Red Hat Ceph Storage 4

Developer Guide

Using the various application programming interfaces for Red Hat Ceph Storage

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Legal Notice

Abstract

This document provides instructions for Using the various application programming interfaces for Red Hat Ceph Storage running on AMD64 and Intel 64 architectures. Red Hat is committed to replacing problematic language in our code, documentation, and web properties. We are beginning with these four terms: master, slave, blacklist, and whitelist. Because of the enormity of this endeavor, these changes will be implemented gradually over several upcoming releases. For more details, see our CTO Chris Wright's message .

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CHAPTER 1. CEPH OBJECT GATEWAY ADMINISTRATIVE API

As a developer, you can administer the Ceph Object Gateway by interacting with the RESTful application programing interface (API). The Ceph Object Gateway makes available the features of the **radosgw-admin** command in a RESTful API. You can manage users, data, quotas and usage which you can integrate with other management platforms.

NOTE

Red Hat recommends using the command-line interface when configuring the Ceph Object Gateway.

The administrative API provides the following functionality:

- Authentication Requests
- **User Account Management**
  - Administrative User
  - Getting User Information
  - Creating
  - Modifying
  - Removing
  - Creating Subuser
  - Modifying Subuser
  - Removing Subuser
- **User Capabilities Management**
  - Adding
  - Removing
- **Key Management**
  - Creating
  - Removing
- **Bucket Management**
  - Getting Bucket Information
  - Checking Index
  - Removing
  - Linking
  - Unlinking

1.1. PREREQUISITES

- A running Red Hat Ceph Storage cluster.
- A RESTful client.

1.2. ADMINISTRATION OPERATIONS

An administrative Application Programming Interface (API) request will be done on a URI that starts with the configurable 'admin' resource entry point. Authorization for the administrative API duplicates the S3 authorization mechanism. Some operations require that the user holds special administrative capabilities. The response entity type, either XML or JSON, might be specified as the 'format' option in the request and defaults to JSON if not specified.

Example

```
PUT /admin/user?caps&format=json HTTP/1.1
Host: FULLY_QUALIFIED_DOMAIN_NAME
Content-Type: text/plain
Authorization: AUTHORIZATION_TOKEN

usage=read
```

1.3. ADMINISTRATION AUTHENTICATION REQUESTS

Amazon's S3 service uses the access key and a hash of the request header and the secret key to authenticate the request. It has the benefit of providing an authenticated request, especially large uploads, without SSL overhead.

Most use cases for the S3 API involve using open source S3 clients such as the **AmazonS3Client** in the Amazon SDK for Java or Python Boto. These libraries do not support the Ceph Object Gateway Admin API. You can subclass and extend these libraries to support the Ceph Admin API. Alternatively, you can create a unique Gateway client.

Creating an execute() method

The CephAdminAPI example class in this section illustrates how to create an **execute()** method that can take request parameters, authenticate the request, call the Ceph Admin API and receive a response.

The CephAdminAPI class example is not supported or intended for commercial use. It is for illustrative purposes only.

Calling the Ceph Object Gateway

The client code contains five calls to the Ceph Object Gateway to demonstrate CRUD operations:

- Create a User
- Get a User
- Modify a User
- Create a Subuser
- Delete a User

To use this example, get the **httpcomponents-client-4.5.3** Apache HTTP components. You can download it for example here: http://hc.apache.org/downloads.cgi. Then unzip the tar file, navigate to its **lib** directory and copy the contents to the **/jre/lib/ext** directory of the **JAVA_HOME** directory, or a custom classpath.

As you examine the CephAdminAPI class example, notice that the **execute()** method takes an HTTP method, a request path, an optional subresource, **null** if not specified, and a map of parameters. To execute with subresources, for example, **subuser**, and **key**, you will need to specify the subresource as an argument in the **execute()** method.

The example method:

1. Builds a URI.
2. Builds an HTTP header string.
3. Instantiates an HTTP request, for example, **PUT**, **POST**, **GET**, **DELETE**.
4. Adds the **Date** header to the HTTP header string and the request header.
5. Adds the **Authorization** header to the HTTP request header.
6. Instantiates an HTTP client and passes it the instantiated HTTP request.
7. Makes a request.
8. Returns a response.

Building the header string

Building the header string is the portion of the process that involves Amazon's S3 authentication procedure. Specifically, the example method does the following:

1. Adds a request type, for example, **PUT**, **POST**, **GET**, **DELETE**.
2. Adds the date.
3. Adds the requestPath.

The request type should be upper case with no leading or trailing white space. If you do not trim white space, authentication will fail. The date MUST be expressed in GMT, or authentication will fail.

The exemplary method does not have any other headers. The Amazon S3 authentication procedure sorts **x-amz** headers lexicographically. So if you are adding **x-amz** headers, be sure to add them lexicographically.

Once you have built the header string, the next step is to instantiate an HTTP request and pass it the URI. The examplary method uses **PUT** for creating a user and subuser, **GET** for getting a user, **POST** for modifying a user and **DELETE** for deleting a user.

Once you instantiate a request, add the **Date** header followed by the **Authorization** header. Amazon's S3 authentication uses the standard **Authorization** header, and has the following structure:

```
Authorization: AWS ACCESS_KEY:HASH_OF_HEADER_AND_SECRET
```

The CephAdminAPI example class has a **base64Sha1Hmac()** method, which takes the header string and the secret key for the admin user, and returns a SHA1 HMAC as a base-64 encoded string. Each **execute()** call will invoke the same line of code to build the **Authorization** header:

```
httpRequest.addHeader("Authorization", "AWS " + this.getAccessKey() + ":" +
base64Sha1Hmac(headerString.toString(), this.getSecretKey()));
```

The following **CephAdminAPI** example class requires you to pass the access key, secret key and an endpoint to the constructor. The class provides accessor methods to change them at runtime.

Example

```
import java.io.IOException;
import java.net.URI;
import java.net.URISyntaxException;
import java.time.OffsetDateTime;
import java.time.format.DateTimeFormatter;
import java.time.ZoneId;

import org.apache.http.HttpEntity;
import org.apache.http.NameValuePair;
import org.apache.http.Header;
import org.apache.http.client.entity.UrlEncodedFormEntity;
import org.apache.http.client.methods.CloseableHttpResponse;
import org.apache.http.client.methods.HttpRequestBase;
import org.apache.http.client.methods.HttpGet;
import org.apache.http.client.methods.HttpPost;
import org.apache.http.client.methods.HttpPut;
import org.apache.http.client.methods.HttpDelete;
import org.apache.http.impl.client.CloseableHttpClient;
import org.apache.http.impl.client.HttpClients;
import org.apache.http.message.BasicNameValuePair;
import org.apache.http.util.EntityUtils;
```

```
import org.apache.http.client.utils.URIBuilder;

import java.util.Base64;
import java.util.Base64.Encoder;
import java.security.MessageDigest;
import java.security.NoSuchAlgorithmException;
import javax.crypto.spec.SecretKeySpec;
import javax.crypto.Mac;

import java.util.Map;
import java.util.Iterator;
import java.util.Set;
import java.util.Map.Entry;

public class CephAdminAPI {

 /*
  * Each call must specify an access key, secret key, endpoint and format.
  */
 String accessKey;
 String secretKey;
 String endpoint;
 String scheme = "http"; //http only.
 int port = 80;

 /*
  * A constructor that takes an access key, secret key, endpoint and format.
  */
 public CephAdminAPI(String accessKey, String secretKey, String endpoint){
  this.accessKey = accessKey;
  this.secretKey = secretKey;
  this.endpoint = endpoint;
 }

 /*
  * Accessor methods for access key, secret key, endpoint and format.
  */
 public String getEndpoint(){
  return this.endpoint;
 }

 public void setEndpoint(String endpoint){
  this.endpoint = endpoint;
 }

 public String getAccessKey(){
  return this.accessKey;
 }

 public void setAccessKey(String accessKey){
  this.accessKey = accessKey;
 }

 public String getSecretKey(){
  return this.secretKey;
 }
```

```
public void setSecretKey(String secretKey){
 this.secretKey = secretKey;
}

/*
 * Takes an HTTP Method, a resource and a map of arguments and
 * returns a CloseableHTTPResponse.
 */
public CloseableHttpResponse execute(String HTTPMethod, String resource,
                                     String subresource, Map arguments) {

 String httpMethod = HTTPMethod;
 String requestPath = resource;
 StringBuffer request = new StringBuffer();
 StringBuffer headerString = new StringBuffer();
 HttpRequestBase httpRequest;
 CloseableHttpClient httpclient;
 URI uri;
 CloseableHttpResponse httpResponse = null;

 try {

  uri = new URIBuilder()
   .setScheme(this.scheme)
   .setHost(this.getEndpoint())
   .setPath(requestPath)
   .setPort(this.port)
   .build();


 if (subresource != null){
  uri = new URIBuilder(uri)
    .setCustomQuery(subresource)
    .build();
 }


 for (Iterator iter = arguments.entrySet().iterator();
 iter.hasNext();) {
  Entry entry = (Entry)iter.next();
  uri = new URIBuilder(uri)
   .setParameter(entry.getKey().toString(),
                           entry.getValue().toString())
   .build();

 }

 request.append(uri);

 headerString.append(HTTPMethod.toUpperCase().trim() + "\n\n\n");

 OffsetDateTime dateTime = OffsetDateTime.now(ZoneId.of("GMT"));
 DateTimeFormatter formatter = DateTimeFormatter.RFC_1123_DATE_TIME;
 String date = dateTime.format(formatter);
```

```
  headerString.append(date + "\n");
  headerString.append(requestPath);

  if (HTTPMethod.equalsIgnoreCase("PUT")){
   httpRequest = new HttpPut(uri);
  } else if (HTTPMethod.equalsIgnoreCase("POST")){
   httpRequest = new HttpPost(uri);
  } else if (HTTPMethod.equalsIgnoreCase("GET")){
   httpRequest = new HttpGet(uri);
  } else if (HTTPMethod.equalsIgnoreCase("DELETE")){
   httpRequest = new HttpDelete(uri);
  } else {
   System.err.println("The HTTP Method must be PUT,
   POST, GET or DELETE.");
   throw new IOException();
  }

  httpRequest.addHeader("Date", date);
  httpRequest.addHeader("Authorization", "AWS " + this.getAccessKey()
  + ":" + base64Sha1Hmac(headerString.toString(),
  this.getSecretKey()));

  httpclient = HttpClients.createDefault();
  httpResponse = httpclient.execute(httpRequest);

 }  catch  (URISyntaxException e){
  System.err.println("The URI is not formatted properly.");
  e.printStackTrace();
 }  catch (IOException e){
  System.err.println("There was an error making the request.");
  e.printStackTrace();
 }
  return httpResponse;
}

/*
 * Takes a uri and a secret key and returns a base64-encoded
 * SHA-1 HMAC.
 */
public String base64Sha1Hmac(String uri, String secretKey) {
 try {

  byte[] keyBytes = secretKey.getBytes("UTF-8");
  SecretKeySpec signingKey = new SecretKeySpec(keyBytes, "HmacSHA1");

  Mac mac = Mac.getInstance("HmacSHA1");
  mac.init(signingKey);

  byte[] rawHmac = mac.doFinal(uri.getBytes("UTF-8"));

  Encoder base64 = Base64.getEncoder();
  return base64.encodeToString(rawHmac);

 } catch (Exception e) {
  throw new RuntimeException(e);
 }
```

```
 }

}
```

The subsequent **CephAdminAPIClient** example illustrates how to instantiate the **CephAdminAPI** class, build a map of request parameters, and use the **execute()** method to create, get, update and delete a user.

Example

```
import java.io.IOException;
import org.apache.http.client.methods.CloseableHttpResponse;
import org.apache.http.HttpEntity;
import org.apache.http.util.EntityUtils;
import java.util.*;


public class CephAdminAPIClient {

 public static void main (String[] args){

  CephAdminAPI adminApi = new CephAdminAPI ("FFC6ZQ6EMIF64194158N",
                          "Xac39eCAhlTGcCAUreuwe1ZuH5oVQFa51lbEMVoT",
                          "ceph-client");

  /*
   * Create a user
   */
  Map requestArgs = new HashMap();
  requestArgs.put("access", "usage=read, write; users=read, write");
  requestArgs.put("display-name", "New User");
  requestArgs.put("email", "new-user@email.com");
  requestArgs.put("format", "json");
  requestArgs.put("uid", "new-user");

  CloseableHttpResponse response =
   adminApi.execute("PUT", "/admin/user", null, requestArgs);

  System.out.println(response.getStatusLine());
  HttpEntity entity = response.getEntity();

  try {
   System.out.println("\nResponse Content is: "
    + EntityUtils.toString(entity, "UTF-8") + "\n");
   response.close();
  } catch (IOException e){
   System.err.println ("Encountered an I/O exception.");
   e.printStackTrace();
  }

  /*
   * Get a user
   */
  requestArgs = new HashMap();
  requestArgs.put("format", "json");
  requestArgs.put("uid", "new-user");
```

```
response = adminApi.execute("GET", "/admin/user", null, requestArgs);

System.out.println(response.getStatusLine());
entity = response.getEntity();

try {
 System.out.println("\nResponse Content is: "
  + EntityUtils.toString(entity, "UTF-8") + "\n");
 response.close();
} catch (IOException e){
 System.err.println ("Encountered an I/O exception.");
 e.printStackTrace();
}

/*
 * Modify a user
 */
requestArgs = new HashMap();
requestArgs.put("display-name", "John Doe");
requestArgs.put("email", "johndoe@email.com");
requestArgs.put("format", "json");
requestArgs.put("uid", "new-user");
requestArgs.put("max-buckets", "100");

response = adminApi.execute("POST", "/admin/user", null, requestArgs);

System.out.println(response.getStatusLine());
entity = response.getEntity();

try {
 System.out.println("\nResponse Content is: "
  + EntityUtils.toString(entity, "UTF-8") + "\n");
 response.close();
} catch (IOException e){
 System.err.println ("Encountered an I/O exception.");
 e.printStackTrace();
}


/*
 * Create a subuser
 */
requestArgs = new HashMap();
requestArgs.put("format", "json");
requestArgs.put("uid", "new-user");
requestArgs.put("subuser", "foobar");

response = adminApi.execute("PUT", "/admin/user", "subuser", requestArgs);
System.out.println(response.getStatusLine());
entity = response.getEntity();

try {
 System.out.println("\nResponse Content is: "
  + EntityUtils.toString(entity, "UTF-8") + "\n");
 response.close();
```

```
} catch (IOException e){
 System.err.println ("Encountered an I/O exception.");
 e.printStackTrace();
}


/*
 * Delete a user
 */
requestArgs = new HashMap();
requestArgs.put("format", "json");
requestArgs.put("uid", "new-user");

response = adminApi.execute("DELETE", "/admin/user", null, requestArgs);
System.out.println(response.getStatusLine());
entity = response.getEntity();

try {
 System.out.println("\nResponse Content is: "
  + EntityUtils.toString(entity, "UTF-8") + "\n");
 response.close();
} catch (IOException e){
 System.err.println ("Encountered an I/O exception.");
 e.printStackTrace();
 }
 }
}
```

Additional Resources

- See the *S3 Authentication section* in the *Red Hat Ceph Storage Developer Guide* for additional details.
- For a more extensive explanation of the Amazon S3 authentication procedure, consult the Signing and Authenticating REST Requests section of Amazon Simple Storage Service documentation.

1.4. CREATING AN ADMINISTRATIVE USER

IMPORTANT

To run the **radosgw-admin** command from the Ceph Object Gateway node, ensure the node has the admin key. The admin key can be copied from any Ceph Monitor node.

Prerequisites

- Root-level access to the Ceph Object Gateway node.

Procedure

1. Create an object gateway user:

   Syntax

```
radosgw-admin user create --uid="USER_NAME" --display-name="DISPLAY_NAME"
```

Example

```
[user@client ~]$ radosgw-admin user create --uid="admin-api-user" --display-name="Admin API User"
```

The **radosgw-admin** command-line interface will return the user.

Example output

```
{
    "user_id": "admin-api-user",
    "display_name": "Admin API User",
    "email": "",
    "suspended": 0,
    "max_buckets": 1000,
    "auid": 0,
    "subusers": [],
    "keys": [
        {
            "user": "admin-api-user",
            "access_key": "NRWGT19TWMYOB1YDBV1Y",
            "secret_key": "gr1VEGIV7rxcP3xvXDFCo4UDwwl2YoNrmtRlIAty"
        }
    ],
    "swift_keys": [],
    "caps": [],
    "op_mask": "read, write, delete",
    "default_placement": "",
    "placement_tags": [],
    "bucket_quota": {
        "enabled": false,
        "max_size_kb": -1,
        "max_objects": -1
    },
    "user_quota": {
        "enabled": false,
        "max_size_kb": -1,
        "max_objects": -1
    },
    "temp_url_keys": []
}
```

2. Assign administrative capabilities to the user you create:

Syntax

```
radosgw-admin caps add --uid="USER_NAME" --caps="users=*"
```

Example

```
[user@client ~]$ radosgw-admin caps add --uid=admin-api-user --caps="users=*"
```

The **radosgw-admin** command-line interface will return the user. The **"caps":** will have the capabilities you assigned to the user:

Example output

```
{
    "user_id": "admin-api-user",
    "display_name": "Admin API User",
    "email": "",
    "suspended": 0,
    "max_buckets": 1000,
    "auid": 0,
    "subusers": [],
    "keys": [
        {
            "user": "admin-api-user",
            "access_key": "NRWGT19TWMYOB1YDBV1Y",
            "secret_key": "gr1VEGIV7rxcP3xvXDFCo4UDwwl2YoNrmtRlIAty"
        }
    ],
    "swift_keys": [],
    "caps": [
        {
            "type": "users",
            "perm": "*"
        }
    ],
    "op_mask": "read, write, delete",
    "default_placement": "",
    "placement_tags": [],
    "bucket_quota": {
        "enabled": false,
        "max_size_kb": -1,
        "max_objects": -1
    },
    "user_quota": {
        "enabled": false,
        "max_size_kb": -1,
        "max_objects": -1
    },
    "temp_url_keys": []
}
```

Now you have a user with administrative privileges.

1.5. GET USER INFORMATION

Get the user's information.

Capabilities

```
users=read
```

Syntax

```
GET /admin/user?format=json HTTP/1.1
Host: FULLY_QUALIFIED_DOMAIN_NAME
```

Table 1.1. Request Parameters

Name	Description	Type	Example	Required
uid	The user for which the information is requested.	String	**foo_user**	Yes

Table 1.2. Response Entities

Name	Description	Type	Parent
user	A container for the user data information.	Container	N/A
user_id	The user ID.	String	**user**
display_name	Display name for the user.	String	**user**
suspended	True if the user is suspended.	Boolean	**user**
max_buckets	The maximum number of buckets to be owned by the user.	Integer	**user**
subusers	Subusers associated with this user account.	Container	**user**
keys	S3 keys associated with this user account.	Container	**user**
swift_keys	Swift keys associated with this user account.	Container	**user**
caps	User capabilities.	Container	**user**

If successful, the response contains the user information.

Special Error Responses

None.

1.6. CREATE A USER

Create a new user. By Default, a S3 key pair will be created automatically and returned in the response. If only one of **access-key** or **secret-key** is provided, the omitted key will be automatically generated. By default, a generated key is added to the keyring without replacing an existing key pair. If **access-key** is specified and refers to an existing key owned by the user then it will be modified.

Capabilities

-

> `users=write`

Syntax

```
PUT /admin/user?format=json HTTP/1.1
Host: FULLY_QUALIFIED_DOMAIN_NAME
```

Table 1.3. Request Parameters

Name	Description	Type	Example	Required
uid	The user ID to be created.	String	**foo_user**	Yes
display-name	The display name of the user to be created.	String	**foo user**	Yes
email	The email address associated with the user.	String	**foo@bar.com**	No
key-type	Key type to be generated, options are: swift, s3 (default).	String	**s3** [**s3**]	No
access-key	Specify access key.	String	**ABCD0EF12GHIJ2K34LMN**	No
secret-key	Specify secret key.	String	**0AbCDEFg1h2i34JkIM5nop6QrSTUV+WxyzaBC7D8**	No
user-caps	User capabilities.	String	**usage=read, write; users=read**	No
generate-key	Generate a new key pair and add to the existing keyring.	Boolean	True [True]	No
max-buckets	Specify the maximum number of buckets the user can own.	Integer	500 [1000]	No
suspended	Specify whether the user should be suspended.	Boolean	False [False]	No

Table 1.4. Response Entities

Name	Description	Type	Parent
user	A container for the user data information.	Container	N/A

Name	Description	Type	Parent
user_id	The user ID.	String	**user**
display_name	Display name for the user.	String	**user**
suspended	True if the user is suspended.	Boolean	**user**
max_buckets	The maximum number of buckets to be owned by the user.	Integer	**user**
subusers	Subusers associated with this user account.	Container	**user**
keys	S3 keys associated with this user account.	Container	**user**
swift_keys	Swift keys associated with this user account.	Container	**user**
caps	User capabilities.	Container	**user**

If successful, the response contains the user information.

Table 1.5. Special Error Responses

Name	Description	Code
UserExists	Attempt to create existing user.	409 Conflict
InvalidAccessKey	Invalid access key specified.	400 Bad Request
InvalidKeyType	Invalid key type specified.	400 Bad Request
InvalidSecretKey	Invalid secret key specified.	400 Bad Request
InvalidKeyType	Invalid key type specified.	400 Bad Request
KeyExists	Provided access key exists and belongs to another user.	409 Conflict
EmailExists	Provided email address exists.	409 Conflict
InvalidCap	Attempt to grant invalid admin capability.	400 Bad Request

Additional Resources

- See the *Red Hat Ceph Storage Developer Guide* for creating subusers.

1.7. MODIFY A USER

Modify an existing user.

Capabilities

`users=write`

Syntax

```
POST /admin/user?format=json HTTP/1.1
Host: FULLY_QUALIFIED_DOMAIN_NAME
```

Table 1.6. Request Parameters

Name	Description	Type	Example	Required
uid	The user ID to be modified.	String	**foo_user**	Yes
display-name	The display name of the user to be modified.	String	**foo user**	No
email	The email address to be associated with the user.	String	**foo@bar.com**	No
generate-key	Generate a new key pair and add to the existing keyring.	Boolean	True [False]	No
access-key	Specify access key.	String	**ABCD0EF12GHIJ2K34LMN**	No
secret-key	Specify secret key.	String	**0AbCDEFg1h2i34JkIM5nop6QrSTUV+WxyzaBC7D8**	No
key-type	Key type to be generated, options are: swift, s3 (default).	String	**s3**	No
user-caps	User capabilities.	String	**usage=read, write; users=read**	No
max-buckets	Specify the maximum number of buckets the user can own.	Integer	500 [1000]	No
suspended	Specify whether the user should be suspended.	Boolean	False [False]	No

Table 1.7. Response Entities

Name	Description	Type	Parent
user	A container for the user data information.	Container	N/A
user_id	The user ID.	String	**user**
display_name	Display name for the user.	String	**user**
suspended	True if the user is suspended.	Boolean	**user**
max_buckets	The maximum number of buckets to be owned by the user.	Integer	**user**
subusers	Subusers associated with this user account.	Container	**user**
keys	S3 keys associated with this user account.	Container	**user**
swift_keys	Swift keys associated with this user account.	Container	**user**
caps	User capabilities.	Container	**user**

If successful, the response contains the user information.

Table 1.8. Special Error Responses

Name	Description	Code
InvalidAccessKey	Invalid access key specified.	400 Bad Request
InvalidKeyType	Invalid key type specified.	400 Bad Request
InvalidSecretKey	Invalid secret key specified.	400 Bad Request
KeyExists	Provided access key exists and belongs to another user.	409 Conflict
EmailExists	Provided email address exists.	409 Conflict
InvalidCap	Attempt to grant invalid admin capability.	400 Bad Request

Additional Resources

- See the *Red Hat Ceph Storage Developer Guide* for modifying subusers.

1.8. REMOVE A USER

Remove an existing user.

Capabilities

```
`users=write`
```

Syntax

```
DELETE /admin/user?format=json HTTP/1.1
Host: FULLY_QUALIFIED_DOMAIN_NAME
```

Table 1.9. Request Parameters

Name	Description	Type	Example	Required
uid	The user ID to be removed.	String	**foo_user**	Yes.
purge-data	When specified the buckets and objects belonging to the user will also be removed.	Boolean	True	No

Response Entities

None.

Special Error Responses

None.

Additional Resources

- See *Red Hat Ceph Storage Developer Guide* for removing subusers.

1.9. CREATE A SUBUSER

Create a new subuser, primarily useful for clients using the Swift API.

NOTE

Either **gen-subuser** or **subuser** is required for a valid request. In general, for a subuser to be useful, it must be granted permissions by specifying **access**. As with user creation if **subuser** is specified without **secret**, then a secret key will be automatically generated.

Capabilities

```
`users=write`
```

Syntax

```
PUT /admin/user?subuser&format=json HTTP/1.1
Host FULLY_QUALIFIED_DOMAIN_NAME
```

Table 1.10. Request Parameters

Name	Description	Type	Example	Required
uid	The user ID under which a subuser is to be created.	String	**foo_user**	Yes
subuser	Specify the subuser ID to be created.	String	**sub_foo**	Yes (or **gen-subuser**)
gen-subuser	Specify the subuser ID to be created.	String	**sub_foo**	Yes (or **subuser**)
secret-key	Specify secret key.	String	**0AbCDEFg1h2i34JklM5nop6QrSTUVWxyzaBC7D8**	No
key-type	Key type to be generated, options are: swift (default), s3.	String	**swift** [**swift**]	No
access	Set access permissions for sub-user, should be one of **read, write, readwrite, full**.	String	**read**	No
generate-secret	Generate the secret key.	Boolean	True [False]	No

Table 1.11. Response Entities

Name	Description	Type	Parent
subusers	Subusers associated with the user account.	Container	N/A
id	Subuser ID.	String	**subusers**

Name	Description	Type	Parent
permissions	Subuser access to user account.	String	**subusers**

If successful, the response contains the subuser information.

