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OUTLINES

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  - Image Storage
  - Block Storage
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INTRODUCTION

- Storage is one of the most widely utilized cloud-computing services.
- Cloud storage has great benefits as it is easily accessible and reliable
- It has rapid deployment along with flexible data backup and recovery options.

- Impacts of storage solutions on Cloud
  - Performance
  - Capacity
  - Availability
  - Interoperability

OPENSTACK STORAGE TYPES

- Image Storage – Glance
- Ephemeral Storage -Nova
- Block Storage -Cinder
- Object Storage - Swift

Storage of Instance

When an instance is created,

1. A **root disk** is created which contains bootloader and core operating system files. (primary disk)
2. Optional **ephemeral disk** can be created (secondary disk)

Memory allocated for root or ephemeral disk is decided by flavor used for creating instance

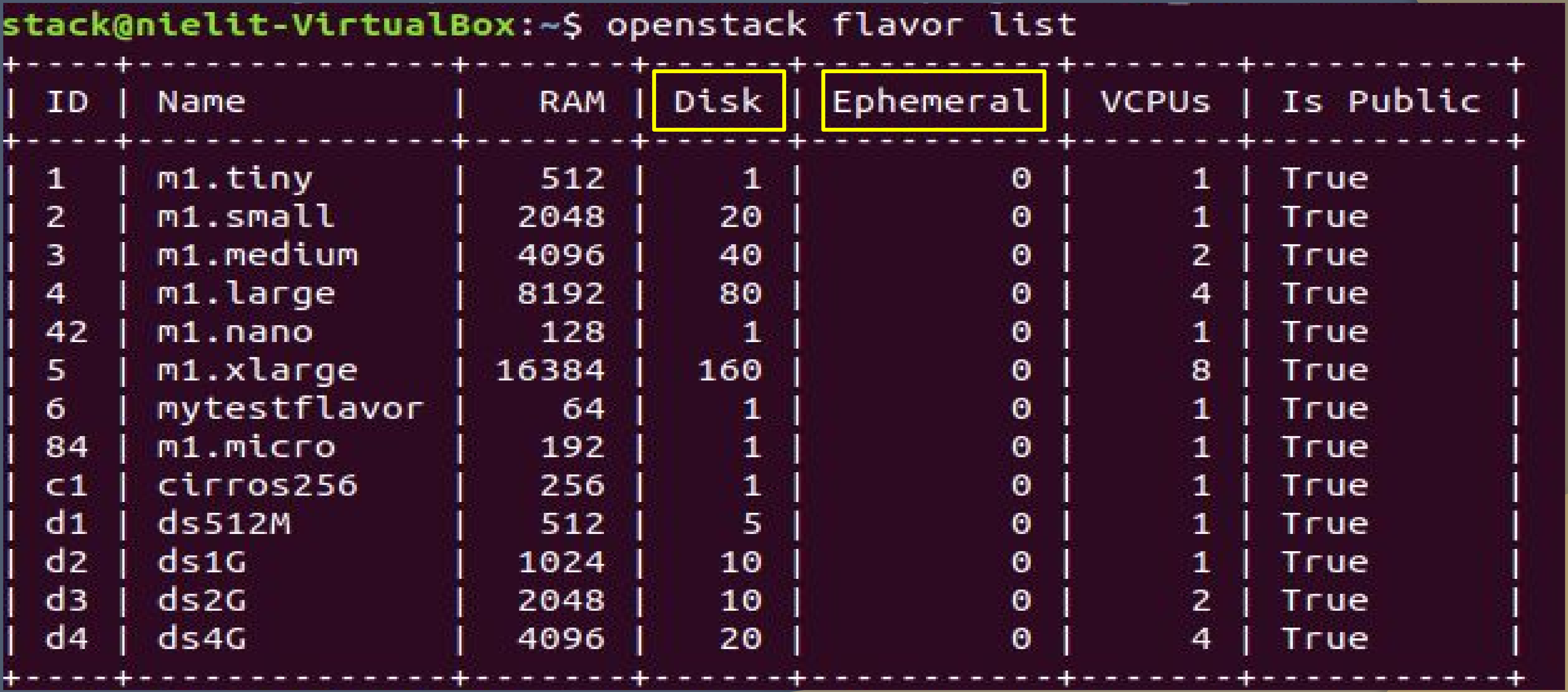
Root Disk

- The root disk contains the operating system for the image, and it is created using an image as a template.
- The size of root disk is defined in the flavor (as disk).
- If the size of the root disk is smaller than the minimum disk defined by the image, the instance is not deployed.
- Openstack supports the use of root disks based on OpenStack volumes in order to make root disks persistent.

Ephemeral Disk

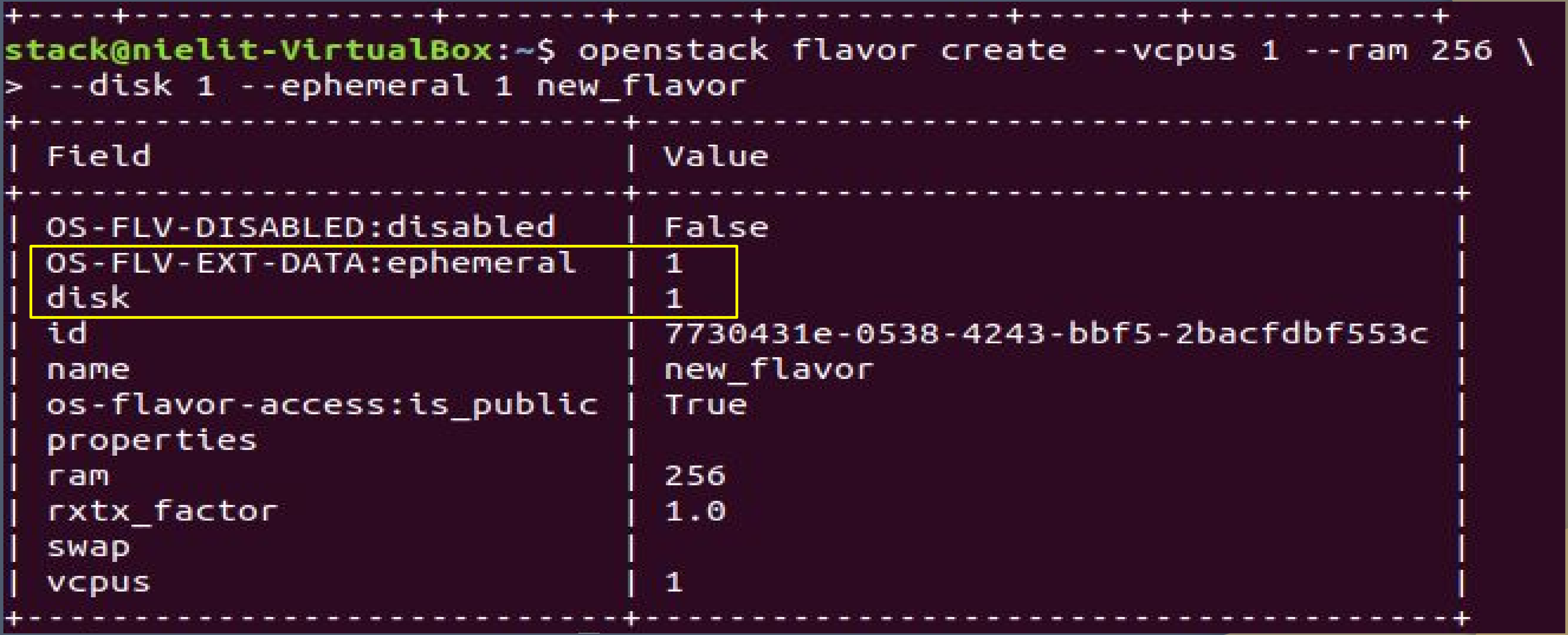
- The ephemeral disk in a flavor defines how much additional disk space is going to be available to the instance.
- The size of ephemeral disk is defined in the flavor (as ephemeral).
- By default, the size of an ephemeral disk in a flavor is 0 GB.
- To make this space available, a device is created in the instance. It needs to be partitioned and formatted with a file system.

