API Gateway

User Guide for Providers

MORE THAN JUST CLOUD | Alibaba Cloud

User Guide for Providers

Overview

API Gateway provides high-performance and highly available API hosting service to help users to publish or access to the APIs on Alibaba Cloud products such as ECS and Container Service. It manages the entire API lifecycle from release and management to maintenance. You can quickly open data or services at low costs and risks through simple operations.

API Gateway provides the following features:

API management

You can manage the lifecycle of an API, including creation, testing, release, deprecation, and version switching.

Easy data conversion

You can configure a mapping rule to convert the calling request into the format required by the backend.

Presetting of request verification

You can preset the verification of the parameter type and values (range, enumeration, regular expression, and JSON Schema) for gateway to preclude the invalid requests, reduce the utilization rate of your backend.

Flexible throttling

You can set throttling for APIs, users, and APPs by minute, hour, or day.

In addition, you can also specialize some users or APPs with the independent throttling.

Easy security protection

API Gateway supports AppKey authentication and HMAC (SHA-1,SHA-256) signature.

API Gateway supports SSL/TSL encryption and uses Alibaba Cloud Security to prevent viruses and attacks.

Comprehensive monitoring and warning

API Gateway provides visualized API monitoring in real time, including the calling traffic, calling method, response time, and error rate, and supports query of historical records for comprehensive analysis. You can also configure and subscribe to the warning method (SMS or email) to check the API running status in real time.

Lower cost of publication

API Gateway automatically generates API documentation and SDKs (service end and mobile end), reducing the cost of publication of API.

Create an API

When you create an API, you must enter the basic information about the API, and define the API request information, the API backend service, and response information. Then, debug the API and set the security configuration. After testing the API, if it works properly, you can publish it to the **Release** environment for your users.

Define an API

On the **API List** page in the API Gateway console, click **Create API** to enter the API creation and definition process.

Basic Information of API

Basic API information includes the API group, API name, security certification method, visibility type, and description.

- **Group**: APIs are managed by group. Before creating an API, you must first create a group (for more information about API groups, see Open an API).
- **API Name**: It is the name of an API and also an unique identifier within its group.

  Security Certification: This method is used to authenticate API requests. Currently, the four methods available are **Alibaba Cloud App**, **OpenID Connect**,**OpenID Connect & Alibaba Cloud App**, and **No Certification**.

- **Alibaba Cloud App**: When the requestor calls this API, they must pass the identity authentication of this app.
- **OpenID Connect**: This is a lightweight standard based on OAuth 2.0, which provides a framework for identity interaction through RESTful APIs. You can use OpenID Connect to connect seamlessly to your own account system. For a detailed introduction, see OpenID Connect.
- **OpenID Connect & Alibaba Cloud App**: Both OpenID Connect and Alibaba Cloud App authentication
- **No Certification**: Any person who knows this API' s request definitions can initiate a request. The gateway does not verify their identities, but directly forwards the requests to your backend service. (We strongly recommend not to use this method.)

Visibility: **Public** or **Private**.

- **Public** APIs: All the users can view a certain sections of the API' s information on the Published API page of the API Gateway console.
- **Private** APIs: You must manually grant authorization to the user, if the user wants to call your private API.

- **Description**: A description of the functions of an API.

Define API request

This part defines how users can send requests to your API, including the relevant protocols, request paths, HTTP methods, request modes, and input parameter definitions.

- **Protocol**: Supports HTTP and HTTPS.
- **Request Path**: The path refers to the API request path for the corresponding service host. The request path can be different from the actual backend service path. You can write any valid and semantically-clear path for users. You can configure dynamic parameters in the request path that require users to input parameters in the Path field. At the same time, the backend service receives parameter from the Path, which are mapped to Query, Header and other locations. In Published API to API Gateway, you can find detailed examples and operation screenshots.
- **HTTP Method**: Supports standard HTTP methods. You can select PUT, GET, POST, DELETE, PATCH, or HEAD.
- **Request Mode**: API Gateway used this mode to process input parameters, **Request Parameter Mapping** or **Request Parameter Passthrough**.
    - **Request Parameter Mapping**: When API Gateway receives a request for your API, it uses mapping relationships to convert the request to the format required by your backend service.Request Parameter Mapping mode features:
        - Definition method: When defining this API, you must add the frontend and backend parameter mapping relationships.
        - Scenarios:

        - For the same interface, define different APIs in API Gateway to provide differentiated services to users.
        - Use API Gateway to standardize legacy system interfaces.
    - Functions:
        - You can configure full frontend to backend mapping, that is, parameter shuffling. For example, you can require API users enter parameters in the **Query** field and set the backend to receive the information in the **Header** field.Supports parameter name conversion and parameter location conversion.
        - You can define parameter verification rules to pre-verify the request parameters, and to reduce the volume of invalid parameters that are processed in the backend.Supports length verification, parameter value verification, parameter regular expression verification, and parameter JSON schema verification.
- **Request Parameter Passthrough**: After API Gateway receives an API request, it does not process the request, but directly forwards it to the backend service. In this mode:
    - You cannot implement parameter verification.
    - You cannot generate detailed API calling documentation.
    - Automatically-generated SDKs do not include request input parameters.

- **Input Parameter Definition**: You can define API request input parameters in this section, including parameter names, parameter locations, types, required or not, their default values, examples, and descriptions. **In Request Parameter Passthrough mode, users do not have to enter parameters**.
    - **Parameter Name**: The parameter name displayed to users.
    - **Parameter Location**: The location of the parameter mentioned in the request that includes Head, Query, and Parameter Path.

      Note: If you configure dynamic parameters in Path, the parameter location also defined as Parameter Path.

    - **Type**: The field type; optional values: String, Int, Long, Float, Double, and Boolean.
    - **Required**: Indicates whether this parameter is required. When set to **Yes**, API Gateway verifies that user requests contain this parameter. Requests without this parameter are rejected.
    - **Default Value**: This option is applied when **Required** is set to **No**. If a user’ s request does not contain the corresponding parameter, API Gateway automatically adds the default value before sending the request to the backend service.
    - **Example**: An example of defining parameters.
    - **Description**:Provides a brief description about the parameter and also mentions points to consider while using it.
    - **Parameter Verification Rules**: Click **More** to configure verification rules for the parameter value, including string length, the minimum and maximum values,

enumeration, regular expressions, JSON schema, and other attributes. API Gateway uses the verification rules to perform preliminary inspections on requests. If an input parameter is invalid, the request is not sent to the backend service. This is to reduce the backend processing load.

Define API backend service

This part mainly defines parameter mapping between the frontend and backend. This is the API backend service configuration, including the backend service address, backend path, backend time-out, parameter mapping, constant parameters, and system parameters. After user requests reach API Gateway, it maps the received requests according to your backend configuration, to the format required by the backend service before the requests are forwarded to the backend service.

- **Backend Service Type**: Currently supports HTTP/HTTPS and Function Compute.
  - HTTP/HTTPS: Select this option if your service is an HTTP/HTTPS service.

    NOTE: If you have an HTTPS service, the backend service must have an SSL certificate.

  - Function Compute: If you select Function Compute for the backend service, you must first create a function in the Function Compute console, enter the function's service name and function name, and obtain Function Compute's role Arn.
- **Backend VPC Access**: When your backend service is in a VPC network, you must select **Enable**. For the usage method, see Open an API in a VPC environment.
- **Backend Service Address**: The host of the backend service. This can be a domain name and in an 'http(s)://host:port' format. This value must begin with "http:// " or "https:// ".
- **Backend Request Path**: This path is the actual request path of your API service on the backend server. If your backend path receives dynamic parameters, specify a particular location and name of the parameter a caller must enter. This declares the corresponding mapping relationship.
- **Backend Timeout**: This is the maximum length of time during which an API must receive a response from the backend service of the called API. This period starts when API Gateway sends a request to the backend service and ends when API Gateway receives a response result from the backend service. Units: milliseconds. This value cannot exceed 30 seconds. If the response time exceeds this value, API Gateway abandons the request and returns the corresponding error message to the user.
- **Constant Parameters**: You can configure constant parameters. These parameters are invisible to the users. However, when requests pass through API Gateway, it adds these parameters to the specified locations in the requests before forwarding the requests to the backend service. This is used to address certain business needs of the backend service. For example, if you require that each request sent by API Gateway to the backend service carry the keyword **aligateway**, you can configure **aligateway** as a constant parameter and specify the location where it is received.

System Parameters: These are API Gateway system parameters. By default, system parameters are not transmitted to you. However, to obtain system parameters, configure their locations and names in the API. The specific content is shown in the following table.

Parameter	Description
CaClientIp	IP address of the client sending the request
CaDomain	Domain name sending the request
CaRequestHandleTime	Request time (GMT)
CaAppId	The ID of the request app
CaRequestId	RequestId
CaApiName	API name
CaHttpSchema	Protocol used by the user to call the API: HTTP or HTTPS.
CaProxy	Proxy (AliCloudApiGateway)

Note: You must make sure that the names of all parameters are globally unique, including the dynamic parameters in Path, Headers parameters, Query parameters, Body parameters (non-binary), constant parameters, and system parameters. If you have a parameter called **name** in the Headers and Query fields at the same time, the system reports an error.

Part 4: Define response

Enter the returned ContentType, response example, failed response example, and error code definitions.

Debug an API

After you define an API successfully, you can debug it on the API debugging page to verify its correctness and usability.

After you create and define an API, you can test whether the created API is usable and the request chain is correct.

1. Click the API name or the **Manage** button to go to the **API Definition** page.
2. Click **Debug API** from the left-side navigation pane.
3. Enter the request parameters and click **Send Request**.The returned results are displayed on the right side of the page.If it returns a successful result, it indicates that the API can be used.If a 4XX or 5XX error code is returned, it indicates that the request has encountered an error. For more information, see How to obtain the error message and Error code table.

Subsequent steps

After completing the API definition and preliminary debugging, you have finished creating an API. You can publish the API in the **Test**, **Pre**, or **Release** environments for ongoing debugging or for the other users to use. You can also bind a Signature key to the API and set Throttling and other security configurations.

Enable API services

Enable API services

This section provides information you must understand for the API group and domain name before you enable API services.

API group

An API group is the management unit of APIs. You must create a group before creating an API. The group consists of four attributes: name, description, region, and domain name. Note that:

The group region is fixed once selected.

Each account can have up to 50 API groups and each API group can have up to 200 APIs.

- When you create a group, the system assigns the group a second-level domain name to test your API. To enable the API service, you must bind the group to an independent domain name filed on Alibaba Cloud and resolve the CNAME of the independent domain name to the second-level domain name of the group. Up to five independent domain names can be bound to a group.

Domain name and certificate

API Gateway locates the unique API group through the domain name, and the unique API through the Path+HTTPMethod. Before enabling API services, you must know the second-level domain name and independent domain name as follows:

- The unique and fixed second-level domain name is assigned by the system during group creation. By default, a second-level domain name is used to call the API only in the test

environment under a small amount of traffic.

An independent domain name is used for enabling API services. You can bind up to five independent domain names to a group. When configuring independent domain names, pay attention to the following points:

Resolve the CNAME of an independent domain name to the API second-level domain name of the group before binding the API group and domain name.

Verify the domain name within one day. Otherwise, the unprocessed binding request is automatically withdrawn by the system.

If a domain name is already bound to another group, resolve the domain name to the second-level domain name of the to-be-bound group before binding. Otherwise, the binding fails.

If your API supports the HTTPS protocol, you must upload the SSL certificate of the domain name by entering the parameters on the **Group Details** page, including the name, content, and private key.

Test, production, and authorization

To test or enable the API, authorization is indispensable. Authorization means granting an app the permission to call an API. Note that:

- You can authorize the created app and access the second-level domain name to call the API.
- You can authorize the apps of customers to access the independent domain name to call your API service.
- Only an authorized app can call the API.

Now you have successfully enabled your API service. From creating the API to enabling it, you can create, modify, delete, view, test, release, remove, authorize, and revoke the authorization of an API. You can also view the release history and switch the version.

Manage an API

API definitions refer to the definitions related to the API request structure when you create an API. You can view, edit, delete, create, or copy an API definition on the console. Pay attention to the following points when you are working with API definitions:

1. Editing the definition of a released API does not affect the definition in the production environment unless you release and synchronize it to the production environment.
2. It is not allowed to directly delete the API definition. Deprecate the API definition before deleting it.
3. You can copy the definition from the test/production environment to overwrite the latest definition, and then, if needed, click **Edit** to modify the definition.

API release management

You can release or deprecate an API in a test or production environment with the following attentions:

1. You can access the second-level domain name or independent domain name to call the API that is released to the test or production environment.
2. The latest released version of an API overwrites the preceding version in the test/production environment and takes effect in real time.
3. When you deprecate an API in the test/production environment, the binding policy, keys, app, and authorization persists are automatically deprecated unless the API is released to production again. To revoke this relationship, you must delete it.

API authorization management

You can establish or revoke the authorization relationship between an API and an app. API Gateway verifies the permission relationship. During authorization, pay attention to the following points:

1. You can authorize one or more APIs to one or more apps. We recommend that you do not operate APIs in multiple groups at the same time during batch operation.
2. During batch operation, select an API and related environment. For example, if an API has been released to both the test and production environments, but only the test environment is chosen, only the API in the test environment is authorized.
3. You can locate an app based on the AppID or Alibaba Mail account provided by the customer.
4. When you need to revoke the authorization for an app under an API, you can view the API authorization list and delete the app from the list.

Release history and version switching

You can view the release history of each of you APIs, including the version number, notes, test/production, and time of each release.

When viewing the release history, you can select a version and switch to it. The new version directly overwrites the previous one and takes effect in real time.

Backend Signature

What Is a Signature Key

A signature key is the Key-Secret pair you create, based on which the backend service verifies the request received from the gateway. Pay attention to the following points:

1. An unchangable region must be selected during key creation. The key can only be bound to APIs in the same region.
2. One API can be bound with only one key. The key can be replaced, modified, bound to, or unbound from the API.
3. After binding a key to an API, the signature information is added to all the requests sent from the gateway to the API at your service backend. You must resolve the signature information through symmetric calculation at the backend to verify the gateway’ s identity. For more information about adding signature to the HTTP service, see Backend HTTP Service Signature.

Modify or Replace the Leaked Key

To modify the Key-Secret pair once a key is leaked or to substitute a key bound to an API with another key, proceed the following steps:

1. Configure the backend to support two keys: the original key and to-be-modified or replaced key, so that the request during the switching process can pass signature verification regardless the key modification or replacement.
2. After the backend is configured, modify the key. Verify that the new Key and Secret take effect and delete the leaked or obsolete key.

Throttling

What is throttling policy

You can set throttling for APIs, users, and apps by minute, hour, or day, or you can sort out the specific users or apps with designated throttling policy. The throttling policy is described as follows:

Throttling policy contains the following dimensions:

API traffic limit	The call times within a unit time for the API bound by the policy must not exceed the set value. The time unit may be minute, hour, or day, for example, 5,000 times per minute.
App traffic limit	The call times called by each app within a unit time for an API bound to the policy must not exceed the set value, for example, 50,000 times per hour.
User traffic limit	The call times called by each Alibaba Cloud account within a unit time must not exceed the set value. An Alibaba Cloud account may have multiple apps. The traffic limit for an Alibaba Cloud account is exactly the limit on the total traffic of all apps in this account. For example, the traffic may be 500,000 times per day.

> The three values can be set in one throttling policy. Note that the user traffic limit must not exceed the API traffic limit, and the app traffic limit must not exceed the user traffic limit.
>
> In addition, you can set an additional threshold value as the traffic limit value (not allowed to exceed the value of API traffic limit) for special apps or users. However, the basic app traffic limit and user traffic limit settings in the throttling policy are no longer applicable to the special apps or users.

An unchangable region must be selected for the throttling policy, and the throttling policy can only be applied to APIs in the same region.

The traffic of a single IP address is restricted within 100 QPS regarding with the value of API traffic limit.

A throttling policy can be bound to multiple APIs, with the limit value and special object settings appliable to each API separately. The lattest policy bound to the API overwrites the previous one and takes effect immediately.

To add a special app or user, you must obtain the app ID (AppID) or the Alibaba Mail account of the user.

On the API Gateway console, you can create, modify, delete, view, bind, and unbind a

throttling policy.

Monitoring and warning

The API Gateway console provides visualized API monitoring and warning in real time. You can obtain the calling status of an API, including the calling traffic, calling method, response time, and error rate. API Gateway displays data statistics on the calling status from multiple dimensions in multiple time units, and supports query of historical data for comprehensive analysis.

You can also configure the warning method (SMS or email) and subscribe to warning information to know the API running status in real time.

Limits

Limits on API Gateway products and business.

Restrictions	Description
User restrictions on activating the API Gateway service.	To activate the service, you must complete the real-name registration.
Restrictions on the number of API groups created by a user.	Each account can have at most 100 API groups.
Restrictions on the number of APIs created by a user.	At most 1000 APIs can be created in each API group. That is, at most 100,000 (100 * 1000) APIs can be created in each account.
Restrictions on the number of independent domain names bound to an API group.	At most five independent domain names can be bound to a group.
Restrictions on the traffic for calling an API.	The traffic of a single IP address of a single user used for calling each API made available by you must not exceed 100 QPS.
The limit of the official subdomain.	When the API group is created successfully, the API gateway issues a secondary domain name for that group. You can test the API in the group by accessing the domain name, and the gateway restricts the number of visits to 1000 times per day. Please do not use the secondary domain name to provide API service directly.
Restrictions on parameter size.	The parameters of the body location

	(including Form and Form other forms) cannot exceed 2 Mb, and other locations (including Header and Query) cannot exceed 128 Kb.

