Object Storage Service

Image Processing Guide

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Image Processing Guide

Image Processing

Alibaba Cloud OSS Image Processing (IMG) is an image processing service that features massive capacity, high security, low costs, and high reliability. By uploading and storing original images in OSS, you can process images anytime, anywhere, on any Internet device through a simple RESTful API. IMG offers image processing APIs. To upload images, use the OSS upload API. IMG is a great solution for you to build image-related services.

> **Note:** IMG is activated automatically when you activate OSS.

Basic features

IMG provides the following features:

- Retrieving image information
- Converting image formats
- Scaling, cropping, and rotating images
- Adding images, texts, and text-and-image watermarks to images
- Customizing image processing styles
- Calling multiple image processing features in a set sequence through pipelines

Previous versions

IMG now has two API versions. This article introduces the features of the new version. Features of the old APIs will not be updated. For compatibility details, see here.

Quick start

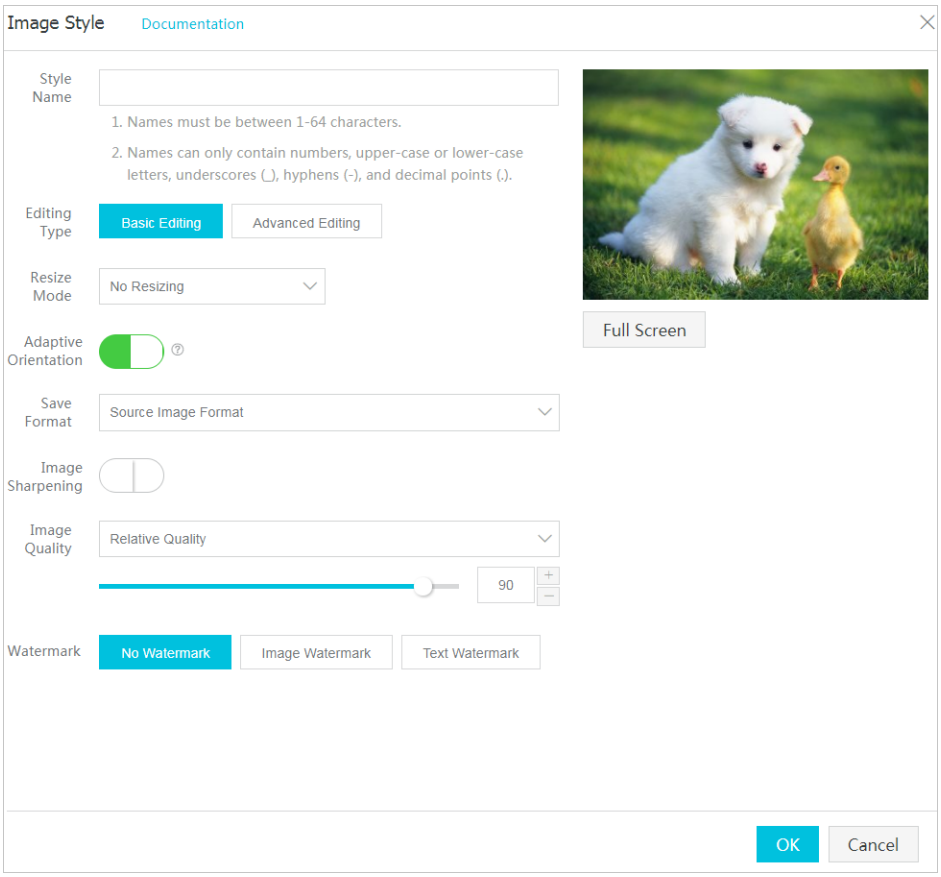
Create an image style

Log on to the OSS console.

Click your bucket name to go to the **Overview** page of the bucket.

On the **Overview** page, click **Image Processing**, and then click **Create Style**.

Create an image style in the **Image Style** page, as shown in the following figure:



Details about the Image Style page:

Style Name: Name of the image style to create. We recommend you give the style a meaningful name so that you can remember it easily, such as XX watermark image rotation.

Editing Type: You can select "Basic editing" to edit the image style with graphical operations. You can also select "Advanced editing" to edit the image style using an SDK or parameters.

Resize Mode: Set the scaling mode for the image.

> **Note:** The "long side" refers the side with a bigger source size to target size ratio. The same applies to the "short side". For example, for an original image that is scaled from 400x200 to 800x100, the original-to-target ratios are 0.5 (400/800) and 2 (200/100). Because 0.5 is less than 2, the 200 side is the longer side, and the 400 side the shorter one.

Thumbnail Size: Set the thumbnail size for the image.

Thumbnail Limit: Set whether to set a restriction for image resizing.

Adaptive Orientation: Set the adaptive orientation for the image.

Image Sharpening: Set whether the image needs to be sharpened.

Image Quality: Set the image quality.

Watermark: Set the image watermark mode.

Edit the image style and click **OK** to save the style.

After creating the new image style, you can apply it to your images through OSS.

Apply an image style

Log on to the OSS console.

Click your bucket name to go to the **Overview** page of the bucket.

On the **Overview** page, click **Files** to select an existing image or upload a new image.

Click the image selected to open the **Preview** page and select your image style name as shown in the following figure:

You can view the processed image in the preview window immediately. A public network access address with the image style is generated at the same time. You only need to click **Copy File URL** to get the access address to the file.

Image Service access rules

In Image Service, URLs are accessed with standard HTTP GET requests, and all processing parameters are in the QueyString of the URL.

Request for thumbnails through processing parameters

If you want to have a source image processed and then returned, the following two formats are available:

URL

Access through a third-level domain name: http://bucket.<endpoint>/object?x-oss-process=image/action,parame_value

Bucket: your Image Service channel.

endpoint: the access domain name for a Bucket’s data center.

Object: In Image Service, an Object is the basic data unit for operating images. It is the same as the Object specified for the OSS instance. The maximum size of a single Object (that is, each image) is 20 MB.

action: the operation to be performed on the image.

parame: the parameter which indicates the operation to be performed on the image.

Combination of multiple actions

Multiple actions are executed in sequence. For example, image/resize,w_200/rotate,90 has the effect of scaling down an image to 200 in width and then rotating the image 90 degrees.

Example

Assume that the requested Bucket is image-demo and located in China East 1 (Hangzhou), with the domain name oss-cn-hangzhou.aliyuncs.com, and the requested image is example.jpg. The URL format for scaling down the image to 200 in width is:

```
http://image-demo.oss-cn-hangzhou.aliyuncs.com/example.jpg?x-oss-process=image/resize,w_200
```

The URL format for HTTPS access is:

```
https://image-demo.oss-cn-hangzhou.aliyuncs.com/example.jpg?x-oss-process=image/resize,w_200
```

The URL format for access through a custom domain name is:

```
http://userdomain/object?x-oss-process=image/action,parame_value
```

Request for thumbnails through styles

Style

Image Service allows you to save image processing operations and parameters as an alias, that is, a style. With styles, a series of operations can be achieved through a short URL.

- A Channel can have multiple styles. Currently, a Channel is allowed to have up to 50 styles.
- A style can be applied to change all Objects in a Channel. For example, if style abc is in Channel A and the style content is 100w.jpg (scaled to 100 in width and saved as a .jpg file), style abc can be applied to all the Objects in Channel A to scale them to 100 in width and saved them as .jpg files.
- A style is only effective within a Channel, that is, the Objects in Channel A cannot use any style in Channel B.

Style naming rules:

- A name can be 1 to 63 characters in length.
- Only numbers, upper-case or lower-case letters, underscores (_), hyphens (-), and periods (.) are permitted.

Channel

A Channel is a namespace of Image Service, and the management entity for billing, permission control, logging, and other advanced functions. An image name is globally unique in Image Service and cannot be modified. You can create up to 10 Channels, but the number of Objects in each Channel is not limited.

Image Service data centers correspond to the OSS data centers. If you create a Bucket in an OSS data center and then activate Image Service, the corresponding Channel belongs to this data center.

> **Note:** Currently, a Channel corresponds to a Bucket in the OSS instance, that is, you can only create a Channel of the same name as a Bucket that you have created on the OSS instance.

Channel naming rules:

- Only lower-case letters, numbers, and hyphens (-) are permitted.
- It must start and end with a lower-case letter or number.
- The length must be 3–63 bytes.

