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How to ensure OpenStack Swift & Amazon S3 Conformance for storage products & services supporting multiple Object APIs

Ankit Agrawal
Tata Consultancy Services Ltd.

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Focal Points of Discussion

1. Object Storage: Overview
2. Object Storage APIs: Overview
3. Conformance Testing Approach
4. Sample Test Cases

Object Storage: Overview (1/2)

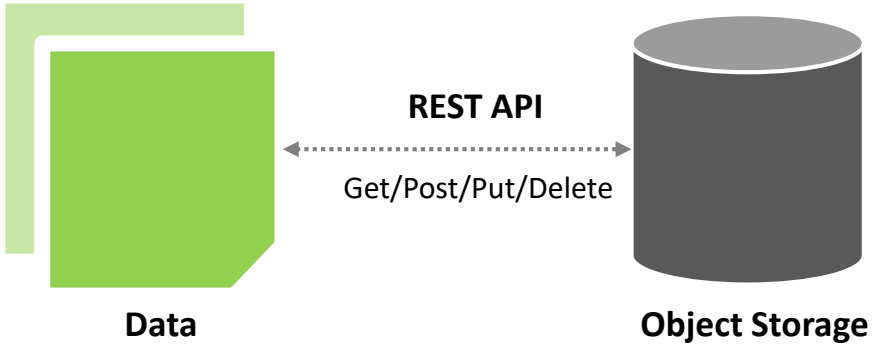
Unstructured Data Growth

- What is Unstructured Data?
- Why Unstructured Data is growing massively?
- Unstructured Data Growth Report
- Why Unstructured Data is so important?

Object Storage: Overview (1/2)

Why Object Storage for Unstructured Data

- Limitless Scalability
- Runs on Commodity Hardware
- Highly Available
- Anytime / Anywhere access
- Flat address space
- Unique ObjectID
- Manageability



Object Storage APIs: Overview

- Object Storage APIs ?
- Why Amazon S3 & OpenStack Swift ?
- Why Conformance to S3 & Swift is critical ?

Conformance Testing Approach

1. OpenStack Swift

2. Amazon S3

Conformance Testing Approach

- Supports the REST API
- Supports Token Based Authentication

Conformance Testing Approach

Discoverability Operations

- GET /info
- lists the activated capabilities

Endpoints Operations:

- GET /v1/endpoints
- List endpoints

Operations on the Accounts

Show account details and list containers

- GET /v1/{account}

Create, update, or delete account metadata

- POST /v1/{account}

Show account metadata

- HEAD /v1/{account}

Conformance Testing Approach

Operations on the Containers

Show container details and list objects

- GET /v1/{account}/{container}

Create container

- PUT /v1/{account}/{container}

Create, update, or delete container metadata

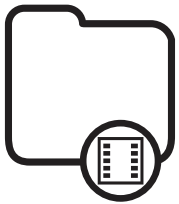
- POST /v1/{account}/{container}

Show container metadata

- HEAD /v1/{account}/{container}

Delete container

- DELETE /v1/{account}/{container}



Operations on the Objects

Get object content and metadata

- GET /v1/{account}/{container}/{object}

Create or replace object

- PUT /v1/{account}/{container}/{object}

Copy object

- COPY /v1/{account}/{container}/{object}

Delete object

- DELETE /v1/{account}/{container}/{object}

Show object metadata

- HEAD /v1/{account}/{container}/{object}

Create or update object metadata

- POST /v1/{account}/{container}/{object}

Sample Test Cases

Test Cases:
OpenStack Swift APIs - Container Operations

Container

Test Case#1:
Show container details and list objects

Test Case#2:
Show container details and list objects for container that does not exist

