

# Alibaba Cloud Object Storage Service

## Best Practices

Issue: 20190509

## Legal disclaimer

---

Alibaba Cloud reminds you to carefully read and fully understand the terms and conditions of this legal disclaimer before you read or use this document. If you have read or used this document, it shall be deemed as your total acceptance of this legal disclaimer.

1. You shall download and obtain this document from the Alibaba Cloud website or other Alibaba Cloud-authorized channels, and use this document for your own legal business activities only. The content of this document is considered confidential information of Alibaba Cloud. You shall strictly abide by the confidentiality obligations. No part of this document shall be disclosed or provided to any third party for use without the prior written consent of Alibaba Cloud.
2. No part of this document shall be excerpted, translated, reproduced, transmitted, or disseminated by any organization, company, or individual in any form or by any means without the prior written consent of Alibaba Cloud.
3. The content of this document may be changed due to product version upgrades, adjustments, or other reasons. Alibaba Cloud reserves the right to modify the content of this document without notice and the updated versions of this document will be occasionally released through Alibaba Cloud-authorized channels. You shall pay attention to the version changes of this document as they occur and download and obtain the most up-to-date version of this document from Alibaba Cloud-authorized channels.
4. This document serves only as a reference guide for your use of Alibaba Cloud products and services. Alibaba Cloud provides the document in the context that Alibaba Cloud products and services are provided on an "as is", "with all faults" and "as available" basis. Alibaba Cloud makes every effort to provide relevant operational guidance based on existing technologies. However, Alibaba Cloud hereby makes a clear statement that it in no way guarantees the accuracy, integrity, applicability, and reliability of the content of this document, either explicitly or implicitly. Alibaba Cloud shall not bear any liability for any errors or financial losses incurred by any organizations, companies, or individuals arising from their download, use, or trust in this document. Alibaba Cloud shall not, under any circumstances, bear responsibility for any indirect, consequential, exemplary, incidental, special, or punitive damages, including lost profits arising from the use

or trust in this document, even if Alibaba Cloud has been notified of the possibility of such a loss.

5. By law, all the content of the Alibaba Cloud website, including but not limited to works, products, images, archives, information, materials, website architecture, website graphic layout, and webpage design, are intellectual property of Alibaba Cloud and/or its affiliates. This intellectual property includes, but is not limited to, trademark rights, patent rights, copyrights, and trade secrets. No part of the Alibaba Cloud website, product programs, or content shall be used, modified, reproduced, publicly transmitted, changed, disseminated, distributed, or published without the prior written consent of Alibaba Cloud and/or its affiliates. The names owned by Alibaba Cloud shall not be used, published, or reproduced for marketing, advertising, promotion, or other purposes without the prior written consent of Alibaba Cloud. The names owned by Alibaba Cloud include, but are not limited to, "Alibaba Cloud", "Aliyun", "HiChina", and other brands of Alibaba Cloud and/or its affiliates, which appear separately or in combination, as well as the auxiliary signs and patterns of the preceding brands, or anything similar to the company names, trade names, trademarks, product or service names, domain names, patterns, logos, marks, signs, or special descriptions that third parties identify as Alibaba Cloud and/or its affiliates).
6. Please contact Alibaba Cloud directly if you discover any errors in this document.



# Generic conventions

Table -1: Style conventions

Style	Description	Example
	This warning information indicates a situation that will cause major system changes, faults, physical injuries, and other adverse results.	 <b>Danger:</b> Resetting will result in the loss of user configuration data.
	This warning information indicates a situation that may cause major system changes, faults, physical injuries, and other adverse results.	 <b>Warning:</b> Restarting will cause business interruption. About 10 minutes are required to restore business.
	This indicates warning information, supplementary instructions, and other content that the user must understand.	 <b>Notice:</b> Take the necessary precautions to save exported data containing sensitive information.
	This indicates supplemental instructions, best practices, tips, and other content that is good to know for the user.	 <b>Note:</b> You can use Ctrl + A to select all files.
>	Multi-level menu cascade.	Settings > Network > Set network type
<b>Bold</b>	It is used for buttons, menus, page names, and other UI elements.	Click OK.
Courier font	It is used for commands.	Run the <code>cd / d C :/ windows</code> command to enter the Windows system folder.
<i>Italics</i>	It is used for parameters and variables.	<code>bae log list --instanceid Instance_ID</code>
[ ] or [a b]	It indicates that it is an optional value, and only one item can be selected.	<code>ipconfig [-all -t]</code>

Style	Description	Example
<code>{}</code> or <code>{a b}</code>	It indicates that it is a required value, and only one item can be selected.	<code>switch {stand   slave}</code>



# Contents

---

Legal disclaimer.....	I
Generic conventions.....	I
1 Migrate data to OSS.....	1
1.1 Migrate data from Amazon S3 to Alibaba Cloud OSS.....	1
1.2 Use OssImport to migrate data.....	5
1.3 Back up an HDFS to OSS for disaster tolerance.....	8
1.4 Migrate data from AWS S3 to Alibaba Cloud OSS by using IPSec VPN and Express Connect.....	12
2 Direct upload to OSS from Web.....	30
3 Application server.....	31
3.1 Permission control.....	31
4 Data processing and analysis.....	38
4.1 Construct a data warehouse by using OSS and MaxCompute.....	38
5 Data backup and recovery.....	42
5.1 Back up buckets.....	42
6 Bucket management.....	44
6.1 Storage class conversion.....	44
6.2 Anti-leech.....	47
6.3 Static website hosting.....	56
7 Data security.....	61
7.1 Check data transmission integrity by using 64-bit CRC.....	61
7.2 Protect data through client encryption.....	64
7.3 Protect data by performing server-side encryption.....	67
8 Terraform.....	72
8.1 Introduction.....	72
8.2 Use Terraform to manage OSS.....	73



# 1 Migrate data to OSS

---

## 1.1 Migrate data from Amazon S3 to Alibaba Cloud OSS

OSS provides S3 API compatibility that allows seamless migration of data from Amazon S3 to Alibaba Cloud OSS. After data is migrated from Amazon S3 to OSS, you can still use S3 APIs to access OSS. You only need to configure your S3 client application as follows:

1. Acquire the AccessKeyId and AccessKeySecret of your OSS primary account and sub-account, and configure the acquired AccessKeyId and AccessKeySecret in the client and SDK you are using.
2. Configure the endpoint for client connection to OSS endpoint. For more information, see [Regions and endpoints](#).

### Migration procedures

For details about migration procedures, see [Use OssImport to migrate data](#).

### Use S3 APIs to access OSS after migration

Take note of the following when you use S3 APIs to access OSS after the migration from S3 to OSS.

- Path style and virtual hosted style

[Virtual hosted style](#) supports accessing OSS by placing the bucket into the host header. For security reasons, OSS only supports virtual hosted style access. Therefore, configurations on your client application are required after the migration from S3 to OSS. Some S3 tools use path style access by default, which also requires proper configurations. Otherwise, OSS may report errors and prohibit access.

- Permission definitions in OSS are not quite the same as they are in S3. You may adjust the permissions as necessary after the migration. See the following table for the main differences between the two.



#### Note:

- See [OSS access](#) for more information on the differences.

- OSS supports only three canned ACL modes in S3: private, public-read, and public-read-write.

Items	Amazon S3 permissions	Amazon S3	Alibaba Cloud OSS
Bucket	READ	With the List permission on the bucket	For all objects under the bucket , if no object permission is set for an object, the object is readable.
	WRITE	Objects in the bucket are writable or overwritable.	<ul style="list-style-type: none"> <li>- Writable for objects not existing under the bucket.</li> <li>- If no object permission is set for an object existing in the bucket , the object is overwritable.</li> <li>- Initiate multipart upload is allowed.</li> </ul>
	READ_ACP	Read bucket ACLs.	Read bucket ACLs . Only the bucket owner and the authorized sub-account have the permission of reading bucket ACLs.
	WRITE_ACP	Configure bucket ACLs.	Configure bucket ACLs. Only the bucket owner and the authorized sub-account have the permission of configuring bucket ACLs.

Items	Amazon S3 permissions	Amazon S3	Alibaba Cloud OSS
Object	READ	Objects are readable.	Objects are readable.
	WRITE	N/A	Objects are overwritable.
	READ_ACP	Read object ACLs.	Read object ACLs . Only the bucket owner and the authorized sub-account have the permission of reading object ACLs.
	WRITE_ACP	Configure object ACLs.	Configure object ACLs. Only the bucket owner and the authorized sub-account have the permission of configuring object ACLs.

- Storage classes

OSS supports the Standard, IA, and Archive storage classes, which correspond to STANDARD, STANDARD\_IA, and GLACIER respectively in Amazon S3.

Different from Amazon S3, OSS does not support specifying the storage class directly when uploading an object. The storage class of the object is determined by that of the bucket. OSS supports three bucket storage classes: Standard, IA, and Archive. You can use the lifecycle rules to automatically transition objects between storage classes.

To read an Archive object in OSS, restore it first by initiating a restore request. Different from S3, OSS does not allow setting the lifetime of the restored (active ) copy. Therefore, OSS ignores the lifetime (Days) set in the S3 API. The restored state lasts for one day by default, and can be prolonged to seven days at most. After that, the object enters the frozen state again.

- ETag
  - For the object uploaded by using a PUT request, the ETag of an OSS object and that of an Amazon S3 object differ in case sensitivity. The ETag is in upper case for an OSS object and in lower case for an S3 object. If your client has ETag validation, ignore case.
  - For the objects uploaded by Multipart Upload, OSS takes the ETag calculation method that is different from S3.

#### Compatible S3 APIs

- Bucket operations:
  - Delete Bucket
  - Get Bucket (list objects)
  - Get Bucket ACL
  - Get Bucket lifecycle
  - Get Bucket location
  - Get bucket Logging
  - Head Bucket
  - Put Bucket
  - Put Bucket ACL
  - Put Bucket lifecycle
  - Put Bucket logging
- Object operations:
  - Delete Object
  - Delete Objects
  - Get Object
  - Get Object ACL
  - Head Object
  - Post Object
  - Put Object
  - Put Object Copy
  - Put Object ACL

- **Multipart operations:**
  - **Abort Multipart Upload**
  - **Complete Multipart Upload**
  - **Initiate Multipart Upload**
  - **List Parts**
  - **Upload Part**
  - **Upload Part Copy**

## 1.2 Use OssImport to migrate data

This topic describes how to migrate data from third-party storage products (or from another OSS source) to OSS by using OssImport.

### Environment configuration

OssImport can be deployed in two modes: standalone mode and distributed mode.

- Standalone mode applies to small-scale data migration scenarios where the data size is smaller than 30 TB.
- Distributed mode applies to large-scale data migration scenarios.

For example, you need to migrate 500 TB of data from an AWS S3 bucket in the Tokyo region to an OSS bucket in the China East 1 (Hangzhou) region within a week. Before migrating the data, you must configure environments to deploy OssImport in distributed mode as follows:

- **Activate OSS.**
  1. Use your Alibaba Cloud account to create an OSS bucket in China East 1 (Hangzhou).
  2. Create a RAM user in the RAM console, and then grant OSS access permissions to the RAM user. You also need to securely store the AccessKeyID and AccessKeySecret of the RAM user.
- **Purchase ECS instances.**

Purchase ECS instances with two CPUs and 4 GB of memory in the China East 1 (Hangzhou) region (in which the OSS bucket is also created). If you want to release

the ECS instances after data migration, we recommend that you select Pay-As-You-Go as the billing method when purchasing the instances.

The number of required ECS instances can be calculated as follows:  $X/Y/(Z/100)$ . In the formula, X indicates the size of data that needs to be migrated, Y indicates the number of days that the migration requires, and Z indicates the transfer speed of a single ECS instance (MB/s), that is, how much TB of data can be migrated by a single ECS instance each day (calculated as  $Z/100$ ). Assume that the transfer speed of an ECS instance is 200 MB/s (that is, an ECS instance can migrate 2 TB of data each day). This means you must purchase 36 ECS instances in total (calculated from  $500/7/2$ ).

- Configure OssImport

For the large-scale data migration requirement in this example, you must deploy OssImport in ECS instances in distributed mode. For the configuration information about distributed mode, such as `conf / job . cfg`, `conf / sys . properties`, and concurrency control, see [Architecture and configuration](#). For more information about OssImport distributed deployment, such as the downloading method of OssImport and the troubleshooting of OssImport configuration, see [Distributed deployment](#).

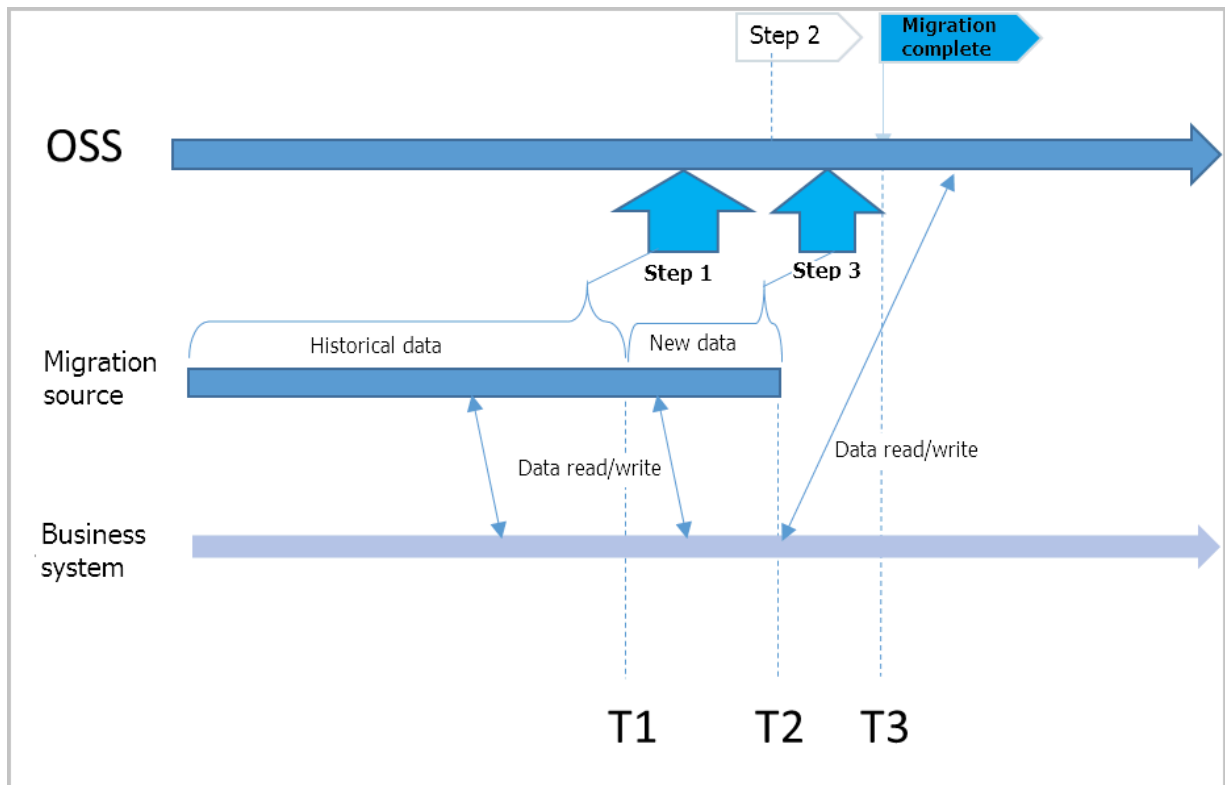
## Procedure

You can use OssImport in distributed mode to migrate data from AWS S3 to OSS as follows:



### Note:

After deploying OssImport in distributed mode in the ECS instances, use OssImport to download data from the AWS S3 bucket in the Tokyo region to the ECS instances in China East 1 (Hangzhou). We recommend you download the data through Internet. Use OssImport to upload the data from the ECS instances to the OSS bucket in China East 1 (Hangzhou). We recommend you upload the data through the intranet.



1. Fully migrate the historical data in AWS S3 before the time T1. For more information, see the Running section in [Distributed deployment](#).

T1 is a UNIX timestamp, namely, the number of seconds elapsed since UTC 00:00, January 1, 1970, and can be obtained by running the `date +%s` command).

2. In the OSS console, enable [Back-to-Origin](#) for the target bucket and set the access URL of the AWS S3 as the origin URL.
3. Switch all read and write operations on AWS S3 to OSS, and record the time (T2).

In this way, all historical data before T1 is directly read from the OSS bucket, and the data stored between T1 and T2 is read from AWS S3 through the mirroring back-to-origin function of OSS.

After T2, all new data is written to OSS and no new data is written to AWS S3.

4. Modify the item `importSync e = T1` in the configuration file `job.cfg`, and then start a migration task again to migrate the data added between T1 and T2.



#### Note:

- After step 4, all read and write operations are performed on the target OSS bucket. Data stored in AWS S3 is historical data, which can be retained or deleted as needed.

- OssImport only migrates and verifies data but does not delete it.

Various costs are incurred during data migration, including the cost of ECS instances, traffic costs, storage costs, and time-dependent costs. Furthermore, if the size of the data to be migrated is larger than 1 TB, the storage cost increases due to the time required for the migration. However, the storage cost generally remains lower than the costs associated with network traffic and ECS instances. You can reduce the time needed for migration by using more ECS instances.

## References

For more information about OssImport, see the following documentations:

[Distributed deployment](#)

[Architecture and configuration](#)

[Data migration](#)

[FAQ](#)

## 1.3 Back up an HDFS to OSS for disaster tolerance

### Background

Currently, many data centers are constructed using Hadoop, and in turn an increasing number of enterprises want to smoothly migrate their services to the cloud.

Object Storage Service (OSS) is the most widely-used storage service on Alibaba Cloud. The OSS data migration tool, `ossimport2`, allows you to sync files from your local devices or a third-party cloud storage service to OSS. However, `ossimport2` cannot read data from Hadoop file systems. As a result, it becomes impossible to make full use of the distributed structure of Hadoop. In addition, this tool only supports local files. Therefore, you must first download files from your Hadoop file system (HDFS) to your local device and then upload them using the tool. This process consumes a great deal of time and energy.

To solve this problem, Alibaba Cloud's E-MapReduce team developed a Hadoop data migration tool `emr-tools`. This tool allows you to migrate data from Hadoop directly to OSS.