Flavors with Root & Ephemeral disk



```
stack@nielit-VirtualBox:~$ openstack flavor list
+----+--------------+-------+------+-----------+-------+-----------+
| ID | Name         |   RAM | Disk | Ephemeral | VCPUs | Is Public |
+----+--------------+-------+------+-----------+-------+-----------+
| 1  | m1.tiny      |   512 |    1 |         0 |     1 | True      |
| 2  | m1.small     |  2048 |   20 |         0 |     1 | True      |
| 3  | m1.medium    |  4096 |   40 |         0 |     2 | True      |
| 4  | m1.large     |  8192 |   80 |         0 |     4 | True      |
| 42 | m1.nano      |   128 |    1 |         0 |     1 | True      |
| 5  | m1.xlarge    | 16384 |  160 |         0 |     8 | True      |
| 6  | mytestflavor |    64 |    1 |         0 |     1 | True      |
| 84 | m1.micro     |   192 |    1 |         0 |     1 | True      |
| c1 | cirros256    |   256 |    1 |         0 |     1 | True      |
| d1 | ds512M       |   512 |    5 |         0 |     1 | True      |
| d2 | ds1G         |  1024 |   10 |         0 |     1 | True      |
| d3 | ds2G         |  2048 |   10 |         0 |     2 | True      |
| d4 | ds4G         |  4096 |   20 |         0 |     4 | True      |
+----+--------------+-------+------+-----------+-------+-----------+
```

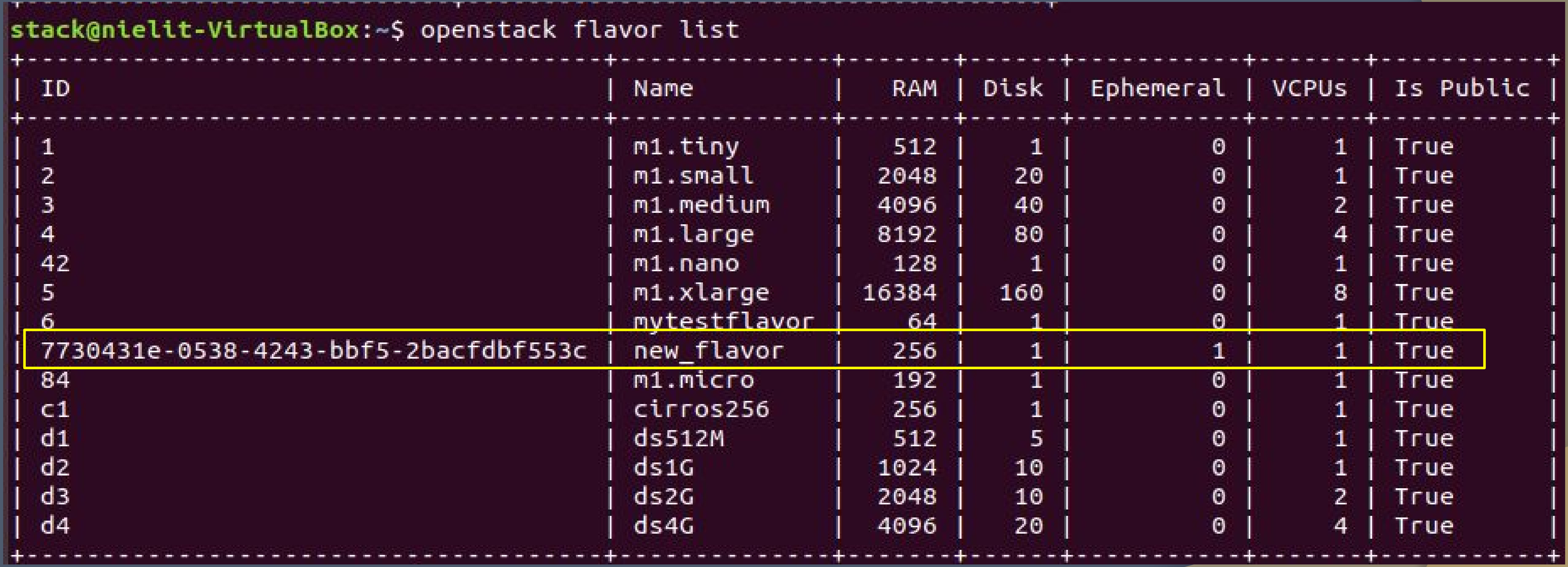
Creating flavor with Root & Ephemeral disk



```
+----+--------------+-------+------+-----------+-------+-----------+
stack@nielit-VirtualBox:~$ openstack flavor create --vcpus 1 --ram 256 \
> --disk 1 --ephemeral 1 new_flavor
+----------------------------+--------------------------------------+
| Field                      | Value                                |
+----------------------------+--------------------------------------+
| OS-FLV-DISABLED:disabled   | False                                |
| OS-FLV-EXT-DATA:ephemeral  | 1                                    |
| disk                       | 1                                    |
| id                         | 7730431e-0538-4243-bbf5-2bacfdbf553c |
| name                       | new_flavor                           |
| os-flavor-access:is_public | True                                 |
| properties                 |                                      |
| ram                        | 256                                  |
| rxtx_factor                | 1.0                                  |
| swap                       |                                      |
| vcpus                      | 1                                    |
+----------------------------+--------------------------------------+
```

The above command creates a Flavor with 1 GB Root disk and 1 GB Ephemeral disk.