Table 1.12. Special Error Responses

Name	Description	Code
SubuserExists	Specified subuser exists.	409 Conflict
InvalidKeyType	Invalid key type specified.	400 Bad Request
InvalidSecretKey	Invalid secret key specified.	400 Bad Request
InvalidAccess	Invalid subuser access specified.	400 Bad Request

1.10. MODIFY A SUBUSER

Modify an existing subuser.

Capabilities

> `users=write`

Syntax

```
POST /admin/user?subuser&format=json HTTP/1.1
Host FULLY_QUALIFIED_DOMAIN_NAME
```

Table 1.13. Request Parameters

Name	Description	Type	Example	Required
uid	The user ID under which the subuser is to be modified.	String	**foo_user**	Yes
subuser	The subuser ID to be modified.	String	**sub_foo**	Yes
generate-secret	Generate a new secret key for the subuser, replacing the existing key.	Boolean	True [False]	No

Name	Description	Type	Example	Required
secret	Specify secret key.	String	**0AbCDEFg1h2i34JkIM5nop6QrSTUV+WxyzaBC7D8**	No
key-type	Key type to be generated, options are: swift (default), s3.	String	**swift** [**swift**]	No
access	Set access permissions for sub-user, should be one of **read, write, readwrite, full**.	String	**read**	No

Table 1.14. Response Entities

Name	Description	Type	Parent
subusers	Subusers associated with the user account.	Container	N/A
id	Subuser ID.	String	**subusers**
permissions	Subuser access to user account.	String	**subusers**

If successful, the response contains the subuser information.

Table 1.15. Special Error Responses

Name	Description	Code
InvalidKeyType	Invalid key type specified.	400 Bad Request
InvalidSecretKey	Invalid secret key specified.	400 Bad Request
InvalidAccess	Invalid subuser access specified.	400 Bad Request

1.11. REMOVE A SUBUSER

Remove an existing subuser.

Capabilities

-

`users=write`

Syntax

```
DELETE /admin/user?subuser&format=json HTTP/1.1
Host FULLY_QUALIFIED_DOMAIN_NAME
```

Table 1.16. Request Parameters

Name	Description	Type	Example	Required
uid	The user ID under which the subuser is to be removed.	String	**foo_user**	Yes
subuser	The subuser ID to be removed.	String	**sub_foo**	Yes
purge-keys	Remove keys belonging to the subuser.	Boolean	True [True]	No

Response Entities

None.

Special Error Responses

None.

1.12. ADD CAPABILITIES TO A USER

Add an administrative capability to a specified user.

Capabilities

`users=write`

Syntax

```
PUT /admin/user?caps&format=json HTTP/1.1
Host FULLY_QUALIFIED_DOMAIN_NAME
```

Table 1.17. Request Parameters

Name	Description	Type	Example	Required
uid	The user ID to add an administrative capability to.	String	**foo_user**	Yes

Name	Description	Type	Example	Required
user-caps	The administrative capability to add to the user.	String	**usage=read, write**	Yes

Table 1.18. Response Entities

Name	Description	Type	Parent
user	A container for the user data information.	Container	N/A
user_id	The user ID.	String	**user**
caps	User capabilities.	Container	**user**

If successful, the response contains the user's capabilities.

Table 1.19. Special Error Responses

Name	Description	Code
InvalidCap	Attempt to grant invalid admin capability.	400 Bad Request

1.13. REMOVE CAPABILITIES FROM A USER

Remove an administrative capability from a specified user.

Capabilities

```
`users=write`
```

Syntax

```
DELETE /admin/user?caps&format=json HTTP/1.1
Host FULLY_QUALIFIED_DOMAIN_NAME
```

Table 1.20. Request Parameters

Name	Description	Type	Example	Required
uid	The user ID to remove an administrative capability from.	String	**foo_user**	Yes

Name	Description	Type	Example	Required
user-caps	The administrative capabilities to remove from the user.	String	**usage=read, write**	Yes

Table 1.21. Response Entities

Name	Description	Type	Parent
user	A container for the user data information.	Container	N/A
user_id	The user ID.	String	**user**
caps	User capabilities.	Container	**user**

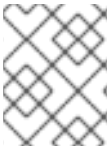
If successful, the response contains the user's capabilities.

Table 1.22. Special Error Responses

Name	Description	Code
InvalidCap	Attempt to remove an invalid admin capability.	400 Bad Request
NoSuchCap	User does not possess specified capability.	404 Not Found

1.14. CREATE A KEY

Create a new key. If a **subuser** is specified then by default created keys will be swift type. If only one of **access-key** or **secret-key** is provided the committed key will be automatically generated, that is if only **secret-key** is specified then **access-key** will be automatically generated. By default, a generated key is added to the keyring without replacing an existing key pair. If **access-key** is specified and refers to an existing key owned by the user then it will be modified. The response is a container listing all keys of the same type as the key created.



NOTE

When creating a swift key, specifying the option **access-key** will have no effect. Additionally, only one swift key might be held by each user or subuser.

Capabilities

```
`users=write`
```

Syntax

```
PUT /admin/user?key&format=json HTTP/1.1
Host FULLY_QUALIFIED_DOMAIN_NAME
```

Table 1.23. Request Parameters

Name	Description	Type	Example	Required
uid	The user ID to receive the new key.	String	**foo_user**	Yes
subuser	The subuser ID to receive the new key.	String	**sub_foo**	No
key-type	Key type to be generated, options are: swift, s3 (default).	String	**s3** [**s3**]	No
access-key	Specify the access key.	String	**AB01C2D3EF45G6H7IJ8K**	No
secret-key	Specify the secret key.	String	**0ab/CdeFGhij1klmnopqRSTUv1WxyZabcDEFgHij**	No
generate-key	Generate a new key pair and add to the existing keyring.	Boolean	True [**True**]	No

Table 1.24. Response Entities

Name	Description	Type	Parent
keys	Keys of type created associated with this user account.	Container	N/A
user	The user account associated with the key.	String	**keys**
access-key	The access key.	String	**keys**
secret-key	The secret key	String	**keys**

Table 1.25. Special Error Responses

Name	Description	Code
InvalidAccessKey	Invalid access key specified.	400 Bad Request
InvalidKeyType	Invalid key type specified.	400 Bad Request
InvalidSecretKey	Invalid secret key specified.	400 Bad Request
InvalidKeyType	Invalid key type specified.	400 Bad Request
KeyExists	Provided access key exists and belongs to another user.	409 Conflict

1.15. REMOVE A KEY

Remove an existing key.

Capabilities

```
`users=write`
```

Syntax

```
DELETE /admin/user?key&format=json HTTP/1.1
Host FULLY_QUALIFIED_DOMAIN_NAME
```

Table 1.26. Request Parameters

Name	Description	Type	Example	Required
access-key	The S3 access key belonging to the S3 key pair to remove.	String	**AB01C2D3EF45G6H7IJ8K**	Yes
uid	The user to remove the key from.	String	**foo_user**	No
subuser	The subuser to remove the key from.	String	**sub_foo**	No

Name	Description	Type	Example	Required
key-type	Key type to be removed, options are: swift, s3. **NOTE** Required to remove swift key.	String	**swift**	No

Special Error Responses

None.

Response Entities

None.

1.16. BUCKET NOTIFICATIONS

As a storage administrator, you can use these APIs to provide configuration and control interfaces for the bucket notification mechanism. The API topics are named objects that contain the definition of a specific endpoint. Bucket notifications associate topics with a specific bucket. The *S3 bucket operations* section gives more details on bucket notifications.

NOTE

In all topic actions, the parameters are URL encoded, and sent in the message body using **application/x-www-form-urlencoded** content type.

NOTE

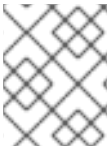
Any bucket notification already associated with the topic needs to be re-created for the topic update to take effect.

1.16.1. Prerequisites

- Create bucket notifications on the Ceph Object Gateway.

1.16.2. Creating a topic

You can create topics before creating bucket notifications. A topic is a Simple Notification Service (SNS) entity and all the topic operations, that is, **create**, **delete**, **list** and **get**, are SNS operations. The topic needs to have endpoint parameters that are used when a bucket notification is created. Once the request is successful, the response includes the topic Amazon Resource Name (ARN) that can be used later to reference this topic in the bucket notification request.



NOTE

A **topic_arn** provides the bucket notification configuration, and is generated after a topic is created.

Prerequisites

- A running Red Hat Ceph Storage cluster.
- Root-level access.
- Installation of the Ceph Object Gateway.
- User access key and secret key.
- Endpoint parameters.

Procedure

1. Create a topic with the following request format:

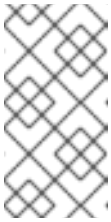
   Syntax

   ```
   POST
   Action=CreateTopic
   &Name=TOPIC_NAME
   [&Attributes.entry.1.key=amqp-exchange&Attributes.entry.1.value=EXCHANGE]
   [&Attributes.entry.2.key=amqp-ack-level&Attributes.entry.2.value=none|broker|routable]
   [&Attributes.entry.3.key=verify-ssl&Attributes.entry.3.value=true|false]
   [&Attributes.entry.4.key=kafka-ack-level&Attributes.entry.4.value=none|broker]
   [&Attributes.entry.5.key=use-ssl&Attributes.entry.5.value=true|false]
   [&Attributes.entry.6.key=ca-location&Attributes.entry.6.value=FILE_PATH]
   [&Attributes.entry.7.key=OpaqueData&Attributes.entry.7.value=OPAQUE_DATA]
   [&Attributes.entry.8.key=push-endpoint&Attributes.entry.8.value=ENDPOINT]
   ```

   Here are the request parameters:

   - **Endpoint**: URL of an endpoint to send notifications to.
   - **OpaqueData**: opaque data is set in the topic configuration and added to all notifications triggered by the topic.
   - HTTP endpoint:
     - **URL**: http[s]://*FQDN*[: *PORT*]
     - **port defaults to**: Use 80/443 for HTTP[S] accordingly.
     - **verify-ssl**: Indicates whether the server certificate is validated by the client or not. By default , it is **true**.
   - AMQP0.9.1 endpoint:
     - **URL**: amqp://[*USER* : *PASSWORD* @] *FQDN* [: *PORT*][/*VHOST*].
     - User and password defaults to: **guest** and **guest** respectively.

- User and password can only be provided with HTTPS. Otherwise, the topic creation request is rejected.
- **port defaults to**: 5672.
- **vhost** defaults to: "/"
- **amqp-exchange**: The exchanges must exist and be able to route messages based on topics. This is a mandatory parameter for AMQP0.9.1. Different topics pointing to the same endpoint must use the same exchange.
- **amqp-ack-level**: No end to end acknowledgement is required, as messages may persist in the broker before being delivered into their final destination. Three acknowledgement methods exist:
  - **none**: Message is considered **delivered** if sent to the broker.
  - **broker**: By default the message is considered **delivered** if acknowledged by the broker.
  - **routable**: Message is considered **delivered** if the broker can route to a consumer.



NOTE

The key and value of a specific parameter does not have to reside in the same line, or in any specific order, but must use the same index. Attribute indexing does not need to be sequential or start from any specific value.

NOTE

The **topic-name** is used for the AMQP topic.

- Kafka endpoint:
  - **URL**: kafka://[*USER*: *PASSWORD* @] *FQDN*[: *PORT*].
  - If **use-ssl** is set to **false** by default. If **use-ssl** is set to **true**, secure connection is used for connecting with the broker.
  - If **ca-location** is provided, and secure connection is used, the specified CA will be used, instead of the default one, to authenticate the broker.
  - User and password can only be provided over HTTP[S]. If not,topic creation request will be rejected.
  - User and password may only be provided together with **use-ssl**, if not, connection to the broker would fail.
  - **port defaults to**: 9092.
  - **kafka-ack-level**: no end to end acknowledgement required, as messages may persist in the broker before being delivered into their final destination. Two acknowledgement methods exist:
    - **none**: message is considered **delivered** if sent to the broker.

- **broker**: By default, the message is considered **delivered** if acknowledged by the broker.

2. Create a response in the following format:

Syntax

```
<CreateTopicResponse xmlns="https://sns.amazonaws.com/doc/2010-03-31/">
    <CreateTopicResult>
        <TopicArn></TopicArn>
    </CreateTopicResult>
    <ResponseMetadata>
        <RequestId></RequestId>
    </ResponseMetadata>
</CreateTopicResponse>
```

NOTE

The topic Amazon Resource Name (ARN) in the response will have the following format: **arn:aws:sns:*ZONE_GROUP*:*TENANT*:*TOPIC***

The following is an example of AMQP0.9.1 endpoint:

Syntax

```
"client.create_topic(Name='my-topic' , Attributes={'push-endpoint': 'amqp://127.0.0.1:5672',
'amqp-exchange': 'ex1', 'amqp-ack-level': 'broker'})"
```

1.16.3. Getting topic information

Returns information about specific topic. This can include endpoint information if it is provided.

Prerequisites

- A running Red Hat Ceph Storage cluster.
- Root-level access.
- Installation of the Ceph Object Gateway.
- User access key and secret key.
- Endpoint parameters.

Procedure

1. Get topic information with the following request format:

Syntax

```
POST
Action=GetTopic
&TopicArn=TOPIC_ARN
```

Here is an example of the response format:

```
<GetTopicResponse>
 <GetTopicRersult>
  <Topic>
   <User>
   </User>
   <Name>
   </Name>
   <EndPoint>
    <EndpointAddress>
    </EndpointAddress>
    <EndpointArgs>
    </EndpointArgs>
    <EndpointTopic>
    </EndpointTopic>
   </EndPoint>
   <TopicArn>
   </TopicArn>
   <OpaqueData>
   </OpaqueData>
  </Topic>
 </GetTopicResult>
 <ResponseMetadata>
  <RequestId>
  </RequestId>
 </ResponseMetadata>
</GetTopicResponse>
```

These are the tags and their definitions:

- **User**: Name of the user that created the topic.
- **Name**: Name of the topic.
- **EndpointAddress**: The endpoint URL. If the endpoint URL contains user and password information, request must be made over HTTPS. If not, the topic get request will be rejected.
- **EndPointArgs**: The endpoint arguments.
- **EndpointTopic**: The topic name that will be sent to the endpoint, can be different than the above topic name.
- **TopicArn**: Topic ARN.

1.16.4. Listing topics

List the topics that the user has defined.

Prerequisites

- A running Red Hat Ceph Storage cluster.
- Root-level access.

- Installation of the Ceph Object Gateway.
- User access key and secret key.
- Endpoint parameters.

Procedure

1. List topic information with the following request format:

```
POST
Action=ListTopics
```

Here is an example of the response format:

```
<ListTopicdResponse xmlns="https://sns.amazonaws.com/doc/2020-03-31/">
  <ListTopicsRersult>
    <Topics>
      <member>
        <User>
        </User>
        <Name>
        </Name>
        <EndPoint>
          <EndpointAddress>
          </EndpointAddress>
          <EndpointArgs>
          </EndpointArgs>
          <EndpointTopic>
          </EndpointTopic>
        </EndPoint>
        <TopicArn>
        </TopicArn>
        <OpaqueData>
        </OpaqueData>
      </member>
    </Topics>
  </ListTopicsResult>
  <ResponseMetadata>
    <RequestId>
    </RequestId>
  </ResponseMetadata>
</ListTopicsResponse>
```

NOTE

If endpoint URL contains user and password information, in any of the topics, the request must be made over HTTPS. If not, topic list request is rejected.

1.16.5. Deleting topics

Removing a deleted topic results with no operation and not a failure.

Prerequisites

- A running Red Hat Ceph Storage cluster.
- Root-level access.
- Installation of the Ceph Object Gateway.
- User access key and secret key.
- Endpoint parameters.

Procedure

1. Delete a topic with the following request format:

   Syntax

   ```
   POST
   Action=DeleteTopic
   &TopicArn=TOPIC_ARN
   ```

   Here is an example of the response format:

   ```
   <DeleteTopicResponse xmlns="https://sns.amazonaws.com/doc/2020-03-31/">
     <ResponseMetadata>
       <RequestId>
       </RequestId>
     </ResponseMetadata>
   </DeleteTopicResponse>
   ```

1.16.6. Event record

An event holds information about the operation done by the Ceph Object Gateway and is sent as a payload over the chosen endpoint, such as, HTTP, HTTPS, Kafka or AMQ0.9.1. The event record is in a JSON format.

Example

```
{"Records":[
    {
        "eventVersion":"2.1",
        "eventSource":"ceph:s3",
        "awsRegion":"us-east-1",
        "eventTime":"2019-11-22T13:47:35.124724Z",
        "eventName":"s3:ObjectCreated:Put",
        "userIdentity":{
            "principalId":"tester"
        },
        "requestParameters":{
            "sourceIPAddress":""
        },
        "responseElements":{
            "x-amz-request-id":"503a4c37-85eb-47cd-8681-2817e80b4281.5330.903595",
            "x-amz-id-2":"14d2-zone1-zonegroup1"
        },
```

```
        "s3":{
            "s3SchemaVersion":"1.0",
            "configurationId":"mynotif1",
            "bucket":{
                "name":"mybucket1",
                "ownerIdentity":{
                    "principalId":"tester"
                },
                "arn":"arn:aws:s3:us-east-1::mybucket1",
                "id":"503a4c37-85eb-47cd-8681-2817e80b4281.5332.38"
            },
            "object":{
                "key":"myimage1.jpg",
                "size":"1024",
                "eTag":"37b51d194a7513e45b56f6524f2d51f2",
                "versionId":"",
                "sequencer": "F7E6D75DC742D108",
                "metadata":[],
                "tags":[]
            }
        },
        "eventId":"",
        "opaqueData":"me@example.com"
    }
]}
```

These are the event record keys and their definitions:

- **awsRegion**: Zonegroup.
- **eventTime**: Timestamp that indicates when the event was triggered.
- **eventName**: The type of the event.
- **userIdentity.principalId**: The identity of the user that triggered the event.
- **requestParameters.sourceIPAddress**: The IP address of the client that triggered the event. This field is not supported.
- **responseElements.x-amz-request-id**: The request ID that triggered the event.
- **responseElements.x_amz_id_2**: The identity of the Ceph Object Gateway on which the event was triggered. The identity format is *RGWID-ZONE-ZONEGROUP*.
- **s3.configurationId**: The notification ID that created the event.
- **s3.bucket.name**: The name of the bucket.
- **s3.bucket.ownerIdentity.principalId**: The owner of the bucket.
- **s3.bucket.arn**: Amazon Resource Name (ARN) of the bucket.
- **s3.bucket.id**: Identity of the bucket.
- **s3.object.key**: The object key.
- **s3.object.size**: The size of the object.

- **s3.object.eTag**: The object etag.
- **s3.object.version**: The object version in a versioned bucket.
- **s3.object.sequencer**: Monotonically increasing identifier of the change per object in the hexadecimal format.
- **s3.object.metadata**: Any metadata set on the object sent as **x-amz-meta**.
- **s3.object.tags**: Any tags set on the object.
- **s3.eventId**: Unique identity of the event.
- **s3.opaqueData**: Opaque data is set in the topic configuration and added to all notifications triggered by the topic.

Additional Resources

- See the *Event Message Structure* for more information.
- See the *Supported event types* section of the *Red Hat Ceph Storage Developer Guide* for more information.

1.16.7. Supported event types

The following event types are supported:

- **s3:ObjectCreated:***
- **s3:ObjectCreated:Put**
- **s3:ObjectCreated:Post**
- **s3:ObjectCreated:Copy**
- **s3:ObjectCreated:CompleteMultipartUpload**
- **s3:ObjectRemoved:***
- **s3:ObjectRemoved:Delete**
- **s3:ObjectRemoved:DeleteMarkerCreated**

1.16.8. Additional Resources

- See the *Creating bucket notifications* section is the *Red Hat Ceph Storage Object Gateway Configuration and Administration Guide* for more details.

1.17. GET BUCKET INFORMATION

Get information about a subset of the existing buckets. If **uid** is specified without **bucket** then all buckets belonging to the user will be returned. If **bucket** alone is specified, information for that particular bucket will be retrieved.

Capabilities

-

`buckets=read`

Syntax

```
GET /admin/bucket?format=json HTTP/1.1
Host FULLY_QUALIFIED_DOMAIN_NAME
```

Table 1.27. Request Parameters

Name	Description	Type	Example	Required
bucket	The bucket to return info on.	String	**foo_bucket**	No
uid	The user to retrieve bucket information for.	String	**foo_user**	No
stats	Return bucket statistics.	Boolean	True [False]	No

Table 1.28. Response Entities

Name	Description	Type	Parent
stats	Per bucket information.	Container	N/A
buckets	Contains a list of one or more bucket containers.	Container	**bucket**
Container for single bucket information.	Container	**buckets**	**name**
The name of the bucket.	String	**bucket**	**pool**
The pool the bucket is stored in.	String	**bucket**	**id**
The unique bucket ID.	String	**bucket**	**marker**
Internal bucket tag.	String	**bucket**	**owner**
The user ID of the bucket owner.	String	**bucket**	**usage**

Name	Description	Type	Parent
Storage usage information.	Container	**bucket**	**index**

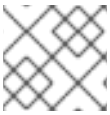
If successful the request returns a buckets container containing the desired bucket information.

Table 1.29. Special Error Responses

Name	Description	Code
IndexRepairFailed	Bucket index repair failed.	409 Conflict

1.18. CHECK A BUCKET INDEX

Check the index of an existing bucket.



NOTE

To check multipart object accounting with **check-objects**, **fix** must be set to True.

Capabilities

buckets=write

Syntax

```
GET /admin/bucket?index&format=json HTTP/1.1
Host FULLY_QUALIFIED_DOMAIN_NAME
```

Table 1.30. Request Parameters

Name	Description	Type	Example	Required
bucket	The bucket to return info on.	String	**foo_bucket**	Yes
check-objects	Check multipart object accounting.	Boolean	True [False]	No
fix	Also fix the bucket index when checking.	Boolean	False [False]	No

Table 1.31. Response Entities

Name	Description	Type
index	Status of bucket index.	String

Table 1.32. Special Error Responses

Name	Description	Code
IndexRepairFailed	Bucket index repair failed.	409 Conflict

1.19. REMOVE A BUCKET

Removes an existing bucket.

Capabilities

```
`buckets=write`
```

Syntax

```
DELETE /admin/bucket?format=json HTTP/1.1
Host FULLY_QUALIFIED_DOMAIN_NAME
```

Table 1.33. Request Parameters

Name	Description	Type	Example	Required
bucket	The bucket to remove.	String	**foo_bucket**	Yes
purge-objects	Remove a buckets objects before deletion.	Boolean	True [False]	No

Response Entities

None.

Table 1.34. Special Error Responses

Name	Description	Code
BucketNotEmpty	Attempted to delete non-empty bucket.	409 Conflict
ObjectRemovalFailed	Unable to remove objects.	409 Conflict

1.20. LINK A BUCKET

Link a bucket to a specified user, unlinking the bucket from any previous user.

Capabilities

> `buckets=write`

Syntax

```
PUT /admin/bucket?format=json HTTP/1.1
Host FULLY_QUALIFIED_DOMAIN_NAME
```

Table 1.35. Request Parameters

Name	Description	Type	Example	Required
bucket	The bucket to unlink.	String	**foo_bucket**	Yes
uid	The user ID to link the bucket to.	String	**foo_user**	Yes

Table 1.36. Response Entities

Name	Description	Type	Parent
bucket	Container for single bucket information.	Container	N/A
name	The name of the bucket.	String	**bucket**
pool	The pool the bucket is stored in.	String	**bucket**
id	The unique bucket ID.	String	**bucket**
marker	Internal bucket tag.	String	**bucket**
owner	The user ID of the bucket owner.	String	**bucket**
usage	Storage usage information.	Container	**bucket**

Name	Description	Type	Parent
index	Status of bucket index.	String	**bucket**

Table 1.37. Special Error Responses

Name	Description	Code
BucketUnlinkFailed	Unable to unlink bucket from specified user.	409 Conflict
BucketLinkFailed	Unable to link bucket to specified user.	409 Conflict

1.21. UNLINK A BUCKET

Unlink a bucket from a specified user. Primarily useful for changing bucket ownership.

Capabilities

```
`buckets=write`
```

Syntax

```
POST /admin/bucket?format=json HTTP/1.1
Host FULLY_QUALIFIED_DOMAIN_NAME
```

Table 1.38. Request Parameters

Name	Description	Type	Example	Required
bucket	The bucket to unlink.	String	**foo_bucket**	Yes
uid	The user ID to unlink the bucket from.	String	**foo_user**	Yes

Response Entities

None.

Table 1.39. Special Error Responses

Name	Description	Code
BucketUnlinkFailed	Unable to unlink bucket from specified user.	409 Conflict

1.22. GET A BUCKET OR OBJECT POLICY

Read the policy of an object or bucket.

Capabilities

```
`buckets=read`
```

Syntax

```
GET /admin/bucket?policy&format=json HTTP/1.1
Host FULLY_QUALIFIED_DOMAIN_NAME
```

Table 1.40. Request Parameters

Name	Description	Type	Example	Required
bucket	The bucket to read the policy from.	String	**foo_bucket**	Yes
object	The object to read the policy from.	String	**foo.txt**	No

Table 1.41. Response Entities

Name	Description	Type	Parent
policy	Access control policy.	Container	N/A

If successful, returns the object or bucket policy

Table 1.42. Special Error Responses

Name	Description	Code
IncompleteBody	Either bucket was not specified for a bucket policy request or bucket and object were not specified for an object policy request.	400 Bad Request

1.23. REMOVE AN OBJECT

Remove an existing object.

NOTE

Does not require owner to be non-suspended.

Capabilities

```
`buckets=write`
```

Syntax

```
DELETE /admin/bucket?object&format=json HTTP/1.1
Host FULLY_QUALIFIED_DOMAIN_NAME
```

Table 1.43. Request Parameters

Name	Description	Type	Example	Required
bucket	The bucket containing the object to be removed.	String	**foo_bucket**	Yes
object	The object to remove.	String	**foo.txt**	Yes

Response Entities

None.

Table 1.44. Special Error Responses

Name	Description	Code
NoSuchObject	Specified object does not exist.	404 Not Found
ObjectRemovalFailed	Unable to remove objects.	409 Conflict

1.24. QUOTAS

The administrative Operations API enables you to set quotas on users and on bucket owned by users. Quotas include the maximum number of objects in a bucket and the maximum storage size in megabytes.