This chapter introduces how to quickly migrate data from HDFS to OSS.



## Prerequisites

Make sure your current machine can access your Hadoop cluster. That is, you must be able to use Hadoop commands to access HDFS.

```
hadoop fs -ls /
```

## Migrate Hadoop data to OSS

1. Download [emr-tools](#).



### Note:

emr-tools is compatible with Hadoop versions 2.4.x, 2.5.x, 2.6.x, and 2.7.x.

2. Extract the compressed tool to a local directory.

```
tar jxf emr - tools . tar . bz2
```

3. Copy HDFS data to OSS.

```
cd emr - tools
./ hdfs2oss4e mr . sh / path / on / hdfs oss :// accessKeyId :
accessKeySecret @ bucket - name . oss - cn - hangzhou . aliyuncs
. com / path / on / oss
```

The relevant parameters are described as follow.

Parameters	Description
accessKeyId	The key used to access OSS APIs. For more information, see <a href="#">How to obtain AccessKeyId and AccessKeySecret</a> .
accessKeySecret	
bucket-name.oss-cn-hangzhou.aliyuncs.com	The OSS access domain name, including the bucket name and endpoint address.

The system enables a Hadoop MapReduce task (DistCp).

4. After the task is completed, local data migration information is displayed. This information is similar to the following sample.

```
17 / 05 / 04 22 : 35 : 08 INFO mapreduce . Job : Job
job_149380_0598643_00_09 completed successfully
17 / 05 / 04 22 : 35 : 08 INFO mapreduce . Job : Counters :
38
File System Counters
FILE : Number of bytes read = 0
FILE : Number of bytes written = 859530
FILE : Number of read operations = 0
FILE : Number of large read operations = 0
FILE : Number of write operations = 0
HDFS : Number of bytes read = 263114
HDFS : Number of bytes written = 0
```

```

HDFS : Number of read operations = 70
HDFS : Number of large read operations = 0
HDFS : Number of write operations = 14
OSS : Number of bytes read = 0
OSS : Number of bytes written = 258660
OSS : Number of read operations = 0
OSS : Number of large read operations = 0
OSS : Number of write operations = 0
Job Counters
  Launched map tasks = 7
  Other local map tasks = 7
  Total time spent by all maps in occupied
slots ( ms )= 60020
  Total time spent by all reduces in occupied
  slots ( ms )= 0
  Total time spent by all map tasks ( ms )=
30010
  Total vcore - millisecon ds taken by all map
tasks = 30010
  Total megabyte - millisecon ds taken by all map
tasks = 45015000
Map - Reduce Framework
  Map input records = 10
  Map output records = 0
  Input split bytes = 952
  Spilled Records = 0
  Failed Shuffles = 0
  Merged Map outputs = 0
  GC time elapsed ( ms )= 542
  CPU time spent ( ms )= 14290
  Physical memory ( bytes ) snapshot = 1562365952
  Virtual memory ( bytes ) snapshot = 1731742105 6
  Total committed heap usage ( bytes )= 1167589376
File Input Format Counters
  Bytes Read = 3502
File Output Format Counters
  Bytes Written = 0
org . apache . hadoop . tools . mapred . CopyMapper $ Counter
  BYTESCOPIED = 258660
  BYTESEXPECTED = 258660
  COPY = 10

```

```
copy from / path / on / hdfs to oss :// accessKeyId :  
accessKeySecret @ bucket - name . oss - cn - hangzhou . aliyuncs  
. com / path / on / oss does succeed !!!
```

#### 5. You can use osscmd to view information about OSS data.

```
osscmd ls oss :// bucket - name / path / on / oss
```

### Migrate OSS data to Hadoop

If you have already created a Hadoop cluster on Alibaba Cloud, you can use the following command to migrate data from OSS to the new Hadoop cluster.

```
./ hdfs2oss4e mr . sh oss :// accessKeyId : accessKeySecret @  
bucket - name . oss - cn - hangzhou . aliyuncs . com / path / on /  
oss / path / on / new - hdfs
```

### More scenarios

In addition to offline clusters, you can also use emr-tools for Hadoop clusters constructed on ECS. This allows you to quickly migrate a self-built cluster to the [E-MapReduce](#) service.

If your cluster is already on ECS, but in a classic network, it will not provide good interoperability with services in Virtual Private Cloud (VPC). In this case, migrate the cluster to a VPC instance. Follow these steps to migrate the cluster:

1. Use emr-tools to migrate data to OSS.
2. Create a new cluster (create it yourself or use E-MapReduce) in the VPC environment.
3. Migrate data from OSS to the new HDFS cluster.

If you use E-MapReduce, on the Hadoop cluster, you can directly access OSS using [Spark](#), [MapReduce](#) and [Hive](#). This not only avoids one data copy operation (from OSS to HDFS), but also greatly reduces storage costs. For more information about cost reduction, see [EMR+OSS: Separated storage and computing](#).

## 1.4 Migrate data from AWS S3 to Alibaba Cloud OSS by using IPsec VPN and Express Connect

This topic describes how to migrate data from a AWS S3 bucket to a Alibaba Cloud OSS bucket by using IPsec VPN tunnel and ExpressConnect.

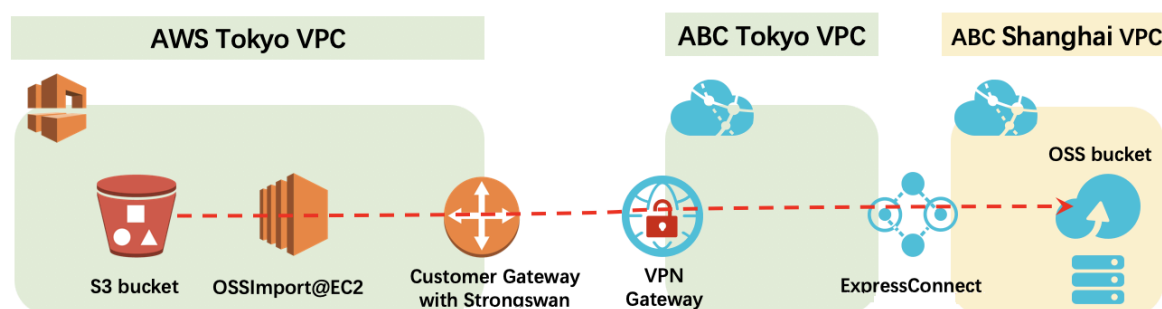
### Background information

When customers migrate data from AWS S3 to Alibaba Cloud OSS, especially cross countries, there are usually two network architectures for them to choose from:

- Transfer data based on the Internet.
- Transfer data based on private network.

This topic focuses on the second network architecture. The IPSEC VPN tunnel and the Alibaba Cloud ExpressConnect product portfolio are combined to meet the customer's needs of transmitting data through internal networks and increasing the security of data transmission.

The following figure shows the overall network architecture.



The advantage of this network architecture is that the data in the S3 bucket is first moved to the Alibaba Cloud Network VPC in the same region as the S3 bucket, and then the data is retransmitted to the OSS bucket of the destination region by means of the Alibaba Cloud ExpressConnect cross-region high-speed network. This network architecture accelerates the transmission speed of cross-country data migration.

### Preparation

The following table describes the information about the network entities involved in the migration process.

Provider	Network entity	Value
AWS	VPC in Tokyo	172.16.0.0/16
	S3 bucket Endpoint	s3.ap-northeast-1.amazonaws.com
	S3 bucket name	eric-s3-tokyo
	OssImport IP address in the EC2 instance	Internal IP address: 172.16.1.183 Public IP address: 3.112.29.59
	Customer Gateway with Strongswan	Public IP address: 3.112.29.59
Alibaba Cloud	VPN Gateway	Public IP address: 47.74.46.62
	VPC in Tokyo Japan	172.24.0.0/16
	Subnet in VPC in Tokyo Japan	172.24.0.0/20
	VPC in Shanghai China	172.19.0.0/16
	Subnet in VPC in Shanghai China	172.19.48.0/20
	OSS bucket endpoint	http://oss-cn-shanghai-internal.aliyuncs.com
	OSS bucket name	eric-oss-datastore-shanghai

**Step 1: Install and configure Strongswan.**

Perform the following operations in AWS to install Strongswan.

## 1. Prepare a VPC and related resources.

### a. Create a VPC with the following settings.

The screenshot shows the AWS VPC Dashboard. On the left, the 'Virtual Private Cloud' section is expanded, and 'Your VPCs' is selected. The main area displays the details for the VPC 'eric\_vpc' (ID: vpc-030c1e94de5a85b58). The 'Description' tab is active, showing the following settings:

- VPC ID: vpc-030c1e94de5a85b58
- State: available
- IPv4 CIDR: 172.16.0.0/16 (highlighted with a red box)
- IPv6 CIDR: -
- Network ACL: acl-0fb7b2ab7b540c495
- DHCP options set: dopt-b59557d2
- Route table: rtb-0fa4339ab28c67e62
- Tenancy: default
- Default VPC: No
- Classic link: Disabled
- DNS resolution: Enabled (highlighted with a red box)
- DNS hostnames: Enabled (highlighted with a red box)
- ClassicLink DNS Support: Disabled
- Owner: 278671983281

### b. Create a subnet with the following settings.

The screenshot shows the AWS VPC Dashboard. On the left, the 'Subnets' section is selected. The main area displays the details for the subnet 'eric\_subnet' (ID: subnet-02067ee68ea08478e). The 'Description' tab is active, showing the following settings:

- Subnet ID: subnet-02067ee68ea08478e
- VPC: vpc-030c1e94de5a85b58 | eric\_vpc
- State: available
- IPv4 CIDR: 172.16.1.0/24 (highlighted with a red box)
- IPv6 CIDR: -
- Available IPv4 Addresses: 250
- Availability Zone: ap-northeast-1a (apne1-az4)
- Network ACL: acl-0fb7b2ab7b540c495
- Route Table: rtb-0fa4339ab28c67e62
- Default subnet: No
- Auto-assign public IPv4 address: No
- Auto-assign IPv6 address: No
- Owner: 278671983281

### c. Create an Internet gateway with the following settings.

The screenshot shows the AWS VPC Dashboard. On the left, the 'Internet Gateways' section is selected. The main area displays the details for the Internet gateway 'eric\_internet\_gateway' (ID: igw-05e243e2aa8862072). The 'Description' tab is active, showing the following settings:

- Name: eric\_internet\_gateway
- ID: igw-05e243e2aa8862072
- State: attached
- VPC: vpc-030c1e94de5a85b58 | eric\_vpc (highlighted with a red box)
- Owner: 278671983281
- Attached VPC ID: vpc-030c1e94de5a85b58 | eric\_vpc
- Owner: 278671983281



Note:

If you want to access EC2 via Internet, such as SSH client, then this gateway is necessary, attach this Internet gateway to the VPC that you just created.

d. Create a security group and allow the traffic.

The screenshot shows the AWS Management Console interface for creating a security group. The 'Create security group' button is highlighted. Below it, the 'Inbound Rules' tab is selected, and a rule is being added for 'All traffic' from '0.0.0.0/0'.

Type	Protocol	Port Range	Source	Description
All traffic	All	All	0.0.0.0/0	
All traffic	All	All	:::0	

2. Create an EC2 instance for Strongswan and OssImport.

a. Launch an EC2 instance in the VPC, subnet and security group.

The screenshot shows the AWS Management Console interface for launching an EC2 instance. The 'Launch Instance' button is highlighted. Below it, the instance 'strongswan+ossimport' is shown in the 'running' state. The 'Security groups' field is highlighted, showing the 'default' security group.

Name	Instance Type	Instance State	IPv4 Public IP	Security Groups	VPC ID	Private IP Addr
strongswan+ossimport	t2.micro	running	3.112.29.59	default	vpc-030c1e94de5a85b58	172.16.1.183

Instance: i-026f8306d5dfed9b6 (strongswan+ossimport) Public DNS: ec2-3-112-29-59.ap-northeast-1.compute.amazonaws.com

Field	Value
Instance ID	i-026f8306d5dfed9b6
Instance state	running
Instance type	t2.micro
Elastic IPs	
Availability zone	ap-northeast-1a
Security groups	default
Scheduled events	No scheduled events
AMI ID	RHEL-7.6_HVM_GA-20181017-x86_64-0-Hourly2-GP2 (ami-08419d23b91152e4)
Platform	-
IAM role	-
Key pair name	3k39knjM
Owner	278671983281
Launch time	December 4, 2018 at 5:13:23 PM UTC+8 (69 hours)

Public DNS (IPv4): ec2-3-112-29-59.ap-northeast-1.compute.amazonaws.com  
 IPv4 Public IP: 3.112.29.59  
 IPv6 IPs: -  
 Private DNS: ip-172-16-1-183.ap-northeast-1.compute.internal  
 Private IPs: 172.16.1.183

Secondary private IPs:  
 VPC ID: vpc-030c1e94de5a85b58  
 Subnet ID: subnet-02067ee68ea08478e



Note:

If you want to access the EC2 instance with SSH client, you need to save the \*.pem file to local compute devices.

#### b. Test to access EC2 with SSH client.

Run the following command to log on the the EC2 instance via SSH:

```
ssh -i 3k3j *** M . pem ec2 - user @ ec2 - 3 - 112 - 29 - 59
. ap - northeast - 1 . compute . amazonaws . com
```

```
[root@EC-Demo-Japan ~]#
[root@EC-Demo-Japan ~]# ssh -i 3k3j *** M.pem ec2-user@ec2-3-112-29-59.ap-northeast-1.compute.amazonaws.com
Last login: Fri Dec 7 04:25:32 2018 from 42.120.75.133

[ec2-user@ip-172-16-1-183 ~]$
[ec2-user@ip-172-16-1-183 ~]$ ip addr
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 9001 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 06:50:ab:0c:9a:ac brd ff:ff:ff:ff:ff:ff
    inet 172.16.1.183/24 brd 172.16.1.255 scope global noprefixroute dynamic eth0
        valid_lft 3144sec preferred_lft 3144sec
    inet6 fe80::450:abff:fe9c:9aac/64 scope link
        valid_lft forever preferred_lft forever
[ec2-user@ip-172-16-1-183 ~]$
```

If you cannot access the EC2 instance via SSH client, it may be because that you need to add a route entry.

### 3. Install Strongswan.

Run the following code to install Strongswan and verify the version of Strongswan:

```
$ wget http://dl.fedoraproject.org/pub/epel/7/x86_64/Packages/s/strongswan-5.7.1-1.el7.x86_64.rpm
$ sudo yum install gcc
$ sudo yum install trousers
$ sudo rpm -ivh strongswan-5.7.1-1.el7.x86_64.rpm
$ strongswan version
Linux strongSwan U5.7.1/K3.10.0-957.el7.x86_64
University of Applied Sciences Rapperswil, Switzerland
See 'strongswan --copyright' for copyright information.
```

### 4. Configure Strongswan.

Run the following code to configure Strongswan:

```
$ sudo vi /etc/strongswan/ipsec.conf
Paste following setting into file:
conn %default
    authby = psk
    type = tunnel
    keyexchange = ikev2
    auto = start
    ike = aes - sha1 - modp1024
```



```

ikelifetim e = 86400s
esp = aes - sha1 - modp1024
lifetime = 86400s
conn abc_shangh ai_oss
left = 172 . 16 . 1 . 183 // Local IP address of EC2 (
Strongswan installed )
leftsubnet = 172 . 16 . 1 . 0 / 24 // AWS Tokyo VPC CIDR
.
leftid = 3 . 112 . 29 . 59 // Public IP address as ID .
right = 47 . 74 . 46 . 62 // Public IP address of
Alibaba Cloud VPN Gateway
rightid = 47 . 74 . 46 . 62 // Public IP address as ID
.
rightsubne t = 100 . 118 . 102 . 0 / 24 // Note ( 1 )

```



#### Note:

When you ping the intranet endpoint of the OSS bucket in some ECS instances in the Alibaba Cloud Shanghai VPC, you can get the IP address which is belonged to this CIDR block. Therefore this CIDR block is used as the right subnet.

```

[root@EC-Demo-Shanghai ~]# ping -c 3 eric-oss-datastore-shanghai.oss-cn-shanghai-internal.aliyuncs.com
PING oss-cn-shanghai-internal.aliyuncs.com (100.118.102.33) 56(84) bytes of data.
64 bytes from 100.118.102.33 (100.118.102.33): icmp_seq=1 ttl=102 time=1.23 ms
64 bytes from 100.118.102.33 (100.118.102.33): icmp_seq=2 ttl=102 time=1.26 ms
64 bytes from 100.118.102.33 (100.118.102.33): icmp_seq=3 ttl=102 time=1.26 ms

--- oss-cn-shanghai-internal.aliyuncs.com ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2002ms
rtt min/avg/max/mdev = 1.235/1.252/1.263/0.042 ms
[root@EC-Demo-Shanghai ~]# ping -c 3 eric-oss-datastore-shanghai.oss-cn-shanghai-internal.aliyuncs.com
PING oss-cn-shanghai-internal.aliyuncs.com (100.118.102.35) 56(84) bytes of data.
64 bytes from 100.118.102.35 (100.118.102.35): icmp_seq=1 ttl=102 time=1.08 ms
64 bytes from 100.118.102.35 (100.118.102.35): icmp_seq=2 ttl=102 time=1.12 ms
64 bytes from 100.118.102.35 (100.118.102.35): icmp_seq=3 ttl=102 time=1.12 ms

--- oss-cn-shanghai-internal.aliyuncs.com ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2003ms
rtt min/avg/max/mdev = 1.089/1.114/1.128/0.042 ms
[root@EC-Demo-Shanghai ~]#

```

## 5. Start Strongswan.

### a. Run the following commands:

```

$ sudo su - root
# echo 1 > /proc/sys/net/ipv4/ip_forward

```



#### Note:

Then you need to add `net.ipv4.ip_forward = 1` into `/etc/sysctl.conf`.

### b. Run the following commands to start Strongswan:

```

# systemctl enable strongswan
# systemctl start strongswan

```

```
# systemctl status strongswan
```

Step 2: Create VPN gateways and IPsec connections.

Follow these steps to create VPN gateways and IPsec connections.