To simplify the process, you can save a specific processing method as a style. Later, you only need to specify a style to call the same processing method. The URL format for image processing by style is as follows:

http://userdomain/object?x-oss-process=style/name

Example

The preceding processing parameters can be saved as the style style-example. Assume that the requested Bucket is image-demo and located in China East 1 (Hangzhou), with the domain name oss-cn-hangzhou.aliyuncs.com, the requested image is example.jpg, and the image access style is style-example, the URL format is constructed as follows:

```
http://image-demo.oss-cn-hangzhou.aliyuncs.com/example.jpg?x-oss-process=style/style-example
```

The URL format for HTTPS access is:

```
https://image-demo.oss-cn-hangzhou.aliyuncs.com/example.jpg?x-oss-process=style/style-example
```

Access through SDK

Public buckets can be accessed using URLs, whereas private files are typically accessed using SDKs. Because in Image Service, URLs are accessed with standard GET operations, only the process parameter needs to be added to the Get Object.

The Python SDK is used as an example:

```
bucket = oss2.Bucket(oss2.Auth(access_key_id, access_key_secret), endpoint, bucket_name)
key = 'example.jpg'
new_pic = 'new-example.jpg'

process = "image/resize,m_fixed,w_100,h_100" //Scale down the image based on the target width and height
bucket.get_object_to_file(key, new_pic, process=process)
```

For more information about Image Service used for OSS SDKs, see Image Service in the SDK documentation. The following table lists links of Image Service used for some SDKs.

SDK	Image Service documentation	Example
Java SDK	Image Service	ImageSample.java

Python SDK	Image Service	image.py
C# SDK	Image Service	ImageProcessSample.cs
PHP SDK	Image Service	Image.php
JS SDK	Image Service	object.test.js
C SDK	Image Service	oss_image_sample.c
iOS SDK	Image Service	AliyunOSSiOSTests.m testGetImage
Android SDK	Image Service	OSSGetObjectTest.testAsyncGetImageWithXOssProcess

Image Service restrictions

The supported formats include JPG, PNG, BMP, GIF, WEBP, and TIFF.

When the width or height of a thumbnail is specified, the image is scaled by a single side by default in the case of proportional scaling. With fixed width and height, the image is scaled down by assuming equal width and height.

The scaled image size is restricted. The product of the width and height of the target thumbnail cannot exceed 4096 x 4096, and the length of a single side cannot exceed 4096 x 4.

When resize is called, the image cannot be enlarged by default. That is, if the requested image is larger than the source image, the source image is returned. If you want to enlarge the image, add the parameter limit,0.

Currently, GIF and WEBP images can be processed once at a time to reduce resource consumption. For example, you cannot crop a GIF or WEBP image immediately after resizing it.

Resize images

Generate a thumbnail of the image as required or make the specified scaling.

Note: The supported formats include jpg, png, bmp, gif, webp, and tiff.

Parameters

Operation name: resize

- Scale up and down with specified width and height

Name	Description	Value range
m	Specify the scaling mode: - lfit: proportional scaling. It refers to the maximum image that is limited in the rectangle of the specified w and h. - mfit: proportional scaling. It refers to the minimum image extending out of the rectangle of the specified w and h. - fill: fixed width and height. It refers to the cropped and centered minimum image extending out of the rectangle of the specified w and h. - pad: fixed width and height, scaling down and filling. - fixed: fixed width and height, enforced scaling down	[lfit, mfit, fill, pad, fixed], the default value is lfit.
w	Specify the target width.	1-4096
h	Specify the target height.	1-4096
l	Specify the longer side of the target.	1-4096
s	Specify the shorter side of the target.	1-4096
limit	Specify whether to process the target thumbnail when it is larger than the original image. 1 indicates not to process, and 0 indicates to process.	0/1. The default value is 1
color	When you set the scaling mode as pad (scaling down and filling), you can select the filling color (The default is white). Filling format of parameters: use hexadecimal color codes, for example 00FF00 (green).	[000000-FFFFFF]

- Proportional scaling

Name	Description	Value range
p	Percentage. If it is smaller than 100, it means to scale down; if it is bigger than 100, it means to scale up.	1-1000

Note

- For the original image:
    - Formats supported: jpg, png, bmp, gif, webp, and tiff.
    - File size cannot exceed 20 MB.
    - When using the image rotation, the width or height of the image cannot exceed 4096.
- For the thumbnail: The scaled image size is restricted. The product of the width and height of the target thumbnail cannot exceed 4096 x 4096, and the length of a single side cannot exceed 4096 x 4.
- When the width or height of a thumbnail is specified, the image is scaled by a single side by default in the case of proportional scaling. With fixed width and height, the image is scaled down by assuming equal width and height.
- When only the width or height of a thumbnail is specified, the image is returned in the same format as the original image. If you want to save the image into other formats, see Quality Change and Format Conversion.
- When resize is called, the image cannot be enlarged by default. That is, if the requested image is larger than the original image, the original image is returned. If you want to enlarge the image, add the parameter limit,0 to be called (for example: https://image-demo.oss-cn-hangzhou.aliyuncs.com/example.jpg?x-oss-process=image/resize,w_500,limit_0)

Example

Scaling-down by a single side (by width and height)

- Scale down an image to 100 in height, and the width is adjusted proportionally.

http://image-demo.oss-cn-hangzhou.aliyuncs.com/example.jpg?x-oss-process=image/resize,h_100

Scaling-down by a single side (by the longer side and shorter side)

- Limit the longer side of an image to 100, and the shorter side is adjusted proportionally.

http://image-demo.oss-cn-hangzhou.aliyuncs.com/example.jpg?x-oss-process=image/resize,l_100

Scaling-down based on target width or height

- Scale down an image to 100 x 100 (w x h).

http://image-demo.oss-cn-hangzhou.aliyuncs.com/example.jpg?x-oss-process=image/resize,m_fixed,h_100,w_100

Proportional scaling, restricted in a rectangle frame

- Scale down an image by the longer side to 100 x 100 (w x h).

http://image-demo.oss-cn-hangzhou.aliyuncs.com/example.jpg?x-oss-process=image/resize,m_lfit,h_100,w_100

- Scale down an image by the longer side to 100 x 100 (w x h) and save it as png.

http://image-demo.oss-cn-hangzhou.aliyuncs.com/example.jpg?x-oss-process=image/resize,m_lfit,h_100,w_100/format,png

Proportional scaling, restricted out of a rectangle frame

- Scale down an image by the shorter side to 100 x 100 (w x h)

http://image-demo.oss-cn-hangzhou.aliyuncs.com/example.jpg?x-oss-process=image/resize,m_mfit,h_100,w_100

Fixed width and height, automatic cropping

- Automatically crop an image to 100 x 100 (w x h)

http://image-demo.oss-cn-hangzhou.aliyuncs.com/example.jpg?x-oss-process=image/resize,m_fill,h_100,w_100

Fixed width and height, scaling down and filling

- Scale down an image by the shorter side to 100 x 100, and then fill the remaining area with a solid color.

http://image-demo.oss-cn-hangzhou.aliyuncs.com/example.jpg?x-oss-process=image/resize,m_pad,h_100,w_100

- Scale down an image by the shorter side to 100 x 100, and then fill the remaining area with red.

http://image-demo.oss-cn-hangzhou.aliyuncs.com/example.jpg?x-oss-process=image/resize,m_pad,h_100,w_100,color_FF0000

- Scale down an image to 1/2 of the original size.

http://image-demo.oss-cn-hangzhou.aliyuncs.com/example.jpg?x-oss-process=image/resize,p_50

Crop images

Incircle

Incircle

This feature allows you to save an image in a circular shape. If the final format of the image is PNG, WebP, or BMP supporting transparent channels, the area of the image outside the circular area is transparent. If the final format of the image is JPG, the area of the image outside the circular area is white.

Parameters

This table provides the description and values for parameters for the circle operation.

Parameter	Description	Value
r	Radius of the circular area of the image	The radius r cannot exceed half of the shorter side of the source image. If the radius r exceeds half of the shorter side of the source image, the circle is still the largest incircle of the source image.

Caveats

- If the final format of the image is PNG, WebP, or BMP supporting transparent channels, the area of the image outside the circular area is transparent.
- If the final format of the image is JPG, the area of the image outside the circular area is white. The PNG format is recommended.
- If the specified radius is greater than the radius of the largest incircle of the source image, the circle is still the largest incircle of the source image.

Example

Crop an image with a crop radius of 100 and keep the original circular size. If the image is saved in JPEG format, the area of the image outside the circular area is white.

To see this example, follow the following link:
http://image-demo.oss-cn-hangzhou.aliyuncs.com/example.jpg?x-oss-process=image/circle,r_100

Crop an image with a crop radius of 100 and save the circle as the smallest square that can enclose the circle. If the image is saved in PNG format, the area of the image outside the circular area is transparent.