Test Case#3:
Create a Container using Swift API

Test Case#4:
Create a Container using custom metadata

Test Case#5:
Delete container metadata

Test Case#6:
Show container metadata

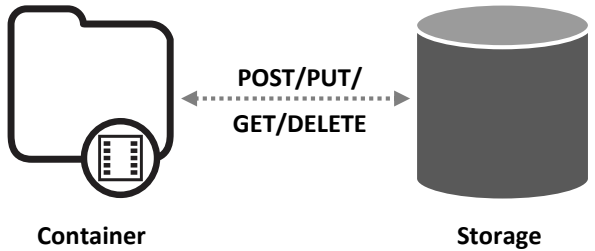
Test Case#7:
Create a container with an ACL to allow anybody to get an object in the particular container

Test Case#8:
Delete an empty Container

Test Case#9:
Delete a Container that does not exist.

Test Case#10:
Delete a non-empty Container

Figure: 1



Sample Test Cases

Test Cases:
OpenStack Swift APIs - Object Operations

Object

Test Case#1:
Show object details for the particular object in the particular container

Test Case#2:
Show object details for the object, which does not exist, in the particular container

Test Case#3:
Create object using Swift API

Test Case#4:
Update existing Object.

Test Case#5:
Copy existing object from one container to other

Test Case#6:
Create object metadata

Test Case#7:
Show object metadata

Test Case#8:
Update object metadata

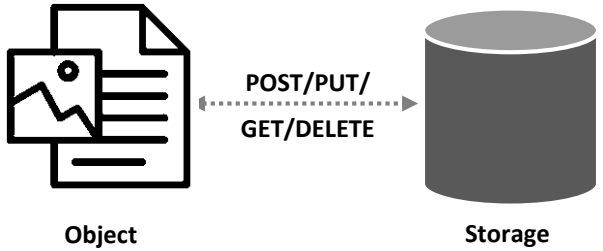
Test Case#9:
Copy non-existing object from one container to other

Test Case#10:
Delete existing object from the particular container

Test Case#11:
Delete non-existing object from the particular container

Test Case#12:
Delete static large object (segments & manifest object)

Figure: 2



Conformance Testing Approach

1. OpenStack Swift

2. Amazon S3

Conformance Testing Approach

- Current Version: 2006-03-01
- Supports the REST APIs
- Authentication - AWS Signature Version 4 Algorithm
- Authentication Methods
  - HTTP Authorization header
  - Query string parameters

Conformance Testing Approach

Common Request Headers

- Authorization
- Content-Length
- Content-Type
- Content-MD5
- Date
- Expect
- Host
- x-amz-content-sha256
- x-amz-date
- x-amz-security-token

Common Response Headers

- Content-Length
- Content-Type
- Connection
- Date
- Etag
- Server
- x-amz-delete-marker
- x-amz-id-2
- x-amz-request-id
- x-amz-version-id

Conformance Testing Approach

Operations on the Service

GET Service:

- Returns a list of all buckets owned by the authenticated sender of the request.
- URI: GET /

Conformance Testing Approach

Operations on the Buckets (Create/Update)

PUT Bucket

- creates a new bucket

PUT Bucket accelerate

- set the Transfer Acceleration state of an existing bucket to enable to perform faster data transfers

PUT Bucket acl

- to set the permissions on an existing bucket using access control lists (ACL)

PUT Bucket inventory

- adds an inventory configuration (identified by the inventory ID) to the bucket.

PUT Bucket cors

- Sets the cors configuration for your bucket

Operations on the Buckets (Retrieve)

GET Bucket (List Objects)

- returns some or all (up to 1,000) of the objects in a bucket.

GET Bucket accelerate

- return the Transfer Acceleration state of a bucket, which is either Enabled or Suspended.

GET Bucket acl

- return the access control list (ACL) of a bucket

GET Bucket inventory

- returns an inventory configuration (identified by the inventory configuration ID) from the bucket.

GET Bucket cors

- Returns the cors configuration information set for the bucket.

Conformance Testing Approach

Operations on the Buckets (Delete)

DELETE Bucket

- deletes the bucket named in the URI.