### 1. Create a VPN gateway and a customer gateway.

#### a. Create a VPN gateway.

VPN Gateways								
<a href="#">Create VPN Gateway</a> <a href="#">Refresh</a> <a href="#">Custom</a>			Instance ID ▾ <input type="text" value="Enter a name or ID"/> <input type="button" value="Q"/>					
Instance ID/Name	IP Address	VPC	Status	Bandwidth	Billing Method	Enable IPsec	Enable SSL	Actions
vpn-6wekb7mwd5ca2u2lgo mh9 eric_vpn_gateway_...	47.74.46.62	vpc-6wekz26fgftrsyy0yst8 vpc_tokyo	● Normal	5Mbps <a href="#">Upgrade</a>	Subscription 01/05/2019, 00:00:00 Expire	Enabled	<a href="#">Enable SSL</a>	<a href="#">Renew</a> <a href="#">ReNew An Temporary</a>

#### b. Create a customer gateway.

Customer Gateways				
<a href="#">Create Customer Gateway</a> <a href="#">Refresh</a> <a href="#">Custom</a>			Instance ID ▾ <input type="text" value="Enter a name or ID"/> <input type="button" value="Q"/>	
Instance ID/Name	IP Address	Description	Created At	Actions
cgw-6we69u6vmpch7mkpf3gzz eric_aws_strongswan	3.112.29.59	-	12/04/2018, 18:54:02	<a href="#">Delete</a>



#### Note:

In this practice, Strongswan@AWS EC2 is used as the customer gateway.

## 2. Create an IPsec connection.

### a. Make basic settings.

**Modify IPsec Connections**

• **Name** ?

ipsec\_aws\_abc 13/128

• **VPN Gateway**

eric\_vpn\_gateway\_tokyo

• **Customer Gateway**

eric\_aws\_strongswan

• **Local Network** ?

0.0.0.0/0

+ Add Local Network

• **Remote Network** ?

172.16.1.0/24

+ Add Remote Network

**Effective Immediately** ?

☒ Yes ☐ No

### b. Make advanced settings.

### Modify IPsec Connections

?

×

Advanced Configuration

IKE Configurations

Pre-Shared Key ?

3k2jM

Version

ikev2

▼

Negotiation Mode ?

main

▼

Encryption Algorithm

aes

▼

Authentication Algorithm

sha1

▼

DH Group

group2

▼

Modify IPsec Connections

SA Life Cycle (seconds)

86400

LocalId ?

47.74.46.62

Remoteld ?

3.112.29.59

IPsec Configurations

Encryption Algorithm

aes

Authentication Algorithm

sha1

DH Group

group2

SA Life Cycle (seconds)

86400

### 3. Check the IPsec connection status.

#### a. Check the IPsec connection status on the Alibaba Cloud console.

IPsec Connections					
Create IPsec Connection		Refresh	Custom	Instance ID <input type="text"/> Enter a name or ID <input type="text"/>	
Instance ID/Name	VPN Gateway	Customer Gateway	Connection Status	Created At	Actions
vco-6weluco9588x12nfl6l ipsec_aws_abc	vpn-6wekb7mwd5ca2u2lgomh9 eric_vpn_gateway_tokyo	cgw-6we69u6vmpch7mkpf3gzz eric_aws_strongswan	● Phase 2 of IKE Tunnel Negotiation Succeeded	12/04/2018, 18:55:47	<a href="#">Edit</a> <a href="#">Delete</a> <a href="#">Download Remote Configuration</a> <a href="#">View Logs</a>

#### b. Check the IPsec connection status on Strongswan by running the following command:

```
# systemctl status strongswan
```

```
[root@ip-172-16-1-183 ossimport]# systemctl status strongswan
● strongswan.service - strongswan IPsec IKEv1/IKEv2 daemon using ipsec.conf
   Loaded: loaded (/usr/lib/systemd/system/strongswan.service; enabled; vendor preset: disabled)
   Active: active (running) since Fri 2018-12-07 07:55:07 UTC; 9s ago
     Main PID: 22547 (starter)
    CGroup: /system.slice/strongswan.service
            22547 /usr/libexec/strongswan/starter --daemon charon --nofork
            22557 /usr/libexec/strongswan/charon

Dec 07 07:55:08 ip-172-16-1-183.ap-northeast-1.compute.internal charon[22557]: 10[IKE] authentication of '47.74.46.62' with pre-shared key successful
Dec 07 07:55:08 ip-172-16-1-183.ap-northeast-1.compute.internal charon[22557]: 10[IKE] IKE_SA abc_shanghai_oss[1] established between 172.16.1.183[3.112.29.59]...47.74.46.62[47.74.46.62]
Dec 07 07:55:08 ip-172-16-1-183.ap-northeast-1.compute.internal charon[22557]: 10[IKE] IKE_SA abc_shanghai_oss[1] established between 172.16.1.183[3.112.29.59]...47.74.46.62[47.74.46.62]
Dec 07 07:55:08 ip-172-16-1-183.ap-northeast-1.compute.internal charon[22557]: 10[IKE] scheduling reauthentication in 85466s
Dec 07 07:55:08 ip-172-16-1-183.ap-northeast-1.compute.internal charon[22557]: 10[IKE] maximum IKE_SA lifetime 86006s
Dec 07 07:55:08 ip-172-16-1-183.ap-northeast-1.compute.internal charon[22557]: 10[CFG] selected proposal: ESP:AES_CBC_128/HMAC_SHA1_96/NO_EXT_SEQ
Dec 07 07:55:08 ip-172-16-1-183.ap-northeast-1.compute.internal charon[22557]: 10[IKE] CHILD_SA abc_shanghai_oss[1] established with SPIs cdf3c91e_i c5fcc5f4_o and TS 172.16.1.0/24 === 100.118.102.0/24
Dec 07 07:55:08 ip-172-16-1-183.ap-northeast-1.compute.internal charon[22557]: 10[IKE] CHILD_SA abc_shanghai_oss[1] established with SPIs cdf3c91e_i c5fcc5f4_o and TS 172.16.1.0/24 === 100.118.102.0/24
Dec 07 07:55:08 ip-172-16-1-183.ap-northeast-1.compute.internal charon[22557]: 10[IKE] received AUTH_LIFETIME of 85603s, scheduling reauthentication in 85063s
Dec 07 07:55:08 ip-172-16-1-183.ap-northeast-1.compute.internal charon[22557]: 10[IKE] peer supports MOBIKE
[root@ip-172-16-1-183 ossimport]#
```

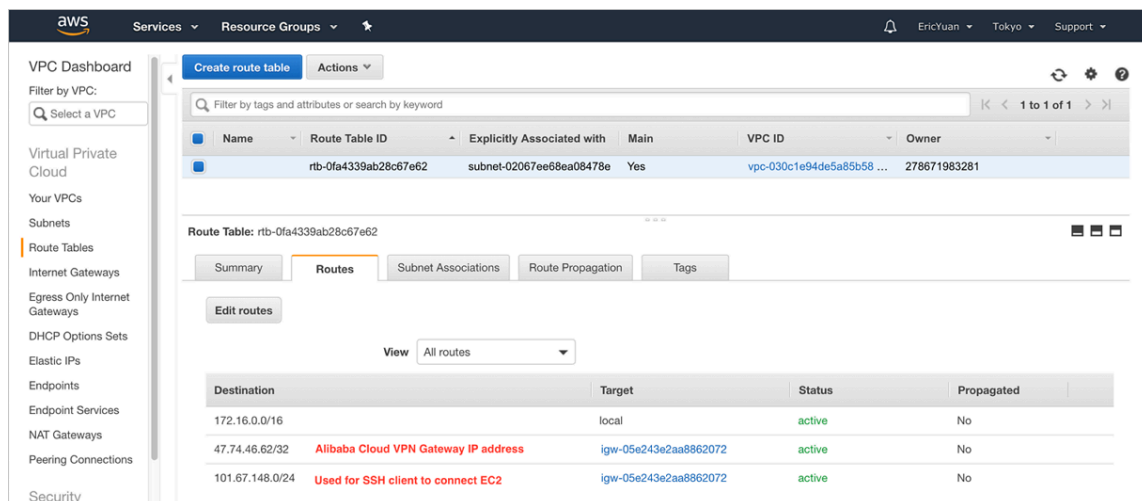
### Step 3: Create VPC Peering Connection.

#### 1. Follow the steps in [Interconnect two VPCs under the same account](#) to create a VPC peering connection on the Alibaba Cloud Express Connect console.

VPC Peering Connections									
Create Peering Connection		Create CEN (Recommended)	Refresh		Instance Name <input type="text"/> Enter <input type="text"/>				
Monitor	Initiator	Initiator Region	Acceptor	Acceptor Region	Belong to Same Account	Specification	Billing Method	Status	Actions
<a href="#">vpc-pr5evyhw9</a>	<a href="#">uf6jdbt238jqm8wzo3rv</a>	China (Shanghai)	<a href="#">vpc-6wekz26fgftrysy0yst8</a>	Japan (Tokyo)	Yes	2Mbps	Pay-As-You-Go Created at Aug 7, 2017, 16:47:30 Connected at Aug 7, 2017, 16:47:33	● Initiator: Activated ● Acceptor: Activated	<a href="#">Route Settings</a>

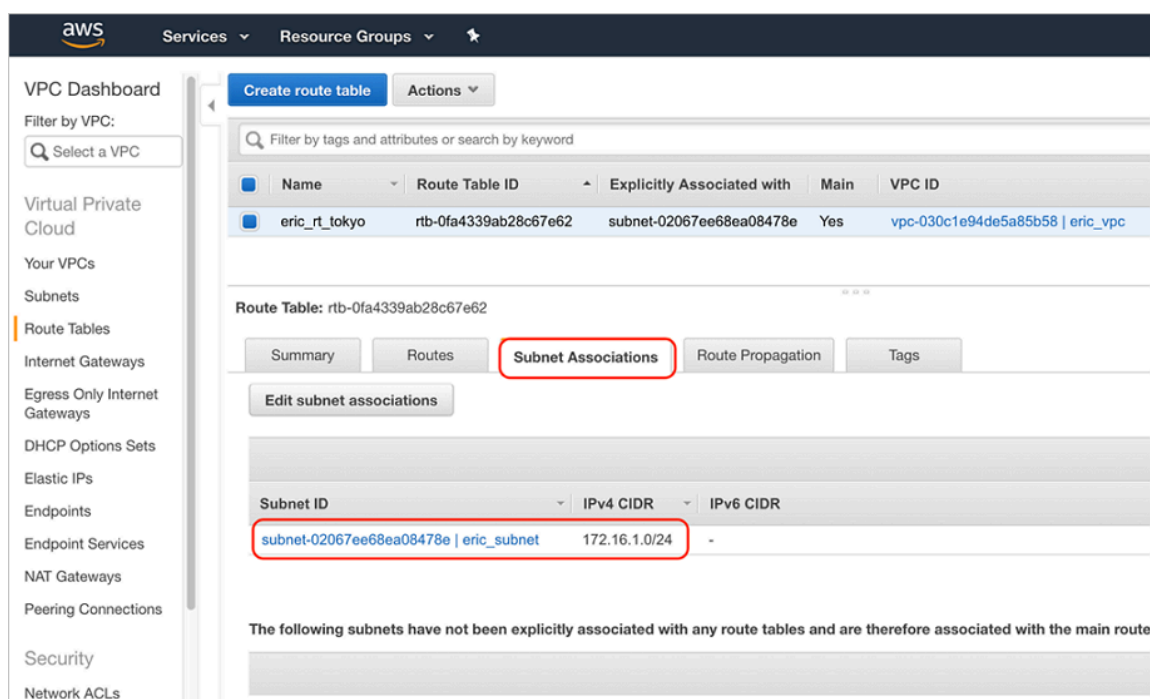
## 2. Add the following routing entries in the route settings both on the AWS VPC and Alibaba Cloud VPC.

### • AWS VPC in Tokyo Japan



**Route Table: rtb-0fa4339ab28c67e62**

Destination	Target	Status	Propagated
172.16.0.0/16	local	active	No
47.74.46.62/32 <i>Alibaba Cloud VPN Gateway IP address</i>	igw-05e243e2aa8862072	active	No
101.67.148.0/24 <i>Used for SSH client to connect EC2</i>	igw-05e243e2aa8862072	active	No



**Route Table: rtb-0fa4339ab28c67e62**

Subnet ID	IPv4 CIDR	IPv6 CIDR
subnet-02067ee68ea08478e   eric_subnet	172.16.1.0/24	-

The following subnets have not been explicitly associated with any route tables and are therefore associated with the main route table.

### • Alibaba Cloud VPC in Tokyo Japan

Basic Information

Route Table ID [vtb-6weu938phhidvxesg4n6m](#)

Router ID [vrt-6wedstuws7iq50c636ycd](#)

Created At Nov 8, 2016, 17:03:12

Add Route

Refresh

Route Table ID	Destination Subnet	Status	Next Hop Instance	Next Hop Type	Route Type
vtb-6weu938phhidvxesg4n6m	100.118.102.0/24	Available	vpc-pr5evyvh9	VPC	Custom
vtb-6weu938phhidvxesg4n6m	172.16.1.0/24	Available	vpn-6wekb7mwd5ca2u2lgomh9	-	Custom
vtb-6weu938phhidvxesg4n6m	172.19.48.0/20	Available	vpc-pr5evyvh9	VPC	Custom
vtb-6weu938phhidvxesg4n6m	172.24.0.0/20	Available		-	System-Defined
vtb-6weu938phhidvxesg4n6m	100.64.0.0/10	Available		-	System-Defined

The subnets in the preceding figure are described as follows:

- 100.118.102.0/24: VPC endpoint of OSS bucket in the China Shanghai region
- 172.16.1.0/24: AWS VPC in Tokyo Japan
- 172.19.48.0/20: Alibaba Cloud VPC in Shanghai China
- Alibaba Cloud VPC in Shanghai China

Basic Information

Route Table ID

vtb-ii9hhd1d5

Router ID

vrt-3i9xt5789

Created At

Aug 31, 2016, 16:35:21

Add Route

Refresh

Route Table ID	Destination Subnet	Status	Next Hop Instance	Next Hop Type	Route Type
vtb-ii9hhd1d5	172.16.1.0/24	Available	vpc-6wekz26fgfltsrny0yst8	VPC	Custom
vtb-ii9hhd1d5	192.168.1.0/24	Available	vpc-251e3e6m4	VPC	Custom
vtb-ii9hhd1d5	172.24.0.0/20	Available	vpc-6wekz26fgfltsrny0yst8	VPC	Custom
vtb-ii9hhd1d5	172.19.18.0/24	Available		-	System-Defined
vtb-ii9hhd1d5	172.19.0.0/20	Available		-	System-Defined
vtb-ii9hhd1d5	172.19.224.0/20	Available		-	System-Defined
vtb-ii9hhd1d5	172.19.48.0/20	Available		-	System-Defined
vtb-ii9hhd1d5	100.64.0.0/10	Available		-	System-Defined

The subnets in the preceding figure are described as follows:

- 172.16.1.0/24: AWS VPC in Tokyo Japan
- 172.24.0.0/20: Alibaba Cloud VPC in Tokyo Japan



### 3. Test the connection between AWS VPC in Tokyo Japan and the Alibaba Cloud OSS bucket in Shanghai.

```
[ec2-user@ip-172-16-1-183 ~]$
[ec2-user@ip-172-16-1-183 ~]$ ping -c 5 eric-oss-datastore-shanghai.oss-cn-shanghai-internal.aliyuncs.com
PING oss-cn-shanghai-internal.aliyuncs.com (100.118.102.36) 56(84) bytes of data:
64 bytes from 100.118.102.36 (100.118.102.36): icmp_seq=1 ttl=101 time=34.2 ms
64 bytes from 100.118.102.36 (100.118.102.36): icmp_seq=2 ttl=101 time=34.2 ms
64 bytes from 100.118.102.36 (100.118.102.36): icmp_seq=3 ttl=101 time=34.1 ms
64 bytes from 100.118.102.36 (100.118.102.36): icmp_seq=4 ttl=101 time=34.9 ms
64 bytes from 100.118.102.36 (100.118.102.36): icmp_seq=5 ttl=101 time=34.2 ms

--- oss-cn-shanghai-internal.aliyuncs.com ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4006ms
rtt min/avg/max/mdev = 34.155/34.369/34.902/0.357 ms
[ec2-user@ip-172-16-1-183 ~]$
```

The test results in the preceding figure show that the connection between the AWS EC2 instance and the Alibaba Cloud OSS bucket is connected. You can deploy OssImport and migrate objects from the AWS S3 bucket to the Alibaba Cloud OSS bucket.

#### Step 4: Create a VPC endpoint for AWS S3 bucket.

In this practice, OssImport deployed on the EC2 instance in VPC is used to move data from the AWS S3 bucket to the OSS bucket. We recommend you create a VPC endpoint for the AWS S3 bucket and associate it with the route table so that OssImport can visit the AWS S3 bucket within the VPC instead of visiting the Internet IP address of the AWS S3 bucket.