To see this example, follow the following link:
http://image-demo.oss-cn-hangzhou.aliyuncs.com/example.jpg?x-oss-process=image/circle,r_100/format,png

Crop

Crop

This feature allows you to crop images by specifying the starting point of where you want to crop, and the width and height of the cropped area.

Parameters

This table provides the description and values of the parameters for the crop operation.

Parameter	Description	Value range
w	Width of the cropped area	[0-image width]
h	Height of the cropped area	[0-image height]

x	X-axis of the crop starting point (the origin is located in the upper-left corner by default)	[0-image border]
y	Y-axis of the crop starting point (the origin is located in the upper-left corner by default)	[0-image border]
g	Location of the origin for cropping. The origin is located in the upper-left corner of any of nine fixed cells.	[nw,north,ne,west,center,east,ne]

Schematic view of the g parameter indicating the origin for cropping:

nw	north	ne
west	center	east
sw	south	se

Caveats

- If the specified starting X-axis and Y-axis values exceed the source image, a BadRequest error is returned. You must specify different values to crop the image.
- If the width and height specified from the starting point exceed the source image size, the source image is cropped to its edges.

Example

Crop an image from the starting point (100, 50) to the edges.

To see this example, follow the following link:
http://image-demo.oss-cn-hangzhou.aliyuncs.com/example.jpg?x-oss-process=image/crop,x_100,y_50

Crop an area of 100x100 from the starting point (100, 50).

To see this example, follow the following link:
http://image-demo.oss-cn-hangzhou.aliyuncs.com/example.jpg?x-oss-process=image/crop,x_100,y_50,w_100,h_100

Crop an area of 200x200 in the lower-right corner of the source image.

To see this example, follow the following link:
http://image-demo.oss-cn-hangzhou.aliyuncs.com/example.jpg?x-oss-process=image/crop,x_0,y_0,w_200,h_200,g_se

Crop an area of 200x200 in the lower-right corner of an image and stretch the cropped area downward by 10x10.

To see this example, follow the following link:
http://image-demo.oss-cn-hangzhou.aliyuncs.com/example.jpg?x-oss-process=image/crop,x_10,y_10,w_200,h_200,g_se

Indexed cut

Indexed cut

This feature allows you to define an x and y-axes coordinate system for an image, and then fetch a specific partition of the image by specifying the length and index.

Parameters

This table provides the description and values for the parameters for the indexcrop operation.

Parameter	Description	Value
x	Length of each image partition during horizontal cutting. Either the x or y	[1, image width]

	parameter must be used.	
y	Length of each image partition during vertical cutting. Either the x or y parameter must be used.	[1, image height]
i	Image partition selected after cutting. **(The value 0 indicates the first partition.)**	[0, maximum partition quantity). If the maximum partition quantity is exceeded, the system returns the source image.

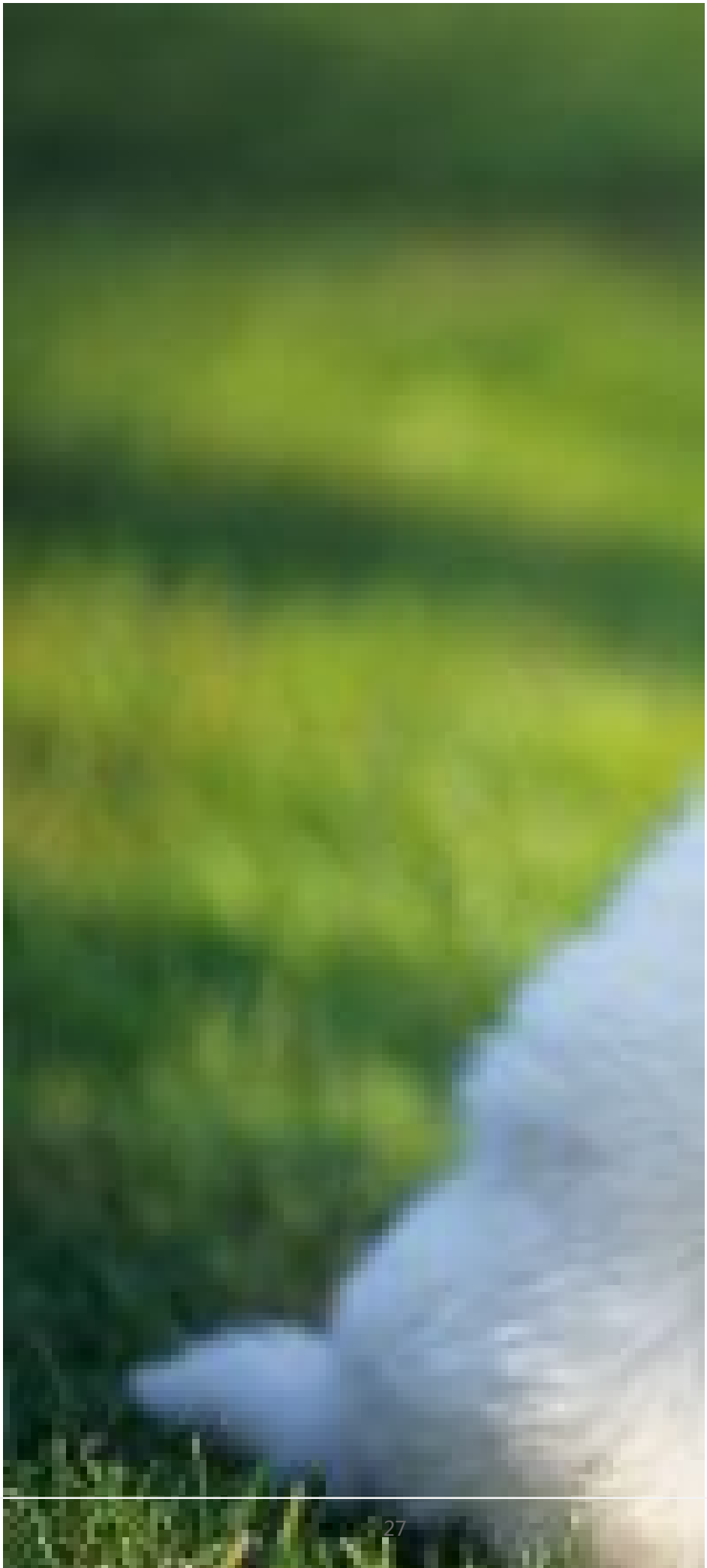
Caveats

- If the specified index exceeds the cut range, the system returns the source image.

Example

Divide an image equally by 100 on the X-axis, and fetch the first partition.

To see this example, follow the following link:
http://image-demo.oss-cn-hangzhou.aliyuncs.com/example.jpg?x-oss-process=image/indexcrop,x_100,i_0



Divide an image equally by 100 on the X-axis, fetch the 100th partition, and check whether the source image is returned.

To see this example, follow the following link:
http://image-demo.oss-cn-hangzhou.aliyuncs.com/example.jpg?x-oss-process=image/indexcrop,x_100,i_100

Rounded rectangle

Rounded rectangle

This feature allows you to save an image in a rounded oblong shape and specify the rounded corner size.

Parameters

This table provides the description and values for parameters for the rounded-corners operation.

Parameter	Description	Value
r	Radius of the cropped rounded corner of an image.	[1, 4096] The radius of the largest rounded corner cannot exceed half of the shorter

		side of the source image.

Caveats

- If the final format of the image is PNG, WebP, or BMP, and supports transparent channels, the area of the image outside the circular area is transparent.
- If the final format of the image is JPG, the area of the image outside the circular area is white.

Example

Crop an image with the radius of the cropped rounded corner being 30, and save the cropped image as JPG.

To see this example, follow the following link:
http://image-demo.oss-cn-hangzhou.aliyuncs.com/example.jpg?x-oss-process=image/rounded-corners,r_30

Crop an image to 100x100 in size, and save the image as PNG with the radius of the rounded corner being 10.

To see this example, follow the following link:
http://image-demo.oss-cn-hangzhou.aliyuncs.com/example.jpg?x-oss-process=image/crop,w_100,h_100/rounded-corners,r_10/format,png

Rotate images

Adaptive orientation

Adaptive orientation

The photos taken by some mobile phones may contain rotation parameters (saved as EXIF data of the photos). You can configure whether to rotate such photos. By default, adaptive orientation is configured.