DELETE Bucket inventory

- deletes an inventory configuration (identified by the inventory configuration ID) from the bucket

DELETE Bucket cors

- Deletes the cors configuration information set for the bucket.

Conformance Testing Approach

Operations on Objects (Create)

PUT Object

- adds an object to a bucket.

PUT Object - Copy

- creates a copy of an object that is already stored

PUT Object acl

- Uses the acl subresource to set the access control list (ACL) permissions for an object that already exists in a bucket.

PUT Object tagging

- uses the tagging subresource to add a set of tags to an existing object.

Operations on Objects (Retrieve)

GET Object

- retrieves objects from Amazon S3.

GET Object ACL

- uses the acl subresource to return the access control list (ACL) of an object.

GET Object tagging

- returns the tags associated with an object.

GET Object torrent

- uses the torrent subresource to return torrent files from a bucket.

Conformance Testing Approach

Operations on Objects (Delete)

Delete Multiple Objects

- delete multiple objects from a bucket using a single HTTP request.

DELETE Object

- removes the null version (if there is one) of an object
- If versioning enabled, permanently deletes the version

DELETE Object tagging

- uses the tagging subresource to remove the entire tag set from the specified object.

Operations on Objects (Others)

HEAD Object

- retrieves metadata from an object without returning the object itself.
- retrieve metadata from a different version, use the versionId subresource.

OPTIONS Object

- A browser can send this preflight request to Amazon S3 to determine if it can send an actual request with the specific origin, HTTP method, and headers.

Sample Test Cases

Test Case Name

TestCase#1

Test Case Description

Create a new Bucket using Amazon S3 compatible APIs

Pre-Test Dependencies

- **Secret Access Key** for Authentication
- Object Storage End-Point (cloud.example.com)

Description

<Test Case : Start>

- Compute and save authentication signature in "**AUTH_SIGNATURE**" variable using *Secret Access Key* and *AWS Signature Version 4* Algorithm.
- Create a bucket named "TestBucket1" using Amazon S3 API
  PUT / HTTP/1.1
  *Host: **TestBucket1**.cloud.example.com*
  Content-Length: 0
  Date: Wed, 01 Mar 2006 12:00:00 GMT
  *Authorization: **AUTH_SIGNATURE***
- Verify if bucket "TestBucket1" created successfully:
  Check for **HTTP status code**: ***200 OK*** returned
  Location header should be: ***/TestBucket1***
  x-amz-id-2 and **x-amz-request-id** should be returned
- "GET /**TestBucket1**" should run successfully.
- Expected Result: Bucket "TestBucket1" should be created successfully.
- Clean-up: Delete bucket "TestBucket1"

<Test Case : End>

Sample Test Cases

Test Case Name

TestCase#2

Test Case Description

List Objects contained in bucket "TestBucket1" successfully.

Pre-Test Dependencies

- **Secret Access Key** for Authentication
- Object Storage End-Point (cloud.example.com)

Description

<Test Case : Start>

- Compute and save authentication signature in "**AUTH_SIGNATURE**" variable using *Secret Access Key* and *AWS Signature Version 4* Algorithm.
- Create bucket *TestBucket1* <<**Refer**: TestScript#1>> and add objects to it.
- List all objects contained in bucket "TestBucket1", using Amazon S3 API
  GET /?list-type=2 *HTTP/1.1*
  Host: ***TestBucket1****.cloud.example.com*
  x-amz-date: 20160430T233541Z
  Authorization: ***AUTH_SIGNATURE***
  Content-Type: text/plain
- Verify if bucket "GET /TestBucket1" executed successfully:
  Check for **HTTP status code**: ***200 OK*** returned
  Response Body should list all objects contained in *TestBucket1*
- Expected Result: All objects contained in bucket "TestBucket1" should be listed successfully.
- Clean-up: Delete bucket "**TestBucket1**"