#### 1. Create a VPC endpoint for the AWS S3 bucket.

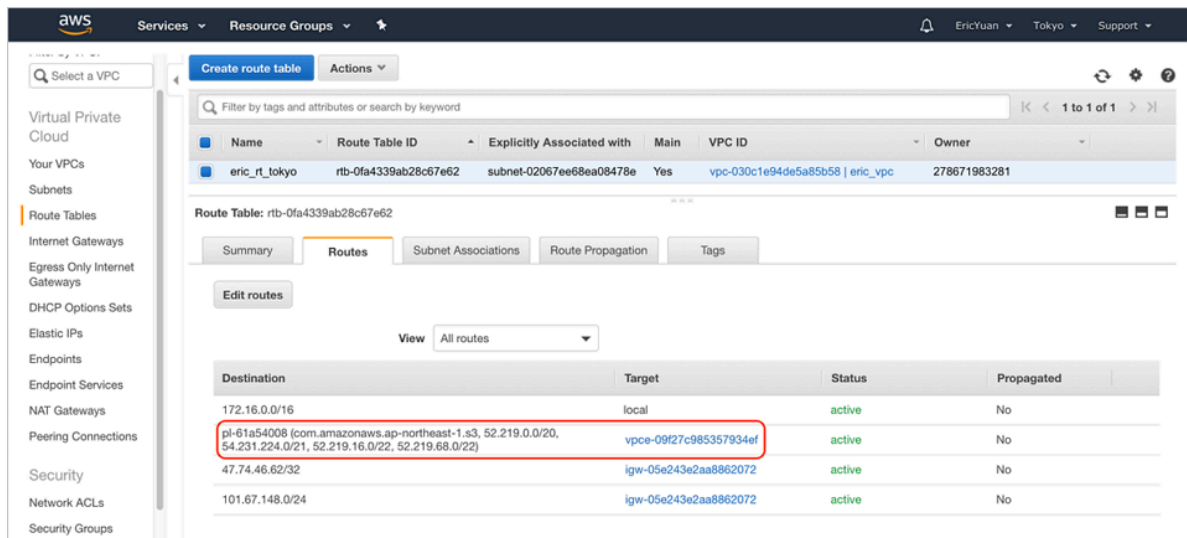
The screenshot shows the AWS VPC console. In the left-hand navigation pane, the 'Endpoints' option is highlighted. The main content area displays a table of VPC endpoints. A red box highlights the endpoint for 'com.amazonaws.ap-northeast-1.s3' with ID 'vpce-09b914a1f1a1a4ba5' and VPC ID 'vpc-030c1e94de5a85b58 | eric\_vpc'. Below this, the 'Route Tables' tab is selected, showing a table with route table associations. A red box highlights the association for route table 'rtb-0fa4339ab28c67e62', which is associated with 'subnet-02067ee68ea08478e | eric\_subnet'.

Endpoint ID	VPC ID	Service name	Endpoint type	Status
vpce-09b914a1f1a1a4ba5	vpc-030c1e94de5a85b58   eric_vpc	com.amazonaws.ap-northeast-1.s3	Gateway	available

Route Table ID	Main	Associated With
rtb-0fa4339ab28c67e62	Yes	subnet-02067ee68ea08478e   eric_subnet

## 2. Check the VPC route table.



## 3. Verify the connection between the AWS S3 VPC endpoint and the EC2 instance.

```
[root@ip-172-16-1-183 ossimport]#
[root@ip-172-16-1-183 ossimport]# ping -c 3 eric-s3-tokyo.s3.ap-northeast-1.amazonaws.com
PING s3.ap-northeast-1.amazonaws.com (52.219.68.24) 56(84) bytes of data:
64 bytes from s3-ap-northeast-1.amazonaws.com (52.219.68.24): icmp_seq=1 ttl=60 time=0.185 ms
64 bytes from s3-ap-northeast-1.amazonaws.com (52.219.68.24): icmp_seq=2 ttl=60 time=0.216 ms
64 bytes from s3-ap-northeast-1.amazonaws.com (52.219.68.24): icmp_seq=3 ttl=60 time=0.253 ms

--- s3.ap-northeast-1.amazonaws.com ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2001ms
rtt min/avg/max/mdev = 0.185/0.218/0.253/0.027 ms
[root@ip-172-16-1-183 ossimport]# a
```

Step 5: Migrate Data from the AWS S3 bucket to the OSS bucket by using OssImport.

Follow the steps in [Use OssImport to migrate data](#) to deploy and configure OssImport.

### 1. Configure the `local_job . cfg` file as follows:

```
srcType = s3
srcAccessKey ey = AK ***** A
srcSecretKey ey =+ RW ***** iM3
srcDomain = s3 . ap - northeast - 1 . amazonaws . com
srcBucket = eric - s3 - tokyo
srcPrefix = source_folder /
destAccessKey = L ***** ic
destSecretKey = nEtM ***** iDx
destDomain = http :// oss - cn - shanghai - internal . aliyuncs .
com
destBucket = eric - oss - datastore - shanghai
destPrefix = destination_folder /
```

### 2. Execute the `import . sh` script and check the migration status as follows:

```
[root@ip-172-16-1-183 ~]# cd /home/ec2-user/ossimport
[root@ip-172-16-1-183 ossimport]# ./import.sh
Clean the previous job, Yes or No: yes
Stop import service completed.
delete jobs dir :./master/jobs/local_test/
```

```

Clean    job : local_test    completed .
submit   job : / home / ec2 - user / ossimport / conf / local_job .
cfg
submit   job : local_test    success !
Start    import    service    completed .

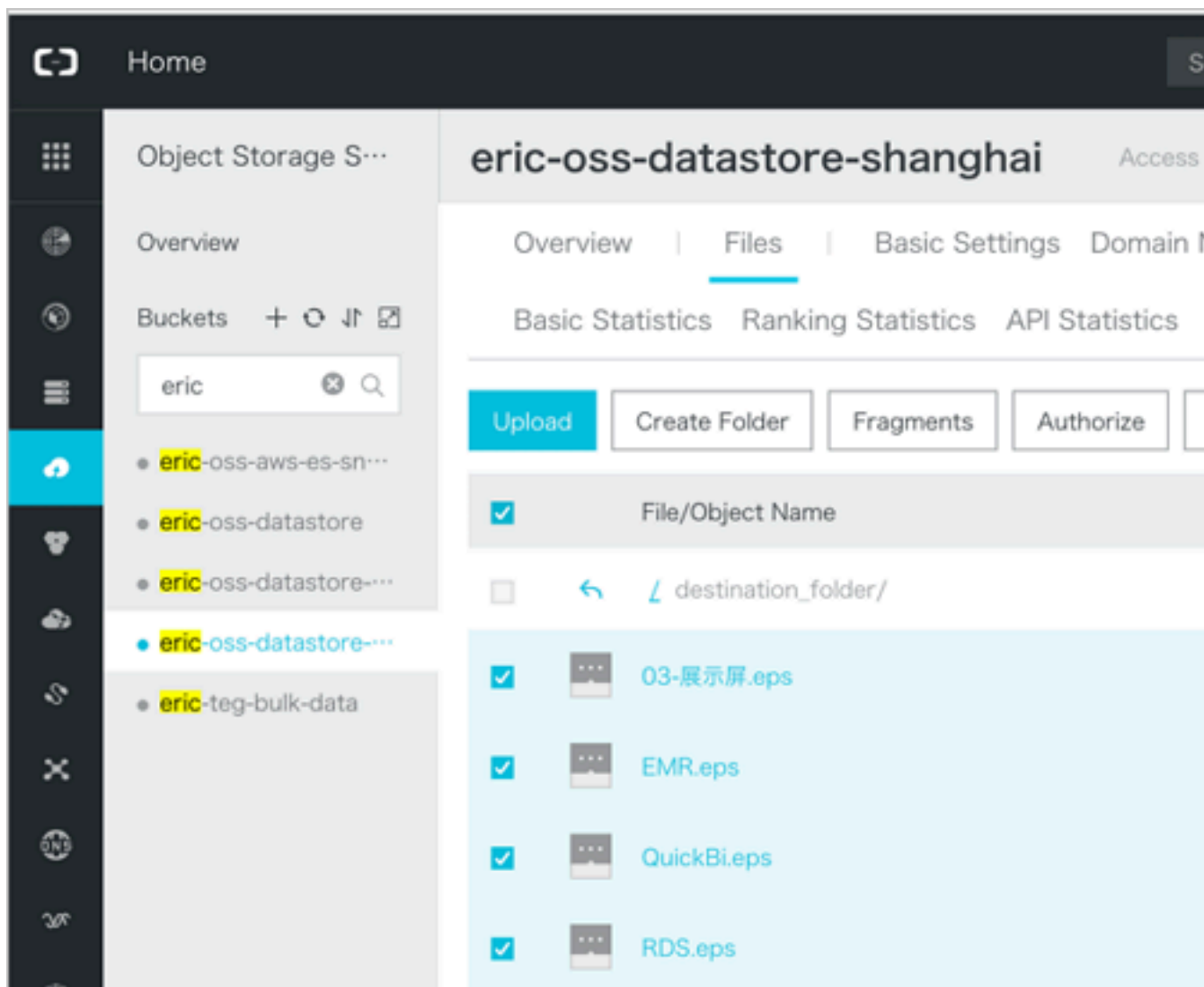
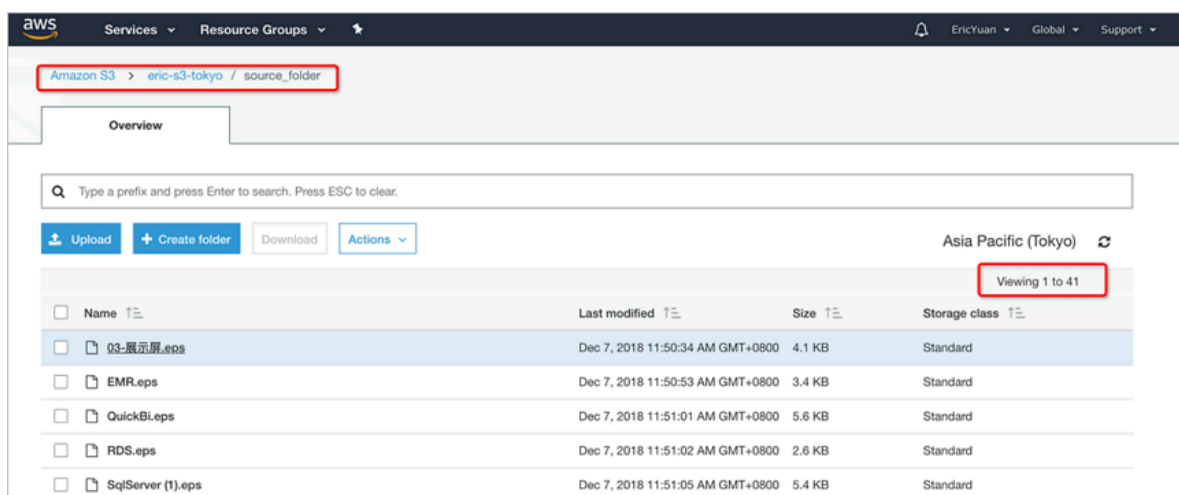
.....
----- job    stats -----
----- job    stat -----
JobName : local_test
JobState : Running
PendingTas    ks : 0
Dispatched    Tasks : 1
RunningTas    ks : 1
SucceedTas    ks : 0
FailedTask    s : 0
ScanFinish    ed : true
RunningTas    ks    Progress :
8528637A12    6676A4FD0D    2F981ED5E0    EF_1544176    618182 : 0 / 191048
1 / 42
-----
----- job    stats -----
----- job    stat -----
JobName : local_test
JobState : Running
PendingTas    ks : 0
Dispatched    Tasks : 1
RunningTas    ks : 1
SucceedTas    ks : 0
FailedTask    s : 0
ScanFinish    ed : true
RunningTas    ks    Progress :
8528637A12    6676A4FD0D    2F981ED5E0    EF_1544176    618182 : 191048 /
191048    42 / 42
[ root @ ip - 172 - 16 - 1 - 183    ossimport ]#

```

**Note:**

You can find detail logs in the `ossimport / logs` folder.

### 3. Compare the files in the AWS S3 bucket and those in the OSS bucket.



As shown in the preceding figure, if the files in the AWS S3 bucket and those in the OSS bucket are the same, the migration is successful.

If the migration fails at any preceding steps, please contact technical support by [opening a ticket](#).

#### References

- [Data migration](#)
- [Migration Technical Guide](#)

## 2 Direct upload to OSS from Web

---

## 3 Application server

### 3.1 Permission control

This document elaborates how to configure different policies to implement different permission controls based on the app server mentioned in [Set up direct data transfer for mobile apps](#) by taking the app-base-oss bucket in the Shanghai region as an example.



**Note:**

- The following illustration assumes you have already activated STS and have thoroughly read the [Set up direct data transfer for mobile apps](#) document.
- The policies mentioned in the following content are covered in the specified policy file in the config.json file mentioned in the previous section.
- The operations on OSS upon retrieving the STS token indicate the process of specifying the policy for the app server, the app server retrieving a temporary credential from the STS and the app using the temporary credential to access OSS.

#### Common policies

- Full authorization policy

For the ease of demonstration, the default policy is shown as follows. This policy indicates that the app is allowed to perform any operation on OSS.



**Note:**

This policy is neither secured nor recommended to use for mobile apps.

```
{
  "Statement": [
    {
      "Action": [
        "oss:*"
      ],
      "Effect": "Allow",
      "Resource": ["acs:oss:*:*:*"]
    }
  ],
  "Version": "1"
}
```

```
}
```

Operations on OSS upon retrieving STS token	Result
List all created buckets.	Successful
Upload the object without a prefix, test.txt.	Successful
Download the object without a prefix, test.txt.	Successful
Upload the object with a prefix, user1/test.txt.	Successful
Download the object with a prefix, user1/test.txt.	Successful
List the object without a prefix, test.txt.	Successful
List the object with a prefix, user1/test.txt.	Successful

- Read-only policies with or without any prefixes

This policy indicates the app can list and download all objects in the bucket app-base-oss.

```
{
  "Statement": [
    {
      "Action": [
        "oss : GetObject ",
        "oss : ListObject s "
      ],
      "Effect": " Allow ",
      "Resource": ["acs : oss ::*: app - base - oss /*", "acs : oss ::*: app - base - oss "]
    }
  ],
  "Version": " 1 "
}
```

Operations on OSS upon retrieving STS token	Result
List all created buckets.	Failed
Upload the object without a prefix, test.txt.	Failed
Download the object without a prefix, test.txt.	Successful



Operations on OSS upon retrieving STS token	Result
Upload the object with a prefix, user1/test.txt.	Failed
Download the object with a prefix, user1/test.txt.	Successful
List the object without a prefix, test.txt.	Successful
List the object with a prefix, user1/test.txt.	Successful

- Read-only policies with a specified prefix

This policy indicates the app can list and download all objects with the prefix of **\*\*user1/\*\*** in the bucket **\*\*app-base-oss\*\***. However, the policy does not specify to download any objects with another prefix. By this way, different apps corresponding to different prefixes are spatially isolated in the bucket.

```
{
  "Statement": [
    {
      "Action": [
        "oss:GetObject",
        "oss:ListObjects"
      ],
      "Effect": "Allow",
      "Resource": [
        "acs:oss:*:*:app-base-oss/user1/*",
        "acs:oss:*:*:app-base-oss/"
      ]
    }
  ],
  "Version": "1"
}
```

Operations on OSS upon retrieving STS token	Result
List all created buckets.	Failed
Upload the object without a prefix, test.txt.	Failed
Download the object without a prefix, test.txt.	Failed
Upload the object with a prefix, user1/test.txt.	Failed
Download the object with a prefix, user1/test.txt.	Successful

Operations on OSS upon retrieving STS token	Result
List the object without a prefix, test.txt.	Successful
List the object with a prefix, user1/test.txt.	Successful

- Write-only policies with no specified prefixes

This policy indicates that the app can upload all objects in the bucket app-base-oss.

```
{
  "Statement": [
    {
      "Action": [
        "oss:PutObject"
      ],
      "Effect": "Allow",
      "Resource": ["acs:oss:*:*:app-base-oss/*", "acs:oss:*:*:app-base-oss"]
    }
  ],
  "Version": "1"
}
```

Operations on OSS upon retrieving STS token	Result
List all created buckets.	Failed
Upload the object without a prefix, test.txt.	Successful
Download the object without a prefix, test.txt.	Failed
Upload the object with a prefix, user1/test.txt.	Successful
Download the object with a prefix, user1/test.txt.	Successful
List the object without a prefix, test.txt.	Successful
List the object with a prefix, user1/test.txt.	Successful

- Write-only policies with a specified prefix

This policy indicates the app can upload all objects with the user1/ prefix in the bucket app-base-oss. The app cannot upload any object with another prefix. In this

way, different apps corresponding to different prefixes are spatially isolated in the bucket.

```
{
  "Statement": [
    {
      "Action": [
        "oss:PutObject"
      ],
      "Effect": "Allow",
      "Resource": ["acs:oss:*:*:app-base-oss/user1/*"],
      "acs:oss:*:*:app-base-oss"
    }
  ],
  "Version": "1"
}
```

Operations on OSS upon retrieving STS token	Result
List all created buckets.	Failed
Upload the object without a prefix, test.txt.	Failed
Download the object without a prefix, test.txt.	Failed
Upload the object with a prefix, user1/test.txt.	Successful
Download the object with a prefix, user1/test.txt.	Failed
List the object without a prefix, test.txt.	Failed
List the object with a prefix, user1/test.txt.	Failed

- Read/write policies with or without any prefixes

This policy indicates that the app can list, download, upload, and delete all objects in the bucket `app-base-oss`.

```
{
  "Statement": [
    {
      "Action": [
        "oss:GetObject",
        "oss:PutObject",
        "oss:DeleteObject",
        "oss:ListParts",
        "oss:AbortMultiPartUpload",
        "oss:ListObjects"
      ],
      "Effect": "Allow",
    }
  ]
}
```

```

    " Resource ": [ " acs : oss :*: *: app - base - oss /*", " acs
: oss :*: *: app - base - oss " ]
  },
  " Version ": " 1 "
}

```

Operations on OSS upon retrieving STS token	Result
List all created buckets.	Failed
Upload the object without a prefix, test.txt.	Successful
Download the object without a prefix, test.txt.	Successful
Upload the object with a prefix, user1/test.txt.	Successful
Download the object with a prefix, user1/test.txt.	Successful
List the object without a prefix, test.txt.	Successful
List the object with a prefix, user1/test.txt.	Successful

- Read/write policies with a specified prefix

This policy indicates the app can list, download, upload, and delete all objects with a prefix of `user1 /` in the bucket `app - base - oss`. The policy does not specify to read or write any objects with another prefix. In this way, different apps corresponding to different prefixes are spatially isolated in the bucket.

```

{
  " Statement ": [
    {
      " Action ": [
        " oss : GetObject ",
        " oss : PutObject ",
        " oss : DeleteObject ",
        " oss : ListParts ",
        " oss : AbortMulti partUpload ",
        " oss : ListObjects "
      ],
      " Effect ": " Allow ",
      " Resource ": [ " acs : oss :*: *: app - base - oss / user1 /
*", " acs : oss :*: *: app - base - oss " ]
    }
  ],
  " Version ": " 1 "
}

```

}

Operations on OSS upon retrieving STS token	Result
List all created buckets.	Failed
Upload the object without a prefix, test.txt.	Failed
Download the object without a prefix, test.txt.	Failed
Upload the object with a prefix, user1/test.txt.	Successful
Download the object with a prefix, user1/test.txt.	Successful
List the object without a prefix, test.txt.	Successful
List the object with a prefix, user1/test.txt.	Successful

## Summary

With the help of preceding examples, we can understand that:

- You can create different policies for various app scenarios and then achieve differentiated permission control for different apps through slight modifications on the app server.
- You can also optimize apps to save the process of making another request to the app server before the STS token expires.
- Tokens are actually issued by the STS. An app server customizes a policy, requests for a token from the STS, and then delivers this token to the app. Here, token is only a shorthand expression. However, a "token" actually contains an "AccessKeyId", an "AccessKeySecret", an "Expiration" value, and a "SecurityToken". These are used in the SDK provided by OSS to the app. For more information, see the implementation of the respective SDK.