Backend Signature Demo

Overview

API Gateway provides the backend HTTP service signature verification function. To enable backend signature, you must create a signature key and bind the key to the corresponding API. (keep this key properly. API Gateway encrypts and stores the key to guarantee the security of the key.) After backend signature is enabled, API Gateway adds signature information to the request destined to the backend HTTP service. The backend HTTP service reads the signature string of API Gateway and performs local signature calculation on the received request to check whether the gateway signature and local signature result are consistent.

All the parameters you have defined are added to the signature, including the service parameters you have entered, and constant system parameters and API Gateway system parameters (such as CaClientIp) you have defined.

How to read the API Gateway signature

- Save the signature calculated by the gateway in the header of the request. The Header name is X-Ca-Signature.

How to add a signature at the backend HTTP service

For more information about the demo (Java) of signature calculation, see https://github.com/aliyun/api-gateway-demo-sign-backend-java.

The signature calculation procedure is as follows:

Organize data involved in signature adding

```
String stringToSign=
HTTPMethod + "\n" + // All letters in the HTTPMethod must be capitalized.
Content-MD5 + "\n" + // Check whether Content-MD5 is empty. If yes, add a linefeed "\n".
Headers + // If Headers is empty, "\n" is not required. The specified Headers includes "\n". For more information, see the headers organization method described as follows.
Url
```

Calculate the signature

```
Mac hmacSha256 = Mac.getInstance("HmacSHA256");
byte[] keyBytes = secret.getBytes("UTF-8");
hmacSha256.init(new SecretKeySpec(keyBytes, 0, keyBytes.length, "HmacSHA256"));
String sign = new String(Base64.encodeBase64(Sha256.doFinal(stringToSign.getBytes("UTF-8")),"UTF-8"));
```

secret is the signature key bound to an API.

Description

Content-MD5

Content-MD5 indicates the MD5 value of the body. MD5 is calculated only when HTTPMethod is **PUT** or **POST** and the body is not a form. The calculation method is as follows:

```
String content-MD5 = Base64.encodeBase64(MD5(bodyStream.getbytes("UTF-8")));
```

Headers

Headers indicates the keys and values of the headers involved in signature calculation. Read the keys of all headers involved in signature calculation from the header of the request. The key is X-Ca-Proxy-Signature-Headers. Multiple keys are separated by commas.

Headers organization method

Rank the keys of all headers involved in signature calculation in lexicographic order, and change all uppercase letters in the key of the header to lowercase, and splice the keys in the following method:

```
String headers =
HeaderKey1.toLowerCase() + ":" + HeaderValue1 + "\n"\+
HeaderKey2.toLowerCase() + ":" + HeaderValue2 + "\n"\+
...
HeaderKeyN.toLowerCase() + ":" + HeaderValueN + "\n"
```

URL

URL indicates the Form parameter in the Path + Query + Body. The organization method is as follows:If Query or Form is not empty, add a **?**, rank the keys of Query+Form in lexicographic order, and then splice them in the following method. If Query or Form is empty, then URL is equal to Path.

```
String url =
Path +
"?" +
Key1 + "=" + Value1 +
"&" + Key2 + "=" + Value2 +
...
"&" + KeyN + "=" + ValueN
```

Note that Query or Form may have multiple values. If multiple values exist, use the first value for signature calculation.

Debugging mode

To access and debug the backend signature conveniently, you can enable the Debug mode. The debugging procedure is as follows:

Add **X-Ca-Request-Mode = debug** to the **header** of the request destined to API Gateway.

The backend service can only read **X-Ca-Proxy-Signature-String-To-Sign** from the **header** because the linefeed is not allowed in the HTTP Header and thereby is replaced with “|”.

NOTE: **X-Ca-Proxy-Signature-String-To-Sign** is not involved in backend signature calculation.

Verify the time stamp

When the backend verifies the time stamp of the request, the system parameter **CaRequestHandleTime** is selectable in API definition and its value is the Greenwich mean time when the gateway receives the request.

OpenID Connect authorization

OpenID Connect is a lightweight standard based on OAuth 2.0, which provides a framework for identity interaction through APIs. Compared with OAuth, OpenID Connect not only authenticates a request, but also specifies the identity of the requester.

Based on OpenID Connect, the API gateway provides two way to authenticate API request:

OpenID Connect

Comply with standard OpenID Connect, the API customer request a “Token” through “userLoginName” and “password” first.And the API gateway performs Token verification on the request when the customer call the API.

OpenID Connect & AlibabaCloudAPP

Based on OpenID Connect, the API gateway performs Appkey+Token verification on the request and authenticates the Appkey and Token. The system of the API provider issues the Token and the gateway issues the Appkey.

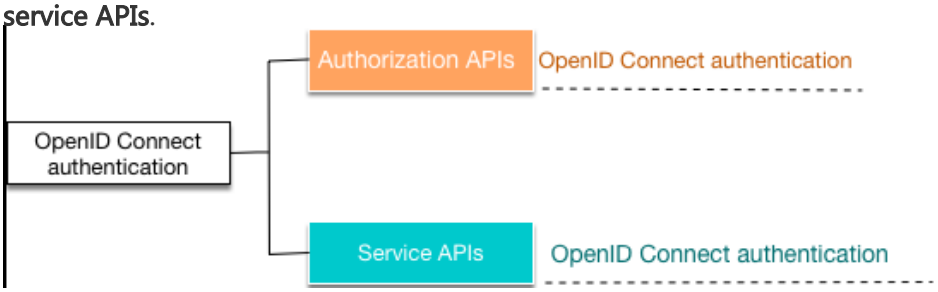
The difference between the OpenID Connect and OpenID Connect & AlibabaCloudApp: OpenID Connect & Alibaba cloud App needs to authenticate APPkey, and OpenID Connect does not.

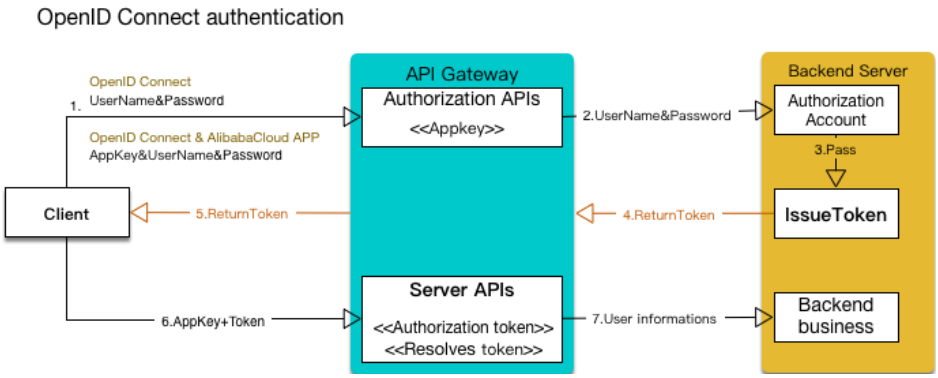
Functions that are not supported by OpenID Connect

- Cannot use App authentication
- Cannot use App level Throttling
- Cannot use AlibabaCloud Account level Throttling

Implementation principle

By performing OpenID Connect authentication, APIs can be classified into **authorization APIs** and **service APIs**.





- Authorization APIs: Interfaces used to issue a Token to the client. When configuring such APIs, you must inform the API gateway about the key corresponding to your Token and the

public key used to resolve the Token.
- Service APIs: Interfaces used to obtain user information and perform an operation. When configuring such APIs, you must inform the API gateway about the parameter that represents the Token in your request. After the request arrives at the API gateway, the API gateway automatically checks whether this request is valid.

Certification method

The client calls an authorization API

The client uses authentications to get the “Token”:

OpenID Connect

The client uses **userLoginName/password** to call an **authorization API** to obtain authorization Token.

OpenID Connect & AlibabaCloudAPP

The client uses your Appkey signature+user name/password to call an authorization API to obtain authorization Token.

After receiving the request, the API gateway authenticates your **Appkey** first(Be effect on OpenID Connect & AlibabaCloudAPP, and OpenID Connect not). If the authentication succeeds, the API gateway calls the account system of the backend service to authenticate your **user name/password**.

After the authentication by the backend service succeeds, you can use the returned **Token** to call a **service API**.

The client calls a service API

The client uses the **Token** obtained by the **authorization API** and the **signed Appkey** to call the **service API**.

The API gateway authenticates and resolves the **Token** and sends the user information contained in the **Token** to the backend.

During this phase, the API provider must follow these steps in advance:

a. Opens the account system, allows the API gateway to authenticate the

user name/password in the request, and issues the Token based on the gateway-provided encryption mode. For more information, see **How to implement the AS module** as follows.

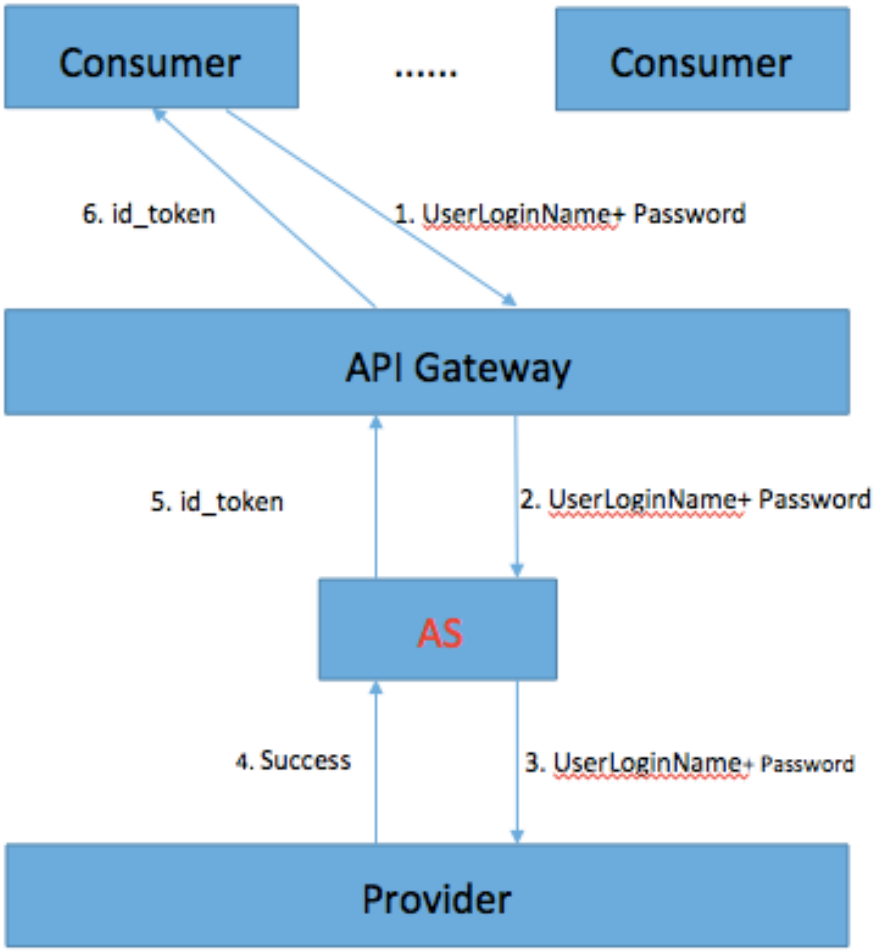
b. Defines the API in the API gateway. For more information, see **Configure an API in the API gateway** as follows.
NOTE: The **user name/password** is extremely sensitive information, which is risky when being transmitted in plaintext. We recommend that you encrypt the user name/password and use the HTTPS protocol for transmission.

Solution

The solution includes two important parts:

1. Authorization server (AS): Used to generate the id_token and manage the KeyPair.

You must perform this step by yourself. For more information about the method, see **Configure an API in the API gateway** as follows.



As shown in the preceding figure, the process is as follows:

1. The Consumer (caller) sends an id_token authentication request to the API gateway, for example, in the user name+password (U+P) mode.
2. The API gateway transparently transmits the request to the AS.
3. The AS sends the user authentication request to the Provider (service provider).
4. The Provider returns the authentication results or an error message if the authentication fails.
5. If the authentication succeeds, the AS generates an id_token, which includes the User information (expandable, and can include other necessary information).

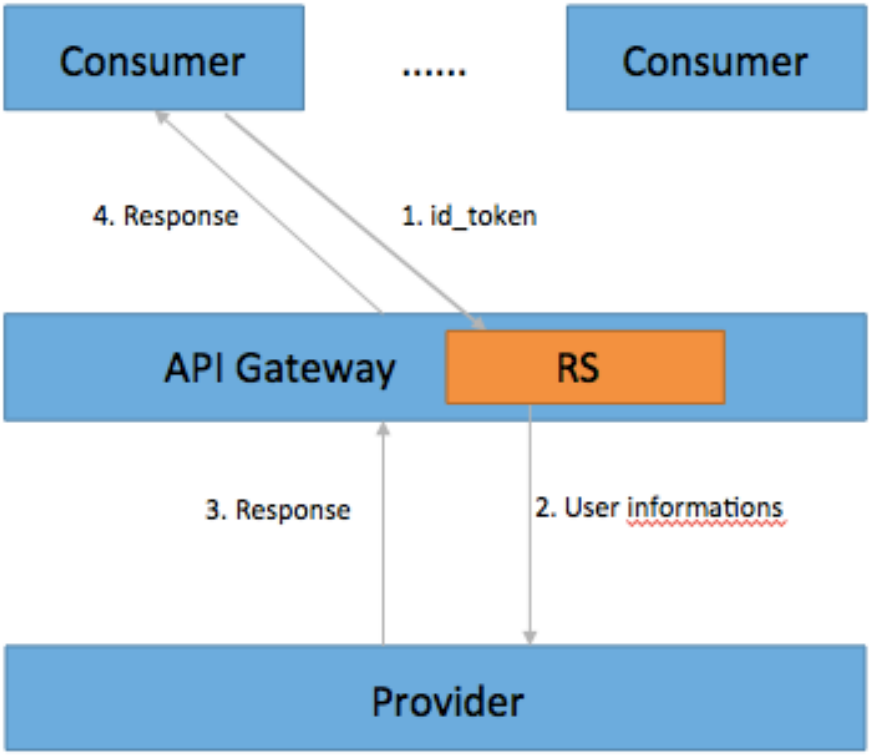
   The API gateway sends the id_token returned by the AS to the Consumer.

   Note: The AS is not required to be independently deployed. It can be integrated in the Provider and used to generate the id_token in the entire system. The generated id_token must meet the Specification in the OIDC protocol (version 1.0).

2. Resource server (RS): Used to verify the id_token and resolve

corresponding information.

This part is implemented by the gateway. Because the RS function has been integrated in the API gateway, the Provider only needs to generate the id_token in compliance with the corresponding encryption rules.



As shown in the preceding figure, the process is as follows:

1. The Consumer sends the parameter with the id_token to the API gateway.
2. The API gateway saves the publicKey used for verification, verifies and resolves the id_token to obtain the User information, and sends the User information to the Provider. If the authentication fails, the API gateway returns an error message.
3. The Provider processes the request and returns the results to the API gateway.
4. The API gateway transparently transmits the results from the Provider to the Consumer.

NOTE: The RS serves as the Consumer of the id_token. The request can be forwarded to the Provider only when the id_token verification succeeds.

How to implement the AS module

Use the OIDC in the AS to generate the id_token

- The id_token, also known as ID Token, is a type of tokens defined in the OIDC protocol. For

more information, see OpenID Connect Core 1.0.
- The KeyPair, keyId, and Claims are required to generate the id_token (for more information about the Claims, see ID_Token).