<Test Case : End>

Sample Test Cases

Test Case Name

TestCase#3

Test Case Description

Create a new bucket and configure access permission using a canned ACL

Pre-Test Dependencies

- **Secret Access Key#1** for Account#1 **and Secret Access Key#2** for Account#2
- Object Storage End-Point (cloud.example.com)

Description

<Test Case : Start>

- Compute and save authentication signature in "**AUTH_SIGNATURE**" variable using *Secret Access Key#1* and *AWS Signature Version 4* Algorithm.
- Create a bucket named "TestBucket1" using Amazon S3 API
  PUT / HTTP/1.1
  *Host: **TestBucket1**.cloud.example.com*
  Content-Length: 0
  x-amz-acl: private
  Date: Wed, 01 Mar 2006 12:00:00 GMT
  *Authorization: **AUTH_SIGNATURE***
- Verify if bucket "TestBucket1" created successfully using Amazon S3 API:
  Check for **HTTP status code**: ***200 OK*** returned
  Location header should be: ***/TestBucket1***
  x-amz-id-2 and **x-amz-request-id** must be returned
- Try to read bucket "GET /**TestBucket1**" using Access Key#2 <<**Refer:** TestCase#2>>, it should return Error Code *AccessDenied* (***403 Forbidden***)
- Expected Result: Bucket "**TestBucket1**" should be created successfully.
- Clean-up: Delete bucket "**TestBucket1**"

<Test Case : End>

Sample Test Cases

Test Case Name

TestCase#4

Test Case Description

Delete an existing bucket

Pre-Test Dependencies

- **Secret Access Key** for Authentication
- Object Storage End-Point (cloud.example.com)

Description

<Test Case : Start>

- Compute and save authentication signature in "**AUTH_SIGNATURE**" variable using *Secret Access Key* and *AWS Signature Version 4* Algorithm.
- Create bucket *TestBucket1* <<**Refer**: TestScript#1>>
- Delete bucket named "TestBucket1" using Amazon S3 API
  DELETE / HTTP/1.1
  *Host: **TestBucket1**.cloud.example.com*
  Date: Wed, 01 Mar 2006 12:00:00 GMT
  *Authorization: **AUTH_SIGNATURE***
- Verify if bucket "TestBucket1" deleted successfully:
  Check for **HTTP status code**: ***204 No Content*** returned
  x-amz-id-2 and **x-amz-request-id** must be returned
- Try to read bucket "GET /**TestBucket1**", it should return Error Code *NoSuchBucket* (***404 Not Found***)
- Expected Result: Bucket "**TestBucket1**" should be deleted successfully.

<Test Case : End>

Sample Test Cases

Test Case Name

TestCase#5

Test Case Description

Create a new Bucket using Amazon S3 compatible APIs

Pre-Test Dependencies

- **Secret Access Key** for Authentication
- Object Storage End-Point (cloud.example.com)

Description

<Test Case : Start>

- Compute and save authentication signature in "**AUTH_SIGNATURE**" variable using *Secret Access Key* and *AWS Signature Version 4* Algorithm.
- Create a bucket named "TestBucket1" using Amazon S3 API
  PUT / HTTP/1.1
  *Host: **TestBucket1**.cloud.example.com*
  Content-Length: 0
  Date: Wed, 01 Mar 2006 12:00:00 GMT
  *Authorization: **AUTH_SIGNATURE***
- Verify if bucket "TestBucket1" created successfully:
  Check for **HTTP status code**: ***200 OK*** returned
  Location header should be: ***/TestBucket1***
  x-amz-id-2 and **x-amz-request-id** should be returned
- "GET /**TestBucket1**" should run successfully.
- Expected Result: Bucket "TestBucket1" should be created successfully.
- Clean-up: Delete bucket "TestBucket1"

<Test Case : End>

Questions?

Thank You

Email: ankit29.a@tcs.com