To view quotas, the user must have a **users=read** capability. To set, modify or disable a quota, the user must have **users=write** capability.

Valid parameters for quotas include:

- **Bucket:** The **bucket** option allows you to specify a quota for buckets owned by a user.

- **Maximum Objects:** The **max-objects** setting allows you to specify the maximum number of objects. A negative value disables this setting.
- **Maximum Size:** The **max-size** option allows you to specify a quota for the maximum number of bytes. A negative value disables this setting.
- **Quota Scope:** The **quota-scope** option sets the scope for the quota. The options are **bucket** and **user**.

1.25. GET A USER QUOTA

To get a quota, the user must have **users** capability set with **read** permission.

Syntax

```
GET /admin/user?quota&uid=UID&quota-type=user
```

1.26. SET A USER QUOTA

To set a quota, the user must have **users** capability set with **write** permission.

Syntax

```
PUT /admin/user?quota&uid=UID&quota-type=user
```

The content must include a JSON representation of the quota settings as encoded in the corresponding read operation.

1.27. GET A BUCKET QUOTA

To get a bucket quota, the user must have **users** capability set with **read** permission.

Syntax

```
GET /admin/user?quota&uid=UID&quota-type=bucket
```

1.28. SET A BUCKET QUOTA

To set a quota, the user must have **users** capability set with **write** permission.

Syntax

```
PUT /admin/user?quota&uid=UID&quota-type=bucket
```

The content must include a JSON representation of the quota settings as encoded in the corresponding read operation.

1.29. SET QUOTA FOR AN INDIVIDUAL BUCKET

To set a quota, the user must have **buckets** capability set with **write** permission.

Syntax

```
PUT /admin/bucket?quota&uid=UID&bucket=BUCKET_NAME&quota
```

The content must include a JSON representation of the quota settings.

1.30. GET USAGE INFORMATION

Requesting bandwidth usage information.

Capabilities

```
`usage=read`
```

Syntax

```
GET /admin/usage?format=json HTTP/1.1
Host: FULLY_QUALIFIED_DOMAIN_NAME
```

Table 1.45. Request Parameters

Name	Description	Type	Required
uid	The user for which the information is requested.	String.	Yes
start	Date and (optional) time that specifies the start time of the requested data. E.g., **2012-09-25 16:00:00**	String	No
end	Date and (optional) time that specifies the end time of the requested data (non-inclusive). E.g., **2012-09-25 16:00:00**	String	No
show-entries	Specifies whether data entries should be returned.	Boolean	No
show-summary	Specifies whether data summary should be returned.	Boolean	No

Table 1.46. Response Entities

Name	Description	Type
usage	A container for the usage information.	Container
entries	A container for the usage entries information.	Container
user	A container for the user data information.	Container
owner	The name of the user that owns the buckets.	String

Name	Description	Type
bucket	The bucket name.	String
time	Time lower bound for which data is being specified (rounded to the beginning of the first relevant hour).	String
epoch	The time specified in seconds since **1/1/1970**.	String
categories	A container for stats categories.	Container
entry	A container for stats entry.	Container
category	Name of request category for which the stats are provided.	String
bytes_sent	Number of bytes sent by the Ceph Object Gateway.	Integer
bytes_received	Number of bytes received by the Ceph Object Gateway.	Integer
ops	Number of operations.	Integer
successful_ops	Number of successful operations.	Integer
summary	A container for stats summary.	Container
total	A container for stats summary aggregated total.	Container

If successful, the response contains the requested information.

1.31. REMOVE USAGE INFORMATION

Remove usage information. With no dates specified, removes all usage information.

Capabilities

> `usage=write`

Syntax

```
DELETE /admin/usage?format=json HTTP/1.1
Host: FULLY_QUALIFIED_DOMAIN_NAME
```

Table 1.47. Request Parameters

Name	Description	Type	Example	Required
uid	The user for which the information is requested.	String	**foo_user**	No
start	Date and (optional) time that specifies the start time of the requested data.	String	**2012-09-25 16:00:00**	No
end	Date and (optional) time that specifies the end time of the requested data (none inclusive).	String	**2012-09-25 16:00:00**	No
remove-all	Required when **uid** is not specified, in order to acknowledge multi-user data removal.	Boolean	True [False]	No

1.32. STANDARD ERROR RESPONSES

The following table details standard error responses and their descriptions.

Name	Description	Code
AccessDenied	Access denied.	403 Forbidden
InternalError	Internal server error.	500 Internal Server Error
NoSuchUser	User does not exist.	404 Not Found
NoSuchBucket	Bucket does not exist.	404 Not Found
NoSuchKey	No such access key.	404 Not Found

CHAPTER 2. CEPH OBJECT GATEWAY AND THE S3 API

As a developer, you can use a RESTful application programing interface (API) that is compatible with the Amazon S3 data access model. You can manage the buckets and objects stored in Red Hat Ceph Storage cluster through the Ceph Object Gateway.

2.1. PREREQUISITES

- A running Red Hat Ceph Storage cluster.
- A RESTful client.

2.2. S3 LIMITATIONS

IMPORTANT

The following limitations should be used with caution. There are implications related to your hardware selections, so you should always discuss these requirements with your Red Hat account team.

- **Maximum object size when using Amazon S3:** Individual Amazon S3 objects can range in size from a minimum of 0B to a maximum of 5TB. The largest object that can be uploaded in a single **PUT** is 5GB. For objects larger than 100MB, you should consider using the Multipart Upload capability.
- **Maximum metadata size when using Amazon S3:** There is no defined limit on the total size of user metadata that can be applied to an object, but a single HTTP request is limited to 16,000 bytes.
- **The amount of data overhead Red Hat Ceph Storage cluster produces to store S3 objects and metadata:** The estimate here is 200-300 bytes plus the length of the object name. Versioned objects consume additional space proportional to the number of versions. Also, transient overhead is produced during multi-part upload and other transactional updates, but these overheads are recovered during garbage collection.

Additional Resources

- See the *Red Hat Ceph Storage Developer Guide* for details on the *unsupported header fields*.

2.3. ACCESSING THE CEPH OBJECT GATEWAY WITH THE S3 API

As a developer, you must configure access to the Ceph Object Gateway and the Secure Token Service (STS) before you can start using the Amazon S3 API.

2.3.1. Prerequisites

- A running Red Hat Ceph Storage cluster.
- A running Ceph Object Gateway.
- A RESTful client.

2.3.2. S3 authentication

Requests to the Ceph Object Gateway can be either authenticated or unauthenticated. Ceph Object Gateway assumes unauthenticated requests are sent by an anonymous user. Ceph Object Gateway supports canned ACLs.

For most use cases, clients use existing open source libraries like the Amazon SDK's **AmazonS3Client** for Java, and Python Boto. With open source libraries you simply pass in the access key and secret key and the library builds the request header and authentication signature for you. However, you can create requests and sign them too.

Authenticating a request requires including an access key and a base 64-encoded hash-based Message Authentication Code (HMAC) in the request before it is sent to the Ceph Object Gateway server. Ceph Object Gateway uses an S3-compatible authentication approach.

Example

```
HTTP/1.1
PUT /buckets/bucket/object.mpeg
Host: cname.domain.com
Date: Mon, 2 Jan 2012 00:01:01 +0000
Content-Encoding: mpeg
Content-Length: 9999999

Authorization: AWS ACCESS_KEY:HASH_OF_HEADER_AND_SECRET
```

In the above example, replace ***ACCESS_KEY*** with the value for the access key ID followed by a colon (**:**). Replace ***HASH_OF_HEADER_AND_SECRET*** with a hash of a canonicalized header string and the secret corresponding to the access key ID.

Generate hash of header string and secret

To generate the hash of the header string and secret:

1. Get the value of the header string.
2. Normalize the request header string into canonical form.
3. Generate an HMAC using a SHA-1 hashing algorithm.
4. Encode the **hmac** result as base-64.

Normalize header

To normalize the header into canonical form:

1. Get all **content-** headers.
2. Remove all **content-** headers except for **content-type** and **content-md5**.
3. Ensure the **content-** header names are lowercase.
4. Sort the **content-** headers lexicographically.
5. Ensure you have a **Date** header AND ensure the specified date uses GMT and not an offset.
6. Get all headers beginning with **x-amz-**.

7. Ensure that the **x-amz-** headers are all lowercase.
8. Sort the **x-amz-** headers lexicographically.
9. Combine multiple instances of the same field name into a single field and separate the field values with a comma.
10. Replace white space and line breaks in header values with a single space.
11. Remove white space before and after colons.
12. Append a new line after each header.
13. Merge the headers back into the request header.

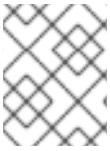
Replace the ***HASH_OF_HEADER_AND_SECRET*** with the base-64 encoded HMAC string.

Additional Resources

- For additional details, consult the Signing and Authenticating REST Requests section of Amazon Simple Storage Service documentation.

2.3.3. S3 server-side encryption

The Ceph Object Gateway supports server-side encryption of uploaded objects for the S3 application programing interface (API). Server-side encryption means that the S3 client sends data over HTTP in its unencrypted form, and the Ceph Object Gateway stores that data in the Red Hat Ceph Storage cluster in encrypted form.



NOTE

Red Hat does NOT support S3 object encryption of Static Large Object (SLO) or Dynamic Large Object (DLO).

IMPORTANT

To use encryption, client requests **MUST** send requests over an SSL connection. Red Hat does not support S3 encryption from a client unless the Ceph Object Gateway uses SSL. However, for testing purposes, administrators may disable SSL during testing by setting the **rgw_crypt_require_ssl** configuration setting to **false** at runtime, setting it to **false** in the Ceph configuration file and restarting the gateway instance, or setting it to **false** in the Ansible configuration files and replaying the Ansible playbooks for the Ceph Object Gateway.

In a production environment, it might not be possible to send encrypted requests over SSL. In such a case, send requests using HTTP with server-side encryption.

For information about how to configure HTTP with server-side encryption, see the *Additional Resources* section below.

There are two options for the management of encryption keys:

Customer-provided Keys

When using customer-provided keys, the S3 client passes an encryption key along with each request to read or write encrypted data. It is the customer's responsibility to manage those keys. Customers must remember which key the Ceph Object Gateway used to encrypt each object.

Ceph Object Gateway implements the customer-provided key behavior in the S3 API according to the Amazon SSE-C specification.

Since the customer handles the key management and the S3 client passes keys to the Ceph Object Gateway, the Ceph Object Gateway requires no special configuration to support this encryption mode.

Key Management Service

When using a key management service, the secure key management service stores the keys and the Ceph Object Gateway retrieves them on demand to serve requests to encrypt or decrypt data.

Ceph Object Gateway implements the key management service behavior in the S3 API according to the Amazon SSE-KMS specification.

IMPORTANT

Currently, the only tested key management implementations are HashiCorp Vault, and OpenStack Barbican. However, OpenStack Barbican is a Technology Preview and is not supported for use in production systems.

Additional Resources

- Amazon SSE-C
- Amazon SSE-KMS
- *Configuring server-side encryption*
- *The HashiCorp Vault*

2.3.4. S3 access control lists

Ceph Object Gateway supports S3-compatible Access Control Lists (ACL) functionality. An ACL is a list of access grants that specify which operations a user can perform on a bucket or on an object. Each grant has a different meaning when applied to a bucket versus applied to an object:

Table 2.1. User Operations

Permission	Bucket	Object
READ	Grantee can list the objects in the bucket.	Grantee can read the object.
WRITE	Grantee can write or delete objects in the bucket.	N/A
READ_ACP	Grantee can read bucket ACL.	Grantee can read the object ACL.
WRITE_ACP	Grantee can write bucket ACL.	Grantee can write to the object ACL.

Permission	Bucket	Object
FULL_CONTROL	Grantee has full permissions for object in the bucket.	Grantee can read or write to the object ACL.

2.3.5. Preparing access to the Ceph Object Gateway using S3

You have to follow some pre-requisites on the Ceph Object Gateway node before attempting to access the gateway server.

WARNING

DO NOT modify the Ceph configuration file to use port **80** and let **Civetweb** use the default Ansible configured port of **8080**.

Prerequisites

- Installation of the Ceph Object Gateway software.
- Root-level access to the Ceph Object Gateway node.

Procedure

1. As **root**, open port **8080** on firewall:

```
[root@rgw ~]# firewall-cmd --zone=public --add-port=8080/tcp --permanent
[root@rgw ~]# firewall-cmd --reload
```

2. Add a wildcard to the DNS server that you are using for the gateway as mentioned in the *Object Gateway Configuration and Administration Guide*.
   You can also set up the gateway node for local DNS caching. To do so, execute the following steps:

   a. As **root**, install and setup **dnsmasq**:

```
[root@rgw ~]# yum install dnsmasq
[root@rgw ~]# echo
"address=/.FQDN_OF_GATEWAY_NODE/IP_OF_GATEWAY_NODE" | tee --append
/etc/dnsmasq.conf
[root@rgw ~]# systemctl start dnsmasq
[root@rgw ~]# systemctl enable dnsmasq
```

   Replace ***IP_OF_GATEWAY_NODE*** and ***FQDN_OF_GATEWAY_NODE*** with the IP address and FQDN of the gateway node.

   b. As **root**, stop NetworkManager:

```
[root@rgw ~]# systemctl stop NetworkManager
[root@rgw ~]# systemctl disable NetworkManager
```

c. As **root**, set the gateway server's IP as the nameserver:

```
[root@rgw ~]# echo "DNS1=IP_OF_GATEWAY_NODE" | tee --append
/etc/sysconfig/network-scripts/ifcfg-eth0
[root@rgw ~]# echo "IP_OF_GATEWAY_NODE FQDN_OF_GATEWAY_NODE" | tee --
append /etc/hosts
[root@rgw ~]# systemctl restart network
[root@rgw ~]# systemctl enable network
[root@rgw ~]# systemctl restart dnsmasq
```

Replace ***IP_OF_GATEWAY_NODE*** and ***FQDN_OF_GATEWAY_NODE*** with the IP address and FQDN of the gateway node.

d. Verify subdomain requests:

```
[user@rgw ~]$ ping mybucket.FQDN_OF_GATEWAY_NODE
```

Replace ***FQDN_OF_GATEWAY_NODE*** with the FQDN of the gateway node.

WARNING

Setting up the gateway server for local DNS caching is for testing purposes only. You won't be able to access outside network after doing this. **It is strongly recommended to use a proper DNS server for the Red Hat Ceph Storage cluster and gateway node.**

3. Create the **radosgw** user for **S3** access carefully as mentioned in the *Object Gateway Configuration and Administration Guide* and copy the generated **access_key** and **secret_key**. You will need these keys for **S3** access and subsequent bucket management tasks.

2.3.6. Accessing the Ceph Object Gateway using Ruby AWS S3

You can use Ruby programming language along with **aws-s3** gem for **S3** access. Execute the steps mentioned below on the node used for accessing the Ceph Object Gateway server with **Ruby AWS::S3**.

Prerequisites

- User-level access to Ceph Object Gateway.
- Root-level access to the node accessing the Ceph Object Gateway.
- Internet access.

Procedure

1. Install the **ruby** package:

```
[root@dev ~]# yum install ruby
```

NOTE

The above command will install **ruby** and it's essential dependencies like **rubygems** and **ruby-libs**. If somehow the command does not install all the dependencies, install them separately.

2. Install the **aws-s3** Ruby package:

```
[root@dev ~]# gem install aws-s3
```

3. Create a project directory:

```
[user@dev ~]$ mkdir ruby_aws_s3
[user@dev ~]$ cd ruby_aws_s3
```

4. Create the connection file:

```
[user@dev ~]$ vim conn.rb
```

5. Paste the following contents into the **conn.rb** file:

Syntax

```
#!/usr/bin/env ruby

require 'aws/s3'
require 'resolv-replace'

AWS::S3::Base.establish_connection!(
        :server            => 'FQDN_OF_GATEWAY_NODE',
        :port          => '8080',
        :access_key_id     => 'MY_ACCESS_KEY',
        :secret_access_key => 'MY_SECRET_KEY'
)
```

Replace ***FQDN_OF_GATEWAY_NODE*** with the FQDN of the Ceph Object Gateway node. Replace ***MY_ACCESS_KEY*** and ***MY_SECRET_KEY*** with the **access_key** and **secret_key** that was generated when you created the **radosgw** user for **S3** access as mentioned in the *Red Hat Ceph Storage Object Gateway Configuration and Administration Guide* .

Example

```
#!/usr/bin/env ruby

require 'aws/s3'
require 'resolv-replace'

AWS::S3::Base.establish_connection!(
        :server            => 'testclient.englab.pnq.redhat.com',
        :port          => '8080',
```

```
        :access_key_id     => '98J4R9P22P5CDL65HKP8',
        :secret_access_key => '6C+jcaP0dp0+FZfrRNgyGA9EzRy25pURldwje049'
)
```

Save the file and exit the editor.

6. Make the file executable:

```
[user@dev ~]$ chmod +x conn.rb
```

7. Run the file:

```
[user@dev ~]$ ./conn.rb | echo $?
```

If you have provided the values correctly in the file, the output of the command will be **0**.

8. Create a new file for creating a bucket:

```
[user@dev ~]$ vim create_bucket.rb
```

Paste the following contents into the file:

```
#!/usr/bin/env ruby

load 'conn.rb'

AWS::S3::Bucket.create('my-new-bucket1')
```

Save the file and exit the editor.

9. Make the file executable:

```
[user@dev ~]$ chmod +x create_bucket.rb
```

10. Run the file:

```
[user@dev ~]$ ./create_bucket.rb
```

If the output of the command is **true** it would mean that bucket **my-new-bucket1** was created successfully.

11. Create a new file for listing owned buckets:

```
[user@dev ~]$ vim list_owned_buckets.rb
```

Paste the following content into the file:

```
#!/usr/bin/env ruby

load 'conn.rb'
```

```
AWS::S3::Service.buckets.each do |bucket|
        puts "{bucket.name}\t{bucket.creation_date}"
end
```

Save the file and exit the editor.

12. Make the file executable:

```
[user@dev ~]$ chmod +x list_owned_buckets.rb
```

13. Run the file:

```
[user@dev ~]$ ./list_owned_buckets.rb
```

The output should look something like this:

```
my-new-bucket1 2020-01-21 10:33:19 UTC
```

14. Create a new file for creating an object:

```
[user@dev ~]$ vim create_object.rb
```

Paste the following contents into the file:

```
#!/usr/bin/env ruby

load 'conn.rb'

AWS::S3::S3Object.store(
        'hello.txt',
        'Hello World!',
        'my-new-bucket1',
        :content_type => 'text/plain'
)
```

Save the file and exit the editor.

15. Make the file executable:

```
[user@dev ~]$ chmod +x create_object.rb
```

16. Run the file:

```
[user@dev ~]$ ./create_object.rb
```

This will create a file **hello.txt** with the string **Hello World!**.

17. Create a new file for listing a bucket's content:

```
[user@dev ~]$ vim list_bucket_content.rb
```

Paste the following content into the file:

```
#!/usr/bin/env ruby

load 'conn.rb'

new_bucket = AWS::S3::Bucket.find('my-new-bucket1')
new_bucket.each do |object|
        puts "{object.key}\t{object.about['content-length']}\t{object.about['last-modified']}"
end
```

Save the file and exit the editor.

18. Make the file executable.

```
[user@dev ~]$ chmod +x list_bucket_content.rb
```

19. Run the file:

```
[user@dev ~]$ ./list_bucket_content.rb
```

The output will look something like this:

```
hello.txt    12    Fri, 22 Jan 2020 15:54:52 GMT
```

20. Create a new file for deleting an empty bucket:

```
[user@dev ~]$ vim del_empty_bucket.rb
```

Paste the following contents into the file:

```
#!/usr/bin/env ruby

load 'conn.rb'

AWS::S3::Bucket.delete('my-new-bucket1')
```

Save the file and exit the editor.

21. Make the file executable:

```
[user@dev ~]$ chmod +x del_empty_bucket.rb
```

22. Run the file:

```
[user@dev ~]$ ./del_empty_bucket.rb | echo $?
```

If the bucket is successfully deleted, the command will return **0** as output.

NOTE

Edit the **create_bucket.rb** file to create empty buckets, for example: **my-new-bucket4**, **my-new-bucket5**. Next, edit the above mentioned **del_empty_bucket.rb** file accordingly before trying to delete empty buckets.

23. Create a new file for deleting non-empty buckets:

```
[user@dev ~]$ vim del_non_empty_bucket.rb
```

Paste the following contents into the file:

```
#!/usr/bin/env ruby

load 'conn.rb'

AWS::S3::Bucket.delete('my-new-bucket1', :force => true)
```

Save the file and exit the editor.

24. Make the file executable:

```
[user@dev ~]$ chmod +x del_non_empty_bucket.rb
```

25. Run the file:

```
[user@dev ~]$ ./del_non_empty_bucket.rb | echo $?
```

If the bucket is successfully deleted, the command will return **0** as output.

26. Create a new file for deleting an object:

```
[user@dev ~]$ vim delete_object.rb
```

Paste the following contents into the file:

```
#!/usr/bin/env ruby

load 'conn.rb'

AWS::S3::S3Object.delete('hello.txt', 'my-new-bucket1')
```

Save the file and exit the editor.

27. Make the file executable:

```
[user@dev ~]$ chmod +x delete_object.rb
```

28. Run the file:

```
[user@dev ~]$ ./delete_object.rb
```

This will delete the object **hello.txt**.

2.3.7. Accessing the Ceph Object Gateway using Ruby AWS SDK

You can use the Ruby programming language along with **aws-sdk** gem for **S3** access. Execute the steps mentioned below on the node used for accessing the Ceph Object Gateway server with **Ruby AWS::SDK**.

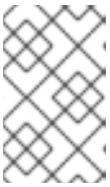
Prerequisites

- User-level access to Ceph Object Gateway.
- Root-level access to the node accessing the Ceph Object Gateway.
- Internet access.

Procedure

1. Install the **ruby** package:

```
[root@dev ~]# yum install ruby
```



NOTE

The above command will install **ruby** and it's essential dependencies like **rubygems** and **ruby-libs**. If somehow the command does not install all the dependencies, install them separately.

2. Install the **aws-sdk** Ruby package:

```
[root@dev ~]# gem install aws-sdk
```

3. Create a project directory:

```
[user@dev ~]$ mkdir ruby_aws_sdk
[user@dev ~]$ cd ruby_aws_sdk
```

4. Create the connection file:

```
[user@ruby_aws_sdk]$ vim conn.rb
```

5. Paste the following contents into the **conn.rb** file:

Syntax

```
#!/usr/bin/env ruby

require 'aws-sdk'
require 'resolv-replace'

Aws.config.update(
        endpoint: 'http://FQDN_OF_GATEWAY_NODE:8080',
        access_key_id: 'MY_ACCESS_KEY',
        secret_access_key: 'MY_SECRET_KEY',
        force_path_style: true,
        region: 'us-east-1'
)
```

Replace ***FQDN_OF_GATEWAY_NODE*** with the FQDN of the Ceph Object Gateway node. Replace ***MY_ACCESS_KEY*** and ***MY_SECRET_KEY*** with the **access_key** and **secret_key** that was generated when you created the **radosgw** user for **S3** access as mentioned in the

Red Hat Ceph Storage Object Gateway Configuration and Administration Guide .

Example

```
#!/usr/bin/env ruby

require 'aws-sdk'
require 'resolv-replace'

Aws.config.update(
        endpoint: 'http://testclient.englab.pnq.redhat.com:8080',
        access_key_id: '98J4R9P22P5CDL65HKP8',
        secret_access_key: '6C+jcaP0dp0+FZfrRNgyGA9EzRy25pURldwje049',
        force_path_style: true,
        region: 'us-east-1'
)
```

Save the file and exit the editor.

6. Make the file executable:

```
[user@ruby_aws_sdk]$ chmod +x conn.rb
```

7. Run the file:

```
[user@ruby_aws_sdk]$ ./conn.rb | echo $?
```

If you have provided the values correctly in the file, the output of the command will be **0**.

8. Create a new file for creating a bucket:

```
[user@ruby_aws_sdk]$ vim create_bucket.rb
```

Paste the following contents into the file:

Syntax

```
#!/usr/bin/env ruby

load 'conn.rb'

s3_client = Aws::S3::Client.new
s3_client.create_bucket(bucket: 'my-new-bucket2')
```

Save the file and exit the editor.

9. Make the file executable:

```
[user@ruby_aws_sdk]$ chmod +x create_bucket.rb
```

10. Run the file:

```
[user@ruby_aws_sdk]$ ./create_bucket.rb
```

If the output of the command is **true**, this means that bucket **my-new-bucket2** was created successfully.

11. Create a new file for listing owned buckets:

```
[user@ruby_aws_sdk]$ vim list_owned_buckets.rb
```

Paste the following content into the file:

```
#!/usr/bin/env ruby

load 'conn.rb'

s3_client = Aws::S3::Client.new
s3_client.list_buckets.buckets.each do |bucket|
        puts "{bucket.name}\t{bucket.creation_date}"
end
```

Save the file and exit the editor.

12. Make the file executable:

```
[user@ruby_aws_sdk]$ chmod +x list_owned_buckets.rb
```

13. Run the file:

```
[user@ruby_aws_sdk]$ ./list_owned_buckets.rb
```

The output should look something like this:

```
my-new-bucket2 2022-04-21 10:33:19 UTC
```

14. Create a new file for creating an object:

```
[user@ruby_aws_sdk]$ vim create_object.rb
```

Paste the following contents into the file:

```
#!/usr/bin/env ruby

load 'conn.rb'

s3_client = Aws::S3::Client.new
s3_client.put_object(
        key: 'hello.txt',
        body: 'Hello World!',
        bucket: 'my-new-bucket2',
        content_type: 'text/plain'
)
```

Save the file and exit the editor.

15. Make the file executable:

```
[user@ruby_aws_sdk]$ chmod +x create_object.rb
```

16. Run the file:

```
[user@ruby_aws_sdk]$ ./create_object.rb
```

This will create a file **hello.txt** with the string **Hello World!**.