Command to list Flavors

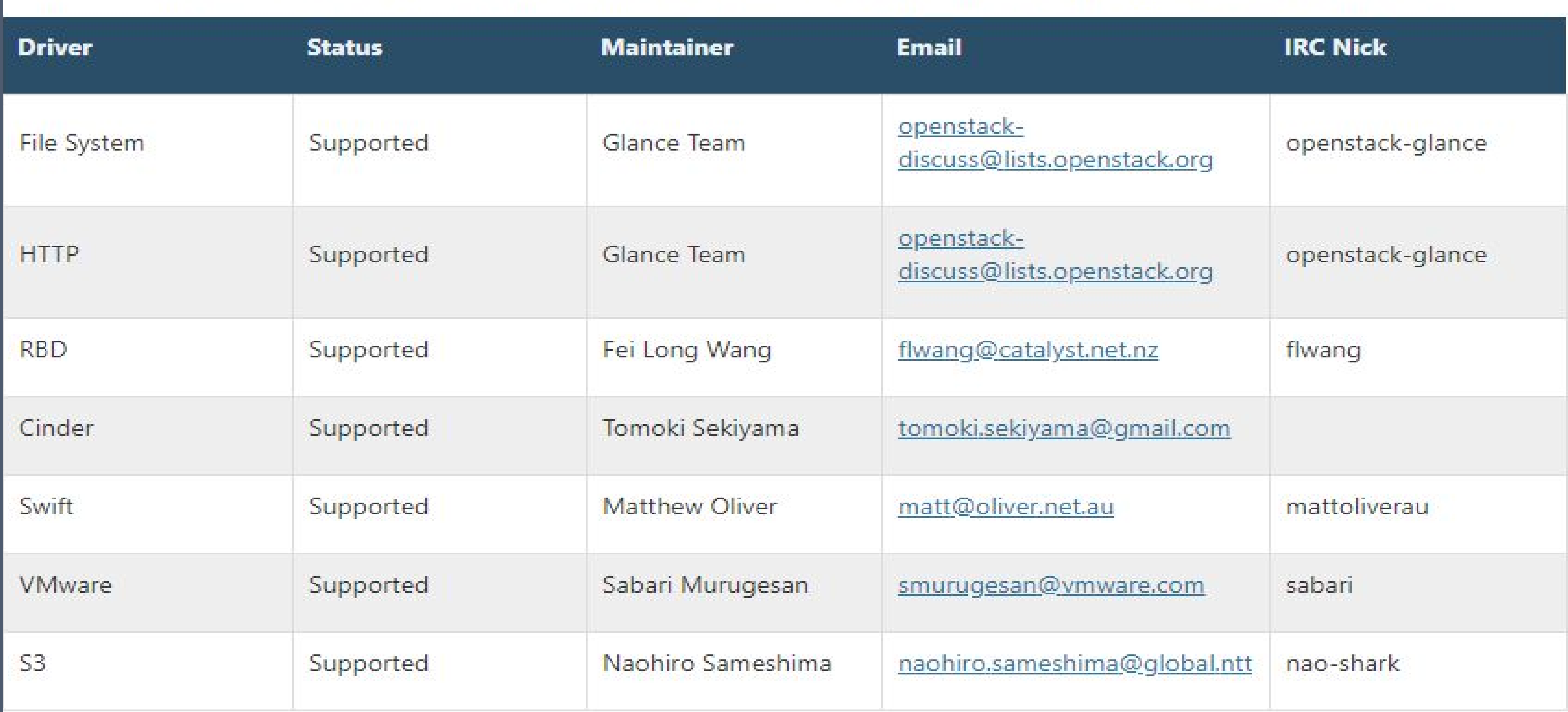


```
stack@nielit-VirtualBox:~$ openstack flavor list
+--------------------------------------+--------------+-------+------+-----------+-------+-----------+
| ID                                   | Name         |   RAM | Disk | Ephemeral | VCPUs | Is Public |
+--------------------------------------+--------------+-------+------+-----------+-------+-----------+
| 1                                    | m1.tiny      |   512 |    1 |         0 |     1 | True      |
| 2                                    | m1.small     |  2048 |   20 |         0 |     1 | True      |
| 3                                    | m1.medium    |  4096 |   40 |         0 |     2 | True      |
| 4                                    | m1.large     |  8192 |   80 |         0 |     4 | True      |
| 42                                   | m1.nano      |   128 |    1 |         0 |     1 | True      |
| 5                                    | m1.xlarge    | 16384 |  160 |         0 |     8 | True      |
| 6                                    | mytestflavor |    64 |    1 |         0 |     1 | True      |
| 7730431e-0538-4243-bbf5-2bacfdbf553c | new_flavor   |   256 |    1 |         1 |     1 | True      |
| 84                                   | m1.micro     |   192 |    1 |         0 |     1 | True      |
| c1                                   | cirros256    |   256 |    1 |         0 |     1 | True      |
| d1                                   | ds512M       |   512 |    5 |         0 |     1 | True      |
| d2                                   | ds1G         |  1024 |   10 |         0 |     1 | True      |
| d3                                   | ds2G         |  2048 |   10 |         0 |     2 | True      |
| d4                                   | ds4G         |  4096 |   20 |         0 |     4 | True      |
+--------------------------------------+--------------+-------+------+-----------+-------+-----------+
```

Glance (image storage)

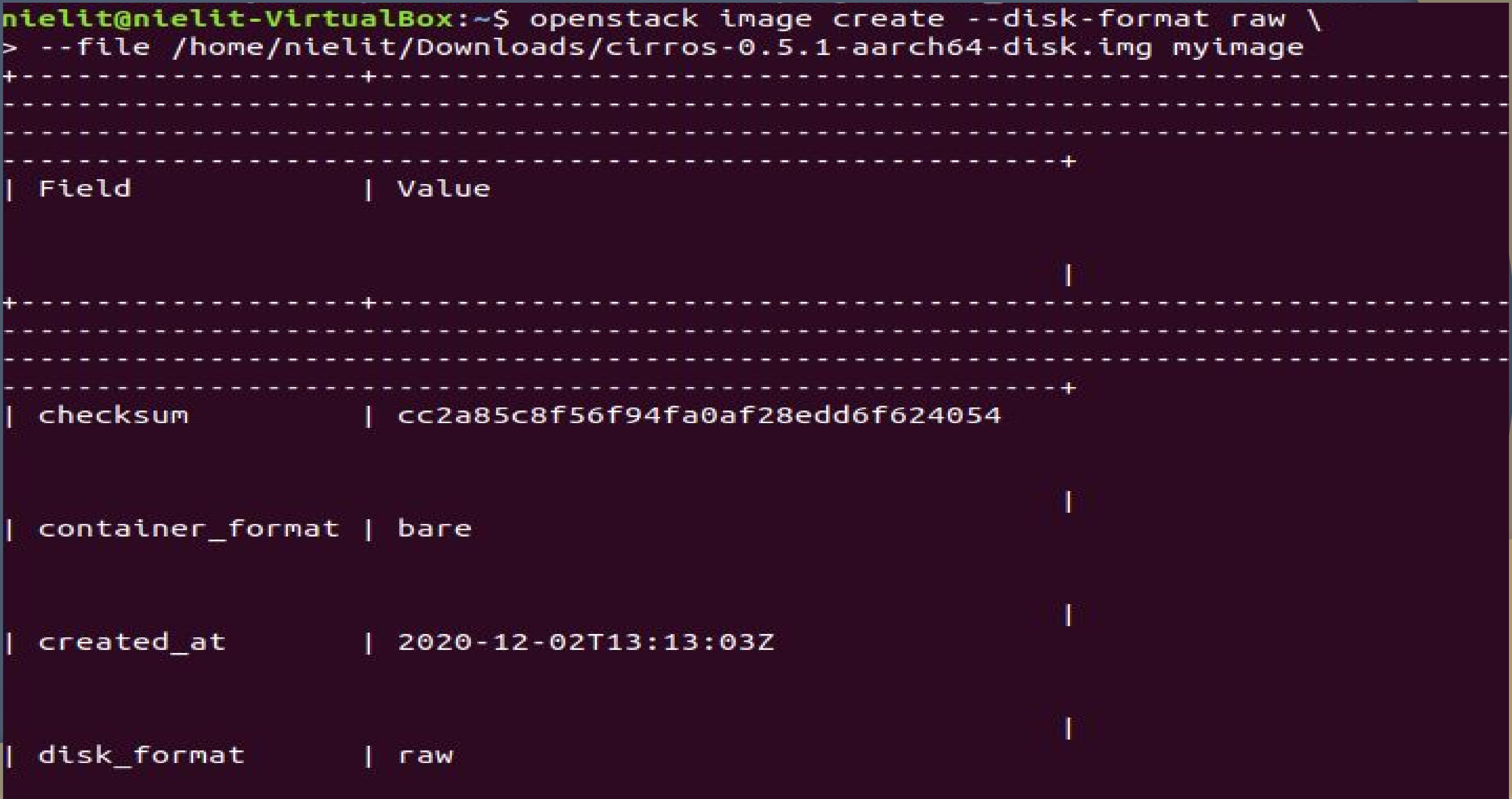
- Glance project provides a service where users can upload and discover images .
- It includes -discovering, registering, and retrieving virtual machine (VM) images.
- Glance can be configured to store images on a variety of storage back ends supported by the glance_store drivers (glance-api.conf configuration file present in /etc/glance/glance-api.conf)
- By default the glance service uses the local file system (all-in-one deployment)
- For production environment, swift backend or some form of shared storage are used with glance.