More references:

- [How to use RAM and STS in OSS](#)
- [RAM documentation](#) and [STS documentation](#)

## 4 Data processing and analysis

---

### 4.1 Construct a data warehouse by using OSS and MaxCompute

This topic describes the method of using MaxCompute to construct a PB data warehouse based on OSS. By using MaxCompute to analyze the massive data stored in OSS, you can complete your big data analysis tasks in minutes and explore data value more efficiently.

#### Features

- Object Storage Service (OSS)

OSS provides three storage classes: Standard, Infrequent Access, and Archive, which are suitable for different data access scenarios. OSS can be used together with Hadoop open-source community products and multiple Alibaba Cloud products, such as EMR, BatchCompute, MaxCompute, machine learning tool PAI, Data Lake Analytics, and Function Compute.

You can create several data analysis applications by using OSS, including:

- Batch processing applications using MapReduce, HIVE, Pig, or Spark, such as offline log computing
  - Interactive query analysis applications, such as Imapla, Presto, and Data Lake Analytics
  - Deep machine training applications, such as Alibaba Cloud PAI
  - Gene rendering computing and delivery applications, such as BatchCompute
  - Big data applications, such as MaxCompute
  - Flow processing applications, such as Function Compute
- MaxCompute

MaxCompute is a big data computing service that provides fast and fully managed data warehouse solutions. MaxCompute can be used together with OSS to analyze and process massive data efficiently. With world-leading processing performance, MaxCompute was rated as the world's leading cloud-based data warehouse by Forrester.

- OSS-external table query

One major feature of MaxCompute is the OSS-external table query function, which can help you query massive objects stored in OSS directly without needing to load data into MaxCompute tables. This can help you move data more efficiently and eliminates the need to store data in multiple places.

A data warehouse solution constructed by using MaxCompute and OSS has the following advantages:

- MaxCompute operates on a serverless, distributed computing architecture. Therefore, it allows for temporary query services in a timely manner based on the requirements of OSS users and does not require additional maintenance or management for server infrastructures, significantly reducing enterprise costs.
- OSS provides storage for massive data that can be accessed by multiple computing applications and services. As a result, you can effectively separate computing and storage resources by storing only one copy of data in OSS.
- A data warehouse solution using OSS and MaxCompute allows you to easily process structured files in open-source formats. Currently, the open-source formats supported are Avro, CSV, ORC, Parquet, RCFile, RegexSerDe, SequenceFile, and TextFile. The gzip compression format is also supported.

#### Application scenario

Financial applications on the Internet need to store a large number of financial data exchange files on OSS every day and must perform structured analysis on large test files. By using the OSS-external table query feature of MaxCompute, these requirements can be met with greater ease. Large files can be loaded on OSS to MaxCompute by using external tables. This process can significantly improve overall efficiency.

#### Example: Analyze data collected from Internet of Things (IoT)

1. Activate OSS. For more information, see [Sign up for OSS](#).
2. Create a bucket. For more information, see [##Bucket](#).
3. Activate MaxCompute. For more information, see [Activate MaxCompute](#).
4. Create a MaxCompute project. For more information, see [##MaxCompute Project](#).

## 5. Grant OSS access permissions to MaxCompute.

You must grant OSS access permissions to the account you used to access MaxCompute because MaxCompute needs to directly access data in OSS. You can log on to the RAM console with your Alibaba Cloud account to [grant permissions](#).

## 6. Upload the data collected from IoT to OSS.



### Note:

You can use any data set to test the procedures described in this topic. In this example, a CSV file named `vehicle.csv` has been uploaded to the `/demo` directory in an OSS bucket named `oss-odps-test`. The endpoint of the bucket is `oss-cn-beijing-internal.aliyuncs.com`.

## 7. Run the following commands to create an external table in MaxCompute. For more information, see [###](#).

```
CREATE EXTERNAL TABLE IF NOT EXISTS ambulance_
data_csv_external
(
    vehicleId    int ,
    recordId     int ,
    patientId    int ,
    calls        int ,
    locationLa   titute double ,
    locationLo   ngtitue double ,
    recordTime   string ,
    direction    string
)
STORED BY 'com.aliyun.odps.CsvStorageHandler'
LOCATION 'oss://oss-cn-beijing-internal.aliyuncs.com/oss-odps-test/Demo/';
```

## 8. Use MaxCompute to query the external table. You can use an external table in the same way as you use a normal table. For more information, see [Obtain and analyze data](#).

Assume that the `/demo/vehicle.csv` file includes the following data:

```
1 , 1 , 51 , 1 , 46 . 81006 , - 92 . 08174 , 9 / 14 / 2014 0 : 00
, S
1 , 2 , 13 , 1 , 46 . 81006 , - 92 . 08174 , 9 / 14 / 2014 0 : 00
, NE
1 , 3 , 48 , 1 , 46 . 81006 , - 92 . 08174 , 9 / 14 / 2014 0 : 00
, NE
1 , 4 , 30 , 1 , 46 . 81006 , - 92 . 08174 , 9 / 14 / 2014 0 : 00
, W
1 , 5 , 47 , 1 , 46 . 81006 , - 92 . 08174 , 9 / 14 / 2014 0 : 00
, S
1 , 6 , 9 , 1 , 46 . 81006 , - 92 . 08174 , 9 / 14 / 2014 0 : 00 ,
S
```



```

1 , 7 , 53 , 1 , 46 . 81006 , - 92 . 08174 , 9 / 14 / 2014 0 : 00
, N
1 , 8 , 63 , 1 , 46 . 81006 , - 92 . 08174 , 9 / 14 / 2014 0 : 00
, SW
1 , 9 , 4 , 1 , 46 . 81006 , - 92 . 08174 , 9 / 14 / 2014 0 : 00 ,
NE
1 , 10 , 31 , 1 , 46 . 81006 , - 92 . 08174 , 9 / 14 / 2014 0 : 00
, N

```

Run the following SQL statement:

```

select recordId , patientId , direction from ambulance_
data_csv_external where patientId > 25 ;

```

The following results are returned.

recordId	patientId	direction
1	51	S
3	48	NE
4	30	W
5	47	S
7	53	N
8	63	SW
10	31	N

For more information about the usage of OSS-external tables, see [Overview of External tables](#).

## 5 Data backup and recovery

---

### 5.1 Back up buckets

Alibaba Cloud offers multiple backup methods for data on OSS to suit different scenarios.

The following methods can be used to back up OSS data on the cloud:

- Cross-region replication (set on the console or using APIs or SDK code)
- OssImport tool

Back up data using cross-region replication

- Applicable scenarios

See [Cross-Region replication development guide](#).

- Operation on the console

See [Cross-Region replication operation guide](#).

- FAQ

See [How to synchronize data to OSS](#).



Note:

- The source bucket and target bucket belong to the same user but different regions.
- The source bucket and target bucket do not use archive storage.
- Data synchronization between buckets in the same region can be implemented using OSS SDK/API code.

Back up data using the OssImport tool

The OssImport tool can migrate data stored on local hosts or other cloud storage systems to OSS. It has the following features:

- Supports a vast variety of data sources, including local drives, Qiniu Cloud, Baidu BOS, AWS S3, Azure Blob, Blob, but also cloud, Tencent cloud cos, Golden Mountain ks3, HTTP, OSS, and so on, and can be expanded as needed.
- Supports resumable upload.
- Supports throttling.

- Supports migration of objects generated after a specified time or with a specified prefix.
- Supports parallel data upload and download.
- Supports the standalone and distributed modes. The standalone mode is easy to deploy and use, while the distributed mode is suitable for large-scale data migration.

#### Applicable scenarios

See [Data migration](#).

#### Installation and deployment

See [Architecture and configuration](#), [Standalone deployment](#) , and [Distributed deployment](#).

#### FAQ

See [FAQ](#).

#### NOTE

- If data needs to be migrated between buckets of different user accounts and the data volume exceeds 10 TB, the distributed version is recommended.
- When using the incremental mode to synchronize object changes between OSS buckets, note that OssImport can synchronize only modification operations (put /append/multipart) and cannot synchronize read or delete operations. No SLA guarantee is provided for timely data synchronization in this mode. Therefore, use the incremental mode with caution.
- Cross-region replication is recommended for data synchronization between different regions, if cross-region replication is enabled in these regions.

## 6 Bucket management

### 6.1 Storage class conversion

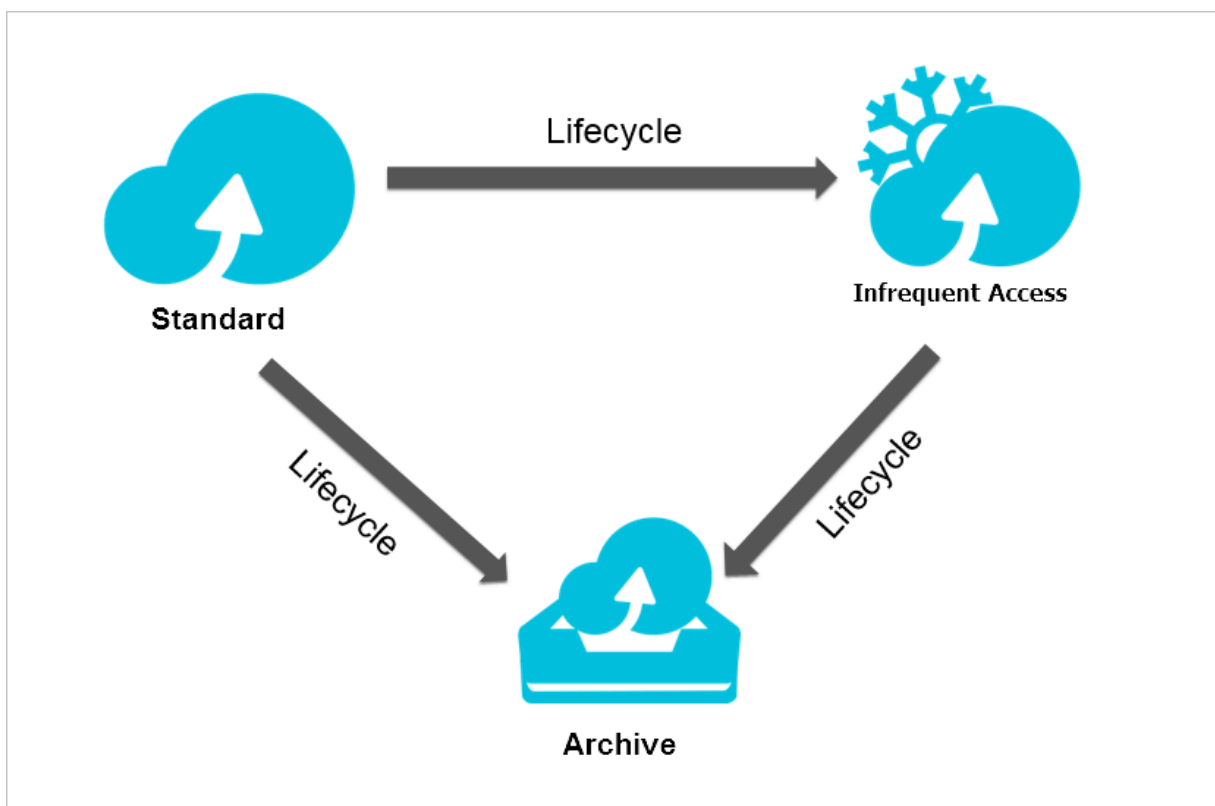
This topic describes how to convert the storage class of an object between Standard, IA, and Archive.

#### Lifecycle Object Transition

OSS supports three [storage classes](#): Standard, Infrequent Access, and Archive.

The Object Transition mechanism is now available in OSS Lifecycle Management function in all regions across China. The following storage classes are supported for automatic conversion:

- Standard -> Infrequent Access
- Standard -> Archive
- Infrequent Access -> Archive

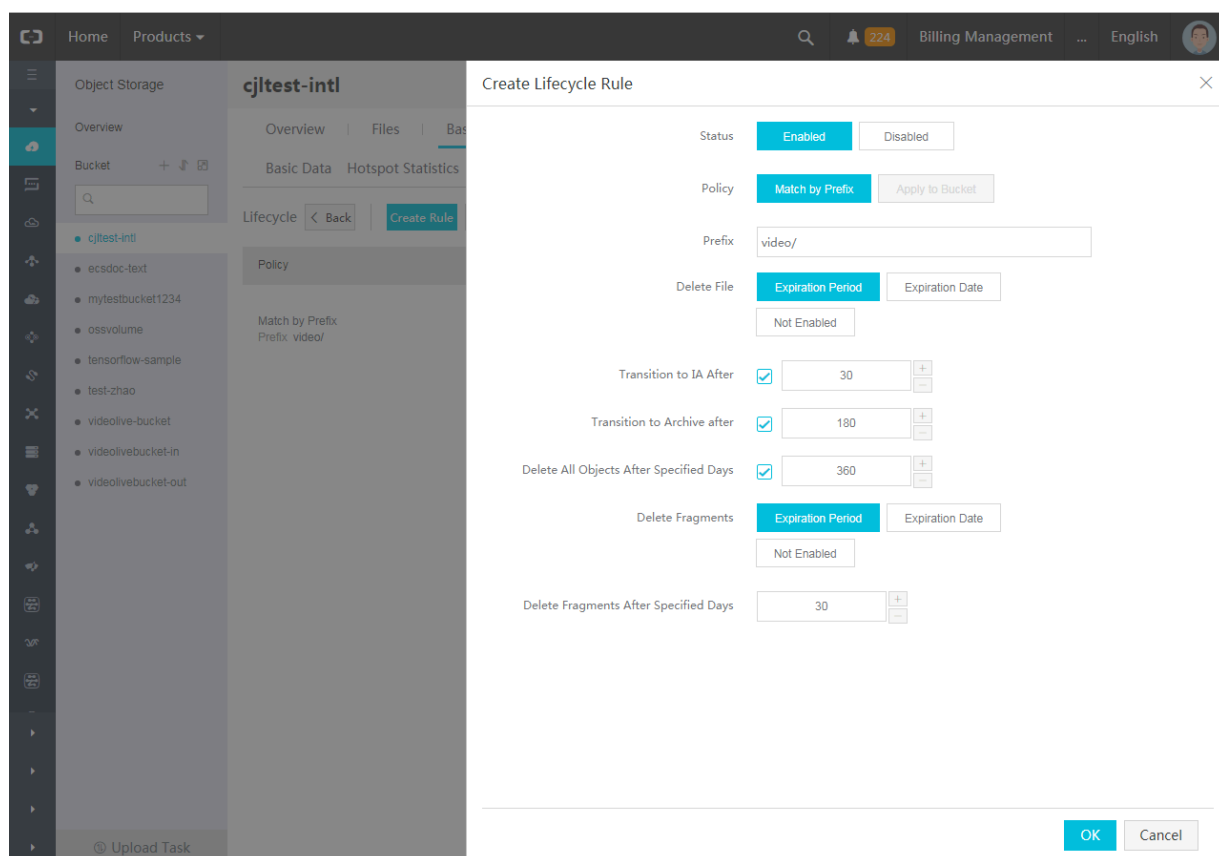


#### Examples

You can configure lifecycle policies for objects with a given prefix in one bucket as follows:

- They are converted to Infrequent Access class after being stored for 30 days.
- They are converted to Archive class after being stored for 180 days.
- They are deleted automatically after being stored for 360 days.

You can complete the configuration of the preceding lifecycle policies in the console. For more information, see [Set lifecycle](#).



#### Note:

If the following three parameters are configured:

Transition to IA After , Transition to Archive After , and Delete All Objects After Specified Days , then the number of days set for each parameter must meet the following criteria:

Days for converting to Infrequent Access < Days for converting to Archive < Specified days for deleting

Notes

After the Object type conversion, the storage cost is calculated based on the unit price of converted storage class.

Notes for Infrequent Access and Archive storage types:

- Minimum billable size:

Objects smaller than 128 KB are charged as 128 KB.

- Minimum storage period:

The stored data is required to be saved for at least 30 days. Charges will be incurred if you delete files that are stored for less than 30 days.

- Restore time of Archive type:

It takes one minute for Archive type Object to restore the data to a readable state

. If real-time read is required in the business scenario, we recommend that you convert the file to the Infrequent Access storage class instead of Archive class.

Otherwise, after converting the file to the Archive class, the data cannot be read in real time.

- Data access charges:

Both Infrequent Access and Archive classes are required to pay data access charges as a separate charge item to outbound traffic. If the average access frequency per Object is higher than once per month, you are not advised to convert the data to Infrequent Access or Archive class.

Storage classes conversion in other ways

For conversions from Archive type to Standard class or Infrequent Access class, or from Infrequent Access class to Standard class, you can read the Object and rewrite it to the Bucket of corresponding storage class. The default storage class of Object is determined by the Bucket.

For example, for the conversion of Infrequent Access Object in the Bucket of Standard type to Standard Object, you can read and rewrite the Object. Based on the type of the Bucket, the newly-written Object is of Standard storage class.

For the Object that has been converted to Archive class, you can only read it after performing Restore operation and restore it to a readable state.

For more information, see [Create and use Archive buckets](#).

## 6.2 Anti-leech

### Background

For example, A is the webmaster of a website. Webpages on the website contain links to images and audio/video files. These static resources are stored on [Alibaba Cloud OSS](#). For example, A may save an image file on OSS with the URL `http://referer-test.oss-cn-hangzhou.aliyuncs.com/aliyun-logo.png`.