17. Create a new file for listing a bucket's content:

```
[user@ruby_aws_sdk]$ vim list_bucket_content.rb
```

Paste the following content into the file:

```
#!/usr/bin/env ruby

load 'conn.rb'

s3_client = Aws::S3::Client.new
s3_client.list_objects(bucket: 'my-new-bucket2').contents.each do |object|
        puts "{object.key}\t{object.size}"
end
```

Save the file and exit the editor.

18. Make the file executable.

```
[user@ruby_aws_sdk]$ chmod +x list_bucket_content.rb
```

19. Run the file:

```
[user@ruby_aws_sdk]$ ./list_bucket_content.rb
```

The output will look something like this:

```
hello.txt    12    Fri, 22 Apr 2022 15:54:52 GMT
```

20. Create a new file for deleting an empty bucket:

```
[user@ruby_aws_sdk]$ vim del_empty_bucket.rb
```

Paste the following contents into the file:

```
#!/usr/bin/env ruby

load 'conn.rb'

s3_client = Aws::S3::Client.new
s3_client.delete_bucket(bucket: 'my-new-bucket2')
```

Save the file and exit the editor.

21. Make the file executable:

```
[user@ruby_aws_sdk]$ chmod +x del_empty_bucket.rb
```

22. Run the file:

```
[user@ruby_aws_sdk]$ ./del_empty_bucket.rb | echo $?
```

If the bucket is successfully deleted, the command will return **0** as output.

NOTE

Edit the **create_bucket.rb** file to create empty buckets, for example: **my-new-bucket6**, **my-new-bucket7**. Next, edit the above mentioned **del_empty_bucket.rb** file accordingly before trying to delete empty buckets.

23. Create a new file for deleting a non-empty bucket:

```
[user@ruby_aws_sdk]$ vim del_non_empty_bucket.rb
```

Paste the following contents into the file:

```
#!/usr/bin/env ruby

load 'conn.rb'

s3_client = Aws::S3::Client.new
Aws::S3::Bucket.new('my-new-bucket2', client: s3_client).clear!
s3_client.delete_bucket(bucket: 'my-new-bucket2')
```

Save the file and exit the editor.

24. Make the file executable:

```
[user@ruby_aws_sdk]$ chmod +x del_non_empty_bucket.rb
```

25. Run the file:

```
[user@ruby_aws_sdk]$ ./del_non_empty_bucket.rb | echo $?
```

If the bucket is successfully deleted, the command will return **0** as output.

26. Create a new file for deleting an object:

```
[user@ruby_aws_sdk]$ vim delete_object.rb
```

Paste the following contents into the file:

```
#!/usr/bin/env ruby

load 'conn.rb'

s3_client = Aws::S3::Client.new
s3_client.delete_object(key: 'hello.txt', bucket: 'my-new-bucket2')
```

Save the file and exit the editor.

27. Make the file executable:

```
[user@ruby_aws_sdk]$ chmod +x delete_object.rb
```

28. Run the file:

```
[user@ruby_aws_sdk]$ ./delete_object.rb
```

This will delete the object **hello.txt**.

2.3.8. Accessing the Ceph Object Gateway using PHP

You can use PHP scripts for S3 access. This procedure provides some example PHP scripts to do various tasks, such as deleting a bucket or an object.

IMPORTANT

The examples given below are tested against **php v5.4.16** and **aws-sdk v2.8.24**. **DO NOT** use the latest version of **aws-sdk** for **php** as it requires **php >= 5.5+**.**php 5.5** is not available in the default repositories of **RHEL 7**. If you want to use **php 5.5**, you will have to enable **epel** and other third party repositories. Also, the configuration options for **php 5.5** and latest version of **aws-sdk** are different.

Prerequisites

- Root-level access to a development workstation.
- Internet access.

Procedure

1. Install the **php** package:

```
[root@dev ~]# yum install php
```

2. Download the zip archive of **aws-sdk** for PHP and extract it.
3. Create a project directory:

```
[user@dev ~]$ mkdir php_s3
[user@dev ~]$ cd php_s3
```

4. Copy the extracted **aws** directory to the project directory. For example:

```
[user@php_s3]$ cp -r ~/Downloads/aws/ ~/php_s3/
```

5. Create the connection file:

```
[user@php_s3]$ vim conn.php
```

6. Paste the following contents in the **conn.php** file:

Syntax

```
<?php
define('AWS_KEY', 'MY_ACCESS_KEY');
define('AWS_SECRET_KEY', 'MY_SECRET_KEY');
define('HOST', 'FQDN_OF_GATEWAY_NODE');
define('PORT', '8080');

// require the AWS SDK for php library
require '/PATH_TO_AWS/aws-autoloader.php';

use Aws\S3\S3Client;

// Establish connection with host using S3 Client
client = S3Client::factory(array(
    'base_url' => HOST,
    'port' => PORT,
    'key'      => AWS_KEY,
    'secret'   => AWS_SECRET_KEY
));
?>
```

Replace ***FQDN_OF_GATEWAY_NODE*** with the FQDN of the gateway node. Replace ***MY_ACCESS_KEY*** and ***MY_SECRET_KEY*** with the **access_key** and **secret_key** that was generated when creating the **radosgw** user for **S3** access as mentioned in the *Red Hat Ceph Storage Object Gateway Configuration and Administration Guide*. Replace ***PATH_TO_AWS*** with the absolute path to the extracted **aws** directory that you copied to the **php** project directory.

Save the file and exit the editor.

7. Run the file:

```
[user@php_s3]$ php -f conn.php | echo $?
```

If you have provided the values correctly in the file, the output of the command will be **0**.

8. Create a new file for creating a bucket:

```
[user@php_s3]$ vim create_bucket.php
```

Paste the following contents into the new file:

Syntax

```
<?php

include 'conn.php';

client->createBucket(array('Bucket' => 'my-new-bucket3'));

?>
```

Save the file and exit the editor.

9. Run the file:

```
[user@php_s3]$ php -f create_bucket.php
```

10. Create a new file for listing owned buckets:

```
[user@php_s3]$ vim list_owned_buckets.php
```

Paste the following content into the file:

Syntax

```
<?php

include 'conn.php';

blist = client->listBuckets();
echo "Buckets belonging to " . blist['Owner']['ID'] . ":\n";
foreach (blist['Buckets'] as b) {
    echo "{b['Name']}\t{b['CreationDate']}\n";
}

?>
```

Save the file and exit the editor.

11. Run the file:

```
[user@php_s3]$ php -f list_owned_buckets.php
```

The output should look similar to this:

```
my-new-bucket3 2022-04-21 10:33:19 UTC
```

12. Create an object by first creating a source file named **hello.txt**:

```
[user@php_s3]$ echo "Hello World!" > hello.txt
```

13. Create a new php file:

```
[user@php_s3]$ vim create_object.php
```

Paste the following contents into the file:

Syntax

```
<?php

include 'conn.php';

key         = 'hello.txt';
source_file = './hello.txt';
acl         = 'private';
```

```
bucket      = 'my-new-bucket3';
client->upload(bucket, key, fopen(source_file, 'r'), acl);

?>
```

Save the file and exit the editor.

14. Run the file:

```
[user@php_s3]$ php -f create_object.php
```

This will create the object **hello.txt** in bucket **my-new-bucket3**.

15. Create a new file for listing a bucket's content:

```
[user@php_s3]$ vim list_bucket_content.php
```

Paste the following content into the file:

Syntax

```
<?php

include 'conn.php';

o_iter = client->getIterator('ListObjects', array(
    'Bucket' => 'my-new-bucket3'
));
foreach (o_iter as o) {
    echo "{o['Key']}\t{o['Size']}\t{o['LastModified']}\n";
}
?>
```

Save the file and exit the editor.

16. Run the file:

```
[user@php_s3]$ php -f list_bucket_content.php
```

The output will look similar to this:

```
hello.txt    12    Fri, 22 Apr 2022 15:54:52 GMT
```

17. Create a new file for deleting an empty bucket:

```
[user@php_s3]$ vim del_empty_bucket.php
```

Paste the following contents into the file:

Syntax

```
<?php

include 'conn.php';
```

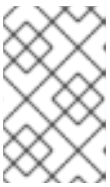
```
client->deleteBucket(array('Bucket' => 'my-new-bucket3'));
?>
```

Save the file and exit the editor.

18. Run the file:

```
[user@php_s3]$ php -f del_empty_bucket.php | echo $?
```

If the bucket is successfully deleted, the command will return **0** as output.



NOTE

Edit the **create_bucket.php** file to create empty buckets, for example: **my-new-bucket4**, **my-new-bucket5**. Next, edit the above mentioned **del_empty_bucket.php** file accordingly before trying to delete empty buckets.

IMPORTANT

Deleting a non-empty bucket is currently not supported in PHP 2 and newer versions of **aws-sdk**.

19. Create a new file for deleting an object:

```
[user@php_s3]$ vim delete_object.php
```

Paste the following contents into the file:

Syntax

```
<?php

include 'conn.php';

client->deleteObject(array(
    'Bucket' => 'my-new-bucket3',
    'Key'    => 'hello.txt',
));
?>
```

Save the file and exit the editor.

20. Run the file:

```
[user@php_s3]$ php -f delete_object.php
```

This will delete the object **hello.txt**.

2.3.9. Accessing the Ceph Object Gateway using AWS CLI

You can use the AWS CLI for S3 access. This procedure provides steps for installing AWS CLI and some example commands to perform various tasks, such as deleting an object from an MFA-Delete enabled bucket.

Prerequisites

- User-level access to Ceph Object Gateway.
- Root-level access to a development workstation.
- A multi-factor authentication (MFA) TOTP token was created using **radosgw-admin mfa create**

Procedure

1. Install the **awscli** package:

```
[user@dev]$ pip3 install --user awscli
```

2. Configure **awscli** to access Ceph Object Storage using AWS CLI:

Syntax

```
aws configure --profile=MY_PROFILE_NAME

AWS Access Key ID [None]: MY_ACCESS_KEY
AWS Secret Access Key [None]: MY_SECRET_KEY
Default region name [None]:
Default output format [None]:
```

Replace ***MY_PROFILE_NAME*** with the name you want to use to identify this profile. Replace ***MY_ACCESS_KEY*** and ***MY_SECRET_KEY*** with the **access_key** and **secret_key** that was generated when creating the **radosgw** user for **S3** access as mentioned in the *Red Hat Ceph Storage Object Gateway Configuration and Administration Guide*.

Example

```
[user@dev]$ aws configure --profile=ceph

AWS Access Key ID [None]: 12345
AWS Secret Access Key [None]: 67890
Default region name [None]:
Default output format [None]:
```

3. Create an alias to point to the FQDN of your Ceph Object Gateway node:

Syntax

```
alias aws="aws --endpoint-url=http://FQDN_OF_GATEWAY_NODE:8080"
```

Replace ***FQDN_OF_GATEWAY_NODE*** with the FQDN of the Ceph Object Gateway node.

Example

```
[user@dev]$ alias aws="aws --endpoint-url=http://testclient.englab.pnq.redhat.com:8080"
```

4. Create a new bucket:

   Syntax

   ```
   aws --profile=MY_PROFILE_NAME s3api create-bucket --bucket BUCKET_NAME
   ```

   Replace ***MY_PROFILE_NAME*** with the name you created to use this profile. Replace ***BUCKET_NAME*** with a name for your new bucket.

   Example

   ```
   [user@dev]$ aws --profile=ceph s3api create-bucket --bucket mybucket
   ```

5. List owned buckets:

   Syntax

   ```
   aws --profile=MY_PROFILE_NAME s3api list-buckets
   ```

   Replace ***MY_PROFILE_NAME*** with the name you created to use this profile.

   Example

   ```
   [user@dev]$ aws --profile=ceph s3api list-buckets
   {
       "Buckets": [
           {
               "Name": "mybucket",
               "CreationDate": "2021-08-31T16:46:15.257Z"
           }
       ],
       "Owner": {
           "DisplayName": "User",
           "ID": "user"
       }
   }
   ```

6. Configure a bucket for MFA-Delete:

   Syntax

   ```
   aws --profile=MY_PROFILE_NAME s3api put-bucket-versioning --bucket BUCKET_NAME --versioning-configuration '{"Status":"Enabled","MFADelete":"Enabled"}' --mfa 'TOTP_SERIAL TOTP_PIN'
   ```

   - Replace ***MY_PROFILE_NAME*** with the name you created to use this profile.
   - Replace ***BUCKET_NAME*** with the name of your new bucket.
   - Replace ***TOTP_SERIAL*** with the string the represents the ID for the TOTP token and replace ***TOTP_PIN*** with the current pin displayed on your MFA authentication device.

- The ***TOTP_SERIAL*** is the string that was specified when you created the radosgw user for S3.
- See the *Creating a new multi-factor authentication TOTP token* section of the *Red Hat Ceph Storage Object Gateway Configuration and Administration Guide* for more details on creating a MFA TOTP token.
- See the *Creating a seed for multi-factor authentication using oathtool* section in the *Red Hat Ceph Storage Developer Guide* for details on creating a MFA seed with oathtool.

Example

```
[user@dev]$ aws --profile=ceph s3api put-bucket-versioning --bucket mybucket --
versioning-configuration '{"Status":"Enabled","MFADelete":"Enabled"}' --mfa 'MFAtest
232009'
```

7. View MFA-Delete status of the bucket versioning state:

Syntax

```
aws --profile=MY_PROFILE_NAME s3api get-bucket-versioning --bucket BUCKET_NAME
```

Replace ***MY_PROFILE_NAME*** with the name you created to use this profile. Replace ***BUCKET_NAME*** with the name of your new bucket.

Example

```
[user@dev]$ aws --profile=ceph s3api get-bucket-versioning --bucket mybucket
{
    "Status": "Enabled",
    "MFADelete": "Enabled"
}
```

8. Add an object to the MFA-Delete enabled bucket:

Syntax

```
aws --profile=MY_PROFILE_NAME s3api put-object --bucket BUCKET_NAME --key
OBJECT_KEY --body LOCAL_FILE
```

- Replace ***MY_PROFILE_NAME*** with the name you created to use this profile.
- Replace ***BUCKET_NAME*** with the name of your new bucket.
- Replace ***OBJECT_KEY*** with the name that will uniquely identify the object in a bucket.
- Replace ***LOCAL_FILE*** with the name of the local file to upload.

Example

```
[user@dev]$ aws --profile=ceph s3api put-object --bucket mybucket --key example --
body testfile
{
```

```
    "ETag": "\"5679b828547a4b44cfb24a23fd9bb9d5\"",
    "VersionId": "3VyyYPTEuIofdvMPWbr1znlOu7lJE3r"
}
```

9. List the object versions for a specific object:

Syntax

```
aws --profile=MY_PROFILE_NAME s3api list-object-versions --bucket BUCKET_NAME --key OBJEC_KEY]
```

- Replace ***MY_PROFILE_NAME*** with the name you created to use this profile.
- Replace ***BUCKET_NAME*** with the name of your new bucket.
- Replace ***OBJECT_KEY*** with the name that was specified to uniquely identify the object in a bucket.

Example

```
[user@dev]$ aws --profile=ceph s3api list-object-versions --bucket mybucket --key example
{
    "IsTruncated": false,
    "KeyMarker": "example",
    "VersionIdMarker": "",
    "Versions": [
        {
            "ETag": "\"5679b828547a4b44cfb24a23fd9bb9d5\"",
            "Size": 196,
            "StorageClass": "STANDARD",
            "Key": "example",
            "VersionId": "3VyyYPTEuIofdvMPWbr1znlOu7lJE3r",
            "IsLatest": true,
            "LastModified": "2021-08-31T17:48:45.484Z",
            "Owner": {
                "DisplayName": "User",
                "ID": "user"
            }
        }
    ],
    "Name": "mybucket",
    "Prefix": "",
    "MaxKeys": 1000,
    "EncodingType": "url"
}
```

10. Delete an object in an MFA-Delete enabled bucket:

Syntax

```
aws --profile=MY_PROFILE_NAME s3api delete-object --bucket BUCKET_NAME --key OBJECT_KEY --version-id VERSION_ID --mfa 'TOTP_SERIAL TOTP_PIN'
```

- Replace ***MY_PROFILE_NAME*** with the name you created to use this profile.
- Replace ***BUCKET_NAME*** with the name of your bucket that contains the object to delete.
- Replace ***OBJECT_KEY*** with the name that uniquely identifies the object in a bucket.
- Replace ***VERSION_ID*** with the VersionID of the specific version of the object you want to delete.
- Replace ***TOTP_SERIAL*** with the string that represents the ID for the TOTP token and ***TOTP_PIN*** to the current pin displayed on your MFA authentication device.

  Example

  ```
  [user@dev]$ aws --profile=ceph s3api delete-object --bucket mybucket --key example --
  version-id 3VyyYPTEuIofdvMPWbr1znlOu7lJE3r --mfa 'MFAtest 420797'
  {
      "VersionId": "3VyyYPTEuIofdvMPWbr1znlOu7lJE3r"
  }
  ```

  If the MFA token is not included, the request fails with the error shown below.

  Example

  ```
  [user@dev]$ aws --profile=ceph s3api delete-object --bucket mybucket --key example --
  version-id 3VyyYPTEuIofdvMPWbr1znlOu7lJE3r
  An error occurred (AccessDenied) when calling the DeleteObject operation: Unknown
  ```

11. List object versions to verify object was deleted from MFA-Delete enabled bucket:

Syntax

```
aws --profile=MY_PROFILE_NAME s3api list-object-versions --bucket BUCKET_NAME --key
OBJECT_KEY
```

- Replace ***MY_PROFILE_NAME*** with the name you created to use this profile.
- Replace ***BUCKET_NAME*** with the name of your bucket.
- Replace ***OBJECT_KEY*** with the name that uniquely identifies the object in a bucket.

Example

```
[user@dev]$ aws --profile=ceph s3api list-object-versions --bucket mybucket --key
example
{
    "IsTruncated": false,
    "KeyMarker": "example",
    "VersionIdMarker": "",
    "Name": "mybucket",
    "Prefix": "",
    "MaxKeys": 1000,
    "EncodingType": "url"
}
```

2.3.10. Creating a seed for multi-factor authentication using the oathtool command

To set up multi-factor authentication (MFA), you must create a secret seed for use by the time-based one time password (TOTP) generator and the back-end MFA system. You can use **oathtool** to generate the hexadecimal seed and optionally **qrencode** to create a QR code to import the token into your MFA device.

Prerequisites

- A Linux system.
- Access to the command line shell.
- **root** or **sudo** access to the Linux system.

Procedure

1. Install the **oathtool** package:

```
[root@dev]# dnf install oathtool
```

2. Install the **qrencode** package:

```
[root@dev]# dnf install qrencode
```

3. Generate a 30 character seed from the **urandom** Linux device file and store it in the shell variable **SEED**:

   Example

```
[user@dev]$ SEED=$(head -10 /dev/urandom | sha512sum | cut -b 1-30)
```

4. Print the seed by running echo on the **SEED** variable:

   Example

```
[user@dev]$ echo $SEED
BA6GLJBJIKC3D7W7YFYXXAQ7
```

5. Feed the **SEED** into the oathtool command:

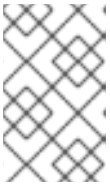
   Syntax

```
oathtool -v -d6 $SEED
```

   Example

```
[user@dev]$ oathtool -v -d6 $SEED
Hex secret: 083c65a4294285b1fedfc1717b821f
Base32 secret: BA6GLJBJIKC3D7W7YFYXXAQ7
Digits: 6
Window size: 0
```

```
Start counter: 0x0 (0)

823182
```



NOTE

The base32 secret is needed to add a token to the authenticator application on your MFA device. You can either use the QR code to import the token into the authenticator application or use the base32 secret manually add it.

6. Optional: Create a QR code image file to add the token to the authenticator:

   Syntax

   ```
   qrencode -o /tmp/user.png 'otpauth://totp/TOTP_SERIAL?secret=_BASE32_SECRET'
   ```

   Replace ***TOTP_SERIAL*** with the string that represents the ID for the (TOTP) token and ***BASE32_SECRET*** with the Base32 secret generated by oathtool.

   Example

   ```
   [user@dev]$ qrencode -o /tmp/user.png 'otpauth://totp/MFAtest?
   secret=BA6GLJBJIKC3D7W7YFYXXAQ7'
   ```

7. Scan the generated QR code image file to add the token to the authenticator application on your MFA device.

8. Create the multi-factor authentication TOTP token for the user using the **radowgw-admin** command.

Additional Resources

- See the *Creating a new multi-factor authentication TOTP token* section of the *Red Hat Ceph Storage Object Gateway Configuration and Administration Guide* for more details on creating an MFA TOTP token.

2.3.11. Secure Token Service

The Amazon Web Services' Secure Token Service (STS) returns a set of temporary security credentials for authenticating users. The Ceph Object Gateway implements a subset of the STS application programming interfaces (APIs) to provide temporary credentials for identity and access management (IAM). Using these temporary credentials authenticates S3 calls by utilizing the STS engine in the Ceph Object Gateway. You can restrict temporary credentials even further by using an IAM policy, which is a parameter passed to the STS APIs.

Additional Resources

- Amazon Web Services Secure Token Service welcome page.

- See the *Configuring and using STS Lite with Keystone* section of the *Red Hat Ceph Storage Developer Guide* for details on STS Lite and Keystone.

- See the *Working around the limitations of using STS Lite with Keystone* section of the *Red Hat Ceph Storage Developer Guide* for details on the limitations of STS Lite and Keystone.

2.3.11.1. The Secure Token Service application programming interfaces

The Ceph Object Gateway implements the following Secure Token Service (STS) application programming interfaces (APIs):

AssumeRole

This API returns a set of temporary credentials for cross-account access. These temporary credentials allow for both, permission policies attached with *Role* and policies attached with *AssumeRole* API. The **RoleArn** and the **RoleSessionName** request parameters are required, but the other request parameters are optional.

RoleArn

Description

The role to assume for the Amazon Resource Name (ARN) with a length of 20 to 2048 characters.

Type

String

Required

Yes

RoleSessionName

Description

Identifying the role session name to assume. The role session name can uniquely identify a session when different principals or different reasons assume a role. This parameter's value has a length of 2 to 64 characters. The **=**, **,**, **.**, **@**, and **-** characters are allowed, but no spaces allowed.

Type

String

Required

Yes

Policy

Description

An identity and access management policy (IAM) in a JSON format for use in an inline session. This parameter's value has a length of 1 to 2048 characters.

Type

String

Required

No

DurationSeconds

Description

The duration of the session in seconds, with a minimum value of **900** seconds to a maximum value of **43200** seconds. The default value is **3600** seconds.

Type

Integer

Required

No

ExternalId

Description

When assuming a role for another account, provide the unique external identifier if available. This parameter's value has a length of 2 to 1224 characters.

Type

String

Required

No

SerialNumber

Description

A user's identification number from their associated multi-factor authentication (MFA) device. The parameter's value can be the serial number of a hardware device or a virtual device, with a length of 9 to 256 characters.

Type

String

Required

No

TokenCode

Description

The value generated from the multi-factor authentication (MFA) device, if the trust policy requires a MFA. If a MFA device is required, and if this parameter's value is empty or expired, then *AssumeRole* call returns an "access denied" error message. This parameter's value has a fixed length of 6 characters.

Type

String

Required

No

AssumeRoleWithWebIdentity

This API returns a set of temporary credentials for users who have been authenticated by an application, such as OpenID Connect or OAuth 2.0 Identity Provider. The **RoleArn** and the **RoleSessionName** request parameters are required, but the other request parameters are optional.

RoleArn

Description

The role to assume for the Amazon Resource Name (ARN) with a length of 20 to 2048 characters.

Type

String

Required

Yes

RoleSessionName

Description

Identifying the role session name to assume. The role session name can uniquely identify a session when different principals or different reasons assume a role. This parameter's value has a length of 2 to 64 characters. The **=**, **,**, **.**, **@**, and **-** characters are allowed, but no spaces allowed.

Type

String

Required

Yes

Policy

Description

An identity and access management policy (IAM) in a JSON format for use in an inline session. This parameter's value has a length of 1 to 2048 characters.

Type

String

Required

No

DurationSeconds

Description

The duration of the session in seconds, with a minimum value of **900** seconds to a maximum value of **43200** seconds. The default value is **3600** seconds.

Type

Integer

Required

No

ProviderId

Description

The fully qualified host component of the domain name from the identity provider. This parameter's value is only valid for OAuth 2.0 access tokens, with a length of 4 to 2048 characters.

Type

String

Required

No

WebIdentityToken

Description

The OpenID Connect identity token or OAuth 2.0 access token provided from an identity provider. This parameter's value has a length of 4 to 2048 characters.

Type

String

Required

No

Additional Resources

- See the *Examples using the Secure Token Service APIs* section of the *Red Hat Ceph Storage Developer Guide* for more details.
- Amazon Web Services Security Token Service, the *AssumeRole* action.
- Amazon Web Services Security Token Service, the *AssumeRoleWithWebIdentity* action.

2.3.11.2. Configuring the Secure Token Service

Configure the Secure Token Service (STS) for use with the Ceph Object Gateway using Ceph Ansible.

NOTE

The S3 and STS APIs co-exist in the same namespace, and both can be accessed from the same endpoint in the Ceph Object Gateway.

Prerequisites

- A Ceph Ansible administration node.
- A running Red Hat Ceph Storage cluster.
- A running Ceph Object Gateway.

Procedure

1. Open for editing the **group_vars/rgws.yml** file.
   a. Add the following lines:

   ```
   rgw_sts_key = STS_KEY
   rgw_s3_auth_use_sts = true
   ```

   Replace:

   - ***STS_KEY*** with the key used to encrypted the session token.
2. Save the changes to the **group_vars/rgws.yml** file.
3. Rerun the appropriate Ceph Ansible playbook:
   a. **Bare-metal** deployments:

   ```
   [user@admin ceph-ansible]$ ansible-playbook site.yml --limit rgws
   ```

   b. **Container** deployments:

```
[user@admin ceph-ansible]$ ansible-playbook site-docker.yml --limit rgws
```

Additional Resources

- See the *Secure Token Service application programming interfaces* section in the *Red Hat Ceph Storage Developer Guide* for more details on the STS APIs.

2.3.11.3. Creating a user for an OpenID Connect provider

To establish trust between the Ceph Object Gateway and the OpenID Connect Provider create a user entity and a role trust policy.