Glance Store Drivers



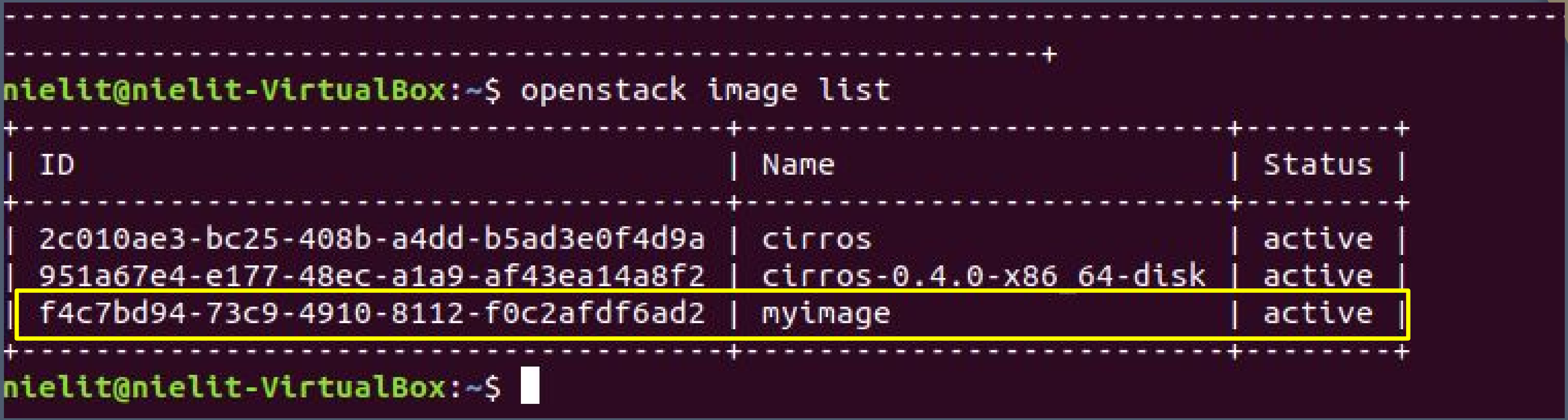
Driver	Status	Maintainer	Email	IRC Nick
File System	Supported	Glance Team	openstack-discuss@lists.openstack.org	openstack-glance
HTTP	Supported	Glance Team	openstack-discuss@lists.openstack.org	openstack-glance
RBD	Supported	Fei Long Wang	flwang@catalyst.net.nz	flwang
Cinder	Supported	Tomoki Sekiyama	tomoki.sekiyama@gmail.com	
Swift	Supported	Matthew Oliver	matt@oliver.net.au	mattoliverau
VMware	Supported	Sabari Murugesan	smurugesan@vmware.com	sabari
S3	Supported	Naohiro Sameshima	naohiro.sameshima@global.ntt	nao-shark

Creating image in Openstack



```
nielit@nielit-VirtualBox:~$ openstack image create --disk-format raw \
> --file /home/nielit/Downloads/cirros-0.5.1-aarch64-disk.img myimage
+------------------+------------------------------------------------------------
--------------------------------------------------------------------------------
--------------------------------------------------------------------------------
--------------------------------------------------------+
| Field            | Value


                                                        |
+------------------+------------------------------------------------------------
--------------------------------------------------------------------------------
--------------------------------------------------------------------------------
--------------------------------------------------------+
| checksum         | cc2a85c8f56f94fa0af28edd6f624054


                                                        |
| container_format | bare


                                                        |
| created_at       | 2020-12-02T13:13:03Z


                                                        |
| disk_format      | raw
```

Command to List images

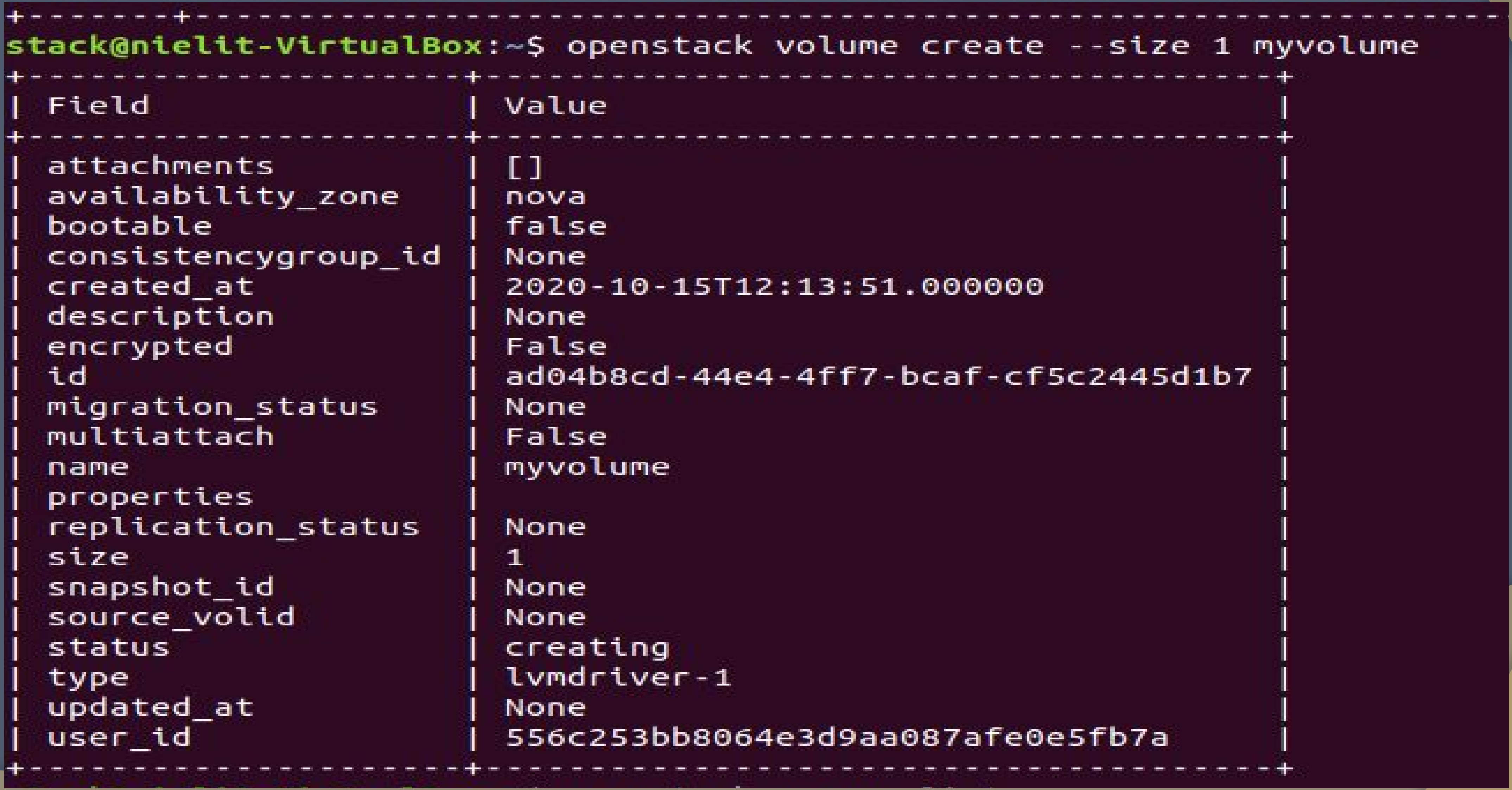


```
------------------------------------------------------------------------------------
-------------------------------------------------------+
nielit@nielit-VirtualBox:~$ openstack image list
+--------------------------------------+--------------------------+--------+
| ID                                   | Name                     | Status |
+--------------------------------------+--------------------------+--------+
| 2c010ae3-bc25-408b-a4dd-b5ad3e0f4d9a | cirros                   | active |
| 951a67e4-e177-48ec-a1a9-af43ea14a8f2 | cirros-0.4.0-x86_64-disk | active |
| f4c7bd94-73c9-4910-8112-f0c2afdf6ad2 | myimage                  | active |
+--------------------------------------+--------------------------+--------+
nielit@nielit-VirtualBox:~$ 
```