KeyId description

The KeyId must be unique. For example, the KeyId generated using the UUID is a string of at least 32 random characters, which can be all numbers or numbers and letters.
Example (Java)

```
String keyId = UUID.randomUUID().toString().replaceAll("-", "");
```

Or

```
String keyId = String.valueOf(UUID.randomUUID().getMostSignificantBits()) +
String.valueOf(UUID.randomUUID().getMostSignificantBits());
```

KeyPair description

The KeyPair is a PKI system-based public and private key pair using the asymmetric algorithm. Each pair contains a publicKey and a privateKey. The publicKey is stored in the RS, which is used for verification. The privateKey is stored in the AS, which serves as the digital signature when the id_token is generated.
The KeyPair uses the RSA SHA256 encryption algorithm. To guarantee security, 2,048 bits are encrypted.
All KeyPairs used in the AS are in the JSON format. The following is an example:
publicKey:

```
{"kty":"RSA","kid":"671741829679797099139504717892261817 21","alg":"ES256","n":"oH5WunqaqIopfOFBz9RfBVVII
cmk0WDJagAcROKFiLJScQ8N\_nrexgbCMlu-dSCUWq7XMnp1ZSqw-XBS2-XEy4W4l2Q7rx3qDWY0cP8pY83hqxTZ6-
8GErJm\_0yOzR4WO4plIVVWt96-
mxn3ZgK8kmaeotkS0zS0pYMb4EEOxFFnGFqjCThuO2pimF0imxiEWw5WCdREz1v8RW72WdEfLpTLJEOpP1FsFyG3OI
DbTYOqowD1YQEf5Nk2TqN\_7pYrGRKsK3BPpw4s9aXHbGrpwsCRwYbKYbmeJst8MQ4AgcorE3NPmp-
E6RxA5jLQ4axXrwC0T458LIVhypWhDqejUw","e":"AQAB"}
```

privateKey:

```
{"kty":"RSA","kid":"671741829679797099139504717892261817 21","alg":"ES256","n":"oH5WunqaqIopfOFBz9RfBVVII
cmk0WDJagAcROKFiLJScQ8N\_nrexgbCMlu-dSCUWq7XMnp1ZSqw-XBS2-XEy4W4l2Q7rx3qDWY0cP8pY83hqxTZ6-
8GErJm\_0yOzR4WO4plIVVWt96-
mxn3ZgK8kmaeotkS0zS0pYMb4EEOxFFnGFqjCThuO2pimF0imxiEWw5WCdREz1v8RW72WdEfLpTLJEOpP1FsFyG3OI
DbTYOqowD1YQEf5Nk2TqN\_7pYrGRKsK3BPpw4s9aXHbGrpwsCRwYbKYbmeJst8MQ4AgcorE3NPmp-
E6RxA5jLQ4axXrwC0T458LIVhypWhDqejUw","e":"AQAB","d":"aQsHnLnOK-1xxghw2KP5JTZyJZsiwt-
ENFqqJfPUzmlYSCNAV4T39chKpkch2utd7hRtSN6Zo4NTnY8EzGQQb9yvunaiEbWUkPyJ6kM3RdlkkGLvVtp0sRwPCZ2
```

```
EAYBlsMad9jkyrtmdC0rtf9jerzt3LMLC7XWbnpC3WAl8rsRDR1CGs\_-
u4sfZfttsaUbJDD9hD0q4NfLDCVOZoQ\_8wkZxyWDAQGCe6GcCbu6N81fTp2CSVbiBj7DST\_4x2NYUA2KG8vyZYcwvi
NTxQzk4iPfdN2YQz\_9aMTZmmhVUGlmTvAjE5ebBqcqKAS0NfhOQHg2uR46eBKBy\_OyVOLohsQ","p":"8Tdo3DCs-
0t9JMtM0lYqPRP4wYJs37Rv6S-ygRui2MI\_hadTY9I2A199JMYw7Fjke\_wa3gqJLa98pbybdLWkrOxXbKEkwE4uc4-
fuNjLbUTC5tqdM5-
nXmpL887uREVYnk8FUzvWeXYTCNCb7OLw5l8yPJ1tR8aNcd0fJNDKh98","q":"qlRrGSTsZzBkDgDi1xlCoYvoM76cbmx
rCUK-
mc\_kBRHfMjlHosxFUnAbxqIBE4eAJEKVfIJLQrHFvIDjQb3kM9ylmwMCu9f8u9DHrT8J7LSDlLqDaXuiM2oiKtW3bAaBP
uiR7sVMFcuB5baCebHU487YymJCBTfeCZtFdi6c4w0","dp":"gVCROKonsjiQCG-s6X4j-saAL016jJsw-
7QEYE6uiMHqR\_6iJ\_uD1V8Vuec-
RxaItyc6SBsh24oeqsNoG7Ndaw7w912UVDwVjwJKQFCJDjU0v4oniItosKcPvM8M0TDUB1qZojuMCWWRYsJjNSWcvA
QA7JoBAd-h6I8AqT39tcU","dq":"BckMQjRg2zhnjZo2Gjw\_aSFJZ8iHo7CHCi98LdlD03BB9oC\_kCYEDMLGDr8d7j3h-
llQnoQGbmN\_ZeGy1l7Oy3wpG9TEWQEDEpYK0jWb7rBK79hN8l1CqyBlvLK5oi-
uYCaiHkwRQ4RACz9huyRxKLOz5VvlBixZnFXrzBHVPlk","qi":"M5NCVjSegf\_KP8kQLAudXUZi\_6X8T-
owtsG\_gB9xYVGnCsbHW8gccRocOY1Xa0KMotTWJl1AskCu-
TZhOJmrdeGpvkdulwmbIcnjA\_Fgflp4lAj4TCWmtRI6982hnC3XP2e-
nf\_z2XsPNiuOactY7W042D\_cajyyX\_tBEJaGOXM"}
```

Example of generating a KeyPair (Java)

```
import java.security.PrivateKey;

import org.jose4j.json.JsonUtil;
import org.jose4j.jwk.RsaJsonWebKey;
import org.jose4j.jwk.RsaJwkGenerator;
import org.jose4j.jws.AlgorithmIdentifiers;
import org.jose4j.jws.JsonWebSignature;
import org.jose4j.jwt.JwtClaims;
import org.jose4j.jwt.NumericDate;
import org.jose4j.lang.JoseException;



String keyId = UUID.randomUUID().toString().replaceAll("-", "");
RsaJsonWebKey jwk = RsaJwkGenerator.generateJwk(2048);
jwk.setKeyId(keyId);
jwk.setAlgorithm(AlgorithmIdentifiers.ECDSA_USING_P256_CURVE_AND_SHA256);
String publicKey = jwk.toJson(RsaJsonWebKey.OutputControlLevel.PUBLIC_ONLY);
String privateKey = jwk.toJson(RsaJsonWebKey.OutputControlLevel.INCLUDE_PRIVATE);
```

Process for generating an id_token

Use the Claims attributes (aud, sub, exp, iat, and iss) defined in the OIDC protocol and the attribute values to generate the Claims (the full name is JwtClaims).

Code example (Java)

```
JwtClaims claims = new JwtClaims();
claims.setGeneratedJwtId();
claims.setIssuedAtToNow();
//expire time
```

```
NumericDate date = NumericDate.now();
date.addSeconds(120);
claims.setExpirationTime(date);
claims.setNotBeforeMinutesInThePast(1);
claims.setSubject("YOUR_SUBJECT");
claims.setAudience("YOUR_AUDIENCE");
//Add custom parameters

claims.setClaim(key, value);
```

Use the keyId, Claims, privateKey, and the digital signature algorithm (RSA SHA256) to generate a JSON Web Signature (JWS).

Code example (Java)

```
JsonWebSignature jws = new JsonWebSignature();
jws.setAlgorithmHeaderValue(AlgorithmIdentifiers.RSA_USING_SHA256);
jws.setKeyIdHeaderValue(keyId);
jws.setPayload(claims.toJson());
PrivateKey privateKey = new RsaJsonWebKey(JsonUtil.parseJson(privateKeyText)).getPrivateKey();
jws.setKey(privateKey);
```

Use the JWS to obtain the value of the id_token.

Code example (Java)

```
String idToken = jws.getCompactSerialization();
```

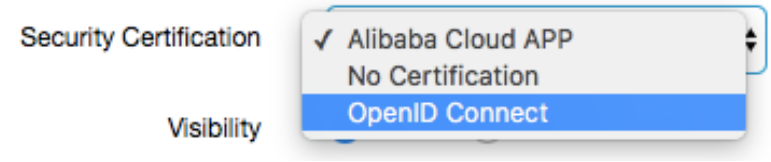
Example of a generated id_token:

```
eyJhbGciOiJSUzI1NiIsImtpZCI6Ijg4NDgzNzI3NTU2OTI5MzI2NzAzMzA5OTA0MzUxMTg1ODE1NDg5In0.eyJ1c2VySWQiOiIzMzcwMTU0NDA2ODI1OTY4NjI3IiwidGFnTmFtZSI6ImNvbmFuVGVzdCIsImV4cCI6MTQ4MDU5Njg3OSwiYXVkIjoiQWxpX0FQSV9Vc2VyIiwianRpIjoiTm9DMFVVeW5xV0N0RUFEVjNoeEIydyIsImlhdCI6MTQ4MDU5MzI3OSwibmJmIjoxNDgwNTkzMjE5LCJzdWIiOiJ7ZGF0YU1hcD0ne3VzZXJJZD0zMzcwMTU0NDA2ODI1OTY4NjI3fScsIHN0YXR1c0NvZGU9JzAnLCBlcnJvcnM9J1tdJ30ifQ.V3rU2VCziSt6uTgdCktYRsIwkMEMsO_jUHNCCIW_Sp4qQ5ExjtwNt9h9mTGKFRujk2z1E0k36smWf9PbNGTZTWmSYN8rvcQqdsupcC6LU9r8jreA1Rw1CmmeWY4HsfBfeInr1wCFrEfZl6_QOtf3raKSK9AowhzEsnYRKAYuc297gmV8qlQdevAwU75qtg8j8ii3hZpJqTX67EteNCHZfhXn8wJjckl5sHz2xPPyMqj8CGRQ1wrZEHjUmNPw-unrUkt6neM0UrSqcjlrQ25L8PEL2TNs7nGVdl6iS7Nasbj8fsERMKcZbP2RFzOZfKJuaivD306cJIpQwxfS1u2bew
```

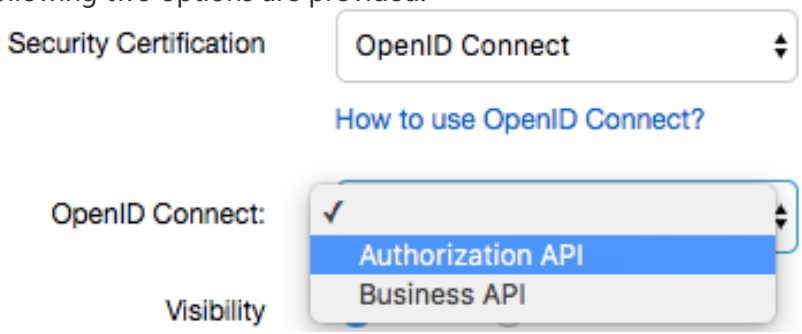
Configure an API in the API gateway

In the API edition function, the **OpenID Connect** option is added to Security certification of

Basic Info. The **Alibaba Cloud App** certification method is also included, which means that only authorized apps can call this API.



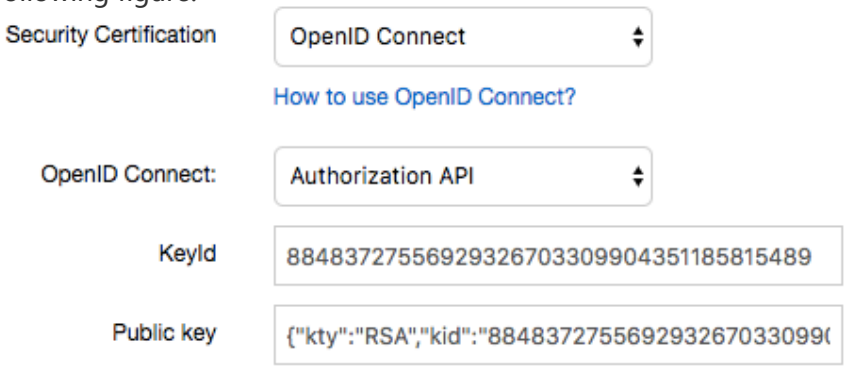
After selecting **OpenID Connect** for Security certification, set **OpenID Connect mode**. The following two options are provided.



i. Authorization APIs: Used to obtain the Token, for example, obtaining the Token using U+P.

ii. Service APIs: Used by the Provider to provide services. The Consumer calls the obtained Token as an input parameter.
The **OpenID Connect** certification method is used for the preceding two types of APIs. The following section describes how to configure these two types of APIs, respectively.

For the authorization APIs, you must configure the KeyId and publicKey, as shown in the following figure.



KeyId: A unique ID corresponding to the KeyPair, which is generated by the AS. For example:

```
884837275569293267033099043511858154 89
```

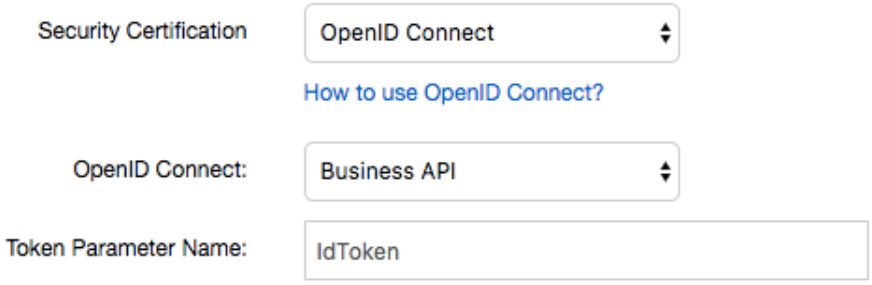
publicKey: Used to verify and resolve the Token, which is generated by the AS. For example:

```
{"kty":"RSA","kid":"884837275569293267033099043511858154 89","alg":"ES256","n":"ie0IKvKLd7Y3izHcZemdDsVVXg5QtWtGF7XEkILnn66R2\_3a30DikqV409OVL7Hv0ElACgCaBLEgZeGHTcdLE1xxDTna8MMBnBNuMVghvFERCKh8uzpxlQsfcnFd5IFdJWj1x5Tscetrow6lA3h5zYx0rF5TkZzC4DclxgDmITRam0dsHBxr3uk9m9YYBz2mX0ehjY0px7vIo7hZH2J3gODEPorIZkk3x8GPdlaA4P9OFAO4au9-zcVQop9vLirxdwDedk2p-F9GP6UiQC9V2LTWqkVw\_oPBf9Rlh8Qdi19jA8SeCfzAxJZYlbOTK8dYAFAVEFsvXCFvdaxQefwWFw","e":"AQAB"}
```

Configurations of other parameters are the same as those for common APIs, which are not described.

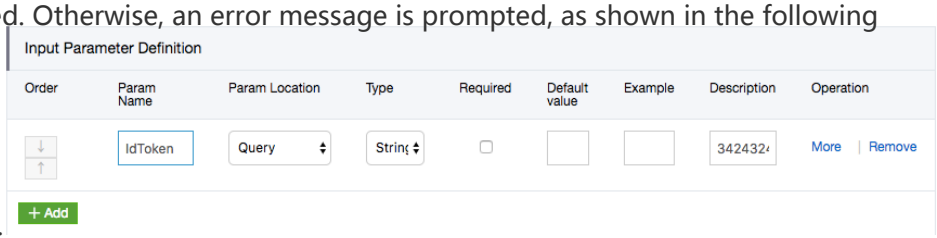
No matter creating an API or modifying an API, the configured KeyId and publicKey take effect only after the API is released.

For the service APIs, you must configure the **parameter corresponding to the Token**.

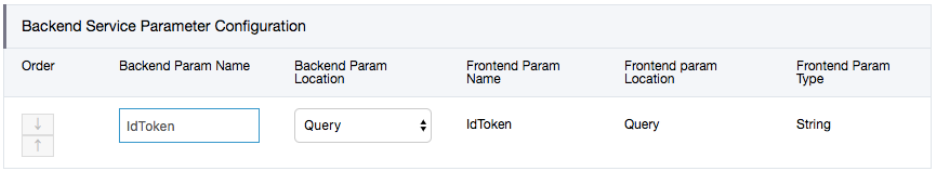


As shown in the preceding figure, the parameter corresponding to the Token is that sent to the id_token when the Consumer calls the API. The API gateway identifies, verifies, and resolves this parameter.

In the Input parameter definition area, a corresponding parameter must be defined. Otherwise, an error message is prompted, as shown in the following figure.



iii. Configuring the custom system parameters: The service API enables configuration of custom system parameters on the **Define API backend server** tab. One example is shown in the following figure.

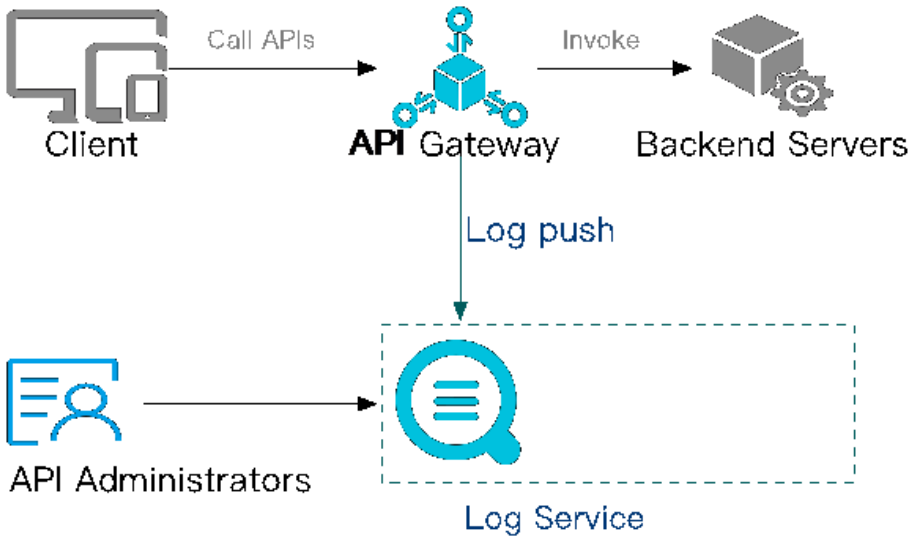


If the id_token generated by the AS contains the userId of the Consumer, the userId resolved from the id_token sent by the Consumer is transmitted to the Provider. The configuration method for custom system parameters is similar to that for system parameters.

Besides the preceding three aspects, the method for defining other configurations of the API is the same as that in the preceding sections, which are not described.

Use Log Service to view API call logs

The API Gateway and Log Service are seamlessly integrated. The Log Service enables you to view real-time log information, download logs, and analyze logs from multiple dimensions. You can also send logs to OSS or MaxCompute.



For details about more Log Service functions, see Log Service help.

You can use the Log Service free-of-charge for the first 500 MB of log data every month. For the prices of other items, see Log Service pricing.