Prerequisites

- User-level access to the Ceph Object Gateway node.

Procedure

1. Create a new Ceph user:

   Syntax

   ```
   radosgw-admin --uid USER_NAME --display-name "DISPLAY_NAME" --access_key USER_NAME --secret SECRET user create
   ```

   Example

   ```
   [user@rgw ~]$ radosgw-admin --uid TESTER --display-name "TestUser" --access_key TESTER --secret test123 user create
   ```

2. Configure the Ceph user capabilities:

   Syntax

   ```
   radosgw-admin caps add --uid="USER_NAME" --caps="oidc-provider=*"
   ```

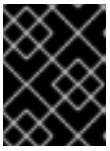
   Example

   ```
   [user@rgw ~]$ radosgw-admin caps add --uid="TESTER" --caps="oidc-provider=*"
   ```

3. Add a condition to the role trust policy using the Secure Token Service (STS) API:

   Syntax

   ```
   "{\"Version\":\"2020-01-17\",\"Statement\":[{\"Effect\":\"Allow\",\"Principal\":{\"Federated\":[\"arn:aws:iam:::oidc-provider/IDP_URL\"]},\"Action\":[\"sts:AssumeRoleWithWebIdentity\"],\"Condition\":{\"StringEquals\":{\"IDP_URL:app_id\":\"AUD_FIELD\"}\}\}\]\}"
   ```



IMPORTANT

The **app_id** in the syntax example above must match the ***AUD_FIELD*** field of the incoming token.

Additional Resources

- See the *Obtaining the Root CA Thumbprint for an OpenID Connect Identity Provider* article on Amazon's website.
- See the *Secure Token Service application programming interfaces* section in the *Red Hat Ceph Storage Developer Guide* for more details on the STS APIs.
- See the *Examples using the Secure Token Service APIs* section of the *Red Hat Ceph Storage Developer Guide* for more details.

2.3.11.4. Obtaining a thumbprint of an OpenID Connect provider

To get the OpenID Connect provider's (IDP) configuration document.

Prerequisites

- Installation of the **openssl** and **curl** packages.

Procedure

1. Get the configuration document from the IDP's URL:

   Syntax

   ```
   curl -k -v \
       -X GET \
       -H "Content-Type: application/x-www-form-urlencoded" \
       "IDP_URL:8000/CONTEXT/realms/REALM/.well-known/openid-configuration" \
     | jq .
   ```

   Example

   ```
   [user@client ~]$ curl -k -v \
       -X GET \
       -H "Content-Type: application/x-www-form-urlencoded" \
       "http://www.example.com:8000/auth/realms/quickstart/.well-known/openid-configuration" \
     | jq .
   ```

2. Get the IDP certificate:

   Syntax

   ```
   curl -k -v \
       -X GET \
       -H "Content-Type: application/x-www-form-urlencoded" \
       "IDP_URL/CONTEXT/realms/REALM/protocol/openid-connect/certs" \
       | jq .
   ```

Example

```
[user@client ~]$ curl -k -v \
    -X GET \
    -H "Content-Type: application/x-www-form-urlencoded" \
    "http://www.example.com/auth/realms/quickstart/protocol/openid-connect/certs" \
    | jq .
```

3. Copy the result of the "x5c" response from the previous command and paste it into the **certificate.crt** file. Include **—-BEGIN CERTIFICATE—-** at the beginning and **—-END CERTIFICATE—-** at the end.

4. Get the certificate thumbprint:

Syntax

```
openssl x509 -in CERT_FILE -fingerprint -noout
```

Example

```
[user@client ~]$ openssl x509 -in certificate.crt -fingerprint -noout
SHA1 Fingerprint=F7:D7:B3:51:5D:D0:D3:19:DD:21:9A:43:A9:EA:72:7A:D6:06:52:87
```

5. Remove all the colons from the SHA1 fingerprint and use this as the input for creating the IDP entity in the IAM request.

Additional Resources

- See the *Obtaining the Root CA Thumbprint for an OpenID Connect Identity Provider* article on Amazon's website.
- See the *Secure Token Service application programming interfaces* section in the *Red Hat Ceph Storage Developer Guide* for more details on the STS APIs.
- See the *Examples using the Secure Token Service APIs* section of the *Red Hat Ceph Storage Developer Guide* for more details.

2.3.11.5. Configuring and using STS Lite with Keystone (Technology Preview)

The Amazon Secure Token Service (STS) and S3 APIs co-exist in the same namespace. The STS options can be configured in conjunction with the Keystone options.

NOTE

Both S3 and STS APIs can be accessed using the same endpoint in Ceph Object Gateway.

Prerequisites

- Red Hat Ceph Storage 3.2 or higher.
- A running Ceph Object Gateway.
- Installation of the Boto Python module, version 3 or higher.

Procedure

1. Open and edit the **group_vars/rgws.yml** file with the following options:

```
rgw_sts_key = STS_KEY
rgw_s3_auth_use_sts = true
```

Replace:

- ***STS_KEY*** with the key used to encrypted the session token.

2. Rerun the appropriate Ceph Ansible playbook:

a. **Bare-metal** deployments:

```
[user@admin ceph-ansible]$ ansible-playbook site.yml --limit rgws
```

b. **Container** deployments:

```
[user@admin ceph-ansible]$ ansible-playbook site-docker.yml --limit rgws
```

3. Generate the EC2 credentials:

Example

```
[user@osp ~]$ openstack ec2 credentials create

+------------+--------------------------------------------------------+
| Field      | Value                                                  |
+------------+--------------------------------------------------------+
| access     | b924dfc87d454d15896691182fdeb0ef                       |
| links      | {u'self': u'http://192.168.0.15/identity/v3/users/     |
|            | 40a7140e424f493d8165abc652dc731c/credentials/          |
|            | OS-EC2/b924dfc87d454d15896691182fdeb0ef'}              |
| project_id | c703801dccaf4a0aaa39bec8c481e25a                       |
| secret     | 6a2142613c504c42a94ba2b82147dc28                       |
| trust_id   | None                                                   |
| user_id    | 40a7140e424f493d8165abc652dc731c                       |
+------------+--------------------------------------------------------+
```

4. Use the generated credentials to get back a set of temporary security credentials using *GetSessionToken* API.

Example

```
import boto3

access_key = b924dfc87d454d15896691182fdeb0ef
secret_key = 6a2142613c504c42a94ba2b82147dc28

client = boto3.client('sts',
aws_access_key_id=access_key,
aws_secret_access_key=secret_key,
endpoint_url=https://www.example.com/rgw,
region_name='',
```

```
)

response = client.get_session_token(
    DurationSeconds=43200
)
```

5. Obtaining the temporary credentials can be used for making S3 calls:

   Example

```
s3client = boto3.client('s3',
  aws_access_key_id = response['Credentials']['AccessKeyId'],
  aws_secret_access_key = response['Credentials']['SecretAccessKey'],
  aws_session_token = response['Credentials']['SessionToken'],
  endpoint_url=https://www.example.com/s3,
  region_name='')

bucket = s3client.create_bucket(Bucket='my-new-shiny-bucket')
response = s3client.list_buckets()
for bucket in response["Buckets"]:
  print "{name}\t{created}".format(
    name = bucket['Name'],
    created = bucket['CreationDate'],
  )
```

6. Create a new *S3Access* role and configure a policy.

   a. Assign a user with administrative CAPS:

      Syntax

```
radosgw-admin caps add --uid="USER" --caps="roles=*"
```

      Example

```
[user@client]$ radosgw-admin caps add --uid="gwadmin" --caps="roles=*"
```

   b. Create the *S3Access* role:

      Syntax

```
radosgw-admin role create --role-name=ROLE_NAME --path=PATH --assume-role-policy-doc=TRUST_POLICY_DOC
```

      Example

```
[user@client]$ radosgw-admin role create --role-name=S3Access --path=/application_abc/component_xyz/ --assume-role-policy-doc=\{\"Version\":\"2012-10-17\",\"Statement\":\[\{\"Effect\":\"Allow\",\"Principal\":\{\"AWS\":\[\"arn:aws:iam:::user/TESTER\"\]\},\"Action\":\[\"sts:AssumeRole\"\]\}\]\}
```

   c. Attach a permission policy to the *S3Access* role:

Syntax

```
radosgw-admin role-policy put --role-name=ROLE_NAME --policy-
name=POLICY_NAME --policy-doc=PERMISSION_POLICY_DOC
```

Example

```
[user@client]$ radosgw-admin role-policy put --role-name=S3Access --policy-
name=Policy --policy-doc=\{\"Version\":\"2012-10-17\",\"Statement\":\[\
{\"Effect\":\"Allow\",\"Action\":\[\"s3:*\"\],\"Resource\":\"arn:aws:s3:::example_bucket\"\}\]\}
```

d. Now another user can assume the role of the **gwadmin** user. For example, the **gwuser** user can assume the permissions of the **gwadmin** user.

e. Make a note of the assuming user's **access_key** and **secret_key** values.

Example

```
[user@client]$ radosgw-admin user info --uid=gwuser | grep -A1 access_key
```

7. Use the *AssumeRole* API call, providing the **access_key** and **secret_key** values from the assuming user:

Example

```
import boto3

access_key = 11BS02LGFB6AL6H1ADMW
secret_key = vzCEkuryfn060dfee4fgQPqFrncKEIkh3ZcdOANY

client = boto3.client('sts',
aws_access_key_id=access_key,
aws_secret_access_key=secret_key,
endpoint_url=https://www.example.com/rgw,
region_name='',
)

response = client.assume_role(
RoleArn='arn:aws:iam:::role/application_abc/component_xyz/S3Access',
RoleSessionName='Bob',
DurationSeconds=3600
)
```

IMPORTANT

The *AssumeRole* API requires the *S3Access* role.

Additional Resources

- See the *Test S3 Access* section in the *Red Hat Ceph Storage Object Gateway Guide* for more information on installing the Boto Python module.

- See the *Create a User* section in the *Red Hat Ceph Storage Object Gateway Guide* for more information.

2.3.11.6. Working around the limitations of using STS Lite with Keystone (Technology Preview)

A limitation with Keystone is that it does not supports STS requests. Another limitation is the payload hash is not included with the request. To work around these two limitations the Boto authentication code must be modified.

Prerequisites

- A running Red Hat Ceph Storage cluster, version 3.2 or higher.
- A running Ceph Object Gateway.
- Installation of Boto Python module, version 3 or higher.

Procedure

1. Open and edit Boto's **auth.py** file.
   a. Add the following four lines to the code block:

```
class SigV4Auth(BaseSigner):
  """
  Sign a request with Signature V4.
  """
  REQUIRES_REGION = True

  def __init__(self, credentials, service_name, region_name):
     self.credentials = credentials
     # We initialize these value here so the unit tests can have
     # valid values.  But these will get overriden in ``add_auth``
     # later for real requests.
     self._region_name = region_name
     if service_name == 'sts': (1)
        self._service_name = 's3' (2)
     else: (3)
        self._service_name = service_name (4)
```

   b. Add the following two lines to the code block:

```
def _modify_request_before_signing(self, request):
       if 'Authorization' in request.headers:
          del request.headers['Authorization']
       self._set_necessary_date_headers(request)
       if self.credentials.token:
          if 'X-Amz-Security-Token' in request.headers:
             del request.headers['X-Amz-Security-Token']
          request.headers['X-Amz-Security-Token'] = self.credentials.token

       if not request.context.get('payload_signing_enabled', True):
          if 'X-Amz-Content-SHA256' in request.headers:
             del request.headers['X-Amz-Content-SHA256']
```

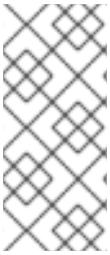
```
        request.headers['X-Amz-Content-SHA256'] = UNSIGNED_PAYLOAD (1)
    else: (2)
        request.headers['X-Amz-Content-SHA256'] = self.payload(request)
```

Additional Resources

- See the *Test S3 Access* section in the Red Hat Ceph Storage *Object Gateway Guide* for more information on installing the Boto Python module.

2.3.12. Session tags for Attribute-based access control (ABAC) in STS

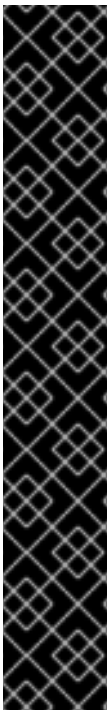
Session tags are key-value pairs that can be passed while federating a user. They are passed as **aws:PrincipalTag** in the session or temporary credentials that are returned back by secure token service (STS). These principal tags consist of session tags that come in as part of the web token and tags that are attached to the role being assumed.



NOTE

Currently, the session tags are only supported as part of the web token passed to **AssumeRoleWithWebIdentity**.

The tags have to be always specified in the following namespace: **https://aws.amazon.com/tags**.



IMPORTANT

The trust policy must have **sts:TagSession** permission if the web token passed in by the federated user contains session tags. Otherwise, the **AssumeRoleWithWebIdentity** action fails.

Example of the trust policy with sts:TagSession:

```
{
    "Version":"2012-10-17",
    "Statement":[
    {
        "Effect":"Allow",
        "Action":["sts:AssumeRoleWithWebIdentity","sts:TagSession"],
        "Principal":{"Federated":["arn:aws:iam:::oidc-
provider/localhost:8080/auth/realms/quickstart"]},
        "Condition":{"StringEquals":{"localhost:8080/auth/realms/quickstart:sub":"test"}}
    }]
  }
```

Properties

The following are the properties of session tags:

- Session tags can be multi-valued.

NOTE

Multi-valued session tags are not supported in Amazon Web Service (AWS).

- Keycloak can be set up as an OpenID Connect Identity Provider (IDP) with a maximum of 50 session tags.
- The maximum size of a key allowed is 128 characters.
- The maximum size of a value allowed is 256 characters.
- The tag or the value cannot start with **aws:**.

Additional Resources

- See the Secure Token Service section in the *Red Hat Ceph Storage Developer Guide* for more information about secure token service.

2.3.12.1. Tag keys

The following are the tag keys that can be used in the role trust policy or the role permission policy.

aws:RequestTag

Description

Compares the key-value pair passed in the request with the key-value pair in the role's trust policy.
In the case of **AssumeRoleWithWebIdentity**, session tags can be used as **aws:RequestTag** in the role trust policy. Those session tags are passed by Keycloak in the web token. As a result, a federated user can assume a role.

aws:PrincipalTag

Description

Compares the key-value pair attached to the principal with the key-value pair in the policy.
In the case of **AssumeRoleWithWebIdentity**, session tags appear as principal tags in the temporary credentials once a user is authenticated. Those session tags are passed by Keycloak in the web token. They can be used as **aws:PrincipalTag** in the role permission policy.

iam:ResourceTag

Description

Compares the key-value pair attached to the resource with the key-value pair in the policy.
In the case of **AssumeRoleWithWebIdentity**, tags attached to the role are compared with those in the trust policy to allow a user to assume a role.

NOTE

The Ceph Object Gateway now supports RESTful APIs for tagging, listing tags, and untagging actions on a role.

aws:TagKeys

Description

Compares tags in the request with the tags in the policy.

In the case of **AssumeRoleWithWebIdentity**, tags are used to check the tag keys in a role trust policy or permission policy before a user is allowed to assume a role.

s3:ResourceTag

Description

Compares tags present on the S3 resource, that is bucket or object, with the tags in the role's permission policy.
It can be used for authorizing an S3 operation in the Ceph Object Gateway. However, this is not allowed in AWS.

It is a key used to refer to tags that have been attached to an object or a bucket. Tags can be attached to an object or a bucket using RESTful APIs available for the same.

2.3.12.2. S3 resource tags

The following list shows which S3 resource tag type is supported for authorizing a particular operation.

Tag type: Object tags

Operations

GetObject, **GetObjectTags**, **DeleteObjectTags**, **DeleteObject**, **PutACLs**, **InitMultipart**, **AbortMultipart** , `**ListMultipart**, **GetAttrs**, **PutObjectRetention**, **GetObjectRetention**, **PutObjectLegalHold**, **GetObjectLegalHold**

Tag type: Bucket tags

Operations

PutObjectTags, **GetBucketTags**, **PutBucketTags**, **DeleteBucketTags**, **GetBucketReplication**, **DeleteBucketReplication**, **GetBucketVersioning**, **SetBucketVersioning**, **GetBucketWebsite**, **SetBucketWebsite**, **DeleteBucketWebsite**, **StatBucket**, **ListBucket**, **GetBucketLogging**, **GetBucketLocation**, **DeleteBucket**, **GetLC**, **PutLC**, **DeleteLC**, **GetCORS**, **PutCORS**, **GetRequestPayment**, **SetRequestPayment**. **PutBucketPolicy**, **GetBucketPolicy**, **DeleteBucketPolicy**, **PutBucketObjectLock**, **GetBucketObjectLock**, **GetBucketPolicyStatus**, **PutBucketPublicAccessBlock**, **GetBucketPublicAccessBlock**, **DeleteBucketPublicAccessBlock**

Tag type: Bucket tags for bucket ACLs, Object tags for object ACLs

Operations

GetACLs, **PutACLs**

Tag type: Object tags of source object, Bucket tags of destination bucket

Operations

PutObject, **CopyObject**

2.4. S3 BUCKET OPERATIONS

As a developer, you can perform bucket operations with the Amazon S3 application programing interface (API) through the Ceph Object Gateway.

The following table list the Amazon S3 functional operations for buckets, along with the function's support status.

Table 2.2. Bucket operations

Feature	Status	Notes
List Buckets	Supported	
Create a Bucket	Supported	Different set of canned ACLs.
Bucket Lifecycle	Partially Supported	**Expiration**, **NoncurrentVersionExpiration** and **AbortIncompleteMultipartUpload** supported.
Put Bucket Lifecycle	Partially Supported	**Expiration**, **NoncurrentVersionExpiration** and **AbortIncompleteMultipartUpload** supported.
Delete Bucket Lifecycle	Supported	
Get Bucket Objects	Supported	
Bucket Location	Supported	
Get Bucket Version	Supported	
Put Bucket Version	Supported	
Delete Bucket	Supported	
Get Bucket ACLs	Supported	Different set of canned ACLs
Put Bucket ACLs	Supported	Different set of canned ACLs
Get Bucket cors	Supported	
Put Bucket cors	Supported	
Delete Bucket cors	Supported	
List Bucket Object Versions	Supported	
Head Bucket	Supported	
List Bucket Multipart Uploads	Supported	

Feature	Status	Notes
Bucket Policies	Partially Supported	
Get a Bucket Request Payment	Supported	
Put a Bucket Request Payment	Supported	
Multi-tenant Bucket Operations	Supported	

2.4.1. Prerequisites

- A running Red Hat Ceph Storage cluster.
- A RESTful client.

2.4.2. S3 create bucket notifications

Create bucket notifications at the bucket level. The notification configuration has the Red Hat Ceph Storage Object Gateway S3 events, **ObjectCreated** and **ObjectRemoved**. These need to be published and the destination to send the bucket notifications. Bucket notifications are S3 operations.

To create a bucket notification for **s3:objectCreate** and **s3:objectRemove** events,use PUT:

Example

```
client.put_bucket_notification_configuration(
   Bucket=bucket_name,
   NotificationConfiguration={
      'TopicConfigurations': [
         {
            'Id': notification_name,
            'TopicArn': topic_arn,
            'Events': ['s3:ObjectCreated:*', 's3:ObjectRemoved:*']
         }]})
```

IMPORTANT

Red Hat supports **ObjectCreate** events, such as, **put**, **post**, **multipartUpload**, and **copy**. Red Hat also supports **ObjectRemove** events, such as, **object_delete** and **s3_multi_object_delete**.

Request Entities

NotificationConfiguration

Description

list of **TopicConfiguration** entities.

Type

Container

Required

Yes

TopicConfiguration

Description

Id, **Topic** and **list** of Event entities.

Type

Container

Required

Yes

id

Description

Name of the notification.

Type

String

Required

Yes

Topic

Description

Topic Amazon Resource Name(ARN)

NOTE

The topic must be created beforehand.

Type

String

Required

Yes

Event

Description

List of supported events. Multiple event entities can be used. If omitted, all events are handled.

Type

String

Required

No

Filter

Description

S3Key, **S3Metadata** and **S3Tags** entities.

Type

Container

Required

No

S3Key

Description

A list of **FilterRule** entities, for filtering based on the object key. At most, 3 entities may be in the list, for example **Name** would be **prefix**, **suffix** or **regex**. All filter rules in the list must match for the filter to match.

Type

Container

Required

No

S3Metadata

Description

A list of **FilterRule** entities, for filtering based on object metadata. All filter rules in the list must match the metadata defined on the object. However, the object still matches if it has other metadata entries not listed in the filter.

Type

Container

Required

No

S3Tags

Description

A list of **FilterRule** entities, for filtering based on object tags. All filter rules in the list must match the tags defined on the object. However, the object still matches if it has other tags not listed in the filter.

Type

Container

Required

No

S3Key.FilterRule

Description

Name and **Value** entities. Name is : **prefix**, **suffix** or **regex**. The **Value** would hold the key prefix, key suffix or a regular expression for matching the key, accordingly.

Type

Container

Required

Yes

S3Metadata.FilterRule

Description

Name and **Value** entities. Name is the name of the metadata attribute for example **x-amz-meta-xxx**. The value is the expected value for this attribute.

Type

Container

Required

Yes

S3Tags.FilterRule

Description

Name and **Value** entities. Name is the tag key, and the value is the tag value.

Type

Container

Required

Yes

HTTP response

400

Status Code

MalformedXML

Description

The XML is not well-formed.

400

Status Code

InvalidArgument

Description

Missing Id or missing or invalid topic ARN or invalid event.

404

Status Code

NoSuchBucket

Description

The bucket does not exist.

404

Status Code

NoSuchKey

Description

The topic does not exist.

id="s3-get-bucket-notifications_dev"]

2.4.3. S3 get bucket notifications

Get a specific notification or list all the notifications configured on a bucket.

Syntax

```
Get /BUCKET?notification=NOTIFICATION_ID HTTP/1.1
Host: cname.domain.com
Date: date
Authorization: AWS ACCESS_KEY:HASH_OF_HEADER_AND_SECRET
```

Example

```
Get /testbucket?notification=testnotificationID HTTP/1.1
Host: cname.domain.com
Date: date
Authorization: AWS ACCESS_KEY:HASH_OF_HEADER_AND_SECRET
```

Example Response

```
<NotificationConfiguration xmlns="http://s3.amazonaws.com/doc/2006-03-01/">
   <TopicConfiguration>
      <Id></Id>
      <Topic></Topic>
      <Event></Event>
      <Filter>
         <S3Key>
            <FilterRule>
               <Name></Name>
               <Value></Value>
            </FilterRule>
         </S3Key>
         <S3Metadata>
            <FilterRule>
               <Name></Name>
               <Value></Value>
            </FilterRule>
         </S3Metadata>
         <S3Tags>
            <FilterRule>
               <Name></Name>
               <Value></Value>
            </FilterRule>
         </S3Tags>
      </Filter>
   </TopicConfiguration>
</NotificationConfiguration>
```

NOTE

The **notification** subresource returns the bucket notification configuration or an empty **NotificationConfiguration** element. The caller must be the bucket owner.

Request Entities

notification-id

Description

Name of the notification. All notifications are listed if the ID is not provided.

Type

String

NotificationConfiguration

Description

list of **TopicConfiguration** entities.

Type

Container

Required

Yes

TopicConfiguration

Description

Id, **Topic** and **list** of Event entities.

Type

Container

Required

Yes

id

Description

Name of the notification.

Type

String

Required

Yes

Topic

Description

Topic Amazon Resource Name(ARN)

NOTE

The topic must be created beforehand.

Type

String

Required

Yes

Event

Description

Handled event. Multiple event entities may exist.

Type

String

Required

Yes

Filter

Description

The filters for the specified configuration.

Type

Container

Required

No

HTTP response

404

Status Code

NoSuchBucket

Description

The bucket does not exist.

404

Status Code

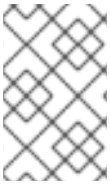
NoSuchKey

Description

The notification does not exist if it has been provided.

2.4.4. S3 delete bucket notifications

Delete a specific or all notifications from a bucket.



NOTE

Notification deletion is an extension to the S3 notification API. Any defined notifications on a bucket are deleted when the bucket is deleted. Deleting an unknown notification for example **double delete**, is not considered an error.

To delete a specific or all notifications use DELETE:

Syntax

```
DELETE /BUCKET?notification=NOTIFICATION_ID HTTP/1.1
```

Example

```
DELETE /testbucket?notification=testnotificationID HTTP/1.1
```

Request Entities

notification-id

Description

Name of the notification. All notifications on the bucket are deleted if the notification ID is not provided.

Type

String

HTTP response

404

Status Code

NoSuchBucket

Description

The bucket does not exist.

2.4.5. Accessing bucket host names

There are two different modes of accessing the buckets. The first, and preferred method identifies the bucket as the top-level directory in the URI.

Example

```
GET /mybucket HTTP/1.1
Host: cname.domain.com
```

The second method identifies the bucket via a virtual bucket host name.

Example

```
GET / HTTP/1.1
Host: mybucket.cname.domain.com
```

TIP

Red Hat prefers the first method, because the second method requires expensive domain certification and DNS wild cards.

2.4.6. S3 list buckets

GET / returns a list of buckets created by the user making the request. **GET** / only returns buckets created by an authenticated user. You cannot make an anonymous request.

Syntax

```
GET / HTTP/1.1
Host: cname.domain.com

Authorization: AWS ACCESS_KEY:HASH_OF_HEADER_AND_SECRET
```

Table 2.3. Response Entities

Name	Type	Description
Buckets	Container	Container for list of buckets.
Bucket	Container	Container for bucket information.
Name	String	Bucket name.
CreationDate	Date	UTC time when the bucket was created.
ListAllMyBucketsResult	Container	A container for the result.
Owner	Container	A container for the bucket owner's **ID** and **DisplayName**.
ID	String	The bucket owner's ID.
DisplayName	String	The bucket owner's display name.

2.4.7. S3 return a list of bucket objects

Returns a list of bucket objects.