Cinder (Block Storage)

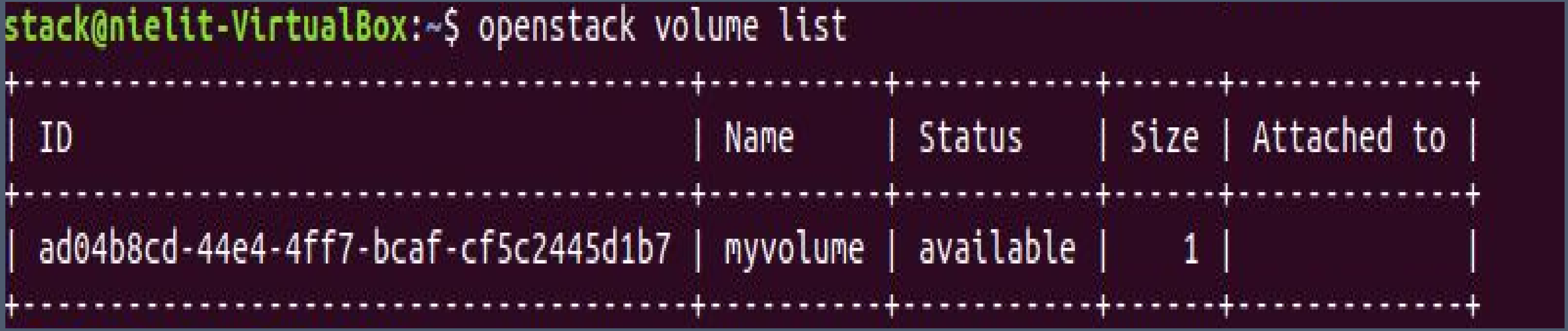
- Cinder is a block storage device.
- It is used to add additional disk volume to the user.
- Data within volume can only be accessed when it is attached to some vm (instances).
- We can connect cinder volume to any one virtual machine at a time.
- We can also detach volume from one vm and attach it to another vm.
- data present in volume persists ever after deletion of vm.
- In AWS, block storage is done using EBS service.

Creating volume in Openstack using command



```
+-------+----------------------------------------------------------------
stack@nielit-VirtualBox:~$ openstack volume create --size 1 myvolume
+---------------------+--------------------------------------+
| Field               | Value                                |
+---------------------+--------------------------------------+
| attachments         | []                                   |
| availability_zone   | nova                                 |
| bootable            | false                                |
| consistencygroup_id | None                                 |
| created_at          | 2020-10-15T12:13:51.000000           |
| description         | None                                 |
| encrypted           | False                                |
| id                  | ad04b8cd-44e4-4ff7-bcaf-cf5c2445d1b7 |
| migration_status    | None                                 |
| multiattach         | False                                |
| name                | myvolume                             |
| properties          |                                      |
| replication_status  | None                                 |
| size                | 1                                    |
| snapshot_id         | None                                 |
| source_volid        | None                                 |
| status              | creating                             |
| type                | lvmdriver-1                          |
| updated_at          | None                                 |
| user_id             | 556c253bb8064e3d9aa087afe0e5fb7a     |
+---------------------+--------------------------------------+
```

Command to list volumes

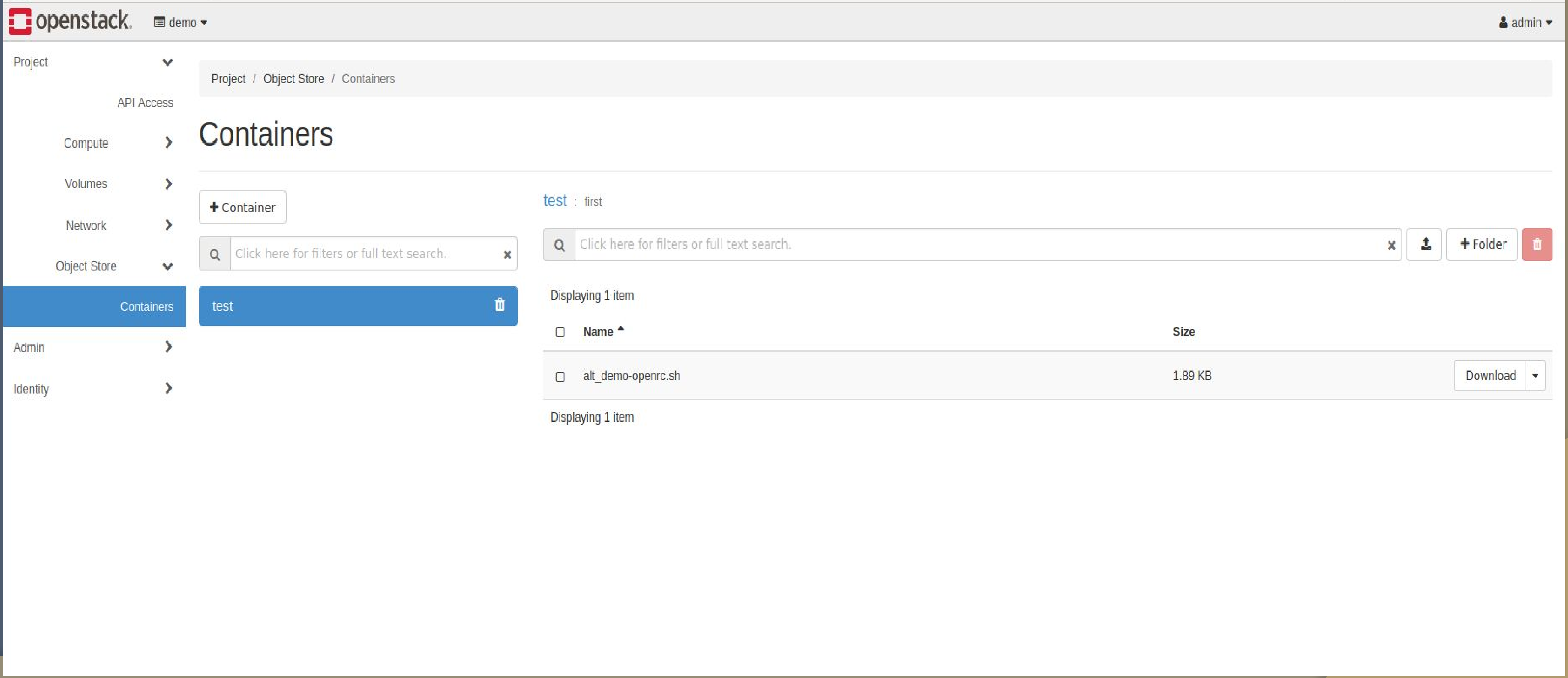


```
stack@nielit-VirtualBox:~$ openstack volume list
+--------------------------------------+----------+-----------+------+-------------+
| ID                                   | Name     | Status    | Size | Attached to |
+--------------------------------------+----------+-----------+------+-------------+
| ad04b8cd-44e4-4ff7-bcaf-cf5c2445d1b7 | myvolume | available |    1 |             |
+--------------------------------------+----------+-----------+------+-------------+
```