For OSS external resource url, see [OSS address](#) such a URL (without signing) requires the user's bucket permission to read publicly.

B is the webmaster of another website, B use the image resources of the website without permission, use this method to steal space and traffic by placing it in a web page on your website. In this case, the third-party web site user sees the B web site, but it's not clear the source of the pictures on the website. Since OSS charges by usage, so that user A does not get any benefit, instead, the cost of resource use is borne.

This article applies to users who use OSS resources as outer chains in a Web page, it also introduces a-like users who have stored their resources on OSS, how to avoid the use of unnecessary resources by setting up anti-theft chains.

### Implementation method

At present, the methods of anti-theft chain provided by OSS mainly include the following two types:

- Set Referer : The operation is available through the console and the SDK, and the user can choose according to their needs.
- Use signature URL: This is suitable for users who are used to developing.

The following two examples are provided in this article:

- Set the Referer anti-theft chain through the console
- Dynamic generation of signed URL anti-theft chains based on PHP SDK

### Set Referer

This section focuses on what Referer is and how OSS uses Referer for anti-theft chains.

- What is Referer?

Referer is HTTP Part of the header that usually comes with a referer when the browser sends a request to the web server, tell the server the source of the link for this request. In the example above, if the web site for user B is userdomain-steal, want to steal a picture link `http://referer-test.oss-cn-hangzhou.aliyuncs.com/aliyun-logo.png`. A's website domain name is `userdomain`.

Suppose the web page of the chain website user domain-steal is as follows:

```
< html >
  < p > This is a test </ p >
  < img src =" http://referer-test.oss-cn-hangzhou.
    aliyuncs.com/aliyun-logo.png " />
</ html >
```

Assume the web page with the source station user domain is as follows:

```
< html >
  < p > This is my test link from OSS URL </ p >
  < img src =" http://referer-test.oss-cn-hangzhou.
    aliyuncs.com/aliyun-logo.png " />
</ html >
```

- When an Internet user uses a browser to access the Web page of B's website `http://userdomain-steal/index.html`, the link in the web page is a picture of the site A. Because a request from one domain name (user domain-steal) jumped to another domain name (maid), the browser takes the Referer with it in the header of the HTTP request, as shown:

You can see that the browser Referer in the HTTP request is `http://userdomain-steal/index.html`. This article mainly uses Chrome's developer mode to view web page requests, as follows:

- The same browser visits `http://userdomain/error.html`, and you can also see that the browser's Referer is `http://userdomain/error.html`.
- If the browser enters the address directly, you can see that Referer is empty in the request.

If a does not have any Referer-related settings on the OSS, all three cases have access to the picture link for user.



- The principle of OSS through Referer anti-theft chain

Thus, when the browser requests the OSS resource, if a page Jump occurs, the browser takes the Referer in the request, and the Referer's value is the URL on the previous page, sometimes Referer is empty.

For both cases, the OSS Referer feature offers two options:

- Sets whether empty Referer access is allowed. It cannot be set separately and needs to be used in conjunction with the Referer whitelist.
- Sets the Referer whitelist.

The details are analyzed as follows:

- Anti-theft chain authentication is performed only if the user is accessing the object through a signed URL or an anonymous access. If the requested header has an "Authorization" field, it does not do anti-theft chain validation.
- A bucket can support multiple Referer parameters.
- The Referer parameter supports wildcard characters '\*' and '?'.
- Users can set up to allow request access for empty referer.
- When the whitelist is empty, the Referer field is not checked for empty ( otherwise all requests will be rejected, because empty Referer will be rejected, for non-empty Referer OSS is also not found on the Referer whitelist ).
- The whitelist is not empty, and a rule is set that does not allow Referer fields to be empty. Only Referer's whitelist of requests is allowed, other requests, including those whose Referer is empty, are rejected.
- The whitelist is not empty, but the rule "allow Referer field to be empty" is set. An empty request with Referer and a whitelist-compliant request are permitted, other requests are rejected.
- Three permissions of bucket (private, public-read, public-read-write) the Referer field is checked.

Wildcard character explanation:

- Asterisks '\*': You can use an asterisks instead of 0 or more characters. If you are looking for a file name that starts with “AEW” , you can enter AEW to search for all types of files with the names starting with “AEW” , for example, AEWT.txt, AEWU.EXE, and AEWI.dll. If you want to narrow down the search scope, you can

enter `AEW.txt` to search for all `.txt` files with names starting with `AEW`, such as `AEWIP.txt` and `AEWDF.txt`.

- Question mark (?): represents one character. If you enter `love?`, all types of files with names starting with “love” and ending with a character are displayed, such as `lovey` and `lovei`. If you want to narrow the search scope, you can enter `love?.doc` to search for all `.doc` files with names starting with “love” and ending with a character, such as `lovey.doc` and `lovei.doc`.
- Anti-leech effects of different Referer settings

The following describes the effects of Referer settings:

- Disable Allow Empty Referer, as shown in the following figure:

**Direct access:** The resources are accessible even when anti-leech protection takes effect. The reason is, if the whitelist is blank, the system does not check whether the Referer field is blank. The Referer setting does not take effect when the whitelist is blank. Therefore, the Referer whitelist must be configured.

- Disable Allow Empty Referer and configure a Referer whitelist.

As shown in the preceding example, the Referer in the browser request is the URL of the current webpage. Therefore, it is necessary to know from which URL the request jumps and then specify the URL.

**Referer whitelist setting rules:**

- In the example, the Referer is `http://userdomain/error.html`. Therefore, the Referer whitelist can be set to `http://userdomain/error.html`. As the Referer check performed by OSS is based on prefix matching, access to other webpages such as `http://userdomain/index`

`.html` fails. To avoid this problem, you can set the Referer whitelist set to `http :// userdomain /.`

- To allow access to other domain names such as `http :// img . userdomain / index .html` , add `http ://*. userdomain /` to the Referer whitelist.

Both entries are configured as shown in the following figure:

After testing, the following results are obtained:

Browser input	Expectation	Result
<code>http://referer-test.oss-cn-hangzhou.aliyuncs.com/aliyun-logo.png</code>	Expectation for direct access with a blank Referer: Blank Referers are not allowed and OSS returns 403.	As expected
<code>http://userdomain/error.html</code>	Expectation for a request from the origin site: successful access.	As expected
<code>http://userdomain-steal/index.html</code>	Expectation for a request from a leeching site: OSS returns 403. Anti-leech protection is successful.	As expected
<code>http://img.userdomain/error.html</code>	Expectation for a request from a third-level domain of the origin site : successful access.	As expected

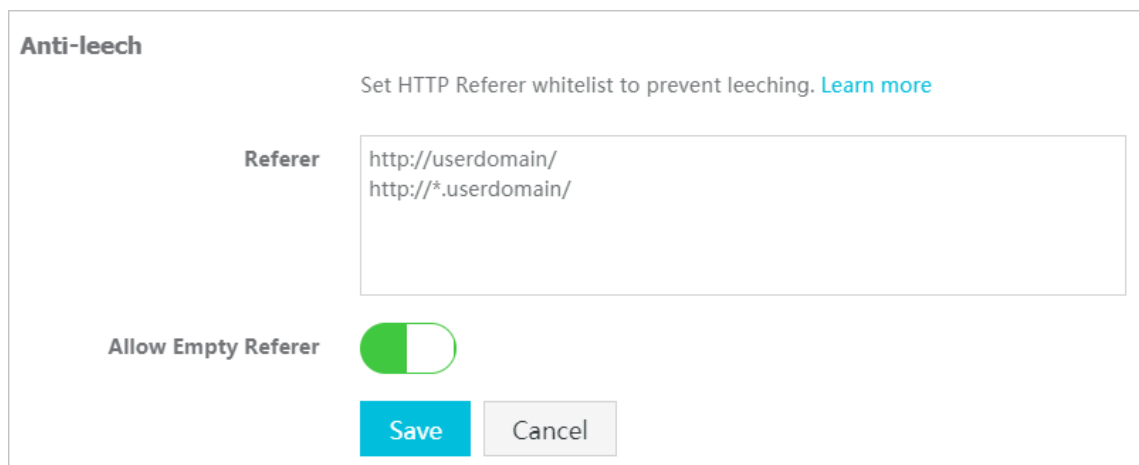


Note:

- In this test, the domain names only serve as examples, and are not the same as the actual domain names you use. Be sure to differentiate them.
- If the Referer whitelist only contains `http://userdomain/`, and the browser attempts to access the resources through the simulated third-level domain name `http://img.userdomain/error.html`, the third-level domain name fails to match any of the entries in the Referer whitelist, and OSS returns 403.

- Enable Allow Empty Referer and configure a Referer whitelist.

The Referer whitelist contains `http://*.userdomain/` and `http://userdomain/`, as shown in the following figure:



**Anti-leech**

Set HTTP Referer whitelist to prevent leeching. [Learn more](#)

**Referer**

`http://userdomain/`  
`http://*.userdomain/`

**Allow Empty Referer** ☒

**Save** **Cancel**

After testing, the following results are obtained:

Browser input	Expectation	Result
<code>http://referer-test.oss-cn-hangzhou.aliyuncs.com/aliyun-logo.png</code>	Expectation for direct access with a blank Referer: successful access	As expected
<code>http://userdomain/error.html</code>	Expectation for a request from the origin site: successful access	As expected
<code>http://userdomain-steal/index.html</code>	Expectation for a request from a leeching site: OSS returns 403. Anti-leech protection is successful.	As expected

Browser input	Expectation	Result
<a href="http://img.userdomain/error.html">http://img.userdomain/error.html</a>	Expectation for a request from a third-level domain of the origin site : successful access	As expected

- How to configure Referer on OSS

Functional use reference:

- API: [Put Bucket Referer](#)
- Console: [Anti-leech settings](#)
- Pros and cons of Referer anti-leech protection

Referer anti-leech protection can be easily configured on the console. The main drawback of the Referer anti-leech protection is that it cannot prevent access attempts by the malicious spoofing Referers. If a leecher uses an application to simulate HTTP requests with a spoofing Referer, the Referer can bypass anti-leech protection settings. If you have higher anti-leech protection requirements, consider using signed URL anti-leech protection.

### Signed URLs

For the principles and implementation methods for signed URLs, see [Authorizing third-Party download](#). A signed URL is implemented as follows:

1. Set the bucket permission to private.
2. Generate a signature based on the expected expiration time (the time when the signed URL expires).

### Specific implementation

1. Install the latest PHP code by referring to the [PHP SDK documentation](#).
2. Generate a signed URL and add it to the webpage as an external link, for example:

```
<? php
require 'vendor/autoload.php';
# Indicates the automatic loading function provided by
the latest PHP .
use OSS \ OssClient ;
# Indicates the namespace used .
$ accessKeyId =" a5etodit71 tlznjt3pdx ****";
# Indicates the AccessKeyId , which must be replaced
by the one you use .
$ accessKeySecret =" secret_key ";
# Indicates the AccessKeySecret , which must be
replaced by the one you use .
```

```

$ endpoint =" oss - cn - hangzhou . aliyuncs . com ";
# Indicates the Endpoint , selected based on the
region created by the bucket . In the example , the
endpoint is Hangzhou .
$ bucket = ' referer - test ';
# Indicates the bucket , which must be replaced by
the one you use .
$ ossClient = new OssClient ($ accessKeyId , $ accessKeySecret , $ endpoint );
$ object = " aliyun - logo . png ";
# Indicates the object to be signed .
$ timeout = 300 ;
# Indicates the expected link expiration time . The
value indicates that the link is valid for 300
seconds from when this line of code starts running
.
$ signedUrl = $ ossClient -> signUrl ($ bucket , $ object , $
timeout ); # Indicates the function used to implement
the signed URL .
$ img = $ signedUrl ;
# Indicates dynamically placing the signed URL in
image resources and printing it out .
$ my_html = "< html >";
$ my_html .= "< img src =\"\".$ img . \"\" />";
$ my_html .= "< p >\".$ img .\"< / p >";
$ my_html .= "< / html >";
echo $ my_html ;
? >

```

3. If the browser requests the resource multiple times, different signed URLs may be displayed. This is a normal phenomenon because the signed URL changes once it expires. After expiration time the link is no longer valid. It is displayed in Unix time format, for example, Expires=1448991693. The time can be converted to the local time. In Linux, the command for converting the time is `date -d @ 1448991693`

. You can also find a conversion tool on the Internet.

### Special instructions

Signed URLs can be used with the Referer whitelist function.

If the expiration time of signed URLs is limited to minutes, even when a leecher spoofs a Referer, the leecher needs to obtain the signed URL and complete leeching before the signed URL expires. Compared with the Referer method, this makes leeching more difficult. Using signed URLs with the Referer whitelist function provides enhanced anti-leech protection results.

### Conclusion

Best practices of OSS-based anti-leech protection:

- Use third-level domain name URLs, such as `referer - test . oss - cn - hangzhou . aliyuncs . com / aliyun - logo . png` , as they are more secure

than bound second-level domain names. The third-level domain name access method provides bucket-level cleaning and isolation, enabling you to respond to a burst in leeching traffic while preventing different buckets from affecting each other, thereby increasing service availability.

- If you use custom domain names as links, bind the CNAME to a third-level domain name, with the rule bucket + endpoint. For example, your bucket is named “test” and the third-level domain name is `test . oss - cn - hangzhou . aliyuncs . com`.
- Set the strictest possible permission for the bucket. For example, set a bucket that provides Internet services to public-read or private. Do not set it to public-read-write. For bucket permission information, see [Access control](#).
- Verify access sources and set a Referer whitelist based on your requirement.
- If you need a more rigorous anti-leeching solution, consider using signed URLs.
- Record access logs of the bucket, so that you can promptly discover leeching and verify the effectiveness of your anti-leeching solution.

## FAQ

- I have configured anti-leech protection on the OSS Console, but the configuration does not take effect. Access to webpages is blocked, whereas access to players is not. Why? How can this problem be fixed?

Currently, anti-leech protection fails to take effect for audio and video files. When a media player, such as Windows Media Player or Flash Player, is used to request OSS resources, a blank Referer request is sent. This causes anti-leech protection ineffective. To resolve this issue, you can see the preceding signed URL anti-leech protection method.

- What is a Referer? How is it sent? How to deal with HTTPS websites? Does anything else need to be added, like commas?

A Referer is a request header in the HTTP protocol. It is attached to a request that involves a page jump. You must check whether the Referer in the request sent by your browser is `http ://` or `https ://`. In normal cases, the Referer is `http ://`.

- How are signed URLs generated? Is storing the AccessKeySecret on the client secure?

See the individual SDK documentation for the method of signing the URL. It is not recommended that the AccessKeySecret be directly stored on the client. RAM provides the [STS service](#) to solve this problem. Also, see [RAM and STS Guide](#).

- How do I use wildcard characters (\*, ?) to write `a . baidu . com` and `b . baidu . com` ?

You can use `http ://*. baidu . com` . If the wildcard character represents a single character only, you can also use `http ://?. baidu . com` .

- \*.domain.com can match a second-level domain name, but does not match domain.com. Only adding a second entry of domain.com does not work either. What settings must be configured?

Note that a Referer generally includes a parameter such as http. You can view the request Referer in Chrome' s developer mode and then specify the corresponding Referer. As in this case, you may have forgotten to include `http ://`, which is required to be `http :// domain . com` .

- What must I do if anti-leech protection does not take effect?

We recommend that you use Chrome to solve the problem. Open developer mode and click on the Web page to view the `Referer` specific values in the HTTP request. Check whether the `Referer` value matches the Referer value configured on OSS. If they do not match, set the Referer value configured on OSS to the Referer value in the HTTP request. If the problem persists, open a ticket.

## 6.3 Static website hosting

This document describes the process and procedure about how to build a simple static website based on OSS right from the beginning and also includes FAQs as well. The following are the key steps:

1. Apply for a domain name.
2. Activate OSS and create a bucket.
3. Activate Static Website Hosting on OSS.
4. Access OSS with custom domain names.



## Static website hosting overview

You can build a simple static website page based on OSS. Once you activate this function, OSS provides a default homepage and a default 404 page. For more information, see [Static Website Hosting](#) in the developer guide.

### Procedure

1. Apply for a domain name
2. Activate OSS and create a bucket
  - a. Log on to the OSS console and create a bucket named “imgleo23” in Shanghai with the endpoint `oss - cn - shanghai . aliyuncs . com`. For detailed operation, see [Create a bucket](#).
  - b. Set the bucket permission to public-read. For detailed operation, see [Set bucket ACL](#).
  - c. Upload the content of index.htm and error.htm. For detailed operation, see [Upload objects](#).

- Body of index.html:

```
< html >
  < head >
    < title > Hello  OSS ! </ title >
    < meta  charset =" utf - 8 ">
  </ head >
  < body >
    < p > Welcome  to  OSS  Static  Website  Hosting .</
  p >
    < p > This  is  the  homepage .</ p >
  </ body >
</ html >
```

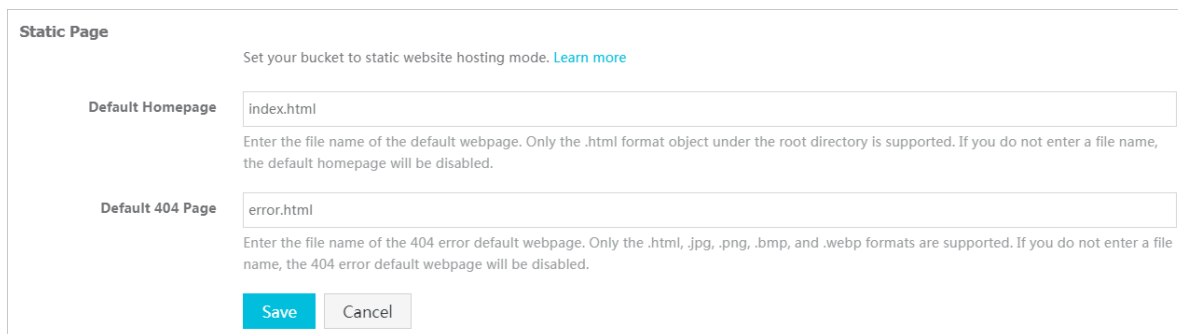
- Body of error.html:

```
< html >
  < head >
    < title > Hello  OSS ! </ title >
    < meta  charset =" utf - 8 ">
  </ head >
  < body >
    < p > This  is  an  error  homepage  for  OSS
  Static  Website  Hosting .</ p >
  </ body >
</ html >
```

- `aliyun - logo . png` is a picture.