Syntax

```
GET /BUCKET?max-keys=25 HTTP/1.1
Host: cname.domain.com
```

Table 2.4. Parameters

Name	Type	Description
prefix	String	Only returns objects that contain the specified prefix.
delimiter	String	The delimiter between the prefix and the rest of the object name.
marker	String	A beginning index for the list of objects returned.
max-keys	Integer	The maximum number of keys to return. Default is 1000.

Table 2.5. HTTP Response

HTTP Status	Status Code	Description
200	OK	Buckets retrieved

GET /***BUCKET*** returns a container for buckets with the following fields:

Table 2.6. Bucket Response Entities

Name	Type	Description
ListBucketResult	Entity	The container for the list of objects.
Name	String	The name of the bucket whose contents will be returned.
Prefix	String	A prefix for the object keys.
Marker	String	A beginning index for the list of objects returned.
MaxKeys	Integer	The maximum number of keys returned.
Delimiter	String	If set, objects with the same prefix will appear in the **CommonPrefixes** list.
IsTruncated	Boolean	If **true**, only a subset of the bucket's contents were returned.
CommonPrefixes	Container	If multiple objects contain the same prefix, they will appear in this list.

The **ListBucketResult** contains objects, where each object is within a **Contents** container.

Table 2.7. Object Response Entities

Name	Type	Description
Contents	Object	A container for the object.
Key	String	The object's key.
LastModified	Date	The object's last-modified date/time.
ETag	String	An MD-5 hash of the object. (entity tag)
Size	Integer	The object's size.
StorageClass	String	Should always return **STANDARD**.

2.4.8. S3 create a new bucket

Creates a new bucket. To create a bucket, you must have a user ID and a valid AWS Access Key ID to authenticate requests. You can not create buckets as an anonymous user.

Constraints

In general, bucket names should follow domain name constraints.

- Bucket names must be unique.
- Bucket names must begin and end with a lowercase letter.
- Bucket names can contain a dash (-).

Syntax

```
PUT /BUCKET HTTP/1.1
Host: cname.domain.com
x-amz-acl: public-read-write

Authorization: AWS ACCESS_KEY:HASH_OF_HEADER_AND_SECRET
```

Table 2.8. Parameters

Name	Description	Valid Values	Required
x-amz-acl	Canned ACLs.	**private**, **public-read**,**public-read-write**, **authenticated-read**	No

HTTP Response

If the bucket name is unique, within constraints and unused, the operation will succeed. If a bucket with the same name already exists and the user is the bucket owner, the operation will succeed. If the bucket name is already in use, the operation will fail.

HTTP Status	Status Code	Description
409	BucketAlreadyExists	Bucket already exists under different user's ownership.

2.4.9. S3 delete a bucket

Deletes a bucket. You can reuse bucket names following a successful bucket removal.

Syntax

```
DELETE /BUCKET HTTP/1.1
Host: cname.domain.com

Authorization: AWS ACCESS_KEY:HASH_OF_HEADER_AND_SECRET
```

Table 2.9. HTTP Response

HTTP Status	Status Code	Description
204	No Content	Bucket removed.

2.4.10. S3 bucket lifecycle

You can use a bucket lifecycle configuration to manage your objects so they are stored effectively throughout their lifetime. The S3 API in the Ceph Object Gateway supports a subset of the AWS bucket lifecycle actions:

- **Expiration**: This defines the lifespan of objects within a bucket. It takes the number of days the object should live or an expiration date, at which point Ceph Object Gateway will delete the object. If the bucket doesn't enable versioning, Ceph Object Gateway will delete the object permanently. If the bucket enables versioning, Ceph Object Gateway will create a delete marker for the current version, and then delete the current version.

- **NoncurrentVersionExpiration**: This defines the lifespan of non-current object versions within a bucket. To use this feature, the bucket must enable versioning. It takes the number of days a non-current object should live, at which point Ceph Object Gateway will delete the non-current object.

- **AbortIncompleteMultipartUpload**: This defines the number of days an incomplete multipart upload should live before it is aborted.

The lifecycle configuration contains one or more rules using the **<Rule>** element.

Example

```
<LifecycleConfiguration>
   <Rule>
     <Prefix/>
     <Status>Enabled</Status>
     <Expiration>
       <Days>10</Days>
     </Expiration>
   </Rule>
</LifecycleConfiguration>
```

A lifecycle rule can apply to all or a subset of objects in a bucket based on the **<Filter>** element that you specify in the lifecycle rule. You can specify a filter several ways:

- Key prefixes

- Object tags

- Both key prefix and one or more object tags

Key prefixes

You can apply a lifecycle rule to a subset of objects based on the key name prefix. For example, specifying **<keypre/>** would apply to objects that begin with **keypre/**:

```
<LifecycleConfiguration>
```

```
    <Rule>
      <Status>Enabled</Status>
      <Filter>
        <Prefix>keypre/</Prefix>
      </Filter>
    </Rule>
</LifecycleConfiguration>
```

You can also apply different lifecycle rules to objects with different key prefixes:

```
<LifecycleConfiguration>
    <Rule>
      <Status>Enabled</Status>
      <Filter>
        <Prefix>keypre/</Prefix>
      </Filter>
    </Rule>
    <Rule>
      <Status>Enabled</Status>
      <Filter>
        <Prefix>mypre/</Prefix>
      </Filter>
    </Rule>
</LifecycleConfiguration>
```

Object tags

You can apply a lifecycle rule to only objects with a specific tag using the **<Key>** and **<Value>** elements:

```
<LifecycleConfiguration>
    <Rule>
      <Status>Enabled</Status>
      <Filter>
        <Tag>
          <Key>key</Key>
          <Value>value</Value>
        </Tag>
      </Filter>
    </Rule>
</LifecycleConfiguration>
```

Both prefix and one or more tags

In a lifecycle rule, you can specify a filter based on both the key prefix and one or more tags. They must be wrapped in the **<And>** element. A filter can have only one prefix, and zero or more tags:

```
<LifecycleConfiguration>
    <Rule>
      <Status>Enabled</Status>
      <Filter>
        <And>
          <Prefix>key-prefix</Prefix>
          <Tag>
            <Key>key1</Key>
            <Value>value1</Value>
```

```
            </Tag>
            <Tag>
              <Key>key2</Key>
              <Value>value2</Value>
            </Tag>
            ...
          </And>
        </Filter>
    </Rule>
</LifecycleConfiguration>
```

Additional Resources

- See the *Red Hat Ceph Storage Developer Guide* for details on getting a bucket lifecycle.
- See the *Red Hat Ceph Storage Developer Guide* for details on creating a bucket lifecycle.
- See the *Red Hat Ceph Storage Developer Guide* for details to delete a bucket lifecycle.

2.4.11. S3 GET bucket lifecycle

To get a bucket lifecycle, use **GET** and specify a destination bucket.

Syntax

```
GET /BUCKET?lifecycle HTTP/1.1
Host: cname.domain.com

Authorization: AWS ACCESS_KEY:HASH_OF_HEADER_AND_SECRET
```

Request Headers

See the Common Request Headers for more information.

Response

The response contains the bucket lifecycle and its elements.

2.4.12. S3 create or replace a bucket lifecycle

To create or replace a bucket lifecycle, use **PUT** and specify a destination bucket and a lifecycle configuration. The Ceph Object Gateway only supports a subset of the S3 lifecycle functionality.

Syntax

```
PUT /BUCKET?lifecycle HTTP/1.1
Host: cname.domain.com

Authorization: AWS ACCESS_KEY:HASH_OF_HEADER_AND_SECRET
<LifecycleConfiguration>
  <Rule>
    <Expiration>
      <Days>10</Days>
    </Expiration>
  </Rule>
```

```
  ...
 <Rule>
 </Rule>
</LifecycleConfiguration>
```

Table 2.10. Request Headers

Name	Description	Valid Values	Required
content-md5	A base64 encoded MD-5 hash of the message.	A string. No defaults or constraints.	No

Additional Resources

- See the *Red Hat Ceph Storage Developer Guide* for details on common Amazon S3 request headers.
- See the *Red Hat Ceph Storage Developer Guide* for details on Amazon S3 bucket lifecycles.

2.4.13. S3 delete a bucket lifecycle

To delete a bucket lifecycle, use **DELETE** and specify a destination bucket.

Syntax

```
DELETE /BUCKET?lifecycle HTTP/1.1
Host: cname.domain.com

Authorization: AWS ACCESS_KEY:HASH_OF_HEADER_AND_SECRET
```

Request Headers

The request does not contain any special elements.

Response

The response returns common response status.

Additional Resources

- See *Appendix A* for Amazon S3 common request headers.
- See *Appendix B* for Amazon S3 common response status codes.

2.4.14. S3 get bucket location

Retrieves the bucket's zone group. The user needs to be the bucket owner to call this. A bucket can be constrained to a zone group by providing **LocationConstraint** during a PUT request.

Add the **location** subresource to bucket resource as shown below.

Syntax

```
GET /BUCKET?location HTTP/1.1
Host: cname.domain.com

Authorization: AWS ACCESS_KEY:HASH_OF_HEADER_AND_SECRET
```

Table 2.11. Response Entities

Name	Type	Description
LocationConstraint	String	The zone group where bucket resides, empty string for default zone group

2.4.15. S3 get bucket versioning

Retrieves the versioning state of a bucket. The user needs to be the bucket owner to call this.

Add the **versioning** subresource to bucket resource as shown below.

Syntax

```
GET /BUCKET?versioning HTTP/1.1
Host: cname.domain.com

Authorization: AWS ACCESS_KEY:HASH_OF_HEADER_AND_SECRET
```

2.4.16. S3 put the bucket versioning

This subresource set the versioning state of an existing bucket. The user needs to be the bucket owner to set the versioning state. If the versioning state has never been set on a bucket, then it has no versioning state. Doing a GET versioning request does not return a versioning state value.

Setting the bucket versioning state:

Enabled : Enables versioning for the objects in the bucket. All objects added to the bucket receive a unique version ID. **Suspended** : Disables versioning for the objects in the bucket. All objects added to the bucket receive the version ID null.

Syntax

```
PUT /BUCKET?versioning HTTP/1.1
```

Table 2.12. Bucket Request Entities

Name	Type	Description
VersioningConfiguration	container	A container for the request.
Status	String	Sets the versioning state of the bucket. Valid Values: Suspended/Enabled

2.4.17. S3 get bucket access control lists

Retrieves the bucket access control list. The user needs to be the bucket owner or to have been granted **READ_ACP** permission on the bucket.

Add the **acl** subresource to the bucket request as shown below.

Syntax

```
GET /BUCKET?acl HTTP/1.1
Host: cname.domain.com

Authorization: AWS ACCESS_KEY:HASH_OF_HEADER_AND_SECRET
```

Table 2.13. Response Entities

Name	Type	Description
AccessControlPolicy	Container	A container for the response.
AccessControlList	Container	A container for the ACL information.
Owner	Container	A container for the bucket owner's **ID** and **DisplayName**.
ID	String	The bucket owner's ID.
DisplayName	String	The bucket owner's display name.
Grant	Container	A container for **Grantee** and **Permission**.
Grantee	Container	A container for the **DisplayName** and **ID** of the user receiving a grant of permission.
Permission	String	The permission given to the **Grantee** bucket.

2.4.18. S3 put bucket Access Control Lists

Sets an access control to an existing bucket. The user needs to be the bucket owner or to have been granted **WRITE_ACP** permission on the bucket.

Add the **acl** subresource to the bucket request as shown below.

Syntax

```
PUT /BUCKET?acl HTTP/1.1
```

Table 2.14. Request Entities

Name	Type	Description
AccessControlPolicy	Container	A container for the request.
AccessControlList	Container	A container for the ACL information.
Owner	Container	A container for the bucket owner's **ID** and **DisplayName**.
ID	String	The bucket owner's ID.
DisplayName	String	The bucket owner's display name.
Grant	Container	A container for **Grantee** and **Permission**.
Grantee	Container	A container for the **DisplayName** and **ID** of the user receiving a grant of permission.
Permission	String	The permission given to the **Grantee** bucket.

2.4.19. S3 get bucket cors

Retrieves the cors configuration information set for the bucket. The user needs to be the bucket owner or to have been granted **READ_ACP** permission on the bucket.

Add the **cors** subresource to the bucket request as shown below.

Syntax

```
GET /BUCKET?cors HTTP/1.1
Host: cname.domain.com

Authorization: AWS ACCESS_KEY:HASH_OF_HEADER_AND_SECRET
```

2.4.20. S3 put bucket cors

Sets the cors configuration for the bucket. The user needs to be the bucket owner or to have been granted **READ_ACP** permission on the bucket.

Add the **cors** subresource to the bucket request as shown below.

Syntax

```
PUT /BUCKET?cors HTTP/1.1
Host: cname.domain.com

Authorization: AWS ACCESS_KEY:HASH_OF_HEADER_AND_SECRET
```

2.4.21. S3 delete a bucket cors

Deletes the cors configuration information set for the bucket. The user needs to be the bucket owner or to have been granted **READ_ACP** permission on the bucket.

Add the **cors** subresource to the bucket request as shown below.

Syntax

```
DELETE /BUCKET?cors HTTP/1.1
Host: cname.domain.com

Authorization: AWS ACCESS_KEY:HASH_OF_HEADER_AND_SECRET
```

2.4.22. S3 list bucket object versions

Returns a list of metadata about all the version of objects within a bucket. Requires READ access to the bucket.

Add the **versions** subresource to the bucket request as shown below.

Syntax

```
GET /BUCKET?versions HTTP/1.1
Host: cname.domain.com

Authorization: AWS ACCESS_KEY:HASH_OF_HEADER_AND_SECRET
```

You can specify parameters for **GET /*BUCKET*?versions**, but none of them are required.

Table 2.15. Parameters

Name	Type	Description
prefix	String	Returns in-progress uploads whose keys contains the specified prefix.
delimiter	String	The delimiter between the prefix and the rest of the object name.
key-marker	String	The beginning marker for the list of uploads.
max-keys	Integer	The maximum number of in-progress uploads. The default is 1000.
version-id-marker	String	Specifies the object version to begin the list.

Table 2.16. Response Entities

Name	Type	Description

Name	Type	Description
KeyMarker	String	The key marker specified by the **key-marker** request parameter (if any).
NextKeyMarker	String	The key marker to use in a subsequent request if **IsTruncated** is **true**.
NextUploadIdMarker	String	The upload ID marker to use in a subsequent request if **IsTruncated** is **true**.
IsTruncated	Boolean	If **true**, only a subset of the bucket's upload contents were returned.
Size	Integer	The size of the uploaded part.
DisplayName	String	The owners's display name.
ID	String	The owners's ID.
Owner	Container	A container for the **ID** and **DisplayName** of the user who owns the object.
StorageClass	String	The method used to store the resulting object. **STANDARD** or **REDUCED_REDUNDANCY**
Version	Container	Container for the version information.
versionId	String	Version ID of an object.
versionIdMarker	String	The last version of the key in a truncated response.

2.4.23. S3 head bucket

Calls HEAD on a bucket to determine if it exists and if the caller has access permissions. Returns **200 OK** if the bucket exists and the caller has permissions; **404 Not Found** if the bucket does not exist; and, **403 Forbidden** if the bucket exists but the caller does not have access permissions.

Syntax

```
HEAD /BUCKET HTTP/1.1
Host: cname.domain.com
Date: date
Authorization: AWS ACCESS_KEY:HASH_OF_HEADER_AND_SECRET
```

2.4.24. S3 list multipart uploads

GET /?uploads returns a list of the current in-progress multipart uploads, that is, the application initiates a multipart upload, but the service hasn't completed all the uploads yet.

Syntax

```
GET /BUCKET?uploads HTTP/1.1
```

You can specify parameters for **GET /*BUCKET*?uploads**, but none of them are required.

Table 2.17. Parameters

Name	Type	Description
prefix	String	Returns in-progress uploads whose keys contains the specified prefix.
delimiter	String	The delimiter between the prefix and the rest of the object name.
key-marker	String	The beginning marker for the list of uploads.
max-keys	Integer	The maximum number of in-progress uploads. The default is 1000.
max-uploads	Integer	The maximum number of multipart uploads. The range from 1-1000. The default is 1000.
version-id-marker	String	Ignored if **key-marker** isn't specified. Specifies the **ID** of first upload to list in lexicographical order at or following the **ID**.

Table 2.18. Response Entities

Name	Type	Description
ListMultipartUploadsResult	Container	A container for the results.
ListMultipartUploadsResult.Prefix	String	The prefix specified by the **prefix** request parameter (if any).
Bucket	String	The bucket that will receive the bucket contents.
KeyMarker	String	The key marker specified by the **key-marker** request parameter (if any).
UploadIdMarker	String	The marker specified by the **upload-id-marker** request parameter (if any).

Name	Type	Description
NextKeyMarker	String	The key marker to use in a subsequent request if **IsTruncated** is **true**.
NextUploadIdMarker	String	The upload ID marker to use in a subsequent request if **IsTruncated** is **true**.
MaxUploads	Integer	The max uploads specified by the **max-uploads** request parameter.
Delimiter	String	If set, objects with the same prefix will appear in the **CommonPrefixes** list.
IsTruncated	Boolean	If **true**, only a subset of the bucket's upload contents were returned.
Upload	Container	A container for **Key**, **UploadId**, **InitiatorOwner**, **StorageClass**, and **Initiated** elements.
Key	String	The key of the object once the multipart upload is complete.
UploadId	String	The **ID** that identifies the multipart upload.
Initiator	Container	Contains the **ID** and **DisplayName** of the user who initiated the upload.
DisplayName	String	The initiator's display name.
ID	String	The initiator's ID.
Owner	Container	A container for the **ID** and **DisplayName** of the user who owns the uploaded object.
StorageClass	String	The method used to store the resulting object. **STANDARD** or **REDUCED_REDUNDANCY**
Initiated	Date	The date and time the user initiated the upload.
CommonPrefixes	Container	If multiple objects contain the same prefix, they will appear in this list.
CommonPrefixes.Prefix	String	The substring of the key after the prefix as defined by the **prefix** request parameter.

2.4.25. S3 bucket policies

The Ceph Object Gateway supports a subset of the Amazon S3 policy language applied to buckets.

Creation and Removal

Ceph Object Gateway manages S3 Bucket policies through standard S3 operations rather than using the **radosgw-admin** CLI tool.

Administrators may use the **s3cmd** command to set or delete a policy.

Example

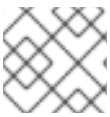
```
$ cat > examplepol
{
  "Version": "2012-10-17",
  "Statement": [{
    "Effect": "Allow",
    "Principal": {"AWS": ["arn:aws:iam::usfolks:user/fred"]},
    "Action": "s3:PutObjectAcl",
    "Resource": [
      "arn:aws:s3:::happybucket/*"
    ]
  }]
}

$ s3cmd setpolicy examplepol s3://happybucket
$ s3cmd delpolicy s3://happybucket
```

Limitations

Ceph Object Gateway only supports the following S3 actions:

- **s3:AbortMultipartUpload**
- **s3:CreateBucket**
- **s3:DeleteBucketPolicy**
- **s3:DeleteBucket**
- **s3:DeleteBucketWebsite**
- **s3:DeleteObject**
- **s3:DeleteObjectVersion**
- **s3:GetBucketAcl**
- **s3:GetBucketCORS**
- **s3:GetBucketLocation**
- **s3:GetBucketPolicy**
- **s3:GetBucketRequestPayment**

- **s3:GetBucketVersioning**
- **s3:GetBucketWebsite**
- **s3:GetLifecycleConfiguration**
- **s3:GetObjectAcl**
- **s3:GetObject**
- **s3:GetObjectTorrent**
- **s3:GetObjectVersionAcl**
- **s3:GetObjectVersion**
- **s3:GetObjectVersionTorrent**
- **s3:ListAllMyBuckets**
- **s3:ListBucketMultiPartUploads**
- **s3:ListBucket**
- **s3:ListBucketVersions**
- **s3:ListMultipartUploadParts**
- **s3:PutBucketAcl**
- **s3:PutBucketCORS**
- **s3:PutBucketPolicy**
- **s3:PutBucketRequestPayment**
- **s3:PutBucketVersioning**
- **s3:PutBucketWebsite**
- **s3:PutLifecycleConfiguration**
- **s3:PutObjectAcl**
- **s3:PutObject**
- **s3:PutObjectVersionAcl**



NOTE

Ceph Object Gateway does not support setting policies on users, groups, or roles.

The Ceph Object Gateway uses the RGW 'tenant' identifier in place of the Amazon twelve-digit account ID. Ceph Object Gateway administrators who want to use policies between Amazon Web Service (AWS) S3 and Ceph Object Gateway S3 will have to use the Amazon account ID as the tenant ID when creating users.

With AWS S3, all tenants share a single namespace. By contrast, Ceph Object Gateway gives every tenant its own namespace of buckets. At present, Ceph Object Gateway clients trying to access a bucket belonging to another tenant MUST address it as **tenant:bucket** in the S3 request.

In the AWS, a bucket policy can grant access to another account, and that account owner can then grant access to individual users with user permissions. Since Ceph Object Gateway does not yet support user, role, and group permissions, account owners will need to grant access directly to individual users.

IMPORTANT

Granting an entire account access to a bucket grants access to ALL users in that account.

Bucket policies do **NOT** support string interpolation.

Ceph Object Gateway supports the following condition keys:

- **aws:CurrentTime**
- **aws:EpochTime**
- **aws:PrincipalType**
- **aws:Referer**
- **aws:SecureTransport**
- **aws:SourceIp**
- **aws:UserAgent**
- **aws:username**

Ceph Object Gateway **ONLY** supports the following condition keys for the **ListBucket** action:

- **s3:prefix**
- **s3:delimiter**
- **s3:max-keys**

Impact on Swift

Ceph Object Gateway provides no functionality to set bucket policies under the Swift API. However, bucket policies that have been set with the S3 API govern Swift as well as S3 operations.

Ceph Object Gateway matches Swift credentials against Principals specified in a policy.

2.4.26. S3 get the request payment configuration on a bucket

Uses the **requestPayment** subresource to return the request payment configuration of a bucket. The user needs to be the bucket owner or to have been granted **READ_ACP** permission on the bucket.

Add the **requestPayment** subresource to the bucket request as shown below.

Syntax

-

```
GET /BUCKET?requestPayment HTTP/1.1
Host: cname.domain.com

Authorization: AWS ACCESS_KEY:HASH_OF_HEADER_AND_SECRET
```

2.4.27. S3 set the request payment configuration on a bucket

Uses the **requestPayment** subresource to set the request payment configuration of a bucket. By default, the bucket owner pays for downloads from the bucket. This configuration parameter enables the bucket owner to specify that the person requesting the download will be charged for the request and the data download from the bucket.

Add the **requestPayment** subresource to the bucket request as shown below.

Syntax

```
PUT /BUCKET?requestPayment HTTP/1.1
Host: cname.domain.com
```

Table 2.19. Request Entities

Name	Type	Description
Payer	Enum	Specifies who pays for the download and request fees.
RequestPaymentConfiguration	Container	A container for **Payer**.

2.4.28. Multi-tenant bucket operations

When a client application accesses buckets, it always operates with credentials of a particular user. In Red Hat Ceph Storage cluster, every user belongs to a tenant. Consequently, every bucket operation has an implicit tenant in its context if no tenant is specified explicitly. Thus multi tenancy is completely backward compatible with previous releases, as long as the referred buckets and referring user belong to the same tenant.

Extensions employed to specify an explicit tenant differ according to the protocol and authentication system used.

In the following example, a colon character separates tenant and bucket. Thus a sample URL would be:

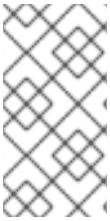
```
https://rgw.domain.com/tenant:bucket
```

By contrast, a simple Python example separates the tenant and bucket in the bucket method itself:

Example

```
from boto.s3.connection import S3Connection, OrdinaryCallingFormat
  c = S3Connection(
    aws_access_key_id="TESTER",
    aws_secret_access_key="test123",
    host="rgw.domain.com",
```

```
  calling_format = OrdinaryCallingFormat()
)
bucket = c.get_bucket("tenant:bucket")
```



NOTE

It's not possible to use S3-style subdomains using multi-tenancy, since host names cannot contain colons or any other separators that are not already valid in bucket names. Using a period creates an ambiguous syntax. Therefore, the **bucket-in-URL-path** format has to be used with multi-tenancy.

Additional Resources

- See Multi Tenancy for additional details.

2.4.29. Additional Resources

- See the *Red Hat Ceph Storage Object Gateway Configuration and Administration Guide* for details on configuring a bucket website.

2.5. S3 OBJECT OPERATIONS

As a developer, you can perform object operations with the Amazon S3 application programing interface (API) through the Ceph Object Gateway.

The following table list the Amazon S3 functional operations for objects, along with the function's support status.

Table 2.20. Object operations

Get Object	Supported	
Get Object Information	Supported	
Put Object	Supported	
Delete Object	Supported	
Delete Multiple Objects	Supported	
Get Object ACLs	Supported	
Put Object ACLs	Supported	
Copy Object	Supported	
Post Object	Supported	
Options Object	Supported	

Get Object	Supported	
Initiate Multipart Upload	Supported	
Add a Part to a Multipart Upload	Supported	
List Parts of a Multipart Upload	Supported	
Assemble Multipart Upload	Supported	
Copy Multipart Upload	Supported	
Abort Multipart Upload	Supported	
Multi-Tenancy	Supported	

2.5.1. Prerequisites

- A running Red Hat Ceph Storage cluster.
- A RESTful client.

2.5.2. S3 get an object from a bucket

Retrieves an object from a bucket:

Syntax

```
GET /BUCKET/OBJECT HTTP/1.1
```

Add the **versionId** subresource to retrieve a particular version of the object:

Syntax

```
GET /BUCKET/OBJECT?versionId=VERSION_ID HTTP/1.1
```

Table 2.21. Request Headers

Name	Description	Valid Values	Required
range	The range of the object to retrieve.	Range: bytes=beginbyte-endbyte	No
if-modified-since	Gets only if modified since the timestamp.	Timestamp	No
if-unmodified-since	Gets only if not modified since the timestamp.	Timestamp	No

Name	Description	Valid Values	Required
if-match	Gets only if object ETag matches ETag.	Entity Tag	No
if-none-match	Gets only if object ETag matches ETag.	Entity Tag	No

Table 2.22. Response Headers

Name	Description
Content-Range	Data range, will only be returned if the range header field was specified in the request
x-amz-version-id	Returns the version ID or null.