Swift (object storage)

- Swift is a object storage device.
- we can configure Swift services as standalone services to provide only the object storage services to the end users – example Google Drive or Dropbox.
- It can be used in openstack for storing or retrieving images (glance) and maintaining backup of volumes (cinder).
- It implements a highly available, distributed, eventually consistent object/blob store that is accessible via HTTP/HTTPS.
- In AWS it is done using S3.

Using Swift



Containers

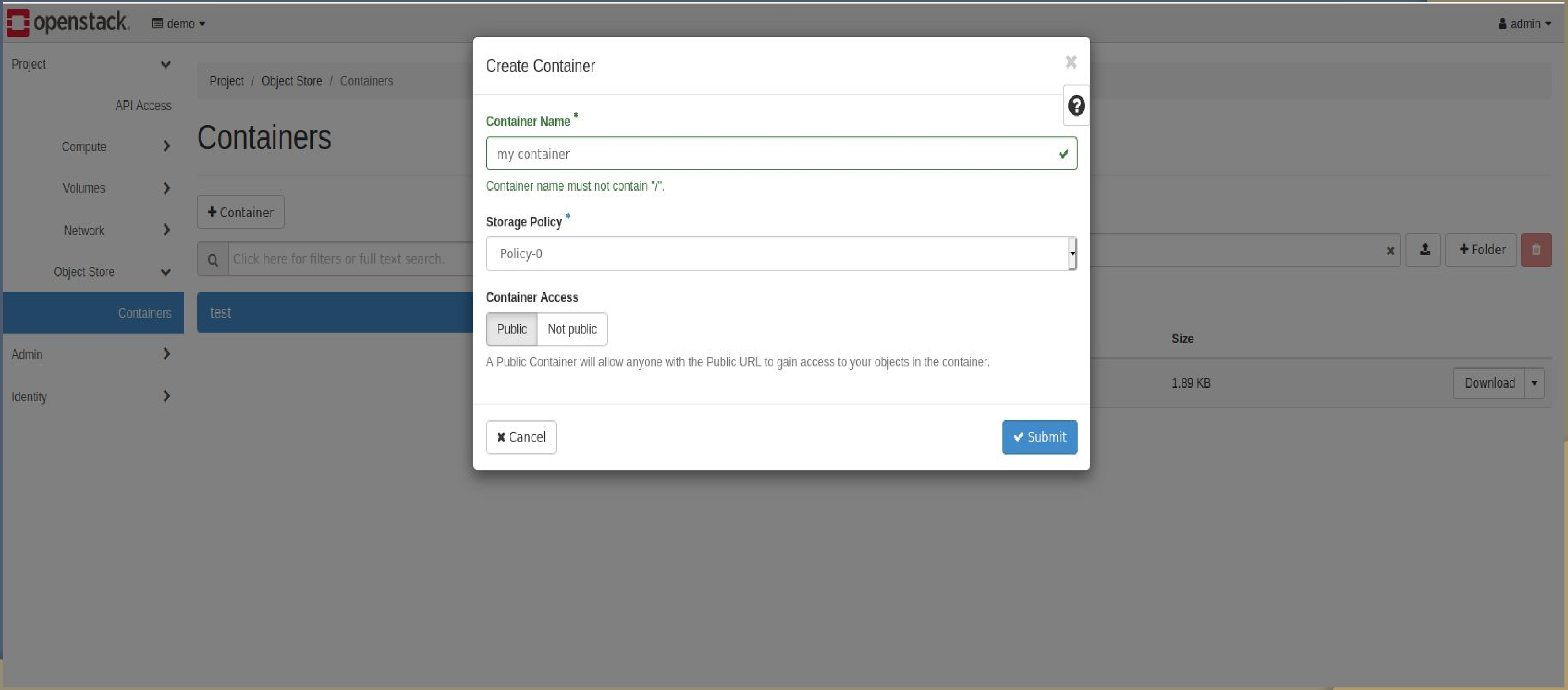
+ Container
Click here for filters or full text search.
test
test : first
Click here for filters or full text search.
+ Folder

Displaying 1 item

□	Name	Size	
□	alt_demo-openrc.sh	1.89 KB	Download

Displaying 1 item

1. Create Container



Create Container

Container Name *

my container

Container name must not contain "/".