Parameters

Operation name: auto-orient

Parameter	Description	Value range
value	Indicates whether to perform auto rotation. The value 0 indicates that the orientation of the source image is retained without auto rotation. The value 1 indicates rotating and then scaling down the image.	[0, 1]

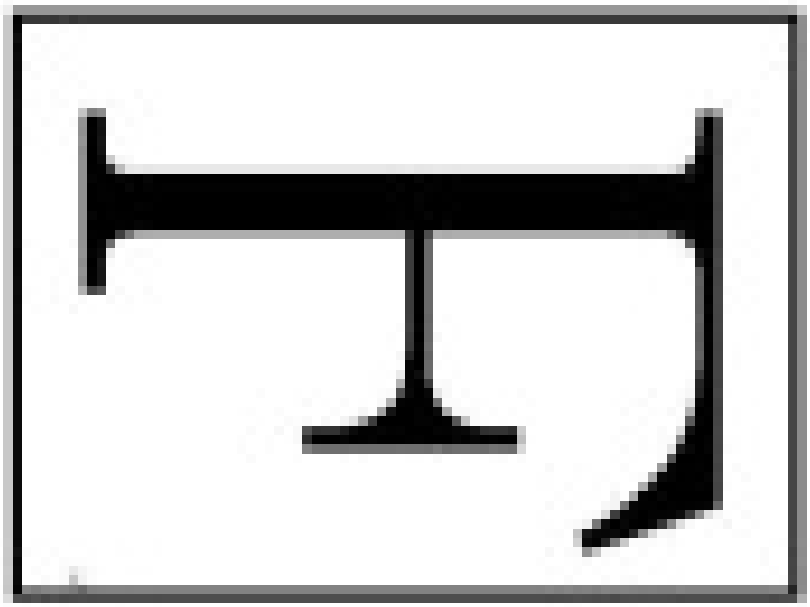
Caveats

- To apply adaptive orientation, make sure that the width and height of the source image are smaller than 4,096.
- If the source image does not contain rotation parameters, setting the parameter of auto-orient for the image does not affect the image.

Example

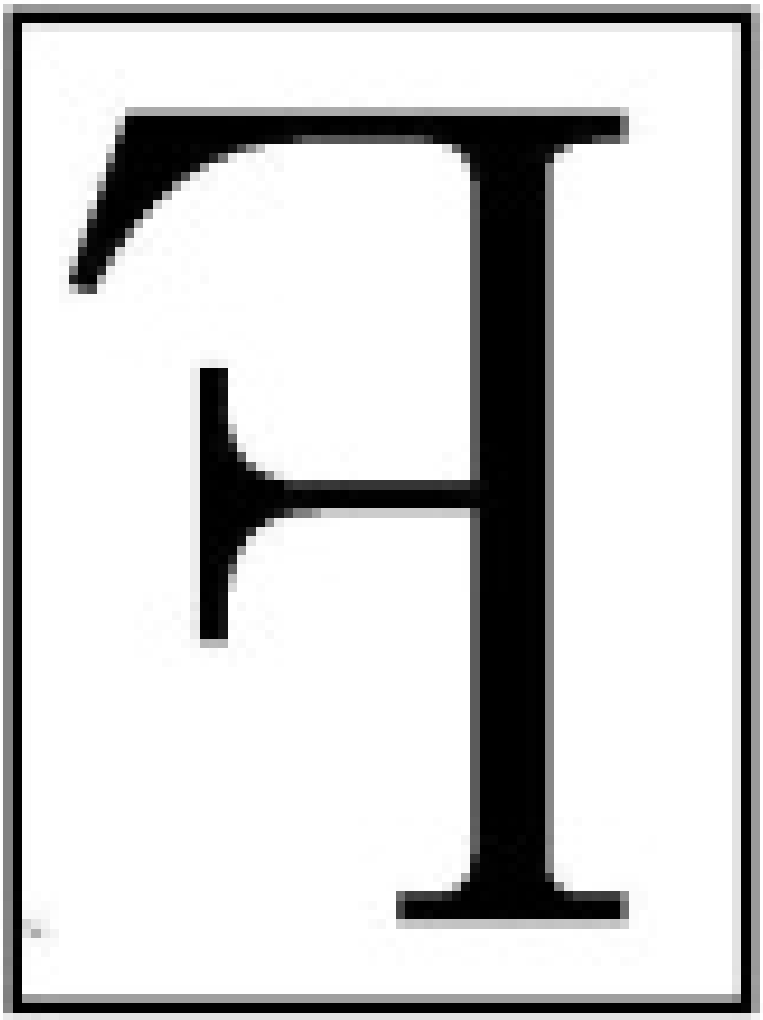
- Scale down an image to 100 in width without auto rotation

http://image-demo.oss-cn-hangzhou.aliyuncs.com/f.jpg?x-oss-process=image/resize,w_100/auto-orient,0



- Scale down an image to 100 in width, and auto-rotate the image by setting the value parameter to 1.

http://image-demo.oss-cn-hangzhou.aliyuncs.com/f.jpg?x-oss-process=image/resize,w_100/auto-orient,1



The target image size is 100x127 (WxH).

Rotate

Rotate

Images can be rotated in clockwise direction.

Parameters

Operation name: rotate

Parameter	Description	Value range
value	Degrees of clockwise rotation	[0, 360] The default value is 0, indicating no rotation.

Caveats

- The rotated image may become larger.
- The size of the image to be rotated is limited. The image width or height cannot exceed 4,096.

Example

- Rotate an image 90 degrees clockwise.

http://image-demo.oss-cn-hangzhou.aliyuncs.com/example.jpg?x-oss-process=image/rotate,90

- Scale down an image to 200x200 (WxH) and then rotate it 90 degrees clockwise.

http://image-demo.oss-cn-hangzhou.aliyuncs.com/example.jpg?x-oss-process=image/resize,w_200,h_200/rotate,90

Apply effects

Blur

Blur

This feature allows you to apply the blur effect to an image.

Parameters

This table provides the description and values for parameters when applying the blur operation.

Parameter	Description	Value
r	Blur radius	[1,50] The greater the value of r, the blurrier the image.
s	Standard deviation of a normal distribution	[1,50] The greater the value of s, the blurrier the image.

Example

Blur an image, with the radius being 3 and standard deviation being 2.

To see this example, follow the following link:
http://image-demo.oss-cn-hangzhou.aliyuncs.com/example.jpg?x-oss-process=image/blur,r_3,s_2

Scale down an image to 200 in width, and blur it with the radius being 3 and standard deviation being 2.

To see this example, follow the following link:
http://image-demo.oss-cn-hangzhou.aliyuncs.com/example.jpg?x-oss-process=image/resize,w_200/blur,r_3,s_2

Brightness

Brightness

This feature allows you to adjust the brightness of a processed image.

Parameters

This table provides a description and value range of the parameters for the bright operation.

Parameter	Description	Value range
value	Brightness adjustment. 0 indicates the original brightness. A value smaller than 0 indicates a brightness lower than the original	[-100, 100]

	brightness, and a value greater than 0 indicates a brightness higher than the original brightness.	

Example

Adjust only the brightness of the source image.

To see this example, follow the following link:
http://image-demo.oss-cn-hangzhou.aliyuncs.com/example.jpg?x-oss-process=image/bright,50

Scale down an image to 200 in width and adjust its brightness.

To see this example, follow the following link:
http://image-demo.oss-cn-hangzhou.aliyuncs.com/example.jpg?x-oss-process=image/resize,w_200/bright,50

Contrast

Contrast

This feature allows you to adjust the contrast of a processed image.

Parameters

This table provides a description and value range of the value parameter for the contrast operation.

Parameter	Description	Value range
value	Contrast adjustment. 0 indicates the original contrast. A value smaller than 0 indicates a contrast lower than the original contrast, and a value greater than 0 indicates a contrast higher than the original contrast.	[-100, 100]

Example

Adjust only the contrast of the source image.

To see this example, follow the following link:
http://image-demo.oss-cn-hangzhou.aliyuncs.com/example.jpg?x-oss-process=image/contrast,-50

Scale down an image to 200 in width and adjust its contrast.

To see this example, follow the following link:
http://image-demo.oss-cn-hangzhou.aliyuncs.com/example.jpg?x-oss-process=image/resize,w_200/contrast,-50

Sharpen

Sharpen

This feature allows you to sharpen a processed image to make it clearer.

Parameters

This table provides a description and value range of the value parameter for the sharpen operation.

Parameter	Description	Value range
value	Sharpens an image. The parameter value indicates the degree of sharpness. The greater the value, the clearer the image.	[50, 399] We recommend that you set this parameter to 100 for optimal effect.