2.5.3. S3 get information on an object

Returns information about an object. This request will return the same header information as with the Get Object request, but will include the metadata only, not the object data payload.

Retrieves the current version of the object:

Syntax

```
HEAD /BUCKET/OBJECT HTTP/1.1
```

Add the **versionId** subresource to retrieve info for a particular version:

Syntax

```
HEAD /BUCKET/OBJECT?versionId=VERSION_ID HTTP/1.1
```

Table 2.23. Request Headers

Name	Description	Valid Values	Required
range	The range of the object to retrieve.	Range: bytes=beginbyte-endbyte	No
if-modified-since	Gets only if modified since the timestamp.	Timestamp	No
if-unmodified-since	Gets only if not modified since the timestamp.	Timestamp	No
if-match	Gets only if object ETag matches ETag.	Entity Tag	No

Name	Description	Valid Values	Required
if-none-match	Gets only if object ETag matches ETag.	Entity Tag	No

Table 2.24. Response Headers

Name	Description
x-amz-version-id	Returns the version ID or null.

2.5.4. S3 add an object to a bucket

Adds an object to a bucket. You must have write permissions on the bucket to perform this operation.

Syntax

```
PUT /BUCKET/OBJECT HTTP/1.1
```

Table 2.25. Request Headers

Name	Description	Valid Values	Required
content-md5	A base64 encoded MD-5 hash of the message.	A string. No defaults or constraints.	No
content-type	A standard MIME type.	Any MIME type. Default: **binary/octet-stream**	No
x-amz-meta-<...>	User metadata. Stored with the object.	A string up to 8kb. No defaults.	No
x-amz-acl	A canned ACL.	**private**, **public-read**, **public-read-write**, **authenticated-read**	No

Table 2.26. Response Headers

Name	Description
x-amz-version-id	Returns the version ID or null.

2.5.5. S3 delete an object

Removes an object. Requires WRITE permission set on the containing bucket.

Deletes an object. If object versioning is on, it creates a marker.

Syntax

```
DELETE /BUCKET/OBJECT HTTP/1.1
```

To delete an object when versioning is on, you must specify the **versionId** subresource and the version of the object to delete.

```
DELETE /BUCKET/OBJECT?versionId=VERSION_ID HTTP/1.1
```

2.5.6. S3 delete multiple objects

This API call deletes multiple objects from a bucket.

Syntax

```
POST /BUCKET/OBJECT?delete HTTP/1.1
```

2.5.7. S3 get an object's Access Control List (ACL)

Returns the ACL for the current version of the object:

Syntax

```
GET /BUCKET/OBJECT?acl HTTP/1.1
```

Add the **versionId** subresource to retrieve the ACL for a particular version:

Syntax

```
GET /BUCKET/OBJECT?versionId=VERSION_ID&acl HTTP/1.1
```

Table 2.27. Response Headers

Name	Description
x-amz-version-id	Returns the version ID or null.

Table 2.28. Response Entities

Name	Type	Description
AccessControlPolicy	Container	A container for the response.
AccessControlList	Container	A container for the ACL information.

Name	Type	Description
Owner	Container	A container for the object owner's **ID** and **DisplayName**.
ID	String	The object owner's ID.
DisplayName	String	The object owner's display name.
Grant	Container	A container for **Grantee** and **Permission**.
Grantee	Container	A container for the **DisplayName** and **ID** of the user receiving a grant of permission.
Permission	String	The permission given to the **Grantee** object.

2.5.8. S3 set an object's Access Control List (ACL)

Sets an object ACL for the current version of the object.

Syntax

```
PUT /BUCKET/OBJECT?acl
```

Table 2.29. Request Entities

Name	Type	Description
AccessControlPolicy	Container	A container for the response.
AccessControlList	Container	A container for the ACL information.
Owner	Container	A container for the object owner's **ID** and **DisplayName**.
ID	String	The object owner's ID.
DisplayName	String	The object owner's display name.
Grant	Container	A container for **Grantee** and **Permission**.
Grantee	Container	A container for the **DisplayName** and **ID** of the user receiving a grant of permission.

Name	Type	Description
Permission	String	The permission given to the **Grantee** object.

2.5.9. S3 copy an object

To copy an object, use **PUT** and specify a destination bucket and the object name.

Syntax

```
PUT /DEST_BUCKET/DEST_OBJECT HTTP/1.1
x-amz-copy-source: SOURCE_BUCKET/SOURCE_OBJECT
```

Table 2.30. Request Headers

Name	Description	Valid Values	Required
x-amz-copy-source	The source bucket name + object name.	*BUCKET/OBJECT*	Yes
x-amz-acl	A canned ACL.	**private**, **public-read**, **public-read-write**, **authenticated-read**	No
x-amz-copy-if-modified-since	Copies only if modified since the timestamp.	Timestamp	No
x-amz-copy-if-unmodified-since	Copies only if unmodified since the timestamp.	Timestamp	No
x-amz-copy-if-match	Copies only if object ETag matches ETag.	Entity Tag	No
x-amz-copy-if-none-match	Copies only if object ETag doesn't match.	Entity Tag	No

Table 2.31. Response Entities

Name	Type	Description
CopyObjectResult	Container	A container for the response elements.
LastModified	Date	The last modified date of the source object.
Etag	String	The ETag of the new object.

Additional Resources

- <additional resource 1>
- <additional resource 2>

2.5.10. S3 add an object to a bucket using HTML forms

Adds an object to a bucket using HTML forms. You must have write permissions on the bucket to perform this operation.

Syntax

```
POST /BUCKET/OBJECT HTTP/1.1
```

2.5.11. S3 determine options for a request

A preflight request to determine if an actual request can be sent with the specific origin, HTTP method, and headers.

Syntax

```
OPTIONS /OBJECT HTTP/1.1
```

2.5.12. S3 initiate a multipart upload

Initiates a multi-part upload process. Returns a **UploadId**, which you can specify when adding additional parts, listing parts, and completing or abandoning a multi-part upload.

Syntax

```
POST /BUCKET/OBJECT?uploads
```

Table 2.32. Request Headers

Name	Description	Valid Values	Required
content-md5	A base64 encoded MD-5 hash of the message.	A string. No defaults or constraints.	No
content-type	A standard MIME type.	Any MIME type. Default: **binary/octet-stream**	No
x-amz-meta-<...>	User metadata. Stored with the object.	A string up to 8kb. No defaults.	No
x-amz-acl	A canned ACL.	**private**, **public-read**, **public-read-write**, **authenticated-read**	No

Table 2.33. Response Entities

Name	Type	Description
InitiatedMultipartUploadsResult	Container	A container for the results.
Bucket	String	The bucket that will receive the object contents.
Key	String	The key specified by the **key** request parameter (if any).
UploadId	String	The ID specified by the **upload-id** request parameter identifying the multipart upload (if any).

2.5.13. S3 add a part to a multipart upload

Adds a part to a multi-part upload.

Specify the **uploadId** subresource and the upload ID to add a part to a multi-part upload:

Syntax

```
PUT /BUCKET/OBJECT?partNumber=&uploadId=UPLOAD_ID HTTP/1.1
```

The following HTTP response might be returned:

Table 2.34. HTTP Response

HTTP Status	Status Code	Description
404	NoSuchUpload	Specified upload-id does not match any initiated upload on this object

2.5.14. S3 list the parts of a multipart upload

Specify the **uploadId** subresource and the upload ID to list the parts of a multi-part upload:

Syntax

```
GET /BUCKET/OBJECT?uploadId=UPLOAD_ID HTTP/1.1
```

Table 2.35. Response Entities

Name	Type	Description
InitiatedMultipartUploadsResult	Container	A container for the results.

Name	Type	Description
Bucket	String	The bucket that will receive the object contents.
Key	String	The key specified by the **key** request parameter (if any).
UploadId	String	The ID specified by the **upload-id** request parameter identifying the multipart upload (if any).
Initiator	Container	Contains the **ID** and **DisplayName** of the user who initiated the upload.
ID	String	The initiator's ID.
DisplayName	String	The initiator's display name.
Owner	Container	A container for the **ID** and **DisplayName** of the user who owns the uploaded object.
StorageClass	String	The method used to store the resulting object. **STANDARD** or **REDUCED_REDUNDANCY**
PartNumberMarker	String	The part marker to use in a subsequent request if **IsTruncated** is **true**. Precedes the list.
NextPartNumberMarker	String	The next part marker to use in a subsequent request if **IsTruncated** is **true**. The end of the list.
MaxParts	Integer	The max parts allowed in the response as specified by the **max-parts** request parameter.
IsTruncated	Boolean	If **true**, only a subset of the object's upload contents were returned.
Part	Container	A container for **Key**, **Part**, **InitiatorOwner**, **StorageClass**, and **Initiated** elements.
PartNumber	Integer	The identification number of the part.
ETag	String	The part's entity tag.
Size	Integer	The size of the uploaded part.

2.5.15. S3 assemble the uploaded parts

Assembles uploaded parts and creates a new object, thereby completing a multipart upload.

Specify the **uploadId** subresource and the upload ID to complete a multi-part upload:

Syntax

```
POST /BUCKET/OBJECT?uploadId=UPLOAD_ID HTTP/1.1
```

Table 2.36. Request Entities

Name	Type	Description	Required
CompleteMultipartUpload	Container	A container consisting of one or more parts.	Yes
Part	Container	A container for the **PartNumber** and **ETag**.	Yes
PartNumber	Integer	The identifier of the part.	Yes
ETag	String	The part's entity tag.	Yes

Table 2.37. Response Entities

Name	Type	Description
CompleteMultipartUploadResult	Container	A container for the response.
Location	URI	The resource identifier (path) of the new object.
Bucket	String	The name of the bucket that contains the new object.
Key	String	The object's key.
ETag	String	The entity tag of the new object.

2.5.16. S3 copy a multipart upload

Uploads a part by copying data from an existing object as data source.

Specify the **uploadId** subresource and the upload ID to perform a multi-part upload copy:

Syntax

```
PUT /BUCKET/OBJECT?partNumber=PartNumber&uploadId=UPLOAD_ID HTTP/1.1
Host: cname.domain.com

Authorization: AWS ACCESS_KEY:HASH_OF_HEADER_AND_SECRET
```

Table 2.38. Request Headers

Name	Description	Valid Values	Required
x-amz-copy-source	The source bucket name and object name.	*BUCKET/OBJECT*	Yes
x-amz-copy-source-range	The range of bytes to copy from the source object.	Range: **bytes=first-last**, where the first and last are the zero-based byte offsets to copy. For example, **bytes=0-9** indicates that you want to copy the first ten bytes of the source.	No

Table 2.39. Response Entities

Name	Type	Description
CopyPartResult	Container	A container for all response elements.
ETag	String	Returns the ETag of the new part.
LastModified	String	Returns the date the part was last modified.

.Additional Resources

- For more information about this feature, see the *Amazon S3 site*.

2.5.17. S3 abort a multipart upload

Aborts a multipart upload.

Specify the **uploadId** subresource and the upload ID to abort a multi-part upload:

Syntax

```
DELETE /BUCKET/OBJECT?uploadId=UPLOAD_ID HTTP/1.1
```

2.5.18. S3 Hadoop interoperability

For data analytics applications that require Hadoop Distributed File System (HDFS) access, the Ceph Object Gateway can be accessed using the Apache S3A connector for Hadoop. The S3A connector is an open source tool that presents S3 compatible object storage as an HDFS file system with HDFS file system read and write semantics to the applications while data is stored in the Ceph Object Gateway.

Ceph Object Gateway is fully compatible with the S3A connector that ships with Hadoop 2.7.3.

2.5.19. Additional Resources

- See the *Red Hat Ceph Storage Object Gateway Configuration and Administration Guide* for details on multi-tenancy.

2.6. ADDITIONAL RESOURCES

- See *Appendix A* for Amazon S3 common request headers.
- See *Appendix B* for Amazon S3 common response status codes.
- See *Appendix C* for unsupported header fields.

CHAPTER 3. CEPH OBJECT GATEWAY AND THE SWIFT API

As a developer, you can use a RESTful application programing interface (API) that is compatible with the Swift API data access model. You can manage the buckets and objects stored in Red Hat Ceph Storage cluster through the Ceph Object Gateway.

The following table describes the support status for current Swift functional features:

Table 3.1. Features

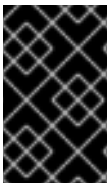
Feature	Status	Remarks
Authentication	Supported	
Get Account Metadata	Supported	No custom metadata
Swift ACLs	Supported	Supports a subset of Swift ACLs
List Containers	Supported	
List Container's Objects	Supported	
Create Container	Supported	
Delete Container	Supported	
Get Container Metadata	Supported	
Add/Update Container Metadata	Supported	
Delete Container Metadata	Supported	
Get Object	Supported	
Create/Update an Object	Supported	
Create Large Object	Supported	
Delete Object	Supported	
Copy Object	Supported	
Get Object Metadata	Supported	
Add/Update Object Metadata	Supported	
Temp URL Operations	Supported	

Feature	Status	Remarks
CORS	Not Supported	
Expiring Objects	Supported	
Object Versioning	Not Supported	
Static Website	Not Supported	

3.1. PREREQUISITES

- A running Red Hat Ceph Storage cluster.
- A RESTful client.

3.2. SWIFT API LIMITATIONS



IMPORTANT

The following limitations should be used with caution. There are implications related to your hardware selections, so you should always discuss these requirements with your Red Hat account team.

- **Maximum object size when using Swift API:** 5GB
- **Maximum metadata size when using Swift API:** There is no defined limit on the total size of user metadata that can be applied to an object, but a single HTTP request is limited to 16,000 bytes.

3.3. CREATE A SWIFT USER

To test the Swift interface, create a Swift subuser. Creating a Swift user is a two step process. The first step is to create the user. The second step is to create the secret key.

NOTE

In a multi-site deployment, always create a user on a host in the master zone of the master zone group.

Prerequisites

- Installation of the Ceph Object Gateway.
- Root-level access to the Ceph Object Gateway node.

Procedure

1. Create the Swift user:

Syntax

```
radosgw-admin subuser create --uid=NAME --subuser=NAME:swift --access=full
```

Replace ***NAME*** with the Swift user name, for example:

Example

```
[root@rgw]# radosgw-admin subuser create --uid=testuser --subuser=testuser:swift --
access=full
{
    "user_id": "testuser",
    "display_name": "First User",
    "email": "",
    "suspended": 0,
    "max_buckets": 1000,
    "auid": 0,
    "subusers": [
        {
            "id": "testuser:swift",
            "permissions": "full-control"
        }
    ],
    "keys": [
        {
            "user": "testuser",
            "access_key": "O8JDE41XMI74O185EHKD",
            "secret_key": "i4Au2yxG5wtr1JK01mI8kjJPM93HNAoVWOSTdJd6"
        }
    ],
    "swift_keys": [
        {
            "user": "testuser:swift",
            "secret_key": "13TLtdEW7bCqgttQgPzxFxziu0AgabtOc6vM8DLA"
        }
    ],
    "caps": [],
    "op_mask": "read, write, delete",
    "default_placement": "",
    "placement_tags": [],
    "bucket_quota": {
        "enabled": false,
        "check_on_raw": false,
        "max_size": -1,
        "max_size_kb": 0,
        "max_objects": -1
    },
    "user_quota": {
        "enabled": false,
        "check_on_raw": false,
        "max_size": -1,
        "max_size_kb": 0,
        "max_objects": -1
    },
```

```
    "temp_url_keys": [],
    "type": "rgw"
}
```

2. Create the secret key:

Syntax

```
radosgw-admin key create --subuser=NAME:swift --key-type=swift --gen-secret
```

Replace ***NAME*** with the Swift user name, for example:

Example

```
[root@rgw]# radosgw-admin key create --subuser=testuser:swift --key-type=swift --gen-
secret
{
    "user_id": "testuser",
    "display_name": "First User",
    "email": "",
    "suspended": 0,
    "max_buckets": 1000,
    "auid": 0,
    "subusers": [
        {
            "id": "testuser:swift",
            "permissions": "full-control"
        }
    ],
    "keys": [
        {
            "user": "testuser",
            "access_key": "O8JDE41XMI74O185EHKD",
            "secret_key": "i4Au2yxG5wtr1JK01mI8kjJPM93HNAoVWOSTdJd6"
        }
    ],
    "swift_keys": [
        {
            "user": "testuser:swift",
            "secret_key": "a4ioT4jEP653CDcdU8p4OuhruwABBRZmyNUbnSSt"
        }
    ],
    "caps": [],
    "op_mask": "read, write, delete",
    "default_placement": "",
    "placement_tags": [],
    "bucket_quota": {
        "enabled": false,
        "check_on_raw": false,
        "max_size": -1,
        "max_size_kb": 0,
        "max_objects": -1
    },
    "user_quota": {
        "enabled": false,
```

```
        "check_on_raw": false,
        "max_size": -1,
        "max_size_kb": 0,
        "max_objects": -1
    },
    "temp_url_keys": [],
    "type": "rgw"
}
```

3.4. SWIFT AUTHENTICATING A USER

To authenticate a user, make a request containing an **X-Auth-User** and a **X-Auth-Key** in the header.

Syntax

```
GET /auth HTTP/1.1
Host: swift.example.com
X-Auth-User: johndoe
X-Auth-Key: R7UUOLFDI2ZI9PRCQ53K
```

Example Response

```
HTTP/1.1 204 No Content
Date: Mon, 16 Jul 2012 11:05:33 GMT
Server: swift
X-Storage-Url: https://swift.example.com
X-Storage-Token: UOlCCC8TahFKlWuv9DB09TWHF0nDjpPElha0kAa
Content-Length: 0
Content-Type: text/plain; charset=UTF-8
```

NOTE

You can retrieve data about Ceph's Swift-compatible service by executing **GET** requests using the **X-Storage-Url** value during authentication.

Additional Resources

- See the *Red Hat Ceph Storage Developer Guide* for Swift request headers.
- See the *Red Hat Ceph Storage Developer Guide* for Swift response headers.

3.5. SWIFT CONTAINER OPERATIONS

As a developer, you can perform container operations with the Swift application programing interface (API) through the Ceph Object Gateway. You can list, create, update, and delete containers. You can also add or update the container's metadata.

3.5.1. Prerequisites

- A running Red Hat Ceph Storage cluster.
- A RESTful client.

3.5.2. Swift container operations

A container is a mechanism for storing data objects. An account can have many containers, but container names must be unique. This API enables a client to create a container, set access controls and metadata, retrieve a container's contents, and delete a container. Since this API makes requests related to information in a particular user's account, all requests in this API must be authenticated unless a container's access control is deliberately made publicly accessible, that is, allows anonymous requests.

NOTE

The Amazon S3 API uses the term 'bucket' to describe a data container. When you hear someone refer to a 'bucket' within the Swift API, the term 'bucket' might be construed as the equivalent of the term 'container.'

One facet of object storage is that it does not support hierarchical paths or directories. Instead, it supports one level consisting of one or more containers, where each container might have objects. The RADOS Gateway's Swift-compatible API supports the notion of 'pseudo-hierarchical containers', which is a means of using object naming to emulate a container, or directory hierarchy without actually implementing one in the storage system. You can name objects with pseudo-hierarchical names, for example, photos/buildings/empire-state.jpg, but container names cannot contain a forward slash (/) character.

IMPORTANT

When uploading large objects to versioned Swift containers, use the **--leave-segments** option with the **python-swiftclient** utility. Not using **--leave-segments** overwrites the manifest file. Consequently, an existing object is overwritten, which leads to data loss.

3.5.3. Swift update a container's Access Control List (ACL)

When a user creates a container, the user has read and write access to the container by default. To allow other users to read a container's contents or write to a container, you must specifically enable the user. You can also specify ***** in the **X-Container-Read** or **X-Container-Write** settings, which effectively enables all users to either read from or write to the container. Setting ***** makes the container public. That is it enables anonymous users to either read from or write to the container.

Syntax

```
POST /AP_VERSION/ACCOUNT/TENANT:CONTAINER HTTP/1.1
Host: FULLY_QUALIFIED_DOMAIN_NAME
X-Auth-Token: AUTH_TOKEN
X-Container-Read: *
X-Container-Write: UID1, UID2, UID3
```

Table 3.2. Request Headers

Name	Description	Type	Required
X-Container-Read	The user IDs with read permissions for the container.	Comma-separated string values of user IDs.	No

Name	Description	Type	Required
X-Container-Write	The user IDs with write permissions for the container.	Comma-separated string values of user IDs.	No

3.5.4. Swift list containers

A **GET** request that specifies the API version and the account will return a list of containers for a particular user account. Since the request returns a particular user's containers, the request requires an authentication token. The request cannot be made anonymously.

Syntax

```
GET /API_VERSION/ACCOUNT HTTP/1.1
Host: FULLY_QUALIFIED_DOMAIN_NAME
X-Auth-Token: AUTH_TOKEN
```

Table 3.3. Request Parameters

Name	Description	Type	Required	Valid Values
limit	Limits the number of results to the specified value.	Integer	No	N/A
format	Defines the format of the result.	String	No	**json** or **xml**
marker	Returns a list of results greater than the marker value.	String	No	N/A

The response contains a list of containers, or returns with an HTTP 204 response code

Table 3.4. Response Entities

Name	Description	Type
account	A list for account information.	Container
container	The list of containers.	Container
name	The name of a container.	String

Name	Description	Type
bytes	The size of the container.	Integer

3.5.5. Swift list a container's objects

To list the objects within a container, make a **GET** request with the with the API version, account, and the name of the container. You can specify query parameters to filter the full list, or leave out the parameters to return a list of the first 10,000 object names stored in the container.

Syntax

```
GET /AP_VERSION/TENANT:CONTAINER HTTP/1.1
Host: FULLY_QUALIFIED_DOMAIN_NAME
X-Auth-Token: AUTH_TOKEN
```

Table 3.5. Parameters

Name	Description	Type	Valid Values	Required
format	Defines the format of the result.	String	**json** or **xml**	No
prefix	Limits the result set to objects beginning with the specified prefix.	String	N/A	No
marker	Returns a list of results greater than the marker value.	String	N/A	No
limit	Limits the number of results to the specified value.	Integer	0 - 10,000	No
delimiter	The delimiter between the prefix and the rest of the object name.	String	N/A	No
path	The pseudo-hierarchical path of the objects.	String	N/A	No

Table 3.6. Response Entities

Name	Description	Type
container	The container.	Container
object	An object within the container.	Container

Name	Description	Type
name	The name of an object within the container.	String
hash	A hash code of the object's contents.	String
last_modified	The last time the object's contents were modified.	Date
content_type	The type of content within the object.	String

3.5.6. Swift create a container

To create a new container, make a **PUT** request with the API version, account, and the name of the new container. The container name must be unique, must not contain a forward-slash (/) character, and should be less than 256 bytes. You can include access control headers and metadata headers in the request. You can also include a storage policy identifying a key for a set of placement pools. For example, execute **radosgw-admin zone get** to see a list of available keys under **placement_pools**. A storage policy enables you to specify a special set of pools for the container, for example, SSD-based storage. The operation is idempotent. If you make a request to create a container that already exists, it will return with a HTTP 202 return code, but will not create another container.

Syntax

```
PUT /AP_VERSION/ACCOUNT/TENANT:CONTAINER HTTP/1.1
Host: FULLY_QUALIFIED_DOMAIN_NAME
X-Auth-Token: AUTH_TOKEN
X-Container-Read: COMMA_SEPARATED_UIDS
X-Container-Write: COMMA_SEPARATED_UIDS
X-Container-Meta-KEY:VALUE
X-Storage-Policy: PLACEMENT_POOLS_KEY
```

Table 3.7. Headers

Name	Description	Type	Required
X-Container-Read	The user IDs with read permissions for the container.	Comma-separated string values of user IDs.	No

Name	Description	Type	Required
X-Container-Write	The user IDs with write permissions for the container.	Comma-separated string values of user IDs.	No
X-Container-Meta-*KEY*	A user-defined meta data key that takes an arbitrary string value.	String	No
X-Storage-Policy	The key that identifies the storage policy under **placement_pools** for the Ceph Object Gateway. Execute **radosgw-admin zone get** for available keys.	String	No

If a container with the same name already exists, and the user is the container owner then the operation will succeed. Otherwise the operation will fail.

Table 3.8. HTTP Response

Name	Description	Status Code
409	The container already exists under a different user's ownership.	**BucketAlreadyExists**

3.5.7. Swift delete a container

To delete a container, make a **DELETE** request with the API version, account, and the name of the container. The container must be empty. If you'd like to check if the container is empty, execute a **HEAD** request against the container. Once you've successfully removed the container, you'll be able to reuse the container name.

Syntax

```
DELETE /AP_VERSION/ACCOUNT/TENANT:CONTAINER HTTP/1.1
Host: FULLY_QUALIFIED_DOMAIN_NAME
X-Auth-Token: AUTH_TOKEN
```

Table 3.9. HTTP Response

Name	Description	Status Code
204	The container was removed.	**NoContent**

3.5.8. Swift add or update the container metadata

To add metadata to a container, make a **POST** request with the API version, account, and container name. You must have write permissions on the container to add or update metadata.

Syntax

```
POST /AP_VERSION/ACCOUNT/TENANT:CONTAINER HTTP/1.1
Host: FULLY_QUALIFIED_DOMAIN_NAME
X-Auth-Token: AUTH_TOKEN
X-Container-Meta-Color: red
X-Container-Meta-Taste: salty
```

Table 3.10. Request Headers

Name	Description	Type	Required
X-Container-Meta-*KEY*	A user-defined meta data key that takes an arbitrary string value.	String	No

3.6. SWIFT OBJECT OPERATIONS

As a developer, you can perform object operations with the Swift application programing interface (API) through the Ceph Object Gateway. You can list, create, update, and delete objects. You can also add or update the object's metadata.

3.6.1. Prerequisites

- A running Red Hat Ceph Storage cluster.
- A RESTful client.