Storage Policy *

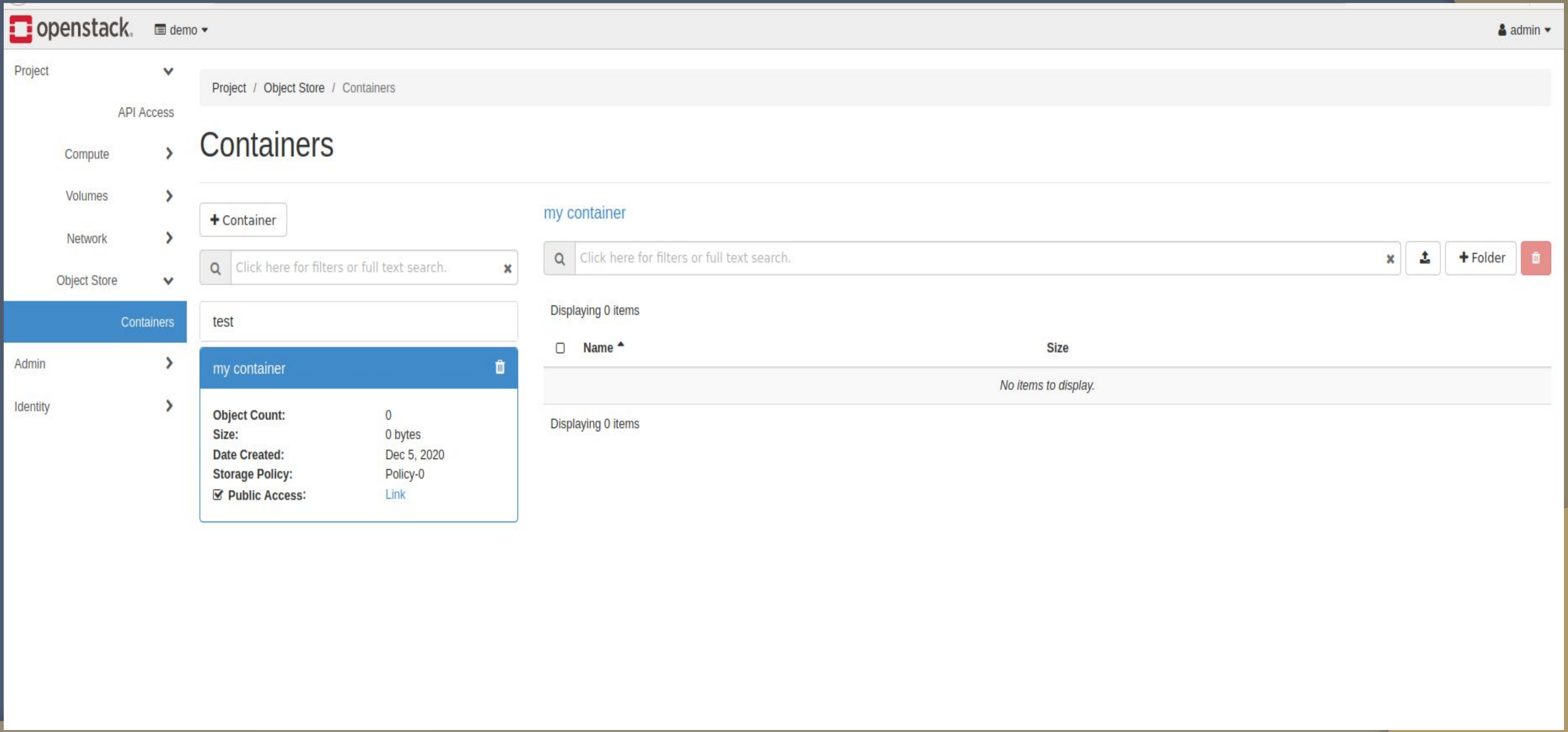
Policy-0

Container Access

Public | Not public

A Public Container will allow anyone with the Public URL to gain access to your objects in the container.

2. Check Container Added



Project / Object Store / Containers

Containers

test

my container

Object Count: 0
Size: 0 bytes
Date Created: Dec 5, 2020
Storage Policy: Policy-0
☑ **Public Access:** Link

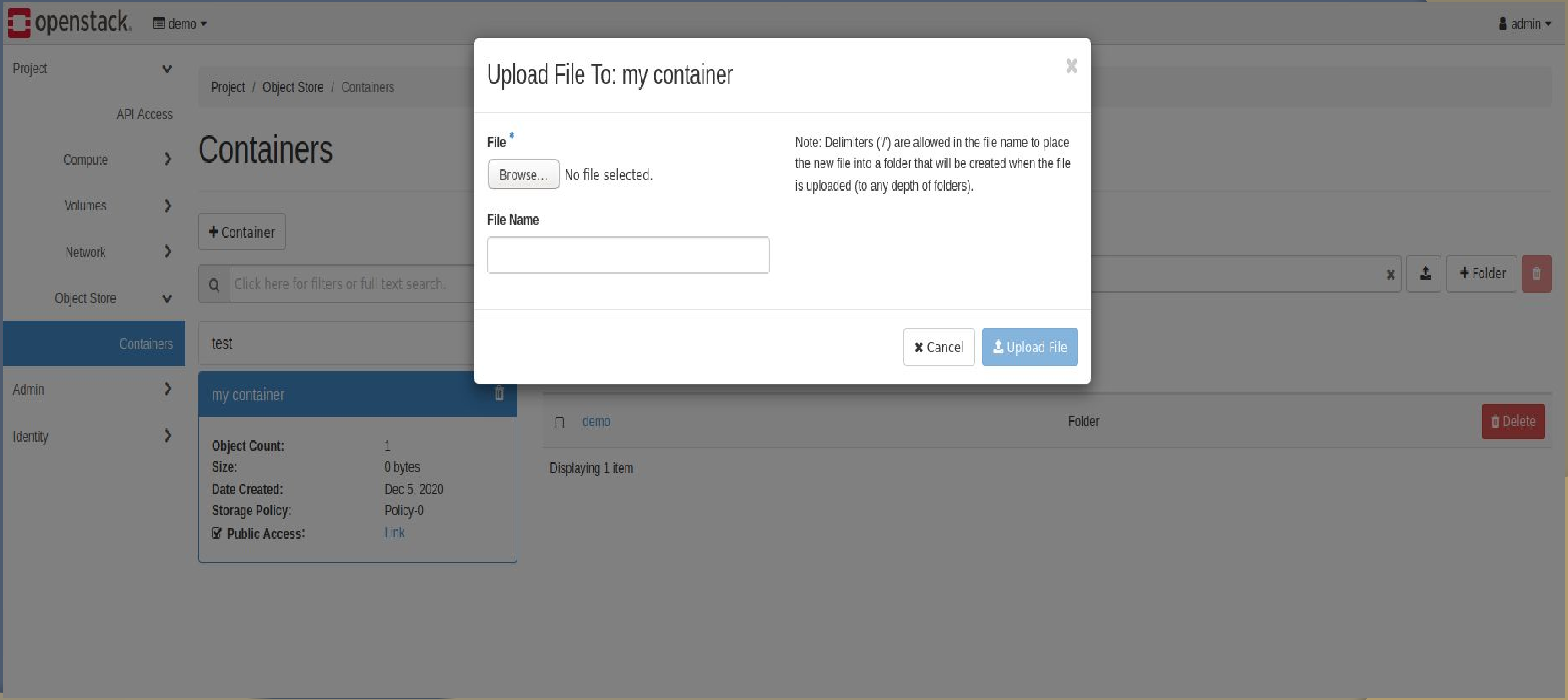
my container

Displaying 0 items

□ Name	Size
No items to display.	

Displaying 0 items

3. Uploading File to Container



Object Count: 1
Size: 0 bytes
Date Created: Dec 5, 2020
Storage Policy: Policy-0
☑ Public Access: Link

