiB
    usage:   3.0 GiB used, 300 GiB / 303 GiB avail
    pgs:     1 active+clean
```

4. Create a Ceph pool

- Create a new pool where you will store your object:

```
[lflores@folio01 build]$ ./bin/ceph osd pool create my-pool
*** DEVELOPER MODE: setting PATH, PYTHONPATH and LD_LIBRARY_PATH ***
2024-09-17T03:38:14.627+0000 7f3765a3b640 -1 WARNING: all dangerous and experimental features are enabled.
2024-09-17T03:38:14.638+0000 7f3765a3b640 -1 WARNING: all dangerous and experimental features are enabled.
pool 'my-pool' created
```

- Check that the pool exists:

```
[lflores@folio01 build]$ ./bin/ceph osd pool ls
*** DEVELOPER MODE: setting PATH, PYTHONPATH and LD_LIBRARY_PATH ***
2024-09-17T03:40:14.449+0000 7f7865c50640 -1 WARNING: all dangerous and experimental features are enabled.
2024-09-17T03:40:14.458+0000 7f7865c50640 -1 WARNING: all dangerous and experimental features are enabled.
.mgr
my-pool
```

5. Upload a file as an object to that pool

- Create a text file:

```
[lflores@folio01 build]$ echo "Hello, world!" > hello-world.txt
[lflores@folio01 build]$ cat hello-world.txt
Hello, world!
```

- Upload the text file to the pool. Here, we use the `rados` command to upload the file as an object into the pool. This command uploads `hello-world.txt` to pool "my-pool" as the object "my-object".

```
[lflores@folio01 build]$ ./bin/rados put my-object --pool=my-pool hello-world.txt
```

6. List & retrieve objects in the pool

- List the objects currently stored in the pool:

```
[lflores@folio01 build]$ ./bin/rados ls --pool=my-pool
2024-09-17T03:49:49.495+0000 7fda1b23e000 -1 WARNING: all dangerous and experimental features are enabled.
2024-09-17T03:49:49.500+0000 7fda1b23e000 -1 WARNING: all dangerous and experimental features are enabled.
2024-09-17T03:49:49.500+0000 7fda1b23e000 -1 WARNING: all dangerous and experimental features are enabled.
my-object
```

- Retrieve the object's contents, saving it to a new text file:

```
[lflores@folio01 build]$ ./bin/rados get my-object --pool=my-pool retrieved-hello-world.txt
```

- Verify the new file's contents:

```
[lflores@folio01 build]$ cat retrieved-hello-world.txt
Hello, world!
```

7. Shut down your cluster

- When you're done using your test cluster, shut it down with the following command:

```
[lflores@folio01 build]$ ../src/stop.sh
WARNING:  ceph-osd still alive after 1 seconds
WARNING:  ceph-osd still alive after 2 seconds
WARNING:  ceph-osd still alive after 4 seconds
```

- Real Ceph clusters run continuously, but it's good practice to shut down your test clusters when you're done with them, or else you'll run into "out of space" problems on your device.

Summary

- In this demo, we created a text file, uploaded it to a Ceph cluster by adding it to a pool, and then retrieved the contents of the text file.
- This demo is a small demonstration of how Ceph stores data:
  - **Pools** are logical partitions that are used to store objects.
  - The data is replicated across the cluster multiple times for **resiliency**.
  - If one part of the cluster fails (perhaps due to a hardware malfunction), your data is still safe.
  - Ceph clusters can scale up by increasing the size of the pools to accommodate large volumes of data.
- See this page for more details about pools:

  https://docs.ceph.com/en/latest/rados/operations/pools/