1 Function overview

1.1 Online log search

You can specify any keyword in logs to complete an exact or fuzzy log search quickly. The search results can be used for fault location or log statistics collection.

1.2 Detailed API call logs

You can obtain detailed API call information based on the following log items:

Log item	Description
apiGroupUid	API group ID
apiGroupName	API group name
apiUid	API ID
apiName	API name
apiStageUid	API environment ID
apiStageName	API environment name
httpMethod	Called HTTP method
path	Request path
domain	Called domain name
statusCode	HttpStatusCode
errorMessage	Error message
appId	Caller application ID
appName	Caller application name
clientIp	IP address of the caller client
exception	Specific error message returned from the backend
providerAliUid	API provider account ID
region	Region name, such as cn-hangzhou
requestHandleTime	Request time (UTC)
requestId	Request ID, globally unique
requestSize	Request size, unit: byte
responseSize	Returned data size, unit: byte
serviceLatency	Backend latency, unit: millisecond

1.3 Custom analysis charts

You can define statistical charts of any log items to obtain statistical data required for business operation.

1.4 Preset analysis reports

The API Gateway provides predefined statistical charts (global) for you to use directly. These statistical charts show log items including the request size, success rate, error rate, latency, number of applications that call an API, error statistics, top groups, top APIs, and top latencies.

2 Use the Log Service to view API logs

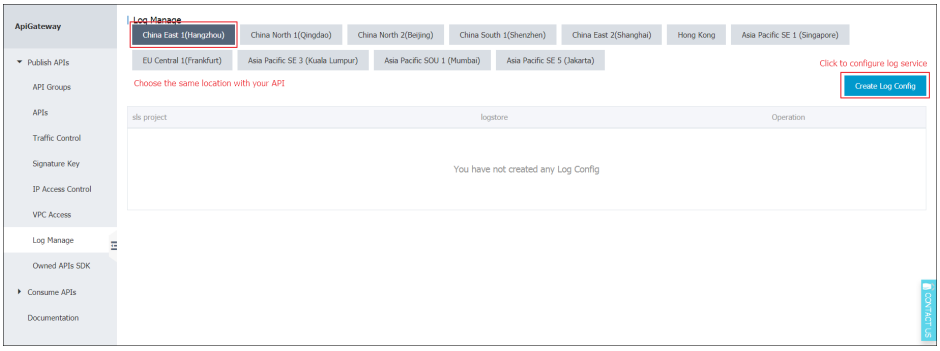
2.1 Configure the Log Service

Before using this function, make sure that you have subscribed to the log service and created a project and a logstore. Click here to create a project and logstore.

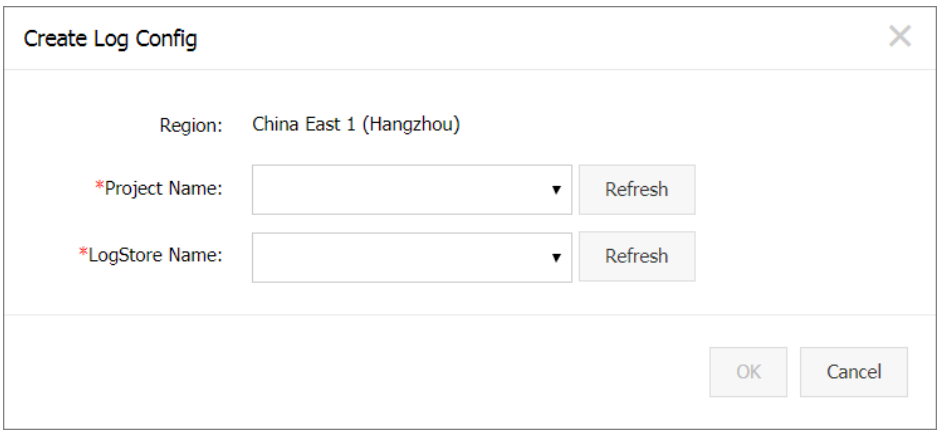
You can configure the Log Service on the API Gateway console or Log Service console.

2.1.1 Configure the Log Service on the API Gateway console

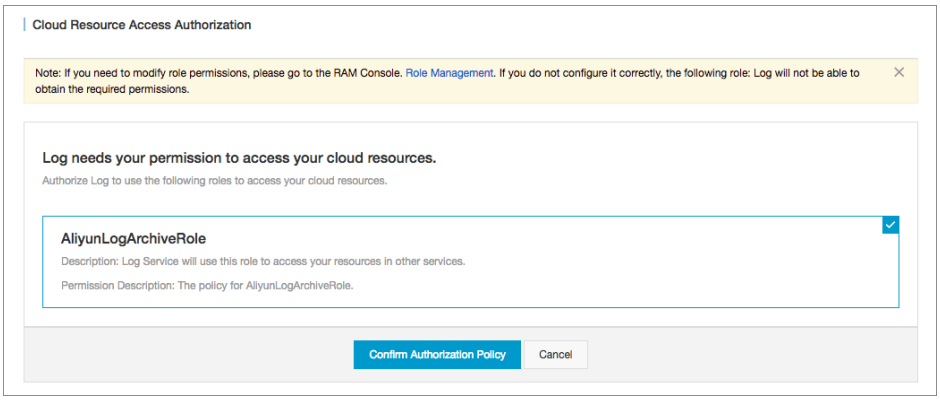
1) Open API Gateway Console and choose “Publish APIs” > “Log Manage” and select the region of your service. In the following figure, China East 1 is used as an example.



2) Click “Create Log Config” to display the log configuration page.



3) Select the project or logstore where the log service is required. If no options are available, click "Authorize Log Service Log Write Operation", and then grant the authority to access your cloud resources.



4) After you confirm the authorization, the API Gateway is successfully associated with the log service.

5) Enable the indexing function to complete the configuration.

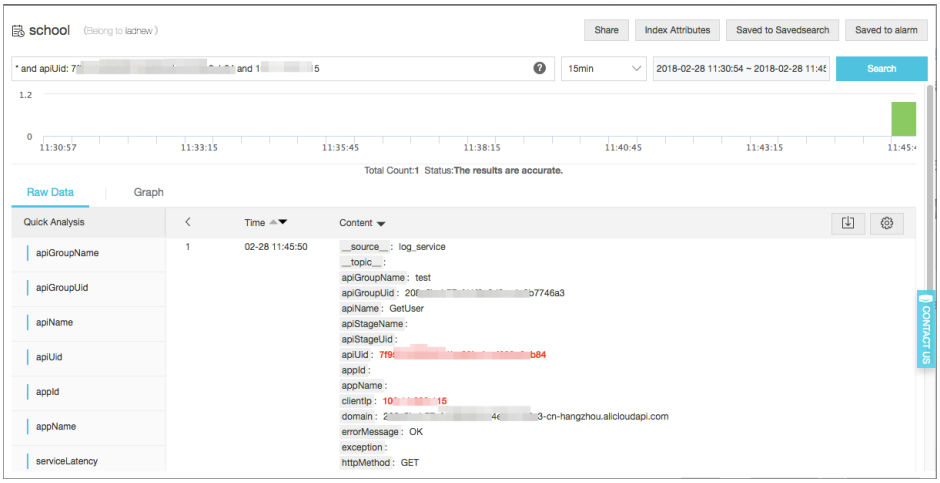
2.1.2 Configure the log service on the Log Service console

For details, see Access logs of API Gateway.

After the configuration is complete, your API calls can be recorded in the logstore for the log service.

2.2 View logs

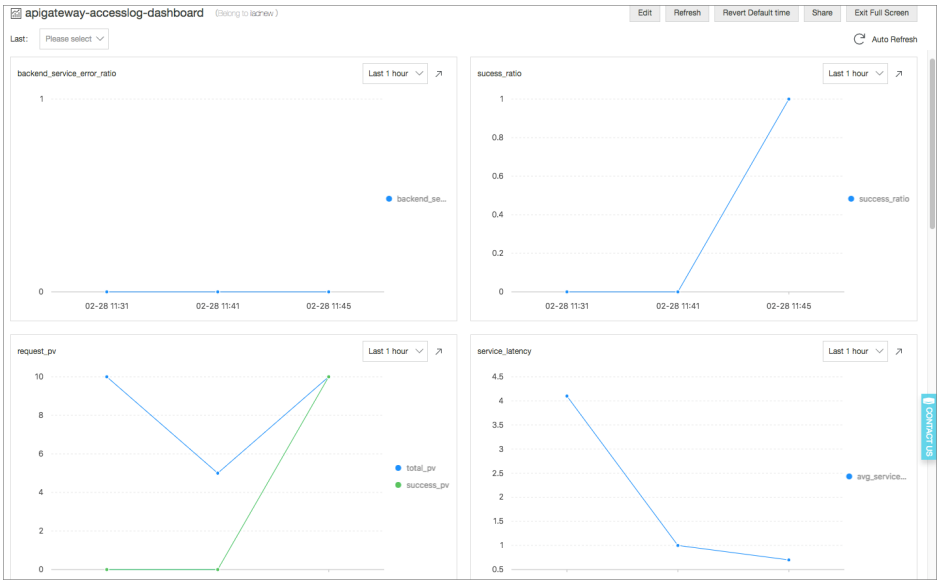
Open API Gateway console and choose "Publish APIs" > "Log Manage" > "Access Log" to go to the log console. Search for call logs online according to Query syntax, as shown in the following figure.



You can also log on to the Log Service console to view logs. For details, see Query logs.

2.3 View predefined reports

Predefined reports are statistical reports preset on the API Gateway to facilitate log statistics collection. Open API Gateway console and choose “Publish APIs” > “Log Manage” > “Access Log” to view the predefined reports. You can also view these predefined logs on the Log Service console.



2.4 Custom query reports

You can define query reports to meet your own business requirements. For details, see Dashboard.

3 Maintain logs

Open API Gateway Console and choose “Publish APIs” > “Log Manage” to modify or delete log

configuration.

- **Modify Config**: Change the project or logstore for the log service. Then API call logs are written in the new logstore, but historical logs are still saved in the original logstore and not migrated to the new logstore.
- **Delete Config**: Delete the mapping between the API Gateway and log service. The API call logs are no longer synchronized to the log service, but the historical logs in the logstore are not deleted.

ApiGateway_RAM

The API gateway and Alibaba Cloud Resource Access Management (RAM) are integrated to enable multiple employees in an enterprise to perform permission-based API management. The API provider can create sub-accounts for employees and allow different employees to manage different APIs.

- By using the RAM, employees can use the sub-accounts to view, create, manage, and delete API groups, APIs, authorizations, and throttling policies. However, the sub-accounts are not the owner of resources, whose operation permissions may be revoked by the primary account at any time.
- Before reading this document, make sure that you have carefully read RAM help manual and API gateway API manual.
- **Skip this section if you do not have such service scenarios.**

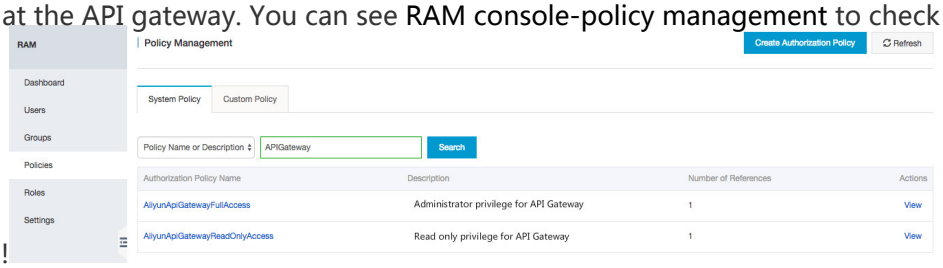
You can use the RAM console or API to add operations.

Part 1: Policy management

The authorization policy (Policy) describes authorization content. This content contains several basic elements, including Effect, Resource, Action, and Condition.

System authorization policy

Two system permissions, AliyunApiGatewayFullAccess, and AliyunApiGatewayReadOnlyAccess, have been preset at the API gateway. You can see RAM console-policy management to check the permissions.!



- AliyunApiGatewayFullAccess: It is an administrator privilege which can be used to manage all resources under the primary account, including API groups, APIs, throttling policies, and applications.
- AliyunApiGatewayReadOnlyAccess: It is used to view all resources under the primary account, including API groups, APIs, throttling policies, and applications, but cannot operate on them.

Custom authorization policy

You can customize management permissions precisely to an operation or resource as needed. For example, you can customize the edition permission for API GetUsers. You can check the defined custom authorization in RAM console-policy management-custom authorization policy.For more information about how to view, create, modify, and delete a custom authorization, see Authorization policy management.
For more information about how to enter the authorization policy content, see Policy basic elements, Policy syntax structure, and authorization policy described as follows.

Part 2: Authorization policy

An authorization policy is a set of permissions described in the policy language. After an authorization policy is attached to a user or a group, the user or all users in the group can acquire the access permissions specified in the policy.
For more information about how to enter the authorization policy content, see Policy basic elements and Policy syntax structure.
Example:

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

This example indicates that all the view operations are allowed.

Action (operation name list) format:

```
"Action":"<service-name>:<action-name>"
```

Among them:

- **service-name** indicates the Alibaba Cloud product name. Set this parameter to **apigateway**.
- **action-name** indicates the API name. See the following table. You can also enter the wildcards *****.

```
 "Action": "apigateway:Describe*" indicates all the view operations.
" Action": "apigateway:*" indicates all operations of the API gateway.
```

Part 3: Resource (operation object list)

A resource usually indicates an operation object, which can be API groups, throttling policies, and applications in the API gateway. The format is as follows:

```
acs:<service-name>:<region>:<account-id>:<relative-id>
```

Among them:

- **acs** is the abbreviation of Alibaba Cloud Service, indicating the Alibaba Cloud public cloud platform.
- **service-name** indicates the Alibaba Cloud product name. Set this parameter to apigateway.
- **region** indicates the region. You can also enter the wildcards ***** which indicate all regions.
- **account-id** indicates the account ID, such as 1234567890123456. You can also enter the wildcards *****.
- **relative-id** indicates the resource description related to the API gateway. The format is similar to a tree-like structure of a file path.

Example:

```
acs:apigateway:$regionid:$accountid:apigroup/$groupId
```

Writing:

```
acs:apigateway:*:$accountid:apigroup/
```

Check the following table by referring to API manual of the API gateway.

Action-Name	Resource
AbolishApi	acs:apigateway:$regionid:$accountid:apigroup/$groupId
AddTrafficSpecialControl	acs:apigateway:$regionid:$accountid:trafficcontrol/$trafficcontrolid
CreateApi	acs:apigateway:$regionid:$accountid:apigroup/$groupId
CreateApiGroup	acs:apigateway:$regionid:$accountid:apigroup/*

CreateTrafficControl	acs:apigateway:$regionid:$accountid:trafficcontrol/*
DeleteAllTrafficSpecialControl	acs:apigateway:$regionid:$accountid:trafficcontrol/$trafficcontrolid
DeleteApi	acs:apigateway:$regionid:$accountid:apigroup/$groupId
DeleteApiGroup	acs:apigateway:$regionid:$accountid:apigroup/$groupId
DeleteDomain	acs:apigateway:$regionid:$accountid:apigroup/$groupId
DeleteDomainCertificate	acs:apigateway:$regionid:$accountid:apigroup/$groupId
DeleteTrafficControl	acs:apigateway:$regionid:$accountid:trafficcontrol/$trafficcontrolId
DeleteTrafficSpecialControl	acs:apigateway:$regionid:$accountid:trafficcontrol/$trafficcontrolId
DeployApi	acs:apigateway:$regionid:$accountid:apigroup/$groupId
DescribeApi	acs:apigateway:$regionid:$accountid:apigroup/$groupId
DescribeApiError	acs:apigateway:$regionid:$accountid:apigroup/$groupId
DescribeApiGroupDetail	acs:apigateway:$regionid:$accountid:apigroup/$groupId
DescribeApiGroups	acs:apigateway:$regionid:$accountid:apigroup/*
DescribeApiLatency	acs:apigateway:$regionid:$accountid:apigroup/$groupId
DescribeApiQps	acs:apigateway:$regionid:$accountid:apigroup/$groupId
DescribeApiRules	acs:apigateway:$regionid:$accountid:apigroup/$groupId
DescribeApis	acs:apigateway:$regionid:$accountid:apigroup/$groupId
DescribeApisByRule	acs:apigateway:$regionid:$accountid:trafficcontrol/$trafficcontrolId oracs:apigateway:$regionid:$accountid:secretkey/$secretKeyId
DescribeApiTraffic	acs:apigateway:$regionid:$accountid:apigroup/$groupid
DescribeAppsByApi	acs:apigateway:$regionid:$accountid:apigroup/$groupId
AddBlackList	acs:apigateway:$regionid:$accountid:blacklist/