Example

Sharpen an image, with the parameter set to 100.

To see this example, follow the following link:
http://image-demo.oss-cn-hangzhou.aliyuncs.com/example.jpg?x-oss-process=image/sharpen,100

Scale down an image to 200 in width and sharpen the image with the parameter set to 100.

To see this example, follow the following link:
http://image-demo.oss-cn-hangzhou.aliyuncs.com/example.jpg?x-oss-process=image/resize,w_200/sharpen,100

Convert formats

Format conversion

Format conversion

You can convert an image to different formats, such as JPG, PNG, BMP, WebP, and GIF. By default, no format is specified and images are returned in the source format.

Parameters

Operation name: format

Name	Description	
jpg	Saves the source image as JPG. If the source image is in PNG, WebP, or BMP format supporting transparent channels, the system fills the transparent section in white by default.	
png	Saves the source image as PNG.	
webp	Saves the source image as WebP.	
bmp	Saves the source image as BMP.	
gif	Saves the source image in GIF format as GIF. If the source image is in another format, it is saved in the source format.	
src	Returns the source image in the source format. If the source image is in GIF format, the first GIF frame is returned and saved as JPG instead of GIF. If you want to save it as GIF, add the 1an parameter.	

Caveats

When an image is saved as JPG, it is saved as baseline JPEG by default. To save it as progressive JPEG, you can set the interlace parameter. For more information, see Progressive display.

Example

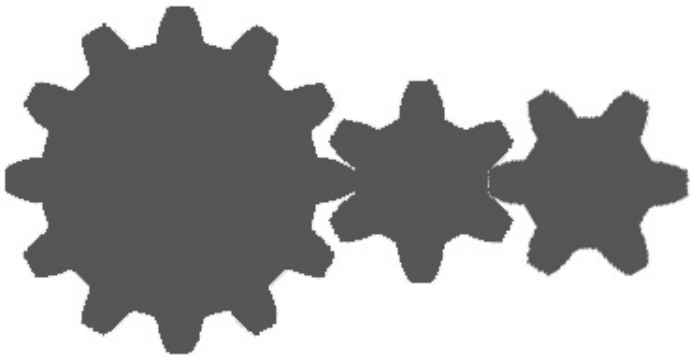
Save a PNG image as JPG.

Request URL: http://image-demo.oss-cn-hangzhou.aliyuncs.com/panda.png?x-oss-process=image/format,jpg

Save a PNG image as JPG with progressive JPEG display

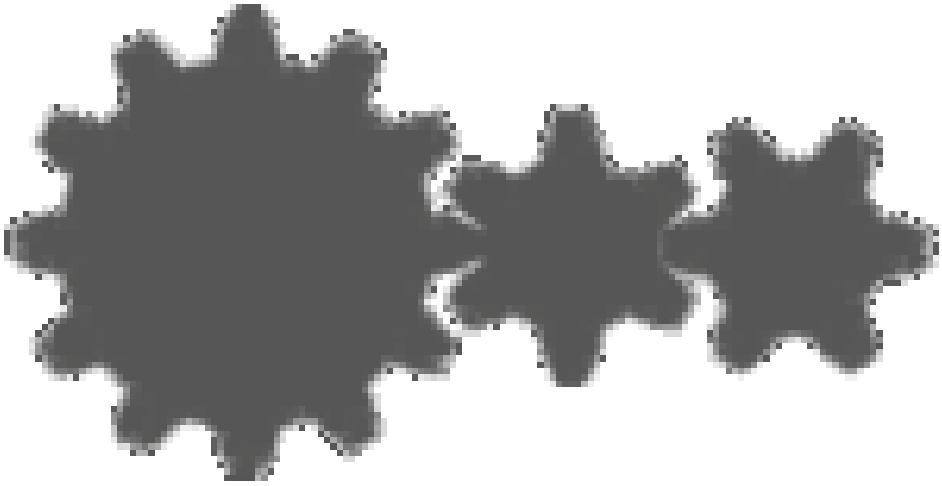
Request URL: http://image-demo.oss-cn-hangzhou.aliyuncs.com/panda.png?x-oss-process=image/interlace,1/format,jpg

Save a GIF image as JPEG.
Request URL: http://image-demo.oss-cn-hangzhou.aliyuncs.com/example.gif?x-oss-process=image/format,jpg



Scale down the image to 200 in width.

Request URL: http://image-demo.oss-cn-hangzhou.aliyuncs.com/example.gif?x-oss-process=image/resize,w_200/format,gif



Save a GIF image as WEBP.
Request URL: http://image-demo.oss-cn-hangzhou.aliyuncs.com/example.gif?x-oss-process=image/resize,w_200/format,webp

Progressive display

Progressive display

JPG images are displayed in two modes:

- Scanning from top to bottom
- Progressive change from blur to clearness (which is obvious under bad network conditions)

By default, images are saved in the first mode. If you want to use the second mode, set the parameter of interlace.

Parameters

Operation name: interlace

Parameter	Description	Value range
[value]	1: saves the source image in progressive JPG format	[0, 1]

	0: saves the source image in common JPG format	

NOTE: The parameter is only meaningful when images are saved as JPG.

Example

Save a PNG format in progressive JPG format.

http://image-demo.oss-cn-hangzhou.aliyuncs.com/panda.png?x-oss-process=image/format,jpg/interlace,1

Scale down an image to 200 in width and save it in progressive JPG format.

http://image-demo.oss-cn-hangzhou.aliyuncs.com/example.jpg?x-oss-process=image/format,jpg/interlace,1

Quality change

Change quality

You can change the quality of an image saved as JPG or WebP.

Parameters

Operation name: quality

Parameter	Description	Value range
q	This parameter determines the relative quality of an image, that is, to compress the source image quality to q%. If the source image quality is 100%, “90q” produces an image of 90% quality. If the source image quality is 80%, “90q” produces an image of 72% quality. This only works on JPG source images. If the source image is WebP, its relative	1-100

	quality is equal to the absolute quality.	
Q	This parameter determines the absolute quality of an image, that is, to compress the source image quality to Q%. If the source image quality is smaller than the specified number, it is not compressed. If the source image quality is 100%, “90Q” produces an image of 90% quality. If the source image quality is 95%, “90Q” produces an image of 90% quality. If the source image quality is 80%, “90Q” produces an image of 80% quality. This only works on images saved as JPG and WebP. If both q and Q are specified, Q takes precedence.	1-100

Caveats

- If neither Q nor q are specified, the image size may increase. If you want an image of fixed quality, use the Q parameter.

Example

Scale down the source image to 100w_100h and save it as JPG of 80% quality relative to the source image.

http://image-demo.oss-cn-hangzhou.aliyuncs.com/example.jpg?x-oss-process=image/resize,w_100,h_100/quality,q_80

Scale down the source image to 100w_100h and save it as JPG of 80% absolute quality.

http://image-demo.oss-cn-hangzhou.aliyuncs.com/example.jpg?x-oss-process=image/resize,w_100,h_100/quality,Q_80

Add watermarks

Add watermarks

This feature allows you to add an image or text as a watermark to another image.

Parameters

This table provides a description of the basic parameters and their values, which can be used with the watermark operation.

Basic parameters

Name	Description	Parameter type
t	It indicates the transparency. This parameter makes the added image watermark or text watermark transparent. Default value: 100 (in the unit of %), indicating no transparency; value range: [0–100]	Optional
g	It indicates the position of a watermark on the target image. The position is shown in the following figure. Value range: [nw,north,ne,west,center,east,sw,south,se]	Optional
x	It indicates the horizontal margin, that is, the horizontal distance between the watermark and the image edge. This parameter is meaningful only when the watermark is in the upper left, middle left, lower-left corner, upper right, middle right, or lower-right corner corner of the image. Default value: 10 Value range: [0–4,096] Unit: pixel (px)	Optional
y	It indicates the vertical margin, that is, the vertical distance between the watermark and the image edge. This parameter is meaningful only when the	Optional

	watermark is in the upper left, top center, upper right, lower-left corner, bottom center, or lower-right corner corner of the image. Default value: 10 Value range: [0–4,096] Unit: pixel (px)	
rotate	It indicates the clockwise rotation angle of the image. Value range: [0,360]	Optional
fill	It indicates the effect of filling the image with a watermark. Value range: [0,1]. 1 indicates that the image is filled with the watermark; 0 indicates no filling effect.	Optional
voffset	It indicates the midline vertical offset. When the watermark is in the middle left, center, or middle right of the image, you can designate the vertical offset of the watermark along the midline. Default value: 0 Value range: [–1,000, 1,000] Unit: pixel (px)	Optional

Caveats

- In addition to the position of a watermark on the image, the horizontal margin, vertical margin, and the midline vertical offset can regulate the watermark layout when the image has multiple watermarks.
- The URL-safe Base64 encoding can be used during image processing. For more information, see RFC4648 or the URL-safe Base64 encoding section.
- The Parameter-Position Mapping Table for the g parameter, is provided as follows:

nw	north	ne
west	center	east
sw	south	se

Image watermark parameters

Name	Description	Parameter type
image	It indicates the object name of an image watermark (which must be encoded). The URL-safe base64 encoding is required: encodedObject = url_safe_base64_encode(object). For example, if the object name is panda.png, the encoded name is cGFuZGEucG5n.	Required parameter

Watermark image preprocessing

When a user applies a watermark, the watermark image can be preprocessed.