### 3. Activate static website hosting on OSS

As shown in the following figure, once you log on to the OSS console, set **Default Homepage** to **index . html** and **Default 404 Page** to **error . html**. For more information, see [Set static website hosting](#).



**Static Page**

Set your bucket to static website hosting mode. [Learn more](#)

**Default Homepage**

Enter the file name of the default webpage. Only the .html format object under the root directory is supported. If you do not enter a file name, the default homepage will be disabled.

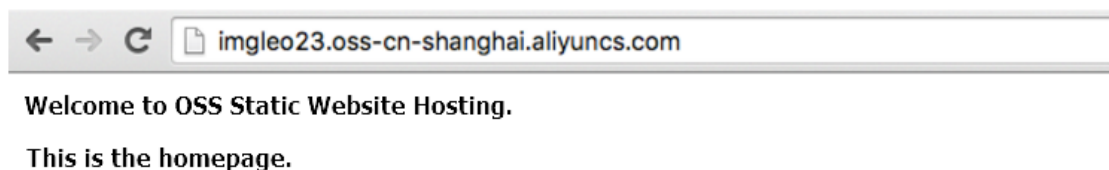
**Default 404 Page**

Enter the file name of the 404 error default webpage. Only the .html, .jpg, .png, .bmp, and .webp formats are supported. If you do not enter a file name, the 404 error default webpage will be disabled.

[Save](#) [Cancel](#)

To test the Static Website Hosting function, enter the URL as shown in the following figure:

- Display the default homepage:



When a similar URL is entered, the body of index.html specified upon activating the function is displayed.

- Display normal files

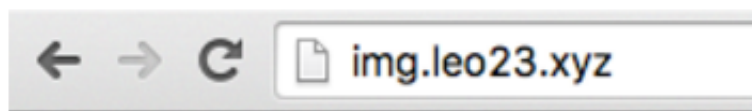


When a matched file for the entered URL is found, data is read successfully.

#### 4. Access OSS with custom domain names

For more information about how to access OSS with custom domain names, see [Access OSS with custom domain names](#).

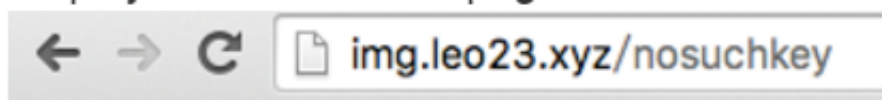
- Display the default homepage



**Welcome to OSS Static Website Hosting.**

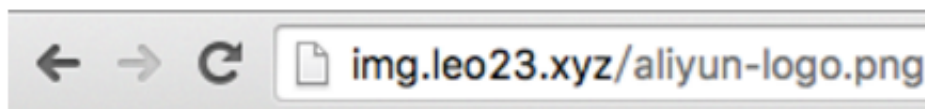
**This is the homepage.**

- Display the default 404 page



**This is an error homepage for OSS Static Website Hosting.**

- Display normal files



#### Note:

When you use an OSS endpoint in Mainland China regions or the Hongkong region to access a web file through the Internet, the Content-Disposition: 'attachment=filename;' is automatically added to the Response Header, and the web file is downloaded as an attachment. If you access OSS with a user domain, the Content-Disposition: 'attachment=filename;' will not be added to the Response Header. For more information about using the user domain to access OSS, see [Bind a custom domain name](#).

## FAQ

- What are the benefits of OSS Static Website Hosting?

An ECS instance is saved in case any user needs a relatively small amount of traffic. In the case of larger traffic volumes, CDN can be used.

- How is OSS priced? How does OSS work with CDN?

For pricing, see the OSS and CDN prices on Alibaba Cloud website. For cases on combination of OSS and CDN, see [CDN-based OSS acceleration practices](#).

- Do the default homepage and default 404 page both need to be set?

The default homepage needs to be set, whereas the default 404 page does not need to be set.

- Why does the browser return a 403 error after a URL is entered?

The reason may be that the bucket permission is not public-read, or your Static Website Hosting function is suspended due to overdue payment.

## 7 Data security

---

### 7.1 Check data transmission integrity by using 64-bit CRC

#### Background

An error may occur when data is transmitted between the client and the server. Currently, OSS can return the 64-bit CRC value for an object uploaded in any mode. To check the data integrity, the client can compare the 64-bit CRC value with the locally calculated value.

- OSS calculates 64-bit CRC value for newly uploaded object, stores the result as metadata of the object, and then adds the `x-oss-hash-crc64ecma` header to the returned response header, indicating its 64-bit CRC value. This 64-bit CRC is calculated according to ECMA-182 Standard.
- For the object that already exists on OSS before the 64-bit CRC goes live, OSS does not calculate its 64-bit CRC value. Therefore, its 64-bit CRC value is not returned when such object is obtained.

#### Operation instructions

- Put Object / Append Object / Post Object / Multipart upload part returns the corresponding 64-bit CRC value. The client can get the 64-bit CRC value returned by the server after the upload is completed and can check it against the locally calculated value.
- In the case of Multipart Complete, if all the parts have their respective 64-bit CRC values, then the 64-bit CRC value of the entire object is returned. Otherwise, the 64-bit CRC value is not returned (for example, if a part has been uploaded before the 64-bit CRC goes live).
- Get Object / Head Object / Get ObjectMeta returns the corresponding 64-bit CRC value (if any). After Get Object is completed, the client can get the 64-bit CRC value returned by the server and check it against the locally calculated value.



#### Note:

The 64-bit CRC value of the entire object is returned for the range get object.

- For copy related operations, for example, Copy Object/Upload Part Copy, the newly generated object/Part may not necessarily have the 64-bit CRC value.

## Python example

An example of complete Python code is as follows. It shows how to check data transmission integrity based on the 64-bit CRC value.

### 1. Calculate the 64-bit CRC value.

```
import oss2
from oss2.models import PartInfo
import os
import crcmod
import random
import string
do_crc64 = crcmod.mkCrcFun(0x142F0E1E BA9EA3693L, initCrc
= 0L, xorOut = 0xffffffffL, rev = True)
def check_crc64 (local_crc64, oss_crc64, msg="check
crc64 "):
    if local_crc64 != oss_crc64:
        print "{0} check crc64 failed. local:{1}, oss:{2}
.".format(msg, local_crc64, oss_crc64)
        return False
    else:
        print "{0} check crc64 ok.".format(msg)
        return True
def random_string (length):
    return ''.join(random.choice(string.lowercase) for i
in range(length))
bucket = oss2.Bucket(oss2.Auth(access_key_id,
access_key_secret), endpoint, bucket_name)
```

### 2. Verify Put Object.

```
content = random_string(1024)
key = 'normal-key'
result = bucket.put_object(key, content)
oss_crc64 = result.headers.get('x-oss-hash-crc64ecma', '')
local_crc64 = str(do_crc64(content))
check_crc64(local_crc64, oss_crc64, "put object")
```

### 3. Verify Get Object.

```
result = bucket.get_object(key)
oss_crc64 = result.headers.get('x-oss-hash-crc64ecma', '')
local_crc64 = str(do_crc64(result.resp.read()))
check_crc64(local_crc64, oss_crc64, "get object")
```

### 4. Verify Upload Part and Complete.

```
part_info_list = []
key = "multipart-key"
result = bucket.init_multipart_upload(key)
upload_id = result.upload_id
part_1 = random_string(1024 * 1024)
result = bucket.upload_part(key, upload_id, 1,
part_1)
oss_crc64 = result.headers.get('x-oss-hash-crc64ecma', '')
local_crc64 = str(do_crc64(part_1))
```

```
# Check whether the uploaded part 1 data is
complete
check_crc64 ( local_crc64 , oss_crc64 , " upload_part
object_1 ")
part_info_list . append ( PartInfo ( 1 , result . etag , len (
part_1 )))
part_2 = random_string ( 1024 * 1024 )
result = bucket . upload_part ( key , upload_id , 2 ,
part_2 )
oss_crc64 = result . headers . get ( ' x - oss - hash - crc64ecma
', '' )
local_crc64 = str ( do_crc64 ( part_2 ))
# Check whether the uploaded part 2 data is
complete
check_crc64 ( local_crc64 , oss_crc64 , " upload_part
object_2 ")
part_info_list . append ( PartInfo ( 2 , result . etag , len (
part_2 )))
result = bucket . complete_multipartupload ( key ,
upload_id , part_info_list )
oss_crc64 = result . headers . get ( ' x - oss - hash - crc64ecma
', '' )
local_crc64 = str ( do_crc64 ( part_2 , do_crc64 ( part_1 )))
# Check whether the final object on the OSS is
consistent with the local file
check_crc64 ( local_crc64 , oss_crc64 , " complete object
")
```

## OSS SDK support

Part of the OSS SDK already supports the data validation using crc64 for the upload and download, as shown in the following table:

SDK	Support for CRC?	Example
Java SDK	Yes	<a href="#">CRCSample.java</a>
Python SDK	Yes	<a href="#">object_check.py</a>
PHP SDK	No	N/A
C# SDK	No	None
C SDK	Yes	<a href="#">oss_crc_sample.c</a>
JavaScript SDK	No	None
Go SDK	Yes	<a href="#">crc_test.go</a>
Ruby SDK	No	None
iOS SDK	Yes	<a href="#">OSSCrc64Tests.m</a>
Android SDK	Yes	<a href="#">OSSCrc64Tests.m</a>

## 7.2 Protect data through client encryption

Client encryption means that the encryption is completed before the user data is sent to the remote server, whereas the plaintext of the key used for encryption is kept in the local computer only. Therefore, the security of user data can be ensured because others cannot decrypt the data to obtain the original data even if the data leaks.

This document describes how to protect data through client encryption based on the current Python SDK version of OSS.

### Principles

1. The user maintains a pair of RSA keys ( `rsa_private_key` and `rsa_public_key` ) in the local computer.
2. Each time when any object is uploaded, a symmetric key `data_key` of AES256 type is generated randomly, and then `data_key` is used to encrypt the original content to obtain `encrypt_content`.
3. Use `rsa_public_key` to encrypt `data_key` to obtain `encrypt_data_key` , place it in the request header as the custom meta of the user, and send it together with `encrypt_content` to the OSS.
4. When Get Object is performed, `encrypt_content` and `encrypt_data_key` in the custom meta of the user are obtained first.
5. The user uses `rsa_private_key` to decrypt `encrypt_data_key` to obtain `data_key` , and then uses `data_key` to decrypt `encrypt_content` to obtain the original content.

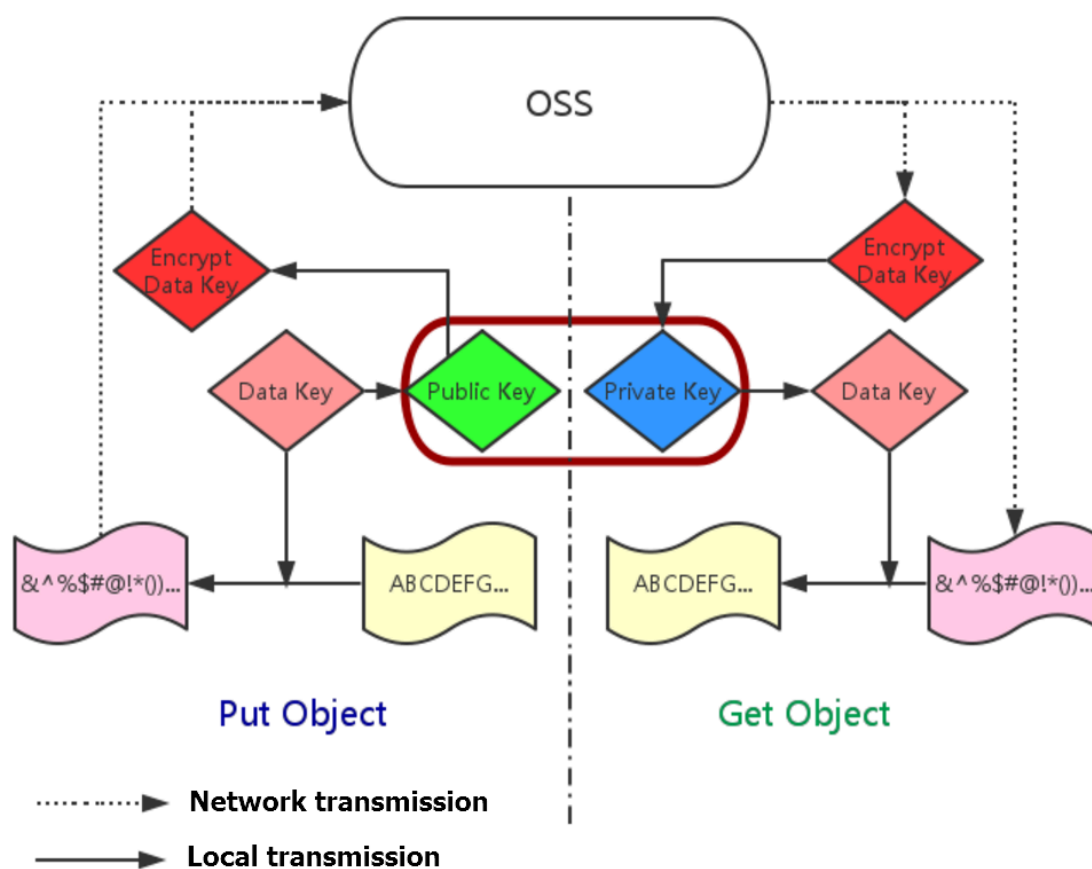


#### Note:

The user's key in this document is an asymmetric RSA key, and the AES256-CTR algorithm is used when object content is encrypted. For more information, see [PyCrypto Document](#). This document describes how to implement client encryption through the custom meta of an object. The user can select the encryption key type and encryption algorithm as required.



## Structural diagram



## Preparation

1. For installation and usage of the Python SDK, see [Quick Installation of Python SDK](#).
2. Install the PyCrypto library.

```
pip install pycrypto
```

## Example of complete Python code

```
# -*- coding : utf - 8 -*-
import os
import shutil
import base64
import random
import oss2
from Crypto . Cipher import PKCS1_OAEP
from Crypto . PublicKey import RSA
from Crypto . Cipher import AES
from Crypto import Random
from Crypto . Util import Counter
# aes 256 , key always is 32 bytes
_AES_256_K_EY_SIZE = 32
_AES_CTR_C_OUNTER_BIT_S_LEN = 8 * 16
class AESCipher :
    def __init__ ( self , key = None , start = None ) :
        self . key = key
```

```

        self . start = start
        if not self . key :
            self . key = Random . new () . read ( _AES_256_K
EY_SIZE )
        if not self . start :
            self . start = random . randint ( 1 , 10 )
            ctr = Counter . new ( _AES_CTR_COUNTER_BIT_S_LEN ,
initial_value = self . start )
            self . cipher = AES . new ( self . key , AES . MODE_CTR ,
counter = ctr )
            def encrypt ( self , raw ):
                return self . cipher . encrypt ( raw )
            def decrypt ( self , enc ):
                return self . cipher . decrypt ( enc )
# First , initialize the information such as AccessKeyId , AccessKeySecret , and Endpoint .
# Obtain the information through environment variables
or replace the information such as "< Your
AccessKeyId >" with the real AccessKeyId , and so on
.

# Use Hangzhou region as an example . Endpoint can be
:
# http :// oss - cn - hangzhou . aliyuncs . com
# https :// oss - cn - hangzhou . aliyuncs . com
# Access using the HTTP and HTTPS protocols respective
ly .
access_key_id = os . getenv ( ' OSS_TEST_ACCESS_KEY_ID ' , '<
your AccessKeyId >' )
access_key_secret = os . getenv ( ' OSS_TEST_ACCESS_KEY_SECRET
' , '< Your AccessKeySecret >' )
bucket_name = os . getenv ( ' OSS_TEST_BUCKET ' , '< Your
Bucket >' )
endpoint = os . getenv ( ' OSS_TEST_ENDPOINT ' , '< Your Access
Domain Name >' )
# Make sure that all the preceding parameters have
been filled in correctly .
for param in ( access_key_id , access_key_secret ,
bucket_name , endpoint ):
    assert '<' not in param , ' Please set the parameter
:' + param
#### 0 prepare #####
# 0 . 1 Generate the RSA key file and save it to
the disk
rsa_private_key_obj = RSA . generate ( 2048 )
rsa_public_key_obj = rsa_private_key_obj . publickey ()
encrypt_obj = PKCS1_OAEP . new ( rsa_public_key_obj )
decrypt_obj = PKCS1_OAEP . new ( rsa_private_key_obj )
# save to local disk
file_out = open ( " private_key . pem " , " w " )
file_out . write ( rsa_private_key_obj . exportKey () )
file_out . close ()
file_out = open ( " public_key . pem " , " w " )
file_out . write ( rsa_public_key_obj . exportKey () )
file_out . close ()
# 0 . 2 Create the Bucket object . All the object -
related interfaces can be implemented by using the
Bucket object
bucket = oss2 . Bucket ( oss2 . Auth ( access_key_id ,
access_key_secret ) , endpoint , bucket_name )
obj_name = ' test - sig - 1 '
content = " test content "
#### 1 Put Object ####

```

```

# 1.1 Generate the one-time symmetric key encrypt_cipher
# used to encrypt this object, where key and start
# are values generated at random
encrypt_cipher = AESCipher()
# 1.2 Use the public key to encrypt the information
# for assisting encryption, and save it in the
# custom meta of the object. When Get Object is
# performed later, we can use the private key to
# perform decryption and obtain the original content
# according to the custom meta
headers = {}
headers['x-oss-meta-x-oss-key'] = base64.b64encode(
    encrypt_cipher.encrypt(encrypt_cipher.key))
headers['x-oss-meta-x-oss-start'] = base64.b64encode(
    encrypt_cipher.encrypt(str(encrypt_cipher.start)))
# 1.3 Use encrypt_cipher to encrypt the original
# content to obtain encrypted content
encrypted_content = encrypt_cipher.encrypt(content)
# 1.4 Upload the object
result = bucket.put_object(obj_name, encrypted_content,
    headers)
if result.status / 100 != 2:
    exit(1)
#### 2 Get Object ####
# 2.1 Download the encrypted object
result = bucket.get_object(obj_name)
if result.status / 100 != 2:
    exit(1)
resp = result.resp
download_encrypted_content = resp.read()
# 2.2 Resolve from the custom meta the key and
# start that are previously used to encrypt this object

download_encrypted_key = base64.b64decode(resp.headers.get(
    'x-oss-meta-x-oss-key', ''))
key = decrypt_cipher.decrypt(download_encrypted_key)
download_encrypted_start = base64.b64decode(resp.headers.get(
    'x-oss-meta-x-oss-start', ''))
start = int(decrypt_cipher.decrypt(download_encrypted_start))
# 2.3 Generate the cipher used for decryption, and
# decrypt it to obtain the original content
decrypt_cipher = AESCipher(key, start)
download_content = decrypt_cipher.decrypt(download_encrypted_content)
if download_content != content:
    print "Error!"
else:
    print "Decrypt ok. Content is: %s" % download_content

```

## 7.3 Protect data by performing server-side encryption

You can protect static data by performing server-side encryption. If you enable the server-side encryption function, OSS encrypts user data (that is, the objects) when writing the data into the hard disks deployed in the data center and automatically

decrypts the data when it is accessed. Authentication is performed on users who access the encrypted data.