	*
DescribeBlackLists	acs:apigateway:$regionid:$accountid:blacklist/*
DescribeDeployedApi	acs:apigateway:$regionid:$accountid:apigroup/$groupId
DescribeDeployedApis	acs:apigateway:$regionid:$accountid:apigroup/$groupId
DescribeDomain	acs:apigateway:$regionid:$accountid:apigroup/$groupId
DescribeDomainResolution	acs:apigateway:$regionid:$accountid:apigroup/$groupId
DescribeHistoryApi	acs:apigateway:$regionid:$accountid:apigroup/$groupId
DescribeHistoryApis	acs:apigateway:$regionid:$accountid:apigroup/*
DescribeRulesByApi	acs:apigateway:$regionid:$accountid:group/$groupId
DescribeSecretKeys	acs:apigateway:$regionid:$accountid:secretkey/*
DescribeTrafficControls	acs:apigateway:$regionid:$accountid:trafficcontrol/*
ModifyApi	acs:apigateway:$regionid:$accountid:apigroup/$groupId
ModifyApiGroup	acs:apigateway:$regionid:$accountid:apigroup/$groupId
ModifySecretKey	acs:apigateway:$regionid:$accountid:secretkey/$secretKeyId
RecoverApiFromHistorical	acs:apigateway:$regionid:$accountid:apigroup/$groupId
RefreshDomain	acs:apigateway:$regionid:$accountid:apigroup/$groupId
RemoveAccessPermissionByApis	acs:apigateway:$regionid:$accountid:apigroup/$groupId
RemoveAccessPermissionByApps	acs:apigateway:$regionid:$accountid:apigroup/$groupId
RemoveAllBlackList	acs:apigateway:$regionid:$accountid:blacklist/*
RemoveApiRule	acs:apigateway:$regionid:$accountid:apigroup/$groupId(acs:apigateway:$regionid:$accountid:secretkey/$secretKeyId oracs:apigateway:$regionid:$accountid:trafficcontrol/$trafficcontrolId)
RemoveAppsFromApi	acs:apigateway:$regionid:$accountid:apigroup

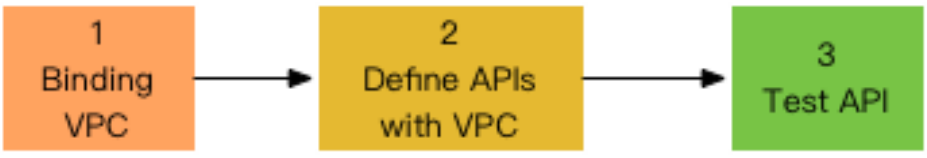
	/$groupId
RemoveBlackList	acs:apigateway:$regionid:$accountid:blacklist/$blacklistid
SetAccessPermissionByApis	acs:apigateway:$regionid:$accountid:apigroup/$groupId
SetAccessPermissions	acs:apigateway:$regionid:$accountid:apigroup/$groupId
SetApiRule	acs:apigateway:$regionid:$accountid:apigroup/$groupId(acs:apigateway:$regionid:$accountid:secretkey/$secretKeyId oracs:apigateway:$regionid:$accountid:trafficcontrol/$trafficcontrolId)
SetDomain	acs:apigateway:$regionid:$accountid:apigroup/$groupId
SetDomainCertificate	acs:apigateway:$regionid:$accountid:apigroup/$groupId
SwitchApi	acs:apigateway:$regionid:$accountid:apigroup/$groupId
CreateSecretKey	acs:apigateway:$regionid:$accountid:secretkey/*
DeleteSecretKey	acs:apigateway:$regionid:$accountid:secretkey/$secretKeyId

Apigateway_VPC

Alibaba Cloud Virtual Private Cloud (VPC) helps you establish an isolated network environment and customize the IP address range, network segment, route table, and gateway. In addition, you can implement interconnection between VPC and traditional IDC through a leased line, VPN, or GRE to build hybrid cloud services.

The API gateway also supports open APIs for your service deployed in a VPC instance. Before reading this document, make sure that you have understood how to use VPC.

If your backend service works in a VPC instance, you must authorize the API gateway to open corresponding APIs. The process of creating an API is as follows:

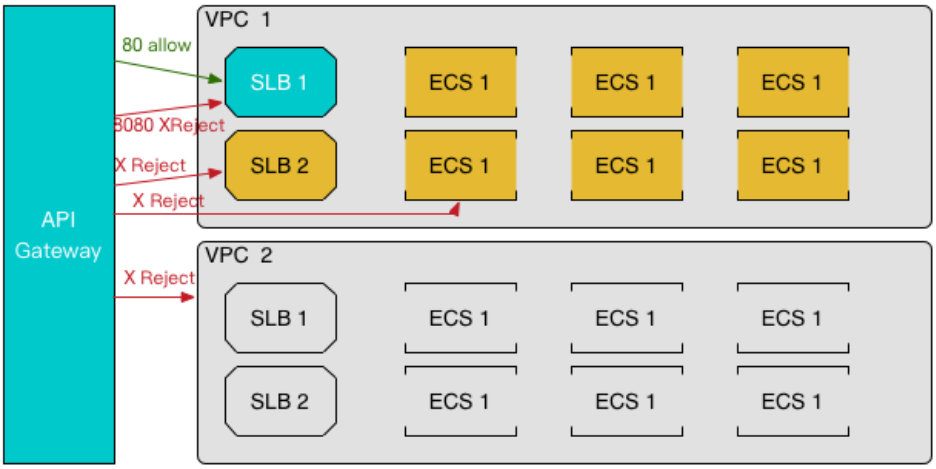


1 Authorize and bind a VPC instance

In a VPC environment, you must authorize the API gateway so that it can access the service in your VPC. During authorization, you must specify the resource and port which the API gateway can access, such as port 443 of Server Load Balancer and port 80 of ECS.

- After the authorization succeeds, the API gateway accesses resources in the VPC instance through the intranet.
- This authorization is only used for the API gateway to access corresponding backend resources.
- The API gateway cannot access unauthorized resources or ports.

For example, if only port 80 of Server Load Balancer 1 in VPC 1 is authorized to the API gateway, the API gateway can only access this port.



1.1 Prepare for a VPC environment

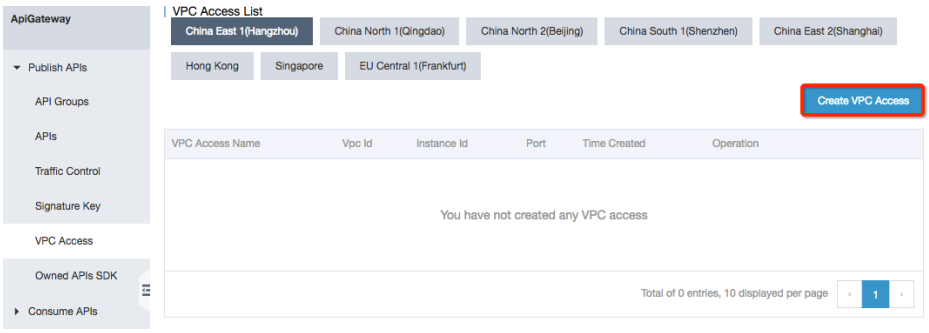
(1) Buy Server Load Balancer and ECS instances in the VPC environment and build the service. For more information, see VPC user manual.

(2) Query the VPC information. Prepare the following VPC information:

- VPC ID: Indicates the ID of the VPC where your backend service is located.
- Instance ID: Indicates the ID of the instance of your backend service. The instance can be an ECS instance or a Server Load Balancer instance. If a Server Load Balancer instance is used, enter its instance ID.
- Port number: Indicates the number of the port that calls your backend service.

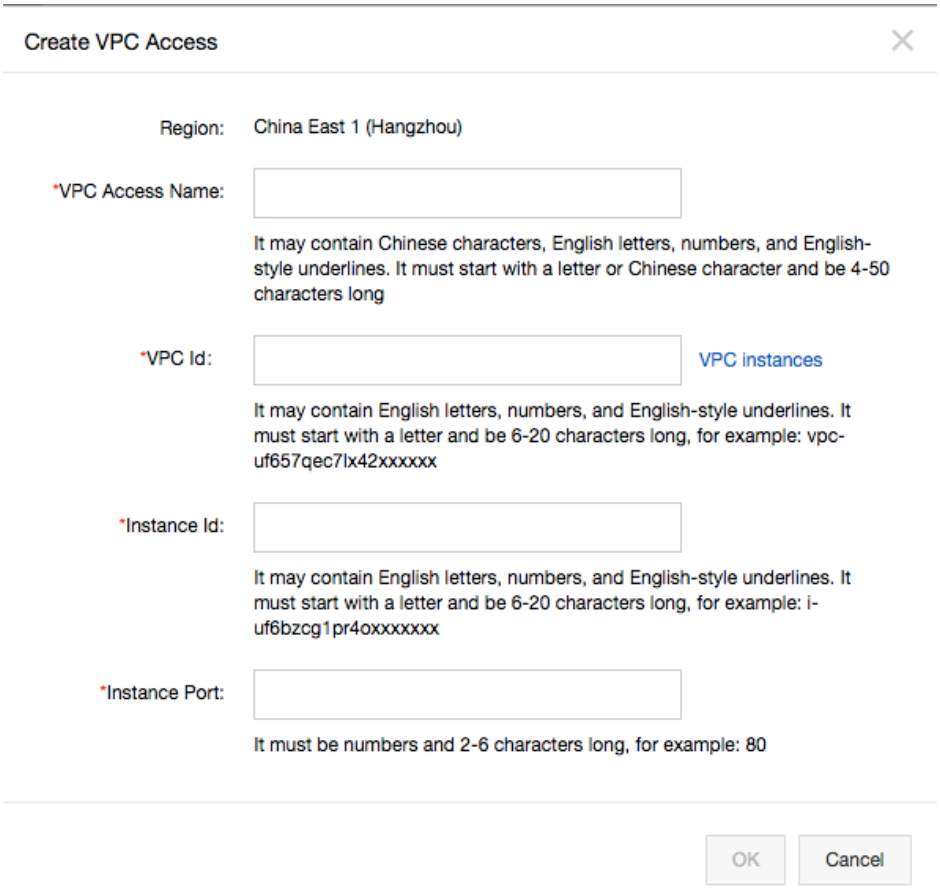
1.2 Authorize the API gateway for access

Click **API Gateway Console** > **Open API** > **Authorize VPC**, and then click **Create Authorization**.



Go to the authorization page and enter corresponding information.

- VPC name: Indicates the name of the authorization, which is used to select the backend address when an API is created. Make sure that this name is unique to facilitate further management.



Click **OK** to complete the authorization.

Repeat the preceding steps if you have multiple VPC instances or need to authorize multiple instances and ports.

2 Create an API

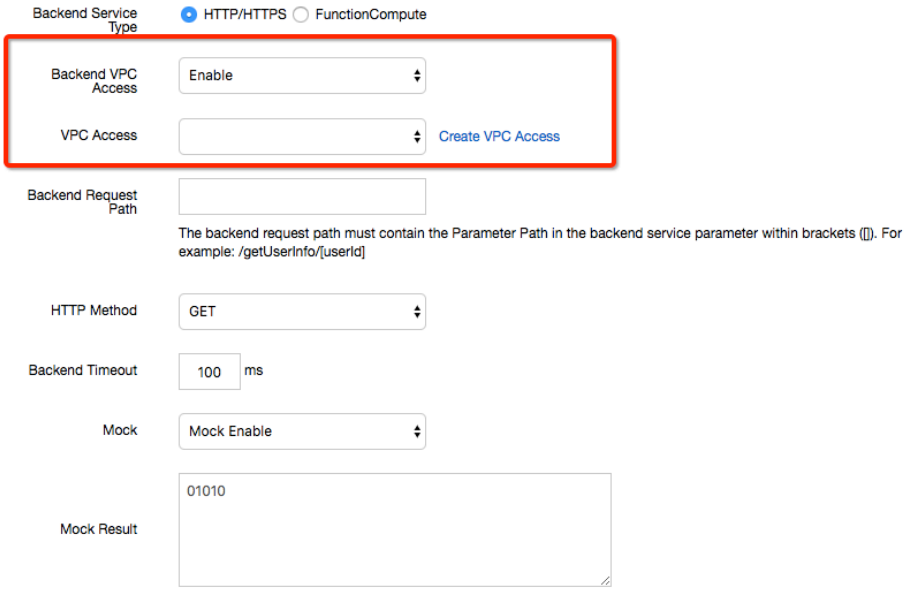
The process for creating an API is the same as that for creating other APIs. For more information, see

Create an API.

When selecting the backend service address:

- VPC channel: Set this parameter to **Use VPC channel**.
- VPC authorization: Select the created authorization as required.

Configuration of other parameters for the API is consistent with that for other APIs.



Save the configuration. The API creation is complete.

3 Authorize a security group

Optional: You can skip this step if you use Server Load Balancer at the backend and have not modified the ECS security group authorization policy.

If ECS serves as the backend service of your API and you have modified the intranet inbound access policy of the security group, you must add an access policy to enable access of the following IP segments (configure the IP segments based on the region where the service is located).

Region	Direction	IP address
China East 1(Hangzhou)	Intranet inbound	100.104.13.0/24
China North 2(Beijing)	Intranet inbound	100.104.106.0/24
China South 1(Shenzhen)	Intranet inbound	100.104.8.0/24
China East 2(Shanghai)	Intranet inbound	100.104.8.0/24
Hong Kong	Intranet inbound	100.104.175.0/24
Asia Pacific SE 1 (Singapore)	Intranet inbound	100.104.175.0/24
EU Central 1(Frankfurt)	Intranet inbound	100.104.72.0/24

Asia Pacific SE 3 (Kuala Lumpur)	Intranet inbound	100.104.112.0/24
Asia Pacific SOU 1 (Mumbai)	Intranet inbound	100.104.233.0/24
Asia Pacific SE 5 (Jakarta)	Intranet inbound	100.104.72.0/24
Asia Pacific NE 1 (Tokyo)	Intranet inbound	100.104.188.0/24
Asia Pacific SE 2 (Sydney)	Intranet inbound	100.104.143.192/26

4 Test the API

You can test your API using the following methods:

- Debug the API
- Download the SDK
- Use the API to call the Demo

5 Revoke authorization

If the authorized resource or port does not provide services, delete the corresponding authorization.

5 FAQ

Is there an extra cost for using this function?

No. This function is free of charge and no extra cost is required.

Can I bind multiple VPC instances?

Yes. You can add multiple authorizations if your backend service works in multiple VPC instances.

Why cannot I authorize my VPC?

Make sure that the VPC ID, instance ID, and port number are correct and that the authorization policy and VPC are within the same region.

If I authorize the API gateway, is my VPC secure?

If you authorize the API gateway to access your VPC, the network between the gateway and VPC is connected. Security restrictions are implemented, and VPC security issues will not occur.

1. Security control authorization: Only the owner of the VPC can perform authorization.
2. Exclusive channel between the API gateway and VPC after authorization: Other persons cannot use this channel.
3. Authorization for the port of a certain resource: The gateway does not have the permission to access other ports or resources.

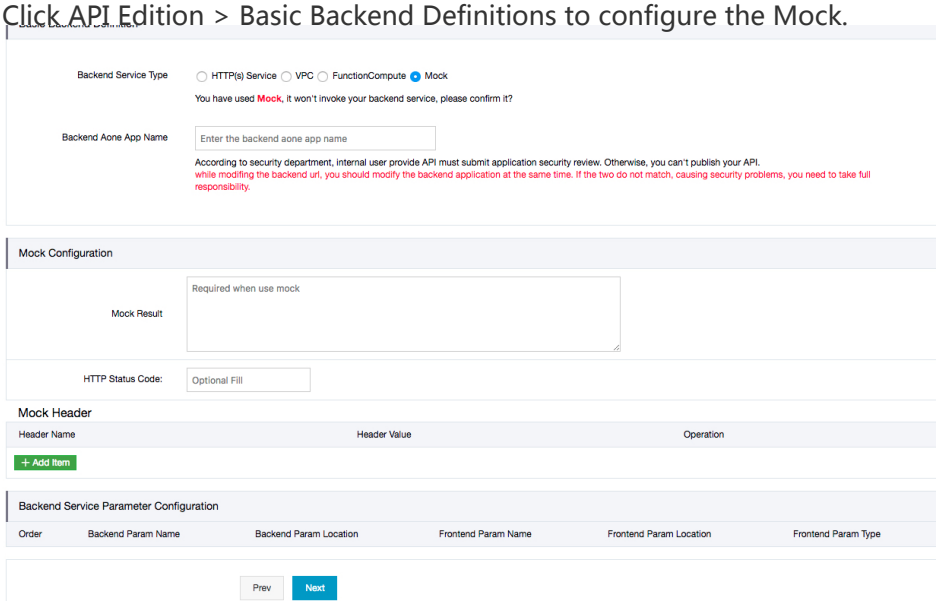
Configure Mock

A project is typically developed by multiple partners working together toward a specific target. The interdependence among the various stakeholders often restricts individual members during the process, and misunderstandings may adversely influence the development process or even impact the project timing. Mock can be used early in the project development cycle to simulate activities and project results. This can greatly reduce miscommunication and misunderstanding among team members in the project development and greatly improve the development efficiency.

API Gateway supports simple configuration in Mock mode.

Configure a Mock

Click API Edition > Basic Backend Definitions to configure the Mock.



1.Enter the Mock response result

You can enter the actual response result in the Mock response result field. Currently, the system supports Mock response results in JSON, XML, and text formats. For example:

```
"result"
:title":"Mock test for API Gateway
```

Save the Mock configuration and **release** it to the testing or production environment for debugging based on your needs. You can also debug on the API debugging page.