demo Folder

Displaying 1 item

Upload File To: my container

File *

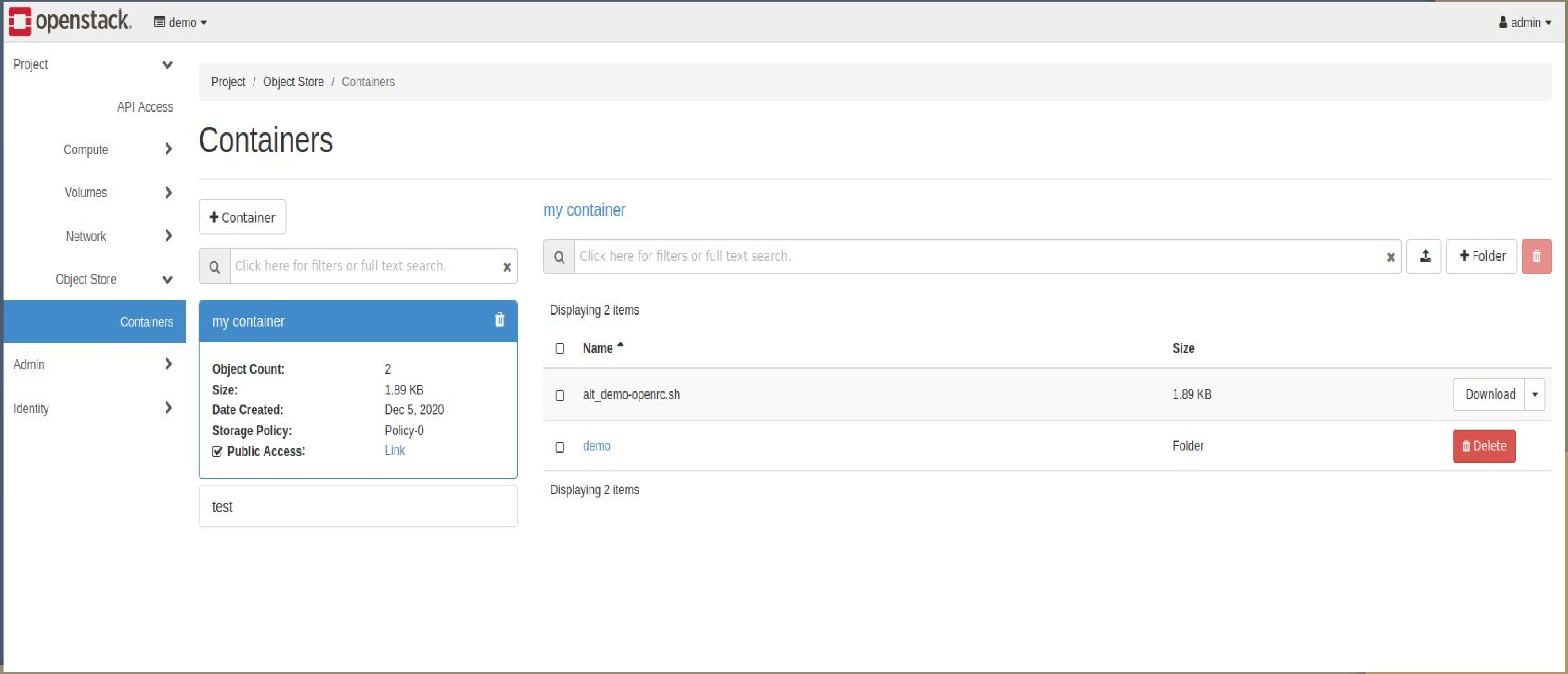
Browse... No file selected.

Note: Delimiters ('/') are allowed in the file name to place the new file into a folder that will be created when the file is uploaded (to any depth of folders).

File Name

✖ Cancel   Upload File

4. File & folder added in Container



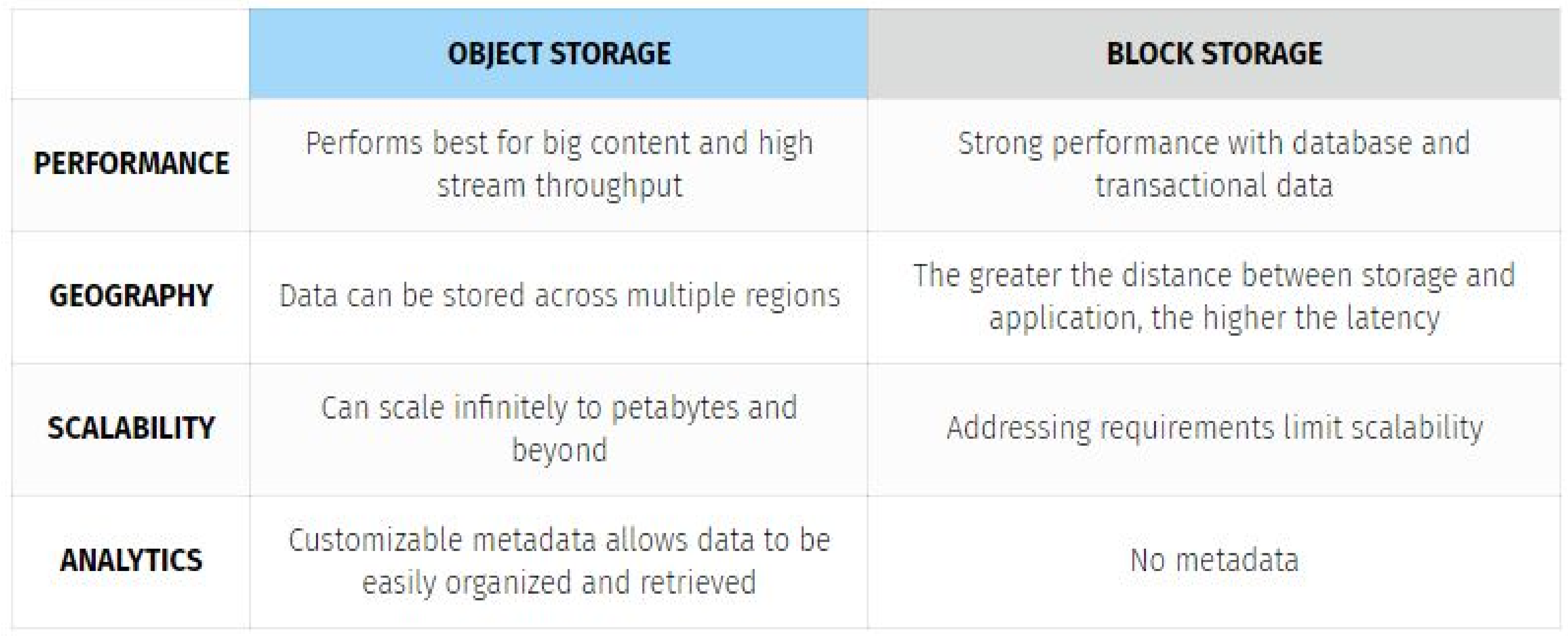
my container

Object Count: 2
Size: 1.89 KB
Date Created: Dec 5, 2020
Storage Policy: Policy-0
☑ Public Access: Link

Displaying 2 items

☐	Name ▴	Size	
☐	alt_demo-openrc.sh	1.89 KB	Download ▾
☐	demo	Folder	Delete

Displaying 2 items



	OBJECT STORAGE	BLOCK STORAGE
PERFORMANCE	Performs best for big content and high stream throughput	Strong performance with database and transactional data
GEOGRAPHY	Data can be stored across multiple regions	The greater the distance between storage and application, the higher the latency
SCALABILITY	Can scale infinitely to petabytes and beyond	Addressing requirements limit scalability
ANALYTICS	Customizable metadata allows data to be easily organized and retrieved	No metadata

OPENSTACK STORAGE TYPES COMPARISON

	Ephemeral storage	Block storage	Object storage	Image Storage
Used by	Nova Compute to run Operating System and Scratch Space	Add additional persistent storage to a VM as Volumes	Stores data including VM images, snapshots in object containers	Glance to store image templates, snapshots of VM
Accessible from	Within a VM	Within a VM	Anywhere	Within Cloud
Accessible through	A file system	A block device that can be partitioned, formatted and mounted on the fly	The REST API	The REST API
Managed by	Openstack Nova	Openstack Cinder	Openstack Swift	Openstack Glance
Persists until	VM is terminated	Deleted by user	Deleted by user	Deleted by user
Sizing	Flavor configurations	Volume requirements	Physical Storage limit	Image store requirements

THANK YOU