Supported preprocessing operations include:

- Image scaling
- Image cropping (incircle not supported)
- Image rotation

Additionally, another parameter is supported for the resize operation: **P**. **P** indicates the watermark image scale relative to the master image. The value range is [1-100], indicating the scale percentage.

For example, if P_10 is set, for a master image of 100x100, the size of the watermark is 10x10.

If the same watermark processing parameters are applied to images of different sizes, the watermark image may be too large or too small. The P parameter solves this problem.

Preprocessing examples

If you scale panda.png to 30% in width, then the watermark file is:panda.png?x-oss-process=image/resize,P_30

After adding URL-safe Base64 encoding this watermark file is: cGFuZGEucG5nP3gtb3NzLXByb2Nlc3M9aW1hZ2UvcmVzaXplLFBfMzA

If the watermark is placed in the lower-right corner corner and the source image width is reduced to 400, the watermark operation is:

watermark=1&object=cGFuZGEucG5nQDMwUA&t=90&p=9&x=10&y=10

This is applied to the image as follows:
http://image-demo.img-cn-hangzhou.aliyuncs.com/example.jpg?x-oss-process=image/resize,w_400/watermark,image_cGFuZGEucG5nP3gtb3NzLXByb2Nlc3M9aW1hZ2UvcmVzaXplLFBfMzA,t_90,g_se,x_10,y_10

If the source image is reduced to 300 in width, the watermark operation is:
http://image-demo.img-cn-hangzhou.aliyuncs.com/example.jpg?x-oss-process=image/resize,w_300/watermark,image_cGFuZGEucG5nP3gtb3NzLXByb2Nlc3M9aW1hZ2UvcmVzaXplLFBfMzA,t_90,g_se,x_10,y_10

Text watermark

Name	Description	Parameter type
text	It indicates the text of the text watermark (encode required). The URL-safe base64 encoding is required: encodeText = url_safe_base64_encode(fontText). Maximum length: 64 characters	Required
type	It indicates the literal type of a text watermark (encoding required) NOTE: The URL-safe base64 encoding is required: encodeText = url_safe_base64_encode(fontType). Value range: See the Literal Type Encoding Table as follows. Default value: wqy-zenhei (encoded value: d3F5LXplbmhlaQ)	Optional
color	It indicates the color of the textual content of a text watermark (encoding required) The URL-safe base64 encoding is required: EncodeFontColor = url_safe_base64_encode(font	Optional

	Color). The parameter format must be # + six hexadecimal numbers. For example, #000000 indicates black. “#” indicates the prefix. Every two digits of 000000 constitute an RGB color. #FFFFFF indicates the white color. Default value: #000000 (black); Base64-encoded value: IzAwMDAwMA	
size	It indicates the size (px) of the textual content of a text watermark. Value range: (0, 1,000] Default value: 40	Optional
shadow	It indicates the shadow transparency of a text watermark. Value range: (0, 100]	Optional
rotate	It indicates the clockwise rotation angle of the text. Value range: [0,360]	Optional

Literal type encoding table

Parameter value	Meaning	URL-safe Base64 encoded value	Remarks
wqy-zenhei	Wen quan yi zheng hei ti, a type of Chinese font	d3F5LXplbmhlaQ==	According to the RFC, the padding characters == can be omitted, that is, d3F5LXplbmhlaQ
wqy-microhei	Micro Hei font of the WenQuanYi Chinese font project	d3F5LW1pY3JvaGVp	
fangzhengshusong	Founder ShuSong, a Chinese Simplified font	ZmFuZ3poZW5nc2h1c29uZw==	According to the RFC, the padding characters == can be omitted, that is, ZmFuZ3poZW5nc2h1c29uZw
fangzhengkaiti	Founder Kai, a Chinese Simplified font	ZmFuZ3poZW5na2FpdGk=	According to the RFC, the padding character = can be omitted, that is, ZmFuZ3poZW5na2FpdGk
fangzhengheiti	Founder Hei, a Chinese Simplified	ZmFuZ3poZW5naGVpdGk=	According to the RFC, the padding

	font		character = can be omitted, that is, ZmFuZ3poZW5naGVpdGk
fangzhengfangsong	Founder FangSong, a Chinese Simplified font	ZmFuZ3poZW5nZmFuZ3Nvbmc=	According to the RFC, the padding character = can be omitted, that is, ZmFuZ3poZW5nZmFuZ3Nvbmc
droidsansfallback	Droid Sans fallback font	ZHJvaWRzYW5zZmFsbGJhY2s=	According to the RFC, the padding character = can be omitted, that is, ZHJvaWRzYW5zZmFsbGJhY2s

Text & image watermark

Name	Description	Parameter type
order	It indicates the order of the text watermark and image watermark of a text & image watermark. Value range: [0, 1]. 0 (default) indicates that the image watermark is before the text watermark; 1 indicates that the text watermark is before the image watermark.	Optional
align	It indicates the alignment of the text watermark and image watermark of a text & image watermark. Value range: [0, 1, 2]. 0 (default): top alignment; 1: center alignment; 2: bottom alignment	Optional
interval	It indicates the spacing between the text watermark and image watermark of a text & image watermark. Value range: [0, 1000]	Optional

URL-safe Base64 encoding

Many parameters must be Base64 encoded during image processing. For more information, see RFC4648.

Note: The URL-safe Base64 encoding is only applicable to some specific watermark parameters (text content, color, and font of a text watermark, and object of an image watermark). Do not use it in a signature.

The encoding format is:

- Encode the content to produce a base64 result.
- Replace the plus sign (+) in the result with a minus sign (-).
- Replace the slash sign (/) in the result with an underscore (_).
- Keep all equal signs (=) at the end of the result;

An example in Python is shown as follows:

```
import base64
input='wqy-microhei'
print(base64.urlsafe_b64encode(input))
```

Example

The following URL watermarks the file example.jpg with panda.png (after URL-safe base64 encoded: cGFuZGEucG5n).
http://image-demo.img-cn-hangzhou.aliyuncs.com/example.jpg?x-oss-process=image/resize,w_300,h_300/auto-orient,1/quality,q_90/format,jpg/watermark,image_cGFuZGEucG5n,t_90,g_se,x_10,y_10

Scale panda.png to 50 in width. Then the watermark file is panda.png?x-oss-process=image/resize,w_50, and

cGFuZGEucG5nP3gtb3NzLXByb2Nlc3M9aW1hZ2UvcmVzaXplLHdfNTA=) after URL-safe Base64 encoding.
The URL is as follows:
http://image-demo.img-cn-hangzhou.aliyuncs.com/example.jpg?x-oss-process=image/resize,w_300,h_300/auto-orient,1/quality,q_90/format,jpg/watermark,image_cGFuZGEucG5nP3gtb3NzLXByb2Nlc3M9aW1hZ2UvcmVzaXplLHdfNTA=,t_90,g_se,x_10,y_10

Obtain image information

Retrieve dominant image tones

You can retrieve the average tones of images.

Request operation

Operation name: average-hue

Return format

0xRRGGBB (RR, GG, and BB are hexadecimal values respectively indicating red, green, and blue)

Example

Access the following URL through a browser:

http://image-demo.oss-cn-hangzhou.aliyuncs.com/example.jpg?x-oss-process=image/average-hue

The following result is returned:

```
{"RGB": "0x5c783b"}
```

Source image:

http://image-demo.oss-cn-hangzhou.aliyuncs.com/example.jpg

0x5c783b corresponds to the color RGB (92,120,59).

Obtain basic information and EXIF data

Obtain basic information and EXIF data

This feature allows you to obtain basic information about a file, including its width, length, file size, format, and, if applicable, EXIF data.