2. Enter response statusCode

The following table lists the valid values of statusCode. Format and status of HTTP 1.1 response status codes are supported. If you specify a statusCode that is not listed in the following table, the system reports an error indicating that the parameter is invalid.

http code	http message
200	OK
201	Created
202	Accepted
203	Non-Authoritative Information
204	No Content
205	Reset Content
206	Partial Content
300	Multiple Choices
301	Moved Permanently
302	Found
303	See Other
304	Not Modified
305	Use Proxy
306	(Unused)
307	Temporary Redirect
400	Bad Request
401	Unauthorized
402	Payment Required
403	Forbidden
404	Not Found
405	Method Not Allowed
406	Not Acceptable
407	Proxy Authentication Required
408	Request Timeout

409	Conflict
410	Gone
411	Length Required
412	Precondition Failed
413	Request Entity Too Large
414	Request-URI Too Long
415	Unsupported Media Type
416	Requested Range Not Satisfiable
417	Expectation Failed
450	Parameter Requried
451	Method Connect Exception
500	Internal Server Error
501	Not Implemented
502	Bad Gateway
503	Service Unavailable
504	Gateway Timeout
505	HTTP Version Not Supported

3.Define a Mock header

API Gateway supports custom Mock headers and duplicate header names. The value of a header name cannot be empty and may only contain numbers, letters, underscores (_), and hyphens (-). The value of a header cannot be empty.

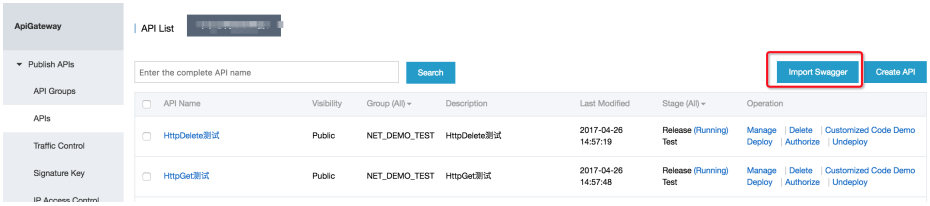
Remove a Mock

To remove a Mock, configure a different backend service. The value of the Mock response result is not removed and you can use the value for the next Mock setting. You need to **release** the change. A change takes effect only after being released.

Create APIs by Importing Swagger

Swagger is a specification used to describe API definitions, and is widely used to define and describe

APIs for backend services. You can now create APIs by importing Swagger 2.0 files into API Gateway. For more information, see ImportSwagger, or operate in the console, as in the following figure:



The API Gateway Swagger extension is based on Swagger 2.0. You can create the Swagger definition for API entities, and import the Swagger file into API Gateway for bulk creations or updating API entities. By default, API Gateway supports Swagger 2.0, which is compatible with most Swagger specifications. However, these Swagger versions have some differences. For more information, see Swagger Compatibility Reference.

This topic describes API Gateway extensions based on Swagger, and provides related examples to describe implementation.

Note: **All parameters and valid values in Swagger are case-sensitive.**

1. Swagger extensions:

The Swagger extensions are used to extend native Swagger Operation Object, providing features such as authentication, parameter mapping, and backend services. In addition, these extensions include the support for processing the ANY method in order to respond to requests made through any HTTP method.All extensions begin with x-aliyun-apigateway-, which are described as follows:

1.1 x-aliyun-apigateway-auth-type: authentication type

The authentication type is applied to Operation Object. The extension is used to specify the API authentication type.

Value range :

- APP (Default): the application authentication for Alibaba Cloud API Gateway.
- ANONYMOUS: Anonymous

Example:

```
...
paths:
'path/':
get:
x-aliyun-apigateway-auth-type: ANONYMOUS
...
```

1.2 x-aliyun-apigateway-paramater-handling: API mapping relationship

The API mapping relationship applied to the Operation Object, is used to specify the mapping relationship between the request parameters and the backend service parameters. When you select PASSTHROUGH as the mapping relationship, the Parameter Objectdoes not support x-aliyun-apigateway-backend-location and x-aliyun-apigateway-backend-name properties.

Value range :

- PASSTHROUGH (Default): the request parameter passthrough.
- MAPPING: the request parameter mapping.

Example:

```
...
paths:
'path/':
get:
x-aliyun-apigateway-paramater-handling: MAPPING
...
```

1.3 x-aliyun-apigateway-backend: backend type

The backend type applied to Operation Object. The parameter is used to specify backend service information. According to the backend service type, the specific properties are as follows:

1.3.1 Backend service type: HTTP

The HTTP backend type is used to configure the service address to achieve direct backend service access.

Property description:

Property name	Type	Description
type	string	Required. The value is HTTP.
address	string	Required. The address of the backend service.
path	string	Required. The path of the backend service. Support the path variable.
method	string	Required. The backend request method.
timeout	int	Optional. The default value is 10,000. The property value

		range is[500,30000]

Example:

```
...
x-aliyun-apigateway-backend:
type: HTTP
address: http://10.10.100.2:8000
path: "/users/{userId}"
method: GET
timeout: 7,000
...
```

1.3.2 Backend service type: HTTP-VPC

The HTTP-VPC backend type is deployed when the backend service is running in the VPC network. You need to Create a VPC authorization, and then import through the VPC authorized name.

Property description:

Property name	Type	Description
type	string	Required. The value is HTTP-VPC.
vpcAccessName	string	Required. The VPC network name that is used by the backend service.
path	string	Required. Specify the backend service path. Support the path variable.
method	string	Required. The backend request method.
timeout	int	Optional. The default value is 10,000. The property value range is[500,30000]

Example:

```
...
x-aliyun-apigateway-backend:
type: HTTP_VPC
vpcAccessName: vpcAccess1
path: "/users/{userId}"
method: GET
timeout: 10,000
...
```

1.3.3 Backend service type: FC

The FC backend type is used to configure the service address to Function Compute backend service access.

Property description:

	Property name	Type	Description
type	string	Required；The value is FC	
fcRegion	string	Required: The region that FC belongs to	
serviceName	string	Required: The service name of current FC	
functionName	string	Required：The function name of current FC	
arn	string	Required: Arn of the current FC.	

Example:

```
...
x-aliyun-apigateway-backend:
type: FC
fcRegion: cn-shanghai
serviceName: fcService
functionName: fcFunction
arn: acs:ram::111111111:role/aliyunapigatewayaccessingfcrole
...
```

1.3.4 Backend service type: MOCK

The MOCK backend type is used to simulate the backend service call by returning the default response.

Property description:

Property name	Type	Description
type	string	Required. The value is MOCK.
mockResult	string	Required. The response result of MOCK.

Example:

```
...
x-aliyun-apigateway-backend:
type: MOCK
mockResult: mock resul sample
...
```

1.4 x-aliyun-apigateway-Constant-parameters: constant parameters

A constant parameter applied toOperation Object is used to specify the parameter applied to the backend service.

Property description:

Property name	Type	Description
backendName	string	Required. The backend parameter name.
value	string	Required. The constant value.
location	String	Required. The location of the constant parameter. You can specify[query,header]
description	string	Optional. The description of the constant parameter.

Example:

```
...
x-aliyun-apigateway-constant-parameters:
- backendName: swaggerConstant
value: swaggerConstant
location: header
description: description of swagger
...
```

1.5 x-aliyun-apigateway-system-parameters: the backend service parameters.

A backend service parameter applied to Operation Object is used to define the system parameters of the API backend service.

Property description:

Property name	Type	Description
systemName	string	Required. The system parameter name.
backendName	string	Required. The backend parameter name.
location	String	Required. The location of the constant parameter. You can specify[query,header]

Example:

```
...
x-aliyun-apigateway-system-parameters:
- systemName: CaAppId
backendName: appId
location: header
...
```

1.6 x-aliyun-apigateway-backend-location: the backend parameter location.

The backend parameter location is applied Parameter Object. The property applies only when the setting is x-aliyun-apigateway-paramater-handling: MAPPING. After the parameter mapping is set, the property is used to specify the parameter location when the backend service sends a request.

Value range :

- path
- header
- query
- formData

Example:

```
...
parameters:
- name: swaggerHeader
in: header
required: false
type: number
format: double
minimum: 0.1
maximum: 0.5
x-aliyun-apigateway-backend-location: query
x-aliyun-apigateway-backend-name: backendQuery
...
```

1.7 x-aliyun-apigateway-backend-name: the backend parameter name.

The backend parameter name is applied to Parameter Object. This property applies only when the setting is x-aliyun-apigateway-paramater-handling: MAPPING. After the parameter mapping is set, the property is used to specify the parameter name when the backend service sends a request.

Example:

```
...
parameters:
- name: swaggerHeader
in: header
required: false
type: number
format: double
minimum: 0.1
maximum: 0.5
x-aliyun-apigateway-backend-location: query
x-aliyun-apigateway-backend-name: backendQuery
...
```

1.8 x-aliyun-apigateway-any-method: ANY method

The ANY method is applied to Path Item Object. The method sets an API to accept any type of HTTP request.

Example:

```
...
paths:
'path/':
x-aliyun-apigateway-any-method:
...
...
```

2. Compatibility

The differences between API Gateway and the Swagger specification when defining APIs are as follows:

2.1 Comparison between Swagger parameter types and original API Gateway type

Swagger type	API Gateway type	Supported verification

		parameters and rules
- type:integer - format:int32	Int	- mininum - maxnum
- type:integer - format:int64	Long	- mininum - maxnum
- type:number - format:float	Float	- mininum - maxnum
- type:number - format:double	Doulbe	- mininum - maxnum
- type:string	String	- maxLength - enumValues - pattern
- type:boolean - format:Boolean	Boolean	-

3. Swagger example

This topic provides three examples of Swagger extensions that are based on API Gateway. The examples cover practically all aspects of the Swagger extensions. You can refer to these examples when you define API entities based on the Swagger extensions.

Note: The examples are only for your reference.

3.1 Swagger example with HTTP as the API Gateway backend service

```
swagger: '2.0'
basePath: /
info:
version: '0.9'
title: Aliyun Api Gateway Swagger Sample
schemes:
- http
- https
paths:
'/http/get/mapping/{userId}':
```

```
get:
operationId: case1
schemes:
- http
- https
x-aliyun-apigateway-paramater-handling: MAPPING
x-aliyun-apigateway-auth-type: ANONYMOUS
x-aliyun-apigateway-backend:
type: HTTP
address: 'http://www.aliyun.com'
path: '/builtin/echo/{userId}'
method: get
timeout: 10000
parameters:
- name: userId
in: path
required: true
type: string
- name: swaggerQuery
in: query
required: false
default: '123465'
type: integer
format: int32
minimum: 0
maximum: 100
- name: swaggerHeader
in: header
required: false
type: number
format: double
minimum: 0.1
maximum: 0.5
x-aliyun-apigateway-backend-location: query
x-aliyun-apigateway-backend-name: backendQuery
x-aliyun-apigateway-constant-parameters:
- backendName: swaggerConstant
value: swaggerConstant
location: header
description: description of swagger
x-aliyun-apigateway-system-parameters:
- systemName: CaAppId
backendName: appId
location: header
responses:
'200':
description: 200 description
'400':
description: 400 description
'/echo/test/post/{userId}':
post:
operationId: testpost
schemes:
- http
- https
x-aliyun-apigateway-paramater-handling: MAPPING
```

```
x-aliyun-apigateway-backend:
type: HTTP
address: 'http://www.aliyun.com'
path: '/builtin/echo/{backend}'
method: post
timeout: 10000
consumes:
- application/x-www-form-urlencoded
parameters:
- name: userId
required: true
in: path
type: string
x-aliyun-apigateway-backend-name: backend
- name: swaggerQuery1
in: query
required: false
default: '123465'
type: integer
format: int32
minimum: 0
maximum: 100
x-aliyun-apigateway-enum: 1,2,3
- name: swaggerQuery2
in: query
required: false
type: string
x-aliyun-apigateway-backend-location: header
x-aliyun-apigateway-backend-name: backendHeader
- name: swaggerHeader
in: header
required: false
type: number
format: double
minimum: 0.1
maximum: 0.5
x-aliyun-apigateway-backend-location: query
x-aliyun-apigateway-backend-name: backendQuery
- name: swaggerFormdata
in: formData
required: true
type: string
responses:
'200':
description: 200 description
'400':
description: 400 description
x-aliyun-apigateway-any-method:
operationId: case2
schemes:
- http
- https
x-aliyun-apigateway-paramater-handling: MAPPING
x-aliyun-apigateway-backend:
type: HTTP
address: 'http://www.aliyun.com'
```

```
path: '/builtin/echo/{abc}'
method: post
timeout: 10000
parameters:
- name: userId
in: path
required: false
default: '123465'
type: integer
format: int32
minimum: 0
maximum: 100
x-aliyun-apigateway-backend-name: abc
x-aliyun-apigateway-backend-location: path
responses:
'200':
description: 200 description
'400':
description: 400 description
```

3.2 Swagger example with HTTP-VPC as the API Gateway backend service

```
swagger: '2.0'
basePath: /
info:
version: '0.9'
title: Aliyun Api Gateway Swagger Sample
schemes:
- http
- https
paths:
'/http/get/mapping/{userId}':
get:
operationId: case1
schemes:
- http
- https
x-aliyun-apigateway-paramater-handling: MAPPING
x-aliyun-apigateway-backend:
type: HTTP-VPC
vpcAccessName: vpcName1
path: '/builtin/echo/{userId}'
method: get
timeout: 10000
parameters:
- name: userId
in: path
required: true
type: string
- name: swaggerQuery
in: query
required: false
```

```
default: '123465'
type: integer
format: int32
minimum: 0
maximum: 100
- name: swaggerHeader
in: header
required: false
type: number
format: double
minimum: 0.1
maximum: 0.5
x-aliyun-apigateway-backend-location: query
x-aliyun-apigateway-backend-name: backendQuery
responses:
'200':
description: 200 description
'400':
description: 400 description
'/echo/test/post':
post:
operationId: testpost
schemes:
- http
- https
x-aliyun-apigateway-paramater-handling: MAPPING
x-aliyun-apigateway-backend:
type: HTTP-VPC
vpcAccessName: vpcName2
path: '/builtin/echo'
method: post
timeout: 10000
consumes:
- application/x-www-form-urlencoded
parameters:
- name: swaggerQuery1
in: query
required: false
default: '123465'
type: integer
format: int32
minimum: 0
maximum: 100
- name: swaggerQuery2
in: query
required: false
type: string
x-aliyun-apigateway-backend-location: header
x-aliyun-apigateway-backend-name: backendHeader
- name: swaggerHeader
in: header
required: false
type: number
format: double
minimum: 0.1
maximum: 0.5
```

```
x-aliyun-apigateway-backend-location: query
x-aliyun-apigateway-backend-name: backendQuery
- name: swaggerFormdata
in: formData
required: true
type: string
responses:
'200':
description: 200 description
'400':
description: 400 description
x-aliyun-apigateway-any-method:
operationId: case2
schemes:
- http
- https
x-aliyun-apigateway-paramater-handling: PASSTHROUGH
x-aliyun-apigateway-backend:
type: HTTP-VPC
vpcAccessName: vpcName3
path: '/builtin/echo'
method: post
timeout: 10000
responses:
'200':
description: 200 description
'400':
description: 400 description
```

3.3 Swagger example with Function Compute as the API Gateway backend service

```
swagger: '2.0'
basePath: /
info:
version: '0.9'
title: Aliyun Api Gateway Swagger Sample
schemes:
- http
- https
paths:
'/http/get/mapping/{userId}':
get:
operationId: case1
schemes:
- http
- https
x-aliyun-apigateway-paramater-handling: MAPPING
x-aliyun-apigateway-backend:
type: FC
fcRegion: cn-shanghai
serviceName: fcService
functionName: fcFunction
```

```
arn: acs:ram::111111111:role/aliyunapigatewayaccessingfcrole
parameters:
- name: userId
in: path
required: true
type: string
responses:
'200':
description: 200 description
'400':
description: 400 description
```

3.4 Swagger example with MOCK as the API Gateway backend service

```
swagger: '2.0'
basePath: /
info:
version: '0.9'
title: Aliyun Api Gateway Swagger Sample
schemes:
- http
paths:
'/mock/get/mapping/{userId}':
get:
operationId: case1
schemes:
- http
- https
x-aliyun-apigateway-paramater-handling: MAPPING
x-aliyun-apigateway-backend:
type: MOCK
mockResult: mock resul sample
mockStatusCode: 200
mockHeaders:
- name: server
value: mock
- name: proxy
value: GW
parameters:
- name: userId
in: path
required: true
type: string
responses:
'200':
description: 200 description
'400':
description: 400 description
```

Environment stage management

What is environment management

Currently, all APIs are grouped into three environments: **Test**, **Pre**, and **Release**. The **Test** and **Pre** environments are used by testers to test or debug APIs. Users use APIs in the **Release** Environment.

You can add variable parameters for API groups, defining different environment stages for APIs used in the Test, Pre, and Release environments. An environment variable is a public constant that can be customized in each environment. When calling APIs, you can place environment parameters in the request. API Gateway distinguishes the request environment according to the environment parameter information in your request.

How to configure environment variable parameters

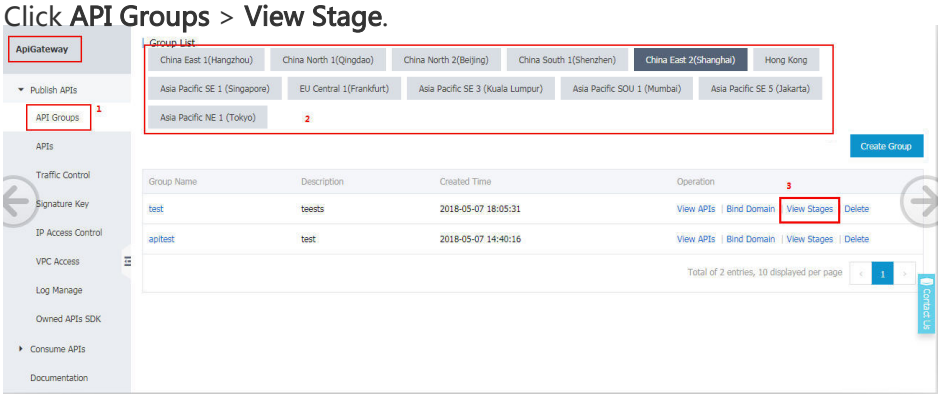
Firstly, create variables for each environment. Then, configure the created environment variables when defining APIs.