3.6.2. Swift object operations

An object is a container for storing data and metadata. A container might have many objects, but the object names must be unique. This API enables a client to create an object, set access controls and metadata, retrieve an object's data and metadata, and delete an object. Since this API makes requests related to information in a particular user's account, all requests in this API must be authenticated. Unless the container or object's access control is deliberately made publicly accessible, that is, allows anonymous requests.

3.6.3. Swift get an object

To retrieve an object, make a **GET** request with the API version, account, container and object name. You must have read permissions on the container to retrieve an object within it.

Syntax

```
GET /AP_VERSION/ACCOUNT/TENANT:CONTAINER/OBJECT HTTP/1.1
Host: FULLY_QUALIFIED_DOMAIN_NAME
X-Auth-Token: AUTH_TOKEN
```

Table 3.11. Request Headers

Name	Description	Type	Required
range	To retrieve a subset of an object's contents, you can specify a byte range.	Date	No
If-Modified-Since	Only copies if modified since the date/time of the source object's **last_modified** attribute.	Date	No
If-Unmodified-Since	Only copies if not modified since the date/time of the source object's **last_modified** attribute.	Date	No
Copy-If-Match	Copies only if the ETag in the request matches the source object's ETag.	ETag.	No
Copy-If-None-Match	Copies only if the ETag in the request does not match the source object's ETag.	ETag.	No

Table 3.12. Response Headers

Name	Description
Content-Range	The range of the subset of object contents. Returned only if the range header field was specified in the request.

3.6.4. Swift create or update an object

To create a new object, make a **PUT** request with the API version, account, container name and the name of the new object. You must have write permission on the container to create or update an object. The object name must be unique within the container. The **PUT** request is not idempotent, so if you do not use a unique name, the request will update the object. However, you can use pseudo-hierarchical syntax in the object name to distinguish it from another object of the same name if it is under a different pseudo-hierarchical directory. You can include access control headers and metadata headers in the request.

Syntax

```
PUT /AP_VERSION/ACCOUNT/TENANT:CONTAINER HTTP/1.1
Host: FULLY_QUALIFIED_DOMAIN_NAME
X-Auth-Token: AUTH_TOKEN
```

Table 3.13. Request Headers

Name	Description	Type	Required	Valid Values
ETag	An MD5 hash of the object's contents. Recommended.	String	No	N/A
Content-Type	The type of content the object contains.	String	No	N/A
Transfer-Encoding	Indicates whether the object is part of a larger aggregate object.	String	No	**chunked**

3.6.5. Swift delete an object

To delete an object, make a **DELETE** request with the API version, account, container and object name. You must have write permissions on the container to delete an object within it. Once you've successfully deleted the object, you will be able to reuse the object name.

Syntax

```
DELETE /API_VERSION/ACCOUNT/TENANT:CONTAINER/OBJECT HTTP/1.1
Host: FULLY_QUALIFIED_DOMAIN_NAME
X-Auth-Token: AUTH_TOKEN
```

3.6.6. Swift copy an object

Copying an object allows you to make a server-side copy of an object, so that you do not have to download it and upload it under another container. To copy the contents of one object to another object, you can make either a **PUT** request or a **COPY** request with the API version, account, and the container name.

For a **PUT** request, use the destination container and object name in the request, and the source container and object in the request header.

For a **Copy** request, use the source container and object in the request, and the destination container and object in the request header. You must have write permission on the container to copy an object. The destination object name must be unique within the container. The request is not idempotent, so if you do not use a unique name, the request will update the destination object. You can use pseudo-hierarchical syntax in the object name to distinguish the destination object from the source object of the same name if it is under a different pseudo-hierarchical directory. You can include access control headers and metadata headers in the request.

Syntax

```
PUT /AP_VERSION/ACCOUNT/TENANT:CONTAINER HTTP/1.1
X-Copy-From: TENANT:SOURCE_CONTAINER/SOURCE_OBJECT
Host: FULLY_QUALIFIED_DOMAIN_NAME
X-Auth-Token: AUTH_TOKEN
```

or alternatively:

Syntax

```
COPY /AP_VERSION/ACCOUNT/TENANT:SOURCE_CONTAINER/SOURCE_OBJECT HTTP/1.1
Destination: TENANT:DEST_CONTAINER/DEST_OBJECT
```

Table 3.14. Request Headers

Name	Description	Type	Required
X-Copy-From	Used with a **PUT** request to define the source container/object path.	String	Yes, if using **PUT**
Destination	Used with a **COPY** request to define the destination container/object path.	String	Yes, if using **COPY**
If-Modified-Since	Only copies if modified since the date/time of the source object's **last_modified** attribute.	Date	No
If-Unmodified-Since	Only copies if not modified since the date/time of the source object's **last_modified** attribute.	Date	No
Copy-If-Match	Copies only if the ETag in the request matches the source object's ETag.	ETag.	No
Copy-If-None-Match	Copies only if the ETag in the request does not match the source object's ETag.	ETag.	No

3.6.7. Swift get object metadata

To retrieve an object's metadata, make a **HEAD** request with the API version, account, container and object name. You must have read permissions on the container to retrieve metadata from an object within the container. This request returns the same header information as the request for the object itself, but it does not return the object's data.

Syntax

```
HEAD /AP_VERSION/ACCOUNT/TENANT:CONTAINER/OBJECT HTTP/1.1
Host: FULLY_QUALIFIED_DOMAIN_NAME
X-Auth-Token: AUTH_TOKEN
```

3.6.8. Swift add or update object metadata

To add metadata to an object, make a **POST** request with the API version, account, container and object name. You must have write permissions on the parent container to add or update metadata.

Syntax

```
POST /AP_VERSION/ACCOUNT/TENANT:CONTAINER/OBJECT HTTP/1.1
Host: FULLY_QUALIFIED_DOMAIN_NAME
X-Auth-Token: AUTH_TOKEN
```

Table 3.15. Request Headers

Name	Description	Type	Required
X-Object-Meta-*KEY*	A user-defined meta data key that takes an arbitrary string value.	String	No

3.7. SWIFT TEMPORARY URL OPERATIONS

To allow temporary access, temp url functionality is supported by swift endpoint of **radosgw**. For example GET requests, to objects without the need to share credentials.

For this functionality, initially the value of **X-Account-Meta-Temp-URL-Key** and optionally **X-Account-Meta-Temp-URL-Key-2** should be set. The Temp URL functionality relies on a HMAC-SHA1 signature against these secret keys.

3.7.1. Swift get temporary URL objects

Temporary URL uses a cryptographic HMAC-SHA1 signature, which includes the following elements:

- The value of the Request method, "GET" for instance
- The expiry time, in format of seconds since the epoch, that is, Unix time
- The request path starting from "v1" onwards

The above items are normalized with newlines appended between them, and a HMAC is generated using the SHA-1 hashing algorithm against one of the Temp URL Keys posted earlier.

A sample python script to demonstrate the above is given below:

Example

```
import hmac
from hashlib import sha1
from time import time

method = 'GET'
host = 'https://objectstore.example.com'
duration_in_seconds = 300  # Duration for which the url is valid
expires = int(time() + duration_in_seconds)
path = '/v1/your-bucket/your-object'
key = 'secret'
hmac_body = '%s\n%s\n%s' % (method, expires, path)
hmac_body = hmac.new(key, hmac_body, sha1).hexdigest()
sig = hmac.new(key, hmac_body, sha1).hexdigest()
rest_uri = "{host}{path}?temp_url_sig={sig}&temp_url_expires={expires}".format(
    host=host, path=path, sig=sig, expires=expires)
print rest_uri
```

Example Output

```
https://objectstore.example.com/v1/your-bucket/your-object?
temp_url_sig=ff4657876227fc6025f04fcf1e82818266d022c6&temp_url_expires=1423200992
```

3.7.2. Swift POST temporary URL keys

A **POST** request to the swift account with the required Key will set the secret temp URL key for the account against which temporary URL access can be provided to accounts. Up to two keys are supported, and signatures are checked against both the keys, if present, so that keys can be rotated without invalidating the temporary URLs.

Syntax

```
POST /API_VERSION/ACCOUNT HTTP/1.1
Host: FULLY_QUALIFIED_DOMAIN_NAME
X-Auth-Token: AUTH_TOKEN
```

Table 3.16. Request Headers

Name	Description	Type	Required
X-Account-Meta-Temp-URL-Key	A user-defined key that takes an arbitrary string value.	String	Yes
X-Account-Meta-Temp-URL-Key-2	A user-defined key that takes an arbitrary string value.	String	No

3.8. SWIFT MULTI-TENANCY CONTAINER OPERATIONS

When a client application accesses containers, it always operates with credentials of a particular user. In Red Hat Ceph Storage cluster, every user belongs to a tenant. Consequently, every container operation has an implicit tenant in its context if no tenant is specified explicitly. Thus multi tenancy is completely backward compatible with previous releases, as long as the referred containers and referring user belong to the same tenant.

Extensions employed to specify an explicit tenant differ according to the protocol and authentication system used.

A colon character separates tenant and container, thus a sample URL would be:

Example

```
https://rgw.domain.com/tenant:container
```

By contrast, in a **create_container()** method, simply separate the tenant and container in the container method itself:

Example

```
create_container("tenant:container")
```

3.9. ADDITIONAL RESOURCES

- See the *Red Hat Ceph Storage Object Gateway Configuration and Administration Guide* for details on multi-tenancy.
- See *Appendix D* for Swift request headers.
- See *Appendix E* for Swift response headers.

APPENDIX A. S3 COMMON REQUEST HEADERS

The following table lists the valid common request headers and their descriptions.

Table A.1. Request Headers

Request Header	Description
CONTENT_LENGTH	Length of the request body.
DATE	Request time and date (in UTC).
HOST	The name of the host server.
AUTHORIZATION	Authorization token.

APPENDIX B. S3 COMMON RESPONSE STATUS CODES

The following table lists the valid common HTTP response status and its corresponding code.

Table B.1. Response Status

HTTP Status	Response Code
100	Continue
200	Success
201	Created
202	Accepted
204	NoContent
206	Partial content
304	NotModified
400	InvalidArgument
400	InvalidDigest
400	BadDigest
400	InvalidBucketName
400	InvalidObjectName
400	UnresolvableGrantByEmailAddress
400	InvalidPart
400	InvalidPartOrder
400	RequestTimeout
400	EntityTooLarge
403	AccessDenied
403	UserSuspended
403	RequestTimeTooSkewed

HTTP Status	Response Code
404	NoSuchKey
404	NoSuchBucket
404	NoSuchUpload
405	MethodNotAllowed
408	RequestTimeout
409	BucketAlreadyExists
409	BucketNotEmpty
411	MissingContentLength
412	PreconditionFailed
416	InvalidRange
422	UnprocessableEntity
500	InternalError

APPENDIX C. S3 UNSUPPORTED HEADER FIELDS

Table C.1. Unsupported Header Fields

Name	Type
x-amz-security-token	Request
Server	Response
x-amz-delete-marker	Response
x-amz-id-2	Response
x-amz-request-id	Response
x-amz-version-id	Response

APPENDIX D. SWIFT REQUEST HEADERS

Table D.1. Request Headers

Name	Description	Type	Required
X-Auth-User	The key Ceph Object Gateway username to authenticate.	String	Yes
X-Auth-Key	The key associated to a Ceph Object Gateway username.	String	Yes

APPENDIX E. SWIFT RESPONSE HEADERS

The response from the server should include an **X-Auth-Token** value. The response might also contain a **X-Storage-Url** that provides the ***API_VERSION/ACCOUNT*** prefix that is specified in other requests throughout the API documentation.

Table E.1. Response Headers

Name	Description	Type
X-Storage-Token	The authorization token for the **X-Auth-User** specified in the request.	String
X-Storage-Url	The URL and ***API_VERSION/ACCOUNT*** path for the user.	String

APPENDIX F. EXAMPLES USING THE SECURE TOKEN SERVICE APIS

These examples are using Python's **boto3** module to interface with the Ceph Object Gateway's implementation of the Secure Token Service (STS). In these examples, **TESTER2** assumes a role created by **TESTER1**, as to access S3 resources owned by **TESTER1** based on the permission policy attached to the role.

The *AssumeRole* example creates a role, assigns a policy to the role, then assumes a role to get temporary credentials and access to S3 resources using those temporary credentials.

The *AssumeRoleWithWebIdentity* example authenticates users using an external application with Keycloak, an OpenID Connect identity provider, assumes a role to get temporary credentials and access S3 resources according to the permission policy of the role.

AssumeRole Example

```
import boto3

iam_client = boto3.client('iam',
aws_access_key_id=ACCESS_KEY_OF_TESTER1,
aws_secret_access_key=SECRET_KEY_OF_TESTER1,
endpoint_url=<IAM URL>,
region_name=''
)

policy_document = "{\"Version\":\"2012-10-17\",\"Statement\":[{\"Effect\":\"Allow\",\"Principal\":
{\"AWS\":[\"arn:aws:iam:::user/TESTER1\"]},\"Action\":[\"sts:AssumeRole\"]}]}"

role_response = iam_client.create_role(
AssumeRolePolicyDocument=policy_document,
Path='/',
RoleName='S3Access',
)

role_policy = "{\"Version\":\"2012-10-17\",\"Statement\":
{\"Effect\":\"Allow\",\"Action\":\"s3:*\",\"Resource\":\"arn:aws:s3:::*\"}}"

response = iam_client.put_role_policy(
RoleName='S3Access',
PolicyName='Policy1',
PolicyDocument=role_policy
)

sts_client = boto3.client('sts',
aws_access_key_id=ACCESS_KEY_OF_TESTER2,
aws_secret_access_key=SECRET_KEY_OF_TESTER2,
endpoint_url=<STS URL>,
region_name='',
)

response = sts_client.assume_role(
RoleArn=role_response['Role']['Arn'],
RoleSessionName='Bob',
DurationSeconds=3600
```

```
)

s3client = boto3.client('s3',
aws_access_key_id = response['Credentials']['AccessKeyId'],
aws_secret_access_key = response['Credentials']['SecretAccessKey'],
aws_session_token = response['Credentials']['SessionToken'],
endpoint_url=<S3 URL>,
region_name='',)

bucket_name = 'my-bucket'
s3bucket = s3client.create_bucket(Bucket=bucket_name)
resp = s3client.list_buckets()
```

AssumeRoleWithWebIdentity Example

```
import boto3

iam_client = boto3.client('iam',
aws_access_key_id=ACCESS_KEY_OF_TESTER1,
aws_secret_access_key=SECRET_KEY_OF_TESTER1,
endpoint_url=<IAM URL>,
region_name=''
)

policy_document = "{\"Version\":\"2012-10-17\",\"Statement\":\[\{\"Effect\":\"Allow\",\"Principal\":\
{\"Federated\":\[\"arn:aws:iam:::oidc-provider/localhost:8080/auth/realms/demo\"\]\},\"Action\":\
[\"sts:AssumeRoleWithWebIdentity\"\],\"Condition\":\{\"StringEquals\":\
{\"localhost:8080/auth/realms/demo:app_id\":\"customer-portal\"\}\}\}\]\}"
role_response = iam_client.create_role(
AssumeRolePolicyDocument=policy_document,
Path='/',
RoleName='S3Access',
)

role_policy = "{\"Version\":\"2012-10-17\",\"Statement\":
{\"Effect\":\"Allow\",\"Action\":\"s3:*\",\"Resource\":\"arn:aws:s3:::*\"}}"

response = iam_client.put_role_policy(
    RoleName='S3Access',
    PolicyName='Policy1',
    PolicyDocument=role_policy
)

sts_client = boto3.client('sts',
aws_access_key_id=ACCESS_KEY_OF_TESTER2,
aws_secret_access_key=SECRET_KEY_OF_TESTER2,
endpoint_url=<STS URL>,
region_name='',
)

response = client.assume_role_with_web_identity(
RoleArn=role_response['Role']['Arn'],
RoleSessionName='Bob',
DurationSeconds=3600,
WebIdentityToken=<Web Token>
)
```

```
s3client = boto3.client('s3',
aws_access_key_id = response['Credentials']['AccessKeyId'],
aws_secret_access_key = response['Credentials']['SecretAccessKey'],
aws_session_token = response['Credentials']['SessionToken'],
endpoint_url=<S3 URL>,
region_name='',)

bucket_name = 'my-bucket'
s3bucket = s3client.create_bucket(Bucket=bucket_name)
resp = s3client.list_buckets()
```

Additional Resources

- See the *Test S3 Access* section of the *Red Hat Ceph Storage Object Gateway Configuration and Administration Guide* for more details on using Python's **boto** module.

APPENDIX G. EXAMPLES USING SESSION TAGS FOR ATTRIBUTE-BASED ACCESS CONTROL IN STS

The following list contains examples of the usage of session tags for Attribute-based access control (ABAC) in STS.

Example of session tags that are passed in by Keycloak in the web token

```
{
   "jti": "947960a3-7e91-4027-99f6-da719b0d4059",
   "exp": 1627438044,
   "nbf": 0,
   "iat": 1627402044,
   "iss": "http://localhost:8080/auth/realms/quickstart",
   "aud": "app-profile-jsp",
   "sub": "test",
   "typ": "ID",
   "azp": "app-profile-jsp",
   "auth_time": 0,
   "session_state": "3a46e3e7-d198-4a64-8b51-69682bcfc670",
   "preferred_username": "test",
   "email_verified": false,
   "acr": "1",
   "https://aws.amazon.com/tags": [
      {
         "principal_tags": {
            "Department": [
               "Engineering",
               "Marketing"
            ]
         }
      }
   ],
   "client_id": "app-profile-jsp",
   "username": "test",
   "active": true
}
```

Example of **aws:RequestTag**

```
{
      "Version":"2012-10-17",
      "Statement":[
      {
         "Effect":"Allow",
         "Action":["sts:AssumeRoleWithWebIdentity","sts:TagSession"],
         "Principal":{"Federated":["arn:aws:iam:::oidc-provider/localhost:8080/auth/realms/quickstart"]},
         "Condition":{"StringEquals":{"aws:RequestTag/Department":"Engineering"}}
      }]
   }
```

Example of **aws:PrincipalTag**

```
{
      "Version":"2012-10-17",
      "Statement":[
      {
         "Effect":"Allow",
         "Action":["s3:*"],
      "Resource":["arn:aws:s3::t1tenant:my-test-bucket","arn:aws:s3::t1tenant:my-test-bucket/*"],"+
         "Condition":{"StringEquals":{"aws:PrincipalTag/Department":"Engineering"}}
      }]
   }
```

Example of aws:ResourceTag

```
{
      "Version":"2012-10-17",
      "Statement":[
      {
         "Effect":"Allow",
         "Action":["sts:AssumeRoleWithWebIdentity","sts:TagSession"],
         "Principal":{"Federated":["arn:aws:iam:::oidc-provider/localhost:8080/auth/realms/quickstart"]},
         "Condition":{"StringEquals":{"iam:ResourceTag/Department":"Engineering"}}(1)
      }]
   }
```

(1) (1) (1) For the above to work, you need to attach the 'Department=Engineering' tag to the role.

Example of aws:TagKeys

```
{
      "Version":"2012-10-17",
      "Statement":[
      {
         "Effect":"Allow",
         "Action":["sts:AssumeRoleWithWebIdentity","sts:TagSession"],
         "Principal":{"Federated":["arn:aws:iam:::oidc-provider/localhost:8080/auth/realms/quickstart"]},
         "Condition":{"ForAllValues:StringEquals":{"aws:TagKeys":["Marketing,Engineering"]}}(1)
      }]
   }
```

(1) **ForAllValues:StringEquals** tests whether every tag key in the request is a subset of the tag keys in the policy. Therefore, the condition restricts the tag keys passed in the request.

Example of s3:ResourceTag

```
{
   "Version":"2012-10-17",
   "Statement":[
   {
      "Effect":"Allow",
      "Action":["s3:PutBucketTagging"],
      "Resource":["arn:aws:s3::t1tenant:my-test-bucket\","arn:aws:s3::t1tenant:my-test-bucket/*"]
   },
```

```
    {
        "Effect":"Allow",
        "Action":["s3:*"],
        "Resource":["*"],
        "Condition":{"StringEquals":{"s3:ResourceTag/Department":\"Engineering"}}(1)
    }
}
```

(1) For the above to work, you need to attach the 'Department=Engineering' tag to the bucket or object on which you want this policy to be applied.

Example of aws:RequestTag with iam:ResourceTag

```
{
        "Version":"2012-10-17",
        "Statement":[
        {
            "Effect":"Allow",
            "Action":["sts:AssumeRoleWithWebIdentity","sts:TagSession"],
            "Principal":{"Federated":["arn:aws:iam:::oidc-provider/localhost:8080/auth/realms/quickstart"]},
            "Condition":{"StringEquals":
{"aws:RequestTag/Department":"${iam:ResourceTag/Department}"}}(1)
        }]
    }
```

(1) This is to assume a role by matching the tags in the incoming request with the tag attached to the role. **aws:RequestTag** is the incoming tag in the JSON Web Token (JWT) and **iam:ResourceTag** is the tag attached to the role being assumed.

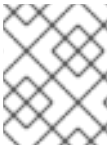
Example of aws:PrincipalTag with s3:ResourceTag

```
{
   "Version":"2012-10-17",
   "Statement":[
   {
       "Effect":"Allow",
       "Action":["s3:PutBucketTagging"],
       "Resource":["arn:aws:s3::t1tenant:my-test-bucket\","arn:aws:s3::t1tenant:my-test-bucket/*"]
   },
   {
       "Effect":"Allow",
       "Action":["s3:*"],
       "Resource":["*"],
       "Condition":{"StringEquals":{"s3:ResourceTag/Department":"${aws:PrincipalTag/Department}"}}
(1)
   }
}
```

(1) This is to evaluate a role permission policy by matching principal tags with S3 resource tags. **aws:PrincipalTag** is the tag passed in along with the temporary credentials and **s3:ResourceTag** is the tag attached to the S3 resource, that is object or bucket.

APPENDIX H. SAMPLE CODE DEMONSTRATING USAGE OF SESSION TAGS

The following is a sample code for tagging a role, bucket, or an object and using tag keys in a role trust and role permission policy.



NOTE

The example assumes that a tag **Department=Engineering** is passed in the JSON Web Token (JWT) access token by Keycloak.

```
# -*- coding: utf-8 -*-

import boto3
import json
from nose.tools import eq_ as eq

access_key = 'TESTER'
secret_key = 'test123'
endpoint = 'http://s3.us-east.localhost:8000'

s3client = boto3.client('s3',
aws_access_key_id = access_key,
aws_secret_access_key = secret_key,
endpoint_url = endpoint,
region_name='',)

s3res = boto3.resource('s3',
        aws_access_key_id = access_key,
        aws_secret_access_key = secret_key,
        endpoint_url = endpoint,
        region_name='',)

iam_client = boto3.client('iam',
aws_access_key_id=access_key,
aws_secret_access_key=secret_key,
endpoint_url=endpoint,
region_name=''
)

bucket_name = 'test-bucket'
s3bucket = s3client.create_bucket(Bucket=bucket_name)

bucket_tagging = s3res.BucketTagging(bucket_name)
Set_Tag = bucket_tagging.put(Tagging={'TagSet':[{'Key':'Department', 'Value': 'Engineering'}]})
try:
    response = iam_client.create_open_id_connect_provider(
        Url='http://localhost:8080/auth/realms/quickstart',
        ClientIDList=[
            'app-profile-jsp',
            'app-jee-jsp'
        ],
        ThumbprintList=[
            'F7D7B3515DD0D319DD219A43A9EA727AD6065287'
```

```
    ]
    )
except ClientError as e:
    print ("Provider already exists")

policy_document = "{\"Version\":\"2012-10-17\",\"Statement\":[{\"Effect\":\"Allow\",\"Principal\":
{\"Federated\":[\"arn:aws:iam:::oidc-provider/localhost:8080/auth/realms/quickstart\"]},\"Action\":
[\"sts:AssumeRoleWithWebIdentity\",\"sts:TagSession\"],\"Condition\":{\"StringEquals\":
{\"aws:RequestTag/Department\":\"${iam:ResourceTag/Department}\"}}}]}"
role_response = ""

print ("\n Getting Role \n")

try:
    role_response = iam_client.get_role(
        RoleName='S3Access'
    )
    print (role_response)
except ClientError as e:
    if e.response['Code'] == 'NoSuchEntity':
        print ("\n Creating Role \n")
        tags_list = [
            {'Key':'Department','Value':'Engineering'},
        ]
        role_response = iam_client.create_role(
            AssumeRolePolicyDocument=policy_document,
            Path='/',
            RoleName='S3Access',
            Tags=tags_list,
        )
        print (role_response)
    else:
        print("Unexpected error: %s" % e)

role_policy = "{\"Version\":\"2012-10-17\",\"Statement\":
{\"Effect\":\"Allow\",\"Action\":\"s3:*\",\"Resource\":\"arn:aws:s3:::*\",\"Condition\":{\"StringEquals\":
{\"s3:ResourceTag/Department\":[\"${aws:PrincipalTag/Department}\"]}}}}"

response = iam_client.put_role_policy(
            RoleName='S3Access',
            PolicyName='Policy1',
            PolicyDocument=role_policy
        )

sts_client = boto3.client('sts',
aws_access_key_id='abc',
aws_secret_access_key='def',
endpoint_url = endpoint,
region_name = '',
)


print ("\n Assuming Role with Web Identity\n")
response = sts_client.assume_role_with_web_identity(
RoleArn=role_response['Role']['Arn'],
RoleSessionName='Bob',
```

```
DurationSeconds=900,
WebIdentityToken='<web-token>')

s3client2 = boto3.client('s3',
aws_access_key_id = response['Credentials']['AccessKeyId'],
aws_secret_access_key = response['Credentials']['SecretAccessKey'],
aws_session_token = response['Credentials']['SessionToken'],
endpoint_url='http://s3.us-east.localhost:8000',
region_name='',)

bucket_body = 'this is a test file'
tags = 'Department=Engineering'
key = "test-1.txt"
s3_put_obj = s3client2.put_object(Body=bucket_body, Bucket=bucket_name, Key=key,
Tagging=tags)
eq(s3_put_obj['ResponseMetadata']['HTTPStatusCode'],200)

s3_get_obj = s3client2.get_object(Bucket=bucket_name, Key=key)
eq(s3_get_obj['ResponseMetadata']['HTTPStatusCode'],200)
```