Results that are returned are in JSON format.

Request syntax

Operation name: info

Parameter	Description	Value range
-	-	-

Example

Example of a request for EXIF data under the condition that the source image does not have EXIF data

To see this example, follow the following link:
http://image-demo.oss-cn-hangzhou.aliyuncs.com/example.jpg?x-oss-process=image/info

```
{
"FileSize": {"value": "21839"},
"Format": {"value": "jpg"},
"ImageHeight": {"value": "267"},
"ImageWidth": {"value": "400"}
}
```

Example of a request for EXIF data under the condition that the source image has EXIF data

To see this example, follow the following link:
http://image-demo.oss-cn-hangzhou.aliyuncs.com/f.jpg?x-oss-process=image/info

```
{
"Compression": {"value": "6"},
"DateTime": {"value": "2015:02:11 15:38:27"},
```

```
"ExifTag": {"value": "2212"},
"FileSize": {"value": "23471"},
"Format": {"value": "jpg"},
"GPSLatitude": {"value": "0deg "},
"GPSLatitudeRef": {"value": "North"},
"GPSLongitude": {"value": "0deg "},
"GPSLongitudeRef": {"value": "East"},
"GPSMapDatum": {"value": "WGS-84"},
"GPSTag": {"value": "4292"},
"GPSVersionID": {"value": "2 2 0 0"},
"ImageHeight": {"value": "333"},
"ImageWidth": {"value": "424"},
"JPEGInterchangeFormat": {"value": "4518"},
"JPEGInterchangeFormatLength": {"value": "3232"},
"Orientation": {"value": "7"},
"ResolutionUnit": {"value": "2"},
"Software": {"value": "Microsoft Windows Photo Viewer 6.1.7600.16385"},
"XResolution": {"value": "96/1"},
"YResolution": {"value": "96/1"}}
```


Response to errors

If an error occurs while accessing the Image Service, the Image Service returns an error code and error message. This enables you to locate and correct the error.

Image Service error response format

An example of an error response message is given as follows:

```
<Error>
<Code>BadRequest</Code>
<Message>Input is not base64 decoding.</Message>
<RequestId>52B155D2D8BD99A15D0005FF</RequestId>
<HostId>userdomain</HostId>
</Error>
```

This error response message contains the following elements:

- Code
  An error code that the Image Service returns to the user.
- Message
  Detailed error information provided by the Image Service.
- RequestId

A unique UUID used to identify an error request. When a problem cannot be solved, this ID can be sent to the Image Service engineers to help locate the cause of the error.
- HostId
  Used to identify the accessed Image Service cluster.

Image Service error codes

Error code	Description	HTTP status code
InvalidArgument	Parameter error	400
BadRequest	Incorrect request	400
MissingArgument	A parameter is missing	400
ImageTooLarge	Image size exceeds the limit	400
WatermarkError	Watermark error	400
AccessDenied	Access is denied	403
SignatureDoesNotMatch	Signature does not match	403
NoSuchFile	Image does not exist	404
NoSuchStyle	Style does not exist	404
InternalError	Internal service error	500
NotImplemented	Method not implemented	501

Processing parameter restrictions

Image Service has the following restrictions:

- The source file size cannot exceed 20 MB.
- Scaling operation: The scaled image size is limited. The product of its width and height cannot exceed 4096 x 4096, and the length of a single side cannot exceed 4096 x 4.
- Rotation operation: The size of the image to be rotated is limited. The image width or height cannot exceed 4,096.
- A maximum of 4 channels are allowed.

Image style

Adding all the changes to the image after the URL makes the URL too long and inconvenient for management and reading. IMG allows you to save common operations as an alias, that is, a style.

With the style, a complicated operation can be performed through a short URL.

Multiple styles (50 at most) are grouped under a bucket. Each style is effective only within the bucket.

Style access rules

URL parameters

```
<File URL>?x-oss-process=style/<StyleName>
```

Example:

bucket.aliyuncs.com/sample.jpg?x-oss-process=style/stylename. This is the default style access method supported by IMG.

Separators

```
<File URL><Separator><StyleName>
```

Example: bucket.aliyuncs.com/sample.jpg@!stylename. @! is the style separator. IMG regards the content after the separator in a URL as the style name. This is an optional method provided by IMG. You can also set separators in the console. Separators such as -, _, /, and ! are also supported.

- StyleName indicates the name of a style.
- Style creations, deletions, and modifications are all performed in the front-end console.
- When the requested style does not exist in the specified bucket, the system returns the "NotSuchStyle" error.

Set separators

In the left-side bucket list of the OSS console, click the bucket to which you want to set separators.

Click the **Image Processing** tab, and then click **Access Settings**.

In the **Access Settings** dialog box, set the following parameters:

Source Image Protection: After enabling the original image protection, you can only access the image file by passing in the StyleName or using a signature-based method. Direct accesses to the OSS original file or accesses by passing in image parameters and modifying the image style are not allowed.

Customize separator

click **OK**.

Example

In this example, a style is created in the bucket image-demo.

Style name	Style content
panda_sytle	image/resize,m_fill,w_300,h_300,limit_0/auto-orient,0/quality,q_90/watermark,image_cGFuZGEucG5n,t_61,g_se,y_10,x_10

Access through parameters

- http://image-demo.oss-cn-hangzhou.aliyuncs.com/example.jpg?x-oss-process=image/resize,m_fill,w_300,h_300,limit_0/auto-orient,0/quality,q_90/watermark,image_cGFuZGEucG5n,t_61,g_se,y_10,x_10

Access through URL parameters in style mode

- http://image-demo.oss-cn-hangzhou.aliyuncs.com/example.jpg?x-oss-process=style/panda_style

Access through style separators in style mode

- http://image-demo.oss-cn-hangzhou.aliyuncs.com/example.jpg@!panda_style

These three methods bring the same result.

Source image protection

To avoid image piracy risks, the exposure to image URLs must be restricted so that only thumbnailed or watermarked images can be obtained. To do this, you can enable source image protection.

Rule description

After enabling the source image protection, you cannot access images in the following two ways:

- Access directly with an OSS address: http://bucket.<endpoint>/object.
- Request thumbnails with processing parameters: http://bucket.<endpoint>/object?x-oss-process=image/action,parame_value

You can only access images in style mode:

- Access through URL parameters: http://bucket.<endpoint>/object?x-oss-process=style/<StyleName>.
- Access through separators: http://bucket.<endpoint>/object<separator><StyleName>.

Note:

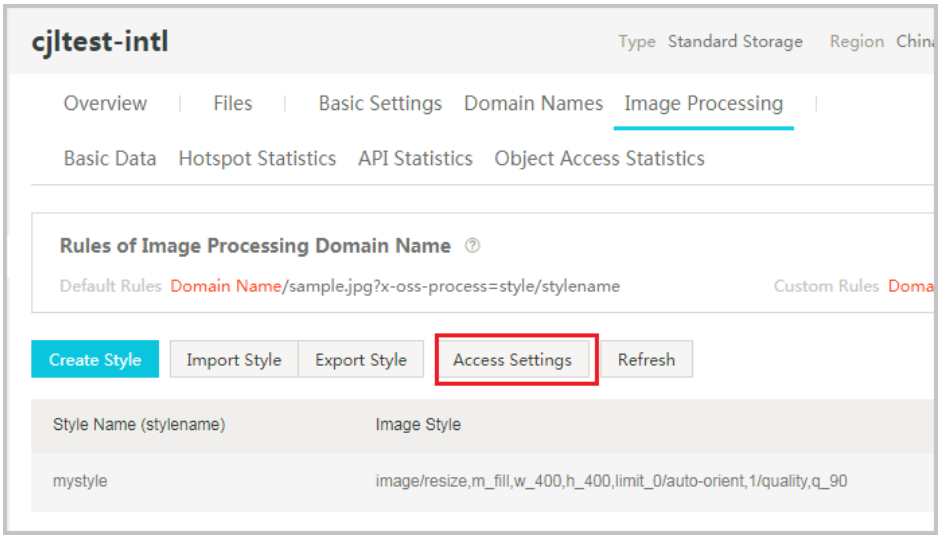
- The preceding rules only apply to anonymous accesses to public-read files. After enabling the source image protection, you can obtain source images using a signature-based method.
- The source image protection is designed for protecting image files, and the suffixes of the image files to be protected must be set. For example, if .jpg files are set for source image protection, you can still directly access the source images of .png files.

You can configure the **access rules** in the **Image Processing** module of the bucket in the console.