Create an environment variable

To distinguish request environments using environment variables, you must add a variable for Test, Pre, and Release environment stages respectively.

Currently, each environment allows you to configure up to 50 environment variables.

1. Log on to the API Gateway console.
2. Click **API Groups** > **View Stage**.



3. Select an environment stage (Release, Pre, or Test) and click **Add Variable**.You must add a variable for each environment stage one by one.

   Enter the variable name and value, and click **Add**.

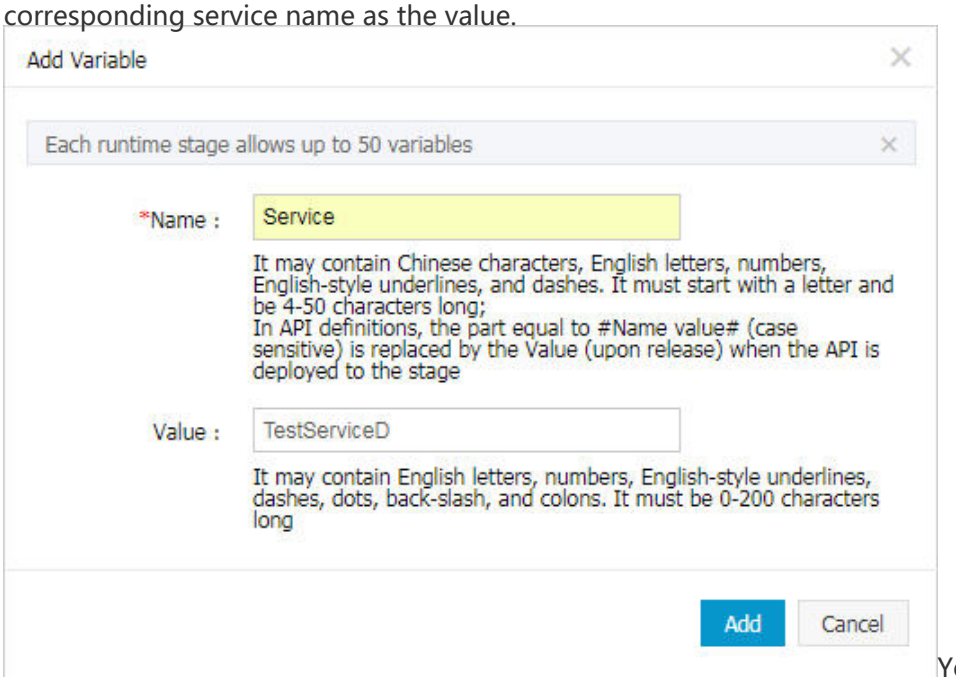
   Name: The user-defined variable name. **Make sure that the names of the variables**

corresponding to the three environment stages are the same.

If you have multiple APIs, we recommend that the variable names indicate the actual functions to facilitate future queries.

Value: Variable value.

If Function Compute is the backend service of the API Gateway, enter the name of the service and function created in Function Compute as values of the variables. You must enter the correct names of the service and function, or else you and the other users cannot call the corresponding API.Here, we use Function Compute as an example.Assuming that we have a function service and its names in the Test, Pre, and Release environments are TestServiceD, PreServiceD, and ServiceD respectively. When you define variables for the APIs of the Test, Pre, and Release environments respectively, you can name the variable “Service” and enter the corresponding service name as the value.

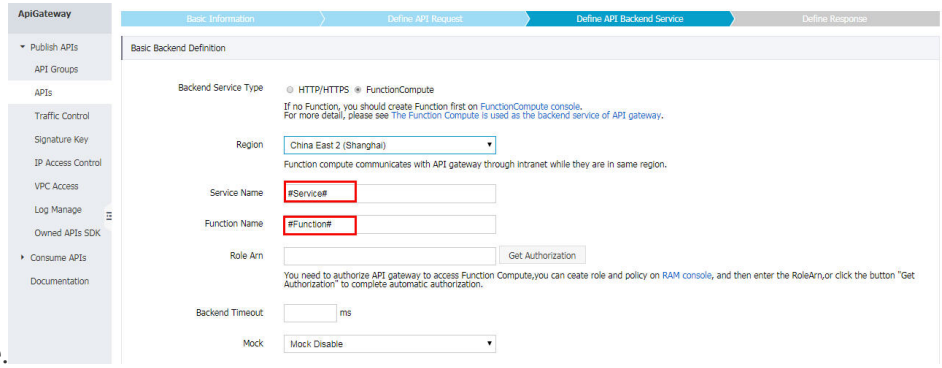


You can also enter the function name as the value of the environment stage variable named as “Function” and set the respective variables for the three environments.

Configure environment variables in API definitions

When you define the APIs, add the variable in the **Request Path**, **Input Parameter Definitions**, and **Define API Backend Service**.

Expression method: #Variable Name#. For example: #Service# or #Function#.When you set Function Compute as API Gateway’ s backend service, you can enter the created variables as a service name



and function name.

Call a multi-environment API

After an API is published, you call the API in different environments.

Calls to the production environment

To call Release environment APIs, you are not required to add an environment variable.

Calls to the pre-release environment

To call Pre environment APIs, add the parameter X-Ca-Stage: RELEASE in the header when calling the API.

Calls to the test environment

To call Test environment APIs, add the parameter X-Ca-Stage: TEST in the header when calling the API.

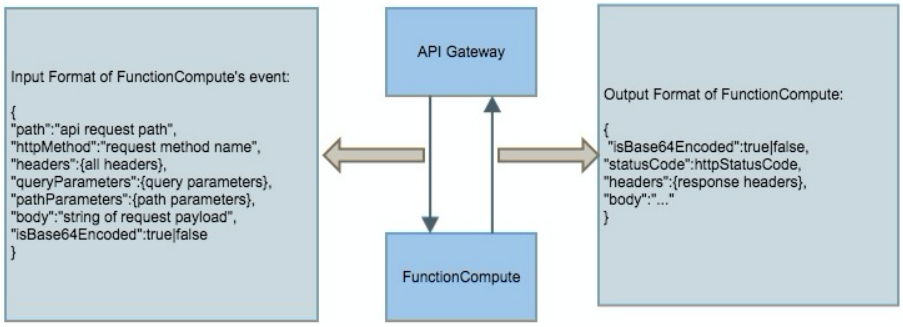
Using Function Compute as API Gateway's backend service

Function Compute is an event-driven service. Function execution can be driven by events. In other words, when a certain event occurs, it triggers a function. Currently, Function Compute supports using API Gateway as an event source. When a request sets Function Compute as the backend service API, API Gateway triggers the corresponding function and Function Compute returns the execution result to API Gateway.

API Gateway interconnects with Function Compute. This allows you to open your function services as APIs and resolves problems including certification, throttling, and data conversion (View API Gateway functions).

Implementation principles

When API Gateway calls Function Compute, the data relevant to the API is converted to Map format for transmission to Function Compute. After the data is processed by Function Compute, the statusCode, other data, body and headers are returned as output as shown in the following figure. Then, API Gateway maps the content returned by Function Compute to statusCode, header, body, and other locations to return it to the client.



Format of parameters transmitted by API Gateway to Function Compute

When Function Compute is used as a backend service of API Gateway, API Gateway uses a fixed mapping structure to send the request parameter event to Function Compute. Function Compute obtains and processes the expected parameters according to the following structure.

```
{
"path":"api request path",
"httpMethod":"request method name",
"headers":{all headers,including system headers},
"queryParameters":{query parameters},
"pathParameters":{path parameters},
"body":"string of request payload",
"isBase64Encoded":"true|false, indicate if the body is Base64-encode"
}
```

Note:

- If "isBase64Encoded" is set to "true", it indicates that the API Gateway uses Base64 to encode the body content transmitted to Function Compute. Before processing the body content, Function Compute must perform Base64 decryption.
- If "isBase64Encoded" is set to "false", it indicates that the API Gateway does not use Base64 to encode the body content.

Format of parameters returned by Function Compute

Function Compute must output the content to return to API Gateway using the following JSON format, to facilitate parsing by API Gateway.

```
{
"isBase64Encoded":true|false,
"statusCode":httpStatusCode,
"headers":{response headers},
"body":"..."
}
```

Note:

- When the body content is encoded in a binary format, you must use Base64 to encode the body content in Function Compute and set "isBase64Encoded" to "true". If the body content does not need to be encoded in Base64 format, set "isBase64Encoded" to "false". When "isBase64Encoded" is "true", API Gateway performs Base64 decryption on the body content before returning it to the client.
- In a Node.js environment, Function Compute sets callback based on the specific situation.
  - To return a successful message: callback{null,{ “statusCode” :200,” body” :” ...” }}.
  - To return an exception: callback{new Error(‘internal server error’),null}.
  - To return a client error: callback{null,{ “statusCode” :400,” body” :” param error” }}.
- If the format of the result returned by Function Compute does not conform to the format requirements, API Gateway returns 503 Service Unavailable to the client.

Create an API with Function Compute as the backend service

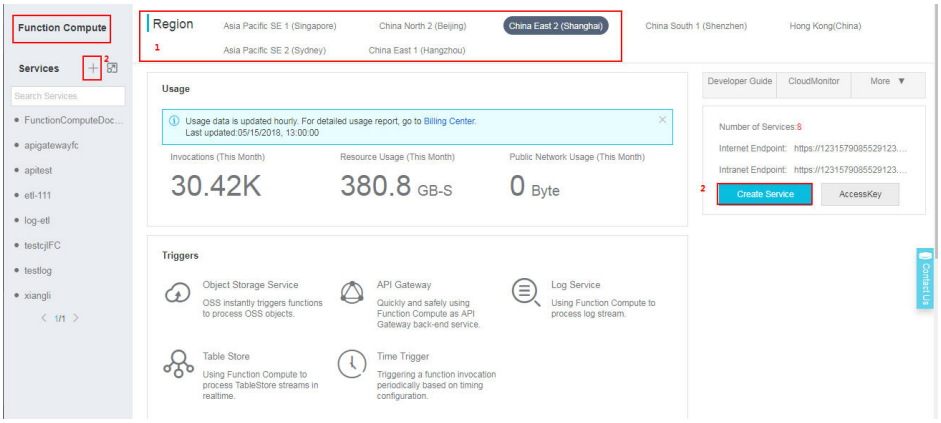
Follow these steps to create an API with Function Compute as a backend service.

1. Create a function in the Function Compute console
2. Create and define a Function Compute backend service API
3. Debug the API
4. Publish the API to the production environment

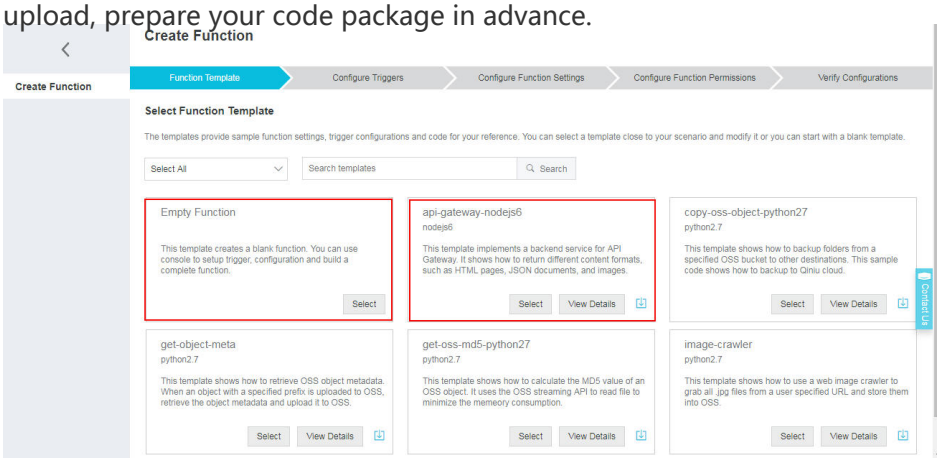
Create a function in the Function Compute console

Create a service. Log on to the Function Compute console, select the **Region** of the service and function to create and click **Create Service**. In the dialog box,complete the service creation process.

Note: After creating the service, you cannot change its region, therefore, make sure you select the correct region.



2. Create a function in the created service. On the page of this newly created service, click **Create Function** to enter the function creation process:
   i. Select a function template.The Function Compute console provides an API Gateway backend implementation template for the Node.js 6 environment: api-gateway-nodejs6.If the api-gateway-nodejs6 template does not suit your business needs, select **Empty Function**. After selecting the **Blank Function** template, you must provide your own code in **Basic Management Configuration**. To finish the upload, prepare your code package in advance.



   ii. Configure the trigger. Select **No Trigger** and click **Next**.
   iii. Configure function settings: Enter basic information, configure the code, set environment variables, and configure the environments. Then, click **Next**.
   iv. Ignore Service Role Management step and click **Next**.As we have already configured the corresponding role Arn permissions in the RAM console, you do not have to configure service role here. When creating an API in the **API Gateway console**, you click **Get Authorization** to automatically obtain the required role Arn.
   v. Check that all the information is correct and then click **Create**.After creating the function, you can review its basic information in the **Function List**.

Create and define a Function Compute backend service API

You must create an API in the API Gateway console and define its backend service as Function Compute.

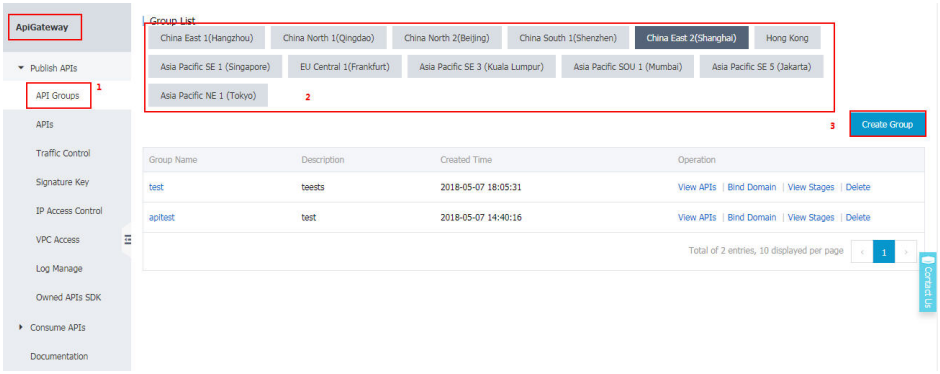
1. Log on to the API Gateway console.

   Create a group.

   Click **API Groups** from the left-side navigation pane, select a region for the group, and click **Create Group**. (Skip this step if you have already created a group.)

   > **Note:** If Function Compute and the API are in different regions, your Function Compute service is accessed over the Internet.

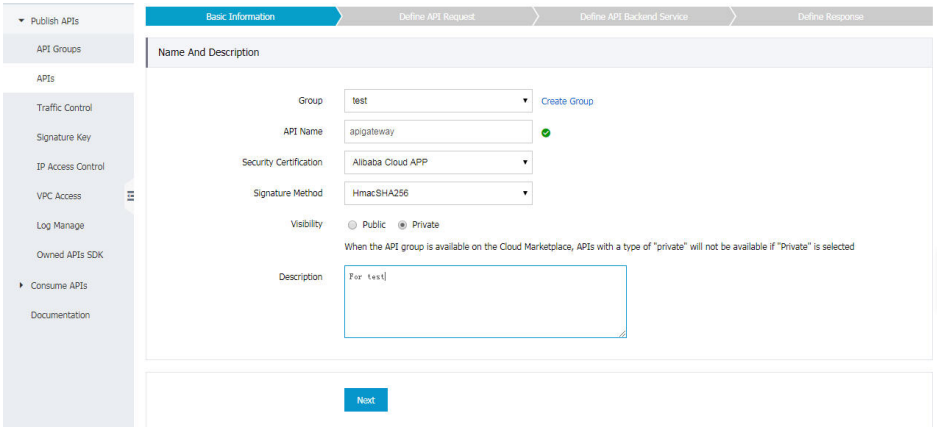
   If you have high data security and network latency requirements, create the API in the same region as the function.



   After creating the API group, you can use **Environment Management** to set environment variables for this group. APIs can be used in three environments: Test, Pre, and Release. To avoid backend address changes because of environment conversations, you can add environment variable parameters to implement automatic request routing. For the environment variable configuration method, see Environment management.

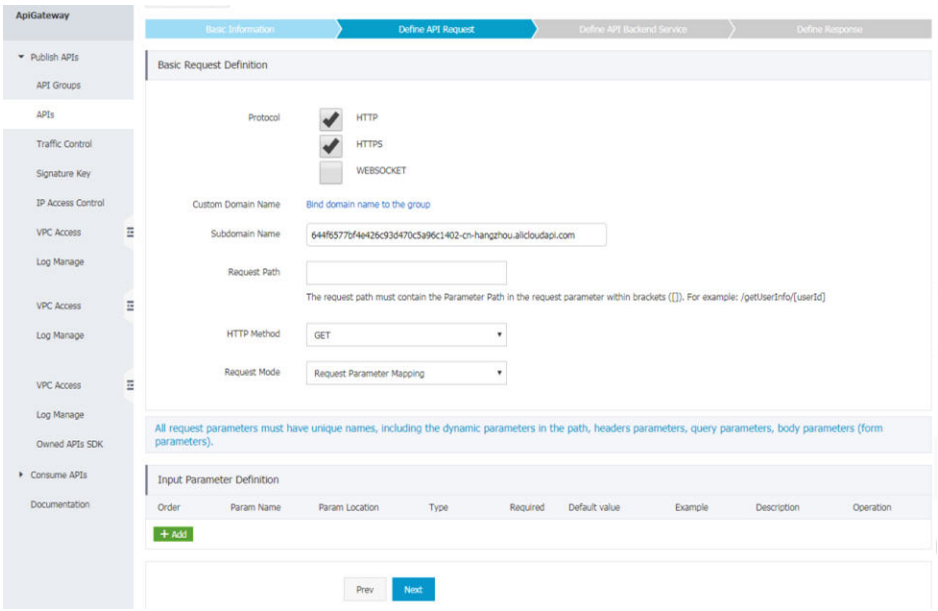
   Create and define an API.

   i. After creating the group, click the **View APIs** button from the Operation column of this group to go to its **API List** page.
   ii. Click **Create API** to enter the API creation and definition process.
   iii. Enter the basic information of the API and click **Next**.



Define API requests and click **Next**.

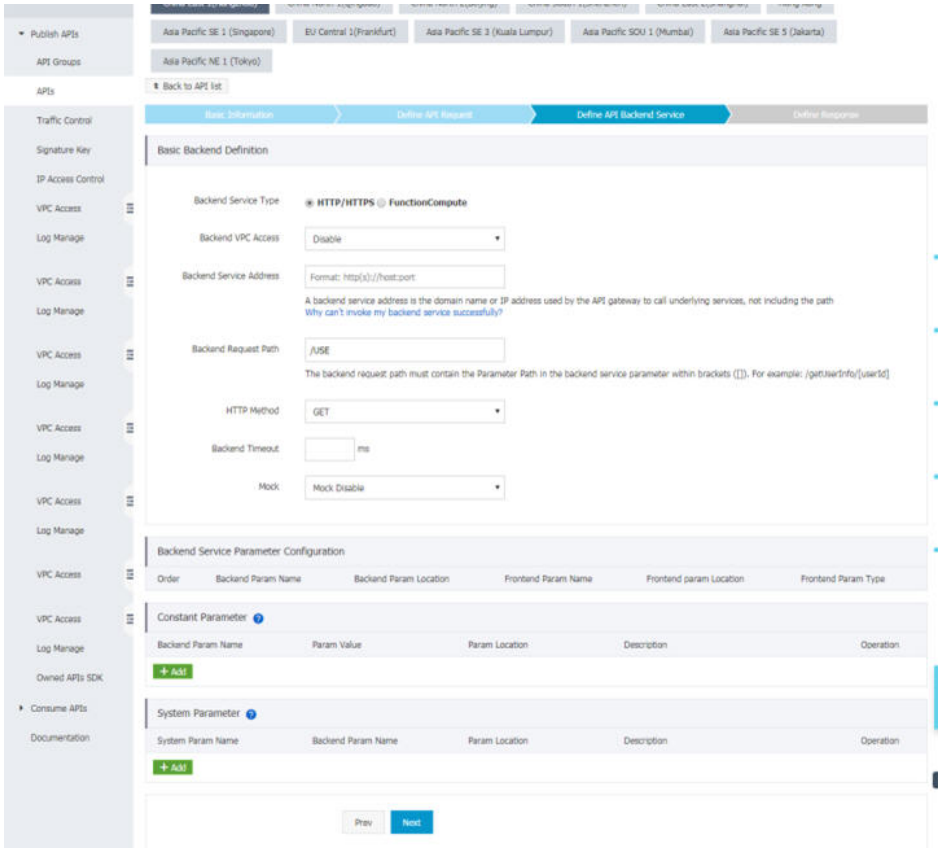
> **Note**: If the **Request Mode** is set to **Request Parameter Passthrough**, the parameter body content sent to API Gateway is not processed, and is forwarded directly to Function Compute.



Define the API backend service and click **Next**.

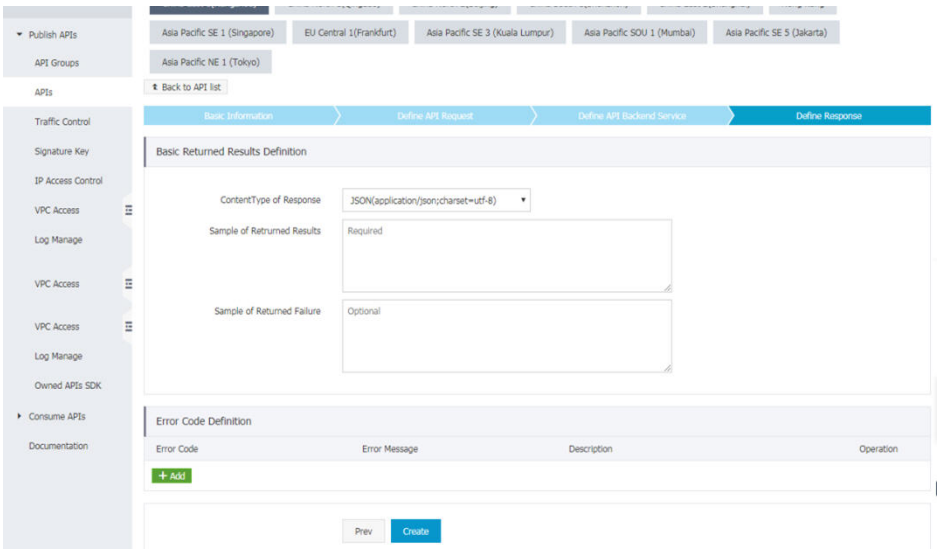
> **Note:** On this page, you must:
>
> i. Set the **Backend Service Type** to **Function Compute**.
> ii. Enter the name of the service you created in the **Function Compute console** as the **Service Name**.
> iii. Enter the name of the function you created in the **Function Compute console** as the **Function Name**.
> iv. Click **Get Authorization** to automatically obtain the role Arn.If this is the first time you have obtained role authorization for Function

Compute as the API Gateway backend service, after you click **Get Authorization**, the RAM console' s authorization page is displayed. You must click the policy to grant permission on the RAM console, and then return to the API creation page and click **Get Authorization** again. The role Arn is then automatically displayed in the selection box.



Define response and then click **Create**.

Note: a returned result sample is required and the format must follow the Format of parameters returned by Function Compute.



For more information, see Create an API.

Debug the API

After you create and define an API, the interface automatically displays the **API List** page. You can test whether the created API is usable and the request chain is correct.

1. On the **API List** page, click the API name or the **Manage** button to go to the **API Definition** page.
2. Click **Debug API** on the left-side navigation pane.
3. Input the request parameters and click **Send Request**.The returned results are displayed on the right-side of the page.If it returns a successful result, it indicates that the API can be used.If a 4XX or 5XX error code is returned, it indicates that the request has encountered an error. For more information, see How to obtain the error message and Error code table.
4. Publish the API to the **Pre** environment for testing before it goes online.After testing proves the API is usable, you can return to the **API Definition** page and publish the API to the **Pre** environment. Then, use the subdomain name to simulate real user requests to test calling.

   Note: If an environment variable is set in the API definition, enter the parameter X-Ca-Stage: RELEASE in the header to call the pre-release environment API.

Publish the API to the production environment

After you debug the API to prove it can be used, you can publish it.

1. On the **API List** page, click the API name or the **Manage** button to go to the **API Definition** page.
2. Click the **Publish** button in the upper-right corner of the page to bring up the **Publish API** dialog box.
3. Select **Release**, enter remarks, and click **Publish**.After the API is published to the production

environment, your users can call it.

For more information about publishing, see the Publish an API document.

Samples

The three samples namely a function code sample, API request sample, and API Gateway return sample are described as follows.

Function code sample

This is a sample of code configured in Function Compute.

```
module.exports.handler = function(event, context, callback) {
var responseCode = 200;
console.log("request: " + JSON.stringify(event.toString()));
//Converts the event to a JSON object.
event=JSON.parse(event.toString());
var isBase64Encoded=false;
//Returns the result for the statusCode you enter; used to test scenarios with different statusCode values
if (event.queryParameters !== null && event.queryParameters !== undefined) {
if (event.queryParameters.httpStatus !== undefined && event.queryParameters.httpStatus !== null &&
event.queryParameters.httpStatus !== "") {
console.log("Received http status: " + event.queryParameters.httpStatus);
responseCode = event.queryParameters.httpStatus;
}
}
//If the body is Base64 encoded, Function Compute must decode the body content
if(event.body!==null&&event.body!==undefined){
if(event.isBase64Encoded!==null&&event.isBase64Encoded!==undefined&&event.isBase64Encoded){
event.body=new Buffer(event.body,'base64').toString();
}
}
//input is the content that API Gateway inputs to Function Compute
var responseBody = {
message: "Hello World!",
input: event
};

//Base64 encodes the body content, can be set according to your actual needs
var base64EncodeStr=new Buffer(JSON.stringify(responseBody)).toString('base64');

//Format of the result that Function Compute returns to API Gateway; must conform to the following requirements:
Set isBase64Encoded according to whether the body must be Base64 encoded
var response = {
isBase64Encoded:true,
statusCode: responseCode,
headers: {
"x-custom-header" : "header value"
},
body: base64EncodeStr
};
console.log("response: " + JSON.stringify(response));
```

```
callback(null, response);
};
```

Sample request

A POST format request path for the following API:

```
/fc/test/invoke/[type]


POST http://test.alicloudapi.com/fc/test/invoke/test?param1=aaa&param2=bbb

"X-Ca-Signature-Headers":"X-Ca-Timestamp,X-Ca-Version,X-Ca-Key,X-Ca-Stage",
"X-Ca-Signature":"TnoBldxxRHrFferGlzzkGcQsaezK+ZzySloKqCOsv2U=",
"X-Ca-Stage":"RELEASE",
"X-Ca-Timestamp":"1496652763510",
"Content-Type":"application/x-www-form-urlencoded; charset=utf-8",
"X-Ca-Version":"1",
"User-Agent":"Apache-HttpClient\/4.1.2 (java 1.6)",
"Host":"test.alicloudapi.com",
"X-Ca-Key":"testKey",
"Date":"Mon, 05 Jun 2017 08:52:43 GMT","Accept":"application/json",
"headerParam":"testHeader"

{"bodyParam":"testBody"}
```

API Gateway return sample

```
200
Date: Mon, 05 Jun 2017 08:52:43 GMT
Content-Type: application/json; charset=UTF-8
Content-Length: 429
Access-Control-Allow-Origin: *
Access-Control-Allow-Methods: GET,POST,PUT,DELETE,HEAD,OPTIONS , PATCH
Access-Control-Allow-Headers: X-Requested-With, X-Sequence,X-Ca-Key,X-Ca-Secret,X-Ca-Version,X-Ca-
Timestamp,X-Ca-Nonce,X-Ca-API-Key,X-Ca-Stage,X-Ca-Client-DeviceId,X-Ca-Client-AppId,X-Ca-Signature,X-Ca-
Signature-Headers,X-Forwarded-For,X-Ca-Date,X-Ca-Request-Mode,Authorization,Content-Type,Accept,Accept-
Ranges,Cache-Control,Range,Content-MD5
Access-Control-Max-Age: 172800
X-Ca-Request-Id: 16E9D4B5-3A1C-445A-BEF1-4AD8E31434EC
x-custom-header: header value

{"message":"Hello World!","input":{"body":"{\"bodyParam\":\"testBody\"}","headers":{"X-Ca-Api-
Gateway":"16E9D4B5-3A1C-445A-BEF1-4AD8E31434EC","headerParam":"testHeader","X-Forwarded-
For":"100.81.146.152","Content-Type":"application/x-www-form-urlencoded; charset=UTF-
8"},"httpMethod":"POST","isBase64Encoded":false,"path":"/fc/test/invoke/test","pathParameters":{"type":"test"},"que
ryParameters":{"param1":"aaa","param2":"bbb"}}}
```

FAQ

Why can’ t I input an existing function?

You must make sure that the service and function names you enter are consistent with the names used to create the service and function on the Function Compute console.

Can I set multiple functions as an API’ s backend service?

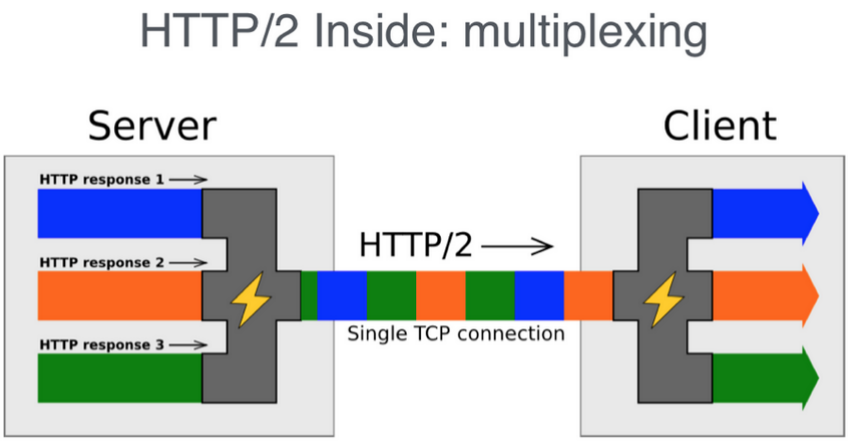
No. Currently, one API can be mapped to one particular function only.

HTTP 2.0

API Gateway supports HTTP 2.0

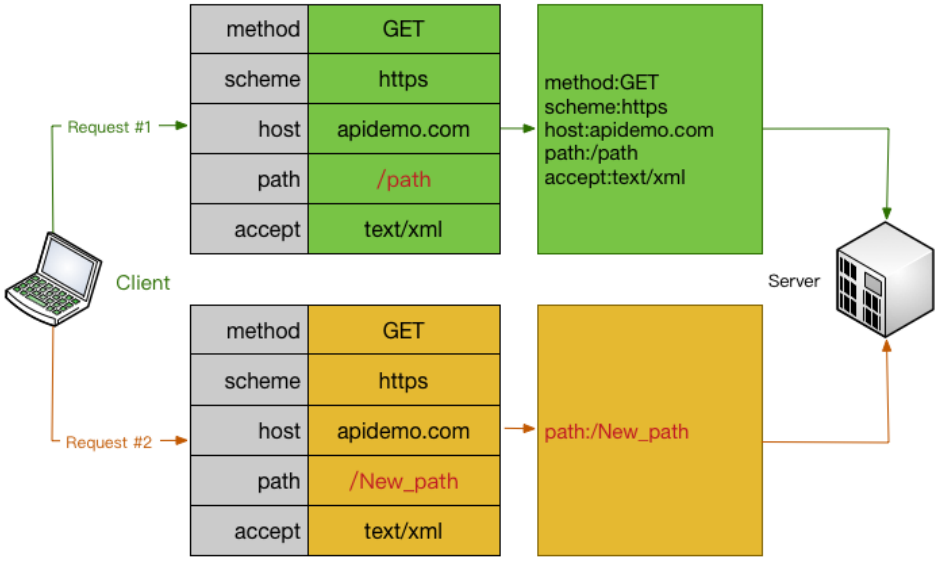
API Gateway supports new features of HTTP 2.0, multiplexing, and request header compression.

- MultiPlexing: Dependency on multiple connections during concurrent processing and sending of requests and responses in HTTP 1.x is eliminated. The client and server can divide an HTTP message into multiple frames independent of each other, send the frames in a random order, and then recombine them at another end, which avoids unnecessary latency and improves efficiency. In case of a large amount of requests, the client can use this method to transmit the request data with only a few connections.



- Header compression: As previously mentioned, the header in HTTP 1.X carries much information and must be resent each time. In HTTP 2.0, the client and server use the “header table” to trace and save the sent key-value pairs. Same data is not repeatedly sent in each request and response. The “header table” exists during the connection duration of

HTTP 2.0 and is incrementally updated by both the client and the server. Each new header key-value pair is either added to the end of the current table or replaces a value in the table, so as to reduce the data volume of each request.



How to enable HTTP 2.0

New API groups (created after July 14, 2017)

All the HTTPS APIs support HTTP2 communication between the client and API Gateway. (HTTP 2.0 runs only in an HTTPS environment, and thus you must Enable HTTPS before using HTTP 2.0.)

Stock API groups

The manual enabling function will be available in the future.

To Support HTTPS

HTTPS is a protocol integrating HTTP and SSL. It encrypts information and data to guarantee data transmission security. HTTPS is widely used today.

The API gateway also supports HTTPS to encrypt your API requests. The encryption can be API-level, that is, you can configure your APIs to support only HTTP or HTTPS or support both of them.

If you require the APIs to support HTTPS, follow these steps:

Step 1. Prepare materials

Prepare the following materials:

- A self-owned controllable domain name
- An SSL certificate applied for this domain name
- Only the PEM certificate format is supported. For more information, see About Certificate Formats.

The SSL certificate contains XXXXX.key and XXXXX.pem, which can be opened using the text editor.

Example:

KEY

```
-----BEGIN RSA PRIVATE KEY-----
MIIEpAIBAAKCAQEA8GjIleJ7rlo86mtbwcDnUfqzTQAm4b3zZEo1aKsfAuwcvCud
....
-----END RSA PRIVATE KEY