**Note:**

For more information about server-side encryption, see [Server-side encryption](#).

OSS supports the following three server-side encryption methods:

- Server-side encryption fully managed by OSS (SSE-OSS)

When sending a request to upload an object or modify the metadata of an object, you can include the `x-oss-server-side-encryption` header in the request and specify its value as AES256. In this method, OSS uses AES256 to encrypt each object with an individual key. Furthermore, the individual keys are encrypted by a customer master key (CMK) that is updated periodically for higher security.

- Server-side encryption using the default managed CMK (SSE-KMS)

When sending a request to upload an object or modify the metadata of an object, you can include the `x-oss-server-side-encryption` header in the request and specify its value as KMS without a specified CMK ID. In this method, OSS generates an individual key to encrypt each object by using the default managed CMK, and automatically decrypts the object when it is downloaded.

- Server-side encryption using a CMK specified by the user (SSE-KMS)

When sending a request to upload an object or modify the metadata of an object, you can include the `x-oss-server-side-encryption` header in the request, specify its value as KMS, and specify the value of `x-oss-server-side-encryption-key-id` to a specified CMK ID. In this method, OSS generates an individual key to encrypt each object by using the specified CMK, and adds the CMK ID used to encrypt an object into the metadata of the object so that the object is automatically decrypted when it is downloaded by an authorized user. You can use key material generated by the system automatically or import key material from an external source.

**Notice:**

- Only one server-side encryption method can be used for an object at one time.

- If you use a CMK to encrypt an object, the data key used in the encryption is also encrypted and is stored as the metadata of the object.
- In server-side encryption that uses the default managed CMK, only the data in the object is encrypted. The metadata of the object is not encrypted.
- Fees for API calls are incurred if you use a CMK to encrypt an object.
- To use a RAM user to encrypt objects with a specified CMK, you must grant the relevant permissions to the RAM user. For more information, see [Use RAM for KMS resource authorization](#).

### Perform server-side encryption fully managed by OSS

1. Log on to the [OSS console](#) and create a bucket. For more information, see [Create a bucket](#).
2. Upload an object in plaintext to OSS. For more information, see [Upload an object](#).
3. Encrypt the uploaded object by running the following Python script:

```
# -*- coding: utf-8 -*-
import oss2

# It is highly risky to log on with AccessKey of an Alibaba Cloud
# account because the account has permissions on all the APIs in
# OSS. We recommend that you log on as a RAM user to access APIs
# or perform routine operations and maintenance. To create a RAM
# account, log on to the RAM console .
auth = oss2.Auth('<yourAccessKeyId>', '<yourAccessKeySecret>')
# This example uses the endpoint oss-cn-hongkong (Hong Kong).
# Specify the actual endpoint based on your requirements.

bucket = oss2.Bucket(auth, 'http://oss-cn-hongkong.aliyuncs.com',
    'test-hongkong-2025')

bucket.update_object_meta('01.txt',{'x-oss-server-side-
    encryption':'AES256'})
```

4. Verify the encryption result.

Use [ossutil](#) to view the object before and after the encryption.

- Before encryption:

```
D : \ 5 - AK_account \ ossutil64 > ossutil64 . exe stat oss
:// test - hongkong - 2025 / 01 . txt
ACL : default
Accept - Ranges : bytes
Content - Length : 62
Content - Md5 : k2GA4LeqHv VpQvBfnleN Og ==
Content - Type : text / plain
Etag : 936180E0B7 AA1EF56942
F05F9E578D 3A
```

```

Last - Modified          : 2018 - 10 - 24 20 : 41 : 54 +
0800 CST
Owner                   : 14166xxxxx x36597
X - Oss - Hash - Crc64ecma : 9888192182 077127097
X - Oss - Object - Type   : Normal
X - Oss - Storage - Class : Standard

```

• **After encryption:**

```

D :\ 5 - AK_account \ ossutil64 > ossutil64 . exe stat oss
:// test - hongkong - 2025 / 01 . txt
ACL                      : default
Accept - Ranges          : bytes
Content - Length         : 62
Content - Md5            : k2GA4LeqHv VpQvBfnleN Og ==
Content - Type           : text / plain
Etag                    : 936180E0B7 AA1EF56942
F05F9E578D 3A
Last - Modified          : 2018 - 10 - 24 20 : 46 : 39 +
0800 CST
Owner                   : 14166xxxxx x36597
X - Oss - Hash - Crc64ecma : 9888192182 077127097
X - Oss - Object - Type   : Normal
X - Oss - Server - Side - Encryption : AES256
X - Oss - Storage - Class : Standard

```

Perform server-side encryption using the default CMK managed by OSS

1. Log on to the [OSS console](#) and create a bucket. For more information, see [Create a bucket](#).
2. Upload an object in plaintext to OSS. For more information, see [Upload an object](#).
3. Activate KMS in [Alibaba Cloud product management page](#).
4. Encrypt the uploaded object by running the following Python script:

```

# -*- coding: utf-8 -*-
import oss2

# It is highly risky to log on with AccessKey of an Alibaba Cloud
# account because the account has permissions on all the APIs in
# OSS. We recommend that you log on as a RAM user to access APIs
# or perform routine operations and maintenance. To create a RAM
# account, log on to the RAM console .
auth = oss2.Auth('<yourAccessKeyId>', '<yourAccessKeySecret>')
This example uses the endpoint oss-cn-hongkong (Hong Kong). Specify
the actual endpoint based on your requirements.
bucket = oss2.Bucket(auth, 'http://oss-cn-hongkong.aliyuncs.com',
'test-hongkong-2025')

```

```
bucket.update_object_meta('01.txt',{'x-oss-server-side-encryption':'KMS'})
```

Perform server-side encryption using a CMK specified by the user

1. Log on to the [OSS console](#) and create a bucket. For more information, see [Create a bucket](#).
2. Upload an object in plaintext to OSS. For more information, see [Upload an object](#).
3. Activate KMS in [Alibaba Cloud product management page](#).
4. Log on to the [KMS console](#). Click Create Key and configure the following options to create a CMK in the same region as the OSS bucket.
  - Customize the description for the key in Description.
  - Select Alibaba Cloud KMS for Key Material Source under Advanced.



Note:

You can also import an external key. For more information, see [Import key material](#).

5. Use the ID of the created CMK to encrypt the upload object by running the following Python script:

```
# -*- coding: utf-8 -*-
import oss2

# It is highly risky to log on with AccessKey of an Alibaba Cloud
# account because the account has permissions on all the APIs in
# OSS. We recommend that you log on as a RAM user to access APIs
# or perform routine operations and maintenance. To create a RAM
# account, log on to the RAM console .
auth = oss2.Auth('<yourAccessKeyId>', '<yourAccessKeySecret>')
# This example uses the endpoint oss-cn-hongkong (Hong Kong).
# Specify the actual endpoint based on your requirements.
bucket = oss2.Bucket(auth, 'http://oss-cn-hongkong.aliyuncs.com',
    'test-hongkong-2025')

bucket.update_object_meta('01.txt',{'x-oss-server-side-encryption':'KMS','x-oss-server-side-encryption-key-id':
    '33701a45-6723-4a04-a367-68c060382652'})
```

## 8 Terraform

---

### 8.1 Introduction

Terraform is an open-source automatic resource orchestration tool that supports multiple cloud service providers. Alibaba Cloud (referenced as [terraform-alicloud-provider](#) in Terraform) allows developers to easily build, update, and version their infrastructure in the Alibaba Cloud Terraform ecosystem by supporting over 90 resources and data sources across more than 20 products and services.

[HashiCorp Terraform](#) is an automatic IT infrastructure orchestration tool that can manage and maintain IT resources by using code. The easy to use Command Line Interface (CLI) of Terraform allows you to deploy configuration files on Alibaba Cloud or any other supported cloud, and control the versions of the configuration files. The CLI provides code for the infrastructures (such as VMs, storage accounts, and network interfaces) defined in the configuration files that describe the cloud resource topology. The Command Line Interface (CLI) of Terraform provides a simple mechanism, which is used to deploy configuration files on Alibaba Cloud or any other supported cloud and control the versions of the configuration files. Terraform is a highly scalable tool that supports new infrastructures through providers. You can use Terraform to create, modify, or delete multiple resources, such as ECS, VPC, RDS, and SLB.

#### Functions of OSS Terraform module

You can use the OSS Terraform module to manage buckets and objects. For example:

- Bucket management functions:
  - Creates a bucket.
  - Configures an ACL for a bucket.
  - Configures Cross-Origin Resource Sharing (CORS) for a bucket.
  - Sets logging for a bucket.
  - Configures static website hosting for a bucket.
  - Configures referers for a bucket.
  - Configures the lifecycle rules of a bucket.



- Object management functions:
  - Uploads an object.
  - Configures server-end encryption for an object.
  - Sets an ACL for an object.
  - Sets Object Meta.

#### References

- For the installation and usage of Terraform, see [Use Terraform to manage OSS](#).
- To download the OSS Terraform module, see [terraform-alicloud-modules](#).
- For more information about the OSS Terraform module, see [alicloud\\_oss\\_bucket](#).

## 8.2 Use Terraform to manage OSS

This topic describes how to install and configure Terraform and how to use Terraform to manage OSS.

#### Install and configure Terraform

Before using Terraform, follow these steps to install and configure Terraform:

1. Download the software package applicable to your operating system from [Terraform official website](#). In this topic, Terraform is installed and configured in a Linux operating system as an example.
2. Extract the software package to the `/usr/local/bin` directory. If you extract the executable file to another directory, you must add the directory to global variables.
3. Run Terraform to verify the directory configuration. If a list of available Terraform options is displayed, Terraform is installed.

```
[ root @ test  bin ]# terraform
```

```
Usage : terraform [- version ] [- help ] < command > [ args ]
```

#### 4. Create and authorize a RAM user.

- a. Log on to the [RAM console](#).
- b. Create a RAM user named `Terraform` and create an AccessKey for the user.  
For more information, see [Create a RAM user](#).
- c. Authorize the RAM user. You can add relevant permissions to the Terraform RAM user as needed. For detailed steps, see [Authorize RAM users](#).



#### Notice:

To maintain data security, do not use the AccessKey of your Alibaba Cloud account to configure Terraform.

#### 5. Create a test directory named `terraform - test`. You must create a separate directory for each Terraform project.

```
[ root @ test bin ]# mkdir terraform - test
```

#### 6. Enter the `terraform - test` directory.

```
[ root @ test bin ]# cd terraform - test
[ root @ test terraform - test ]#
```

#### 7. Create a configuration file. Terraform reads all `*.tf` and `*.tfvars` files in the `terraform - test` directory when running. Therefore, you can write configuration information to different files as needed. Some common configuration files are described as follows:

<code>provider .tf</code>	-- Used to configure providers .
<code>terraform .tfvars</code>	-- Used to configure the
<code>variables required to configure providers .</code>	
<code>variable .tf</code>	-- Used to configure universal
<code>variables .</code>	
<code>resource .tf</code>	-- Used to define resources .
<code>data .tf</code>	-- Used to define package files
<code>.</code>	
<code>output .tf</code>	-- Used to configure the output
<code>.</code>	

For example, when you create the `provider .tf` file, you can configure your authentication information as follows:

```
[ root @ test terraform - test ]# vim provider .tf
provider "alicloud" {
  region      = "cn-beijing"
  access_key  = "LTA ***** N02 "
```

```
secret_key = " M0k8x0 ***** wwff "
```

For more information about configurations, see [alicloud\\_oss\\_bucket](#).

## 8. Initialize your working directory.

```
[ root @ test terraform - test ]# terraform init
```

```
Initializi ng provider plugins ...
- Checking for available provider plugins on https ://
  releases . hashicorp . com ...
- Downloadin g plugin for provider " alicloud " ( 1 . 25 .
  0 )...
```

The following providers do not have any version constraint s in configurat ion , so the latest version was installed .

To prevent automatic upgrades to new major versions that may contain breaking changes , it is recommende d to add version = "... " constraint s to the correspond ing provider blocks in configurat ion , with the constraint strings suggested below .

```
* provider . alicloud : version = "~> 1 . 25 "
```

Terraform has been successful ly initialize d !

You may now begin working with Terraform . Try running " terraform plan " to see any changes that are required for your infrastruc ture . All Terraform commands should now work .

If you ever set or change modules or backend configurat ion for Terraform , rerun this command to reinitiali ze your working directory . If you forget , other commands will detect it and remind you to do so if necessary .



### Notice:

After creating a working directory and configuration files for a Terraform project, you must initialize the working directory.

You can use Terraform after completing the preceding steps.

## Use Terraform to manage OSS

After Terraform is installed, you can run commands in Terraform to manage OSS. Some common commands are described as follows:

- `terraform plan` : You can run this command to view the operations to be executed by a configuration file.

For example, you add a configuration file named `test.tf` that is used to create a bucket as follows:

```
[ root @ test terraform - test ]# vim test.tf
resource "alicloud_oss_bucket" "bucket" {
  bucket = "figo-chen-2020"
  acl    = "private"
}
```

In this case, you can run the `terraform plan` command to view the operations to be executed by the `test.tf` configuration file.

```
[ root @ test terraform - test ]# terraform plan
Refreshing Terraform state in-memory prior to plan
...
The refreshed state will be used to calculate this
plan, but will not be persisted to local or remote state storage.
```

-----

An execution plan has been generated and is shown below.  
Resource actions are indicated with the following symbols:

- + create

Terraform will perform the following actions:

```
+ alicloud_oss_bucket.bucket
   id: < computed >
   acl: "private"
   bucket: "figo-chen-2020"
   creation_date: < computed >
   extranet_endpoint: < computed >
   intranet_endpoint: < computed >
   location: < computed >
   logging_is_enabled: "true"
   owner: < computed >
   referer_policy: < computed >
   storage_class: < computed >
```

```
Plan: 1 to add, 0 to change, 0 to destroy.
```

-----

Note : You didn't specify an "- out " parameter to save this plan , so Terraform can't guarantee that exactly these actions will be performed if " terraform apply " is subsequently run .

- terraform apply : You can run this command to execute a configuration file in the working directory.

For example, if you want to create a bucket named *figo - chen - 2020* , you must add a configuration file named *test . tf* that is used to create the bucket as follows:

```
[ root @ test terraform - test ]# vim test . tf
resource "alicloud_oss_bucket" "bucket - acl" {
  bucket = "figo - chen - 2020"
  acl    = "private"
}
```

Then you can run the `terraform apply` command to execute the configuration file.

```
[ root @ test terraform - test ]# terraform apply

An execution plan has been generated and is shown below .
Resource actions are indicated with the following symbols :
+ create

Terraform will perform the following actions :

+ alicloud_oss_bucket . bucket - acl
  id : < computed >
  acl : "private"
  bucket : "figo - chen - 2020"
  creation_date : < computed >
  extranet_endpoint : < computed >
  intranet_endpoint : < computed >
  location : < computed >
  logging_is_enabled : "true"
  owner : < computed >
  referer_configuration : < computed >
  storage_class : < computed >

Plan : 1 to add , 0 to change , 0 to destroy .

Do you want to perform these actions ?
Terraform will perform the actions described above .
Only 'yes' will be accepted to approve .

Enter a value : yes

alicloud_oss_bucket . bucket - acl : Creating ...
acl : "" => "private"
bucket : "" => "figo - chen - 2020"
creation_date : "" => "< computed >"
```

```

extranet_endpoint : "" => "< computed >"
intranet_endpoint : "" => "< computed >"
location : "" => "< computed >"
logging_is_enable : "" => "true"
owner : "" => "< computed >"
referrer_policy : "" => "< computed >"
storage_class : "" => "< computed >"
alicloud_oss_bucket.bucket - acl : Creation complete after
1s ( ID : figo - chen - 2020 )

Apply complete ! Resources : 1 added , 0 changed , 0
destroyed .

```

**Note:**

After you execute the configuration file, a new bucket is created if the `figo - chen - 2020` bucket does not exist. If the `figo - chen - 2020` bucket already exists and is an empty bucket that is created by Terraform, the bucket is deleted and a new bucket with the same name is created.

- `terraform destroy` : You can run this command to delete an empty bucket that is created by Terraform.
- `terraform import` : You can run this command to import a bucket that is not created by Terraform.

For example, you create a configuration file named `main.tf` and add configurations to the file as follows:

```

[ root @ test terraform - test ]# vim main.tf
resource "alicloud_oss_bucket" "bucket" {
  bucket = "test - hangzhou - 2025"
  acl    = "private"
}

```

Then you can run the following command to import the `test - hangzhou - 2025` bucket:

```

terraform import alicloud_oss_bucket.bucket test -
hangzhou - 2025

```

**References**

- For more bucket configuration examples, see [alicloud\\_oss\\_bucket](#).
- For more object configuration examples, see [alicloud\\_oss\\_bucket\\_object](#).