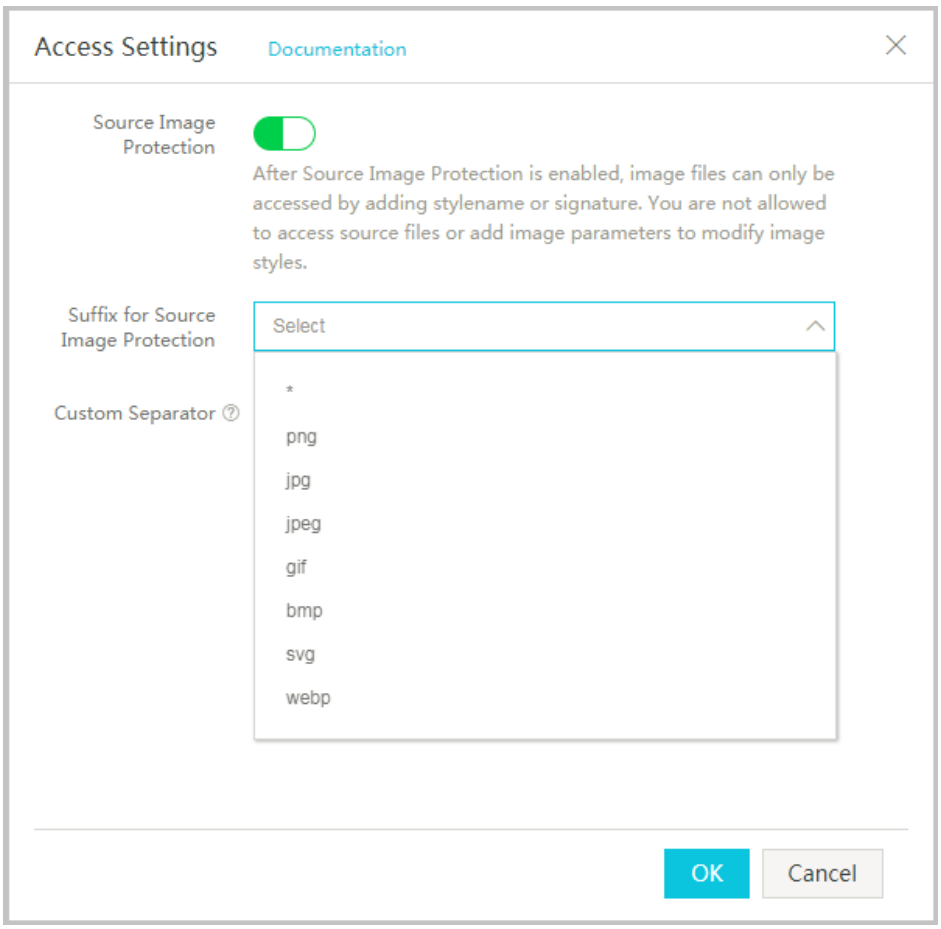
Configure access rules

In the left-side bucket list of the OSS console, click the bucket for which you want to set the source image protection.

Click the **Image Processing** tab to locate the **Access Settings** button. See the following figure:



Click **Access Settings** to open the **Access Settings** dialog box, as shown in the following figure:



In the **Settings** dialog box, perform the following settings:

Enable source image protection: After enabling the source image protection, you can only access the image file by passing in the StyleName or using a signature-based method. Direct accesses to the OSS source file or accesses by passing in image parameters and modifying the image style are not allowed.

Set the suffixes of the image files for source image protection.

Customize separators.

Once you set the needed options, click **OK** to finish setting the source image protection.

Save processing result

We provide the “saveas” operation for data processing. With this feature, you can save the processing result to a designated bucket as resources and assign it with a specified key. After the resource is saved, you can visit the resource directly by specifying the bucket to speed up resource download. This feature applies to ultra-large image cropping or other high-latency operations.

Request syntax

```
POST /ObjectName?x-oss-process HTTP/1.1
Content-Length: ContentLength
Content-Type: ContentType
Host: BucketName.oss-cn-hangzhou.aliyuncs.com
Date: GMT Date
Authorization: SignatureValue

x-oss-process=image/resize,w_100|sys/saveas,o_dGVzdC5qcGc,b_dGVzdA
```

The Post interface is used to call the Image Processing Service. Parameters are passed in the body. The saveas operation is added to support saving the image as an OSS object. Specifically, the parameters following “x-oss-process” are the same as those for calling image processing features using queryString.

List of saveas parameters

Parameter	Meaning
o	Name of the target object. The parameter must be encoded in URL Safe Base64.
b	Name of the target bucket. The parameter must be encoded in URL Safe Base64. If this parameter is not specified, the image is saved to the current bucket by default.

Detail analysis

The saveas operation requires that the caller has the permission for writing data to the target bucket and object. Otherwise, 403 is returned.The bucket and object names in the saveas parameter must conform to the bucket and object naming conventions of the OSS. Otherwise, 400 is returned.The bucket specified for the saveas operation must be in the same region as the current bucket. Otherwise, 400 is returned.The saveas operation is only valid in the Post operation and not in the Get operation. Otherwise, 400 is returned.`

Sample

Request sample

```
POST /?x-oss-process HTTP/1.1
Host: oss-example.oss.aliyuncs.com
Content-Length: 247
Date: Fri, 04 May 2012 03:21:12 GMT
Authorization: OSS qn6qrrqxo2oawuk53otfjbyc:KU5h8YMUC78M30dXqf3JxrTZHiA=

x-oss-process=image/resize,w_100|sys/saveas,o_dGVzdC5qcGc,b_dGVzdA
```

In the sample, the parameters indicate to save the zoomed target image to the bucket named "test", and the object name is "test.jpg".

Response sample

```
HTTP/1.1 200 OK
x-oss-request-id: 534B371674E88A4D8906008B
Date: Fri, 04 May 2012 03:21:12 GMT
Content-Length: 0
Connection: keep-alive
Server: AliyunOSS
```

Video frame capturing

The Image Service not only processes the existing image content but also captures the image at a specified point of the video to complete the video frame capturing.

Parameters

Operation type: video

Operation name: snapshot

Parameter	Description	Value range
t	Screenshot time	Unit: ms. [0, video duration]
w	Screenshot width. If it is specified as 0, the value is automatically calculated.	Pixel value: [0, video width]
h	Screenshot height. If it is specified as 0, the value is	Pixel value: [0, video width]

	automatically calculated. If both w and h are 0, the video is outputted in the original width and height.	
m	Screenshot mode. If not specified, use the default mode. The screenshot is captured accurately at a specified time. If it is set as fast, the most recent key frame before the specific time is captured.	Enumeration value: fast
f	Output image format	Enumeration value: jpg and png

Example

- Find the video content at 7s, and set the output type as jpg.

http://a-image-demo.oss-cn-qingdao.aliyuncs.com/demo.mp4?x-oss-process=video/snapshot,t_7000,f_jpg,w_800,h_600,m_fast

- Find the video content at 50s, and set the output type as jpg. Accurate to the specific time.

http://a-image-demo.oss-cn-qingdao.aliyuncs.com/demo.mp4?x-oss-process=video/snapshot,t_50000,f_jpg,w_800,h_600

FAQs on using old and new versions of APIs and domain names

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Can OSS domain names and IMG domain names be used with the Image Service?

Currently, OSS domain names fully support the Image Service.

However:

- When OSS domain names are being used, only APIs for the new version of the ING service can be used.
- When IMG domain names are being used, APIs for the old and new versions of the IMG service can be used.

What are the advantages of OSS domain names when used with the Image Service?

Using OSS domain names:

- Enables the Image Service to support HTTPS access with enhanced security.
- Eliminates the restriction of each IMG domain name only being able to be bound to a single custom domain name.
- Simplifies the logic of the code required.

If I’m currently using APIs for the old version of the IMG service, how do I switch to OSS domain names?

Currently, APIs for the old version of the IMG service cannot be used with OSS domain names without a request being sent to Alibaba Cloud. To request use of APIs for the old version, submit a ticket to Alibaba Cloud asking for this service.

For style-based access, both OSS and IMG domain names can be used. If all your images are accessed by style, follow these steps to switch to the use of OSS domain names:

1. Enable configuration synchronization in the current Image Service configurations, so that style separators and the source image protection feature can be synchronized to OSS domain names.
2. If you use a custom domain name, direct its CNAME to the OSS domain name.

Are style configurations the same for IMG and OSS domain names?

All style configurations are shared by IMG and OSS domain names. Style configurations for IMG domain names can be applied to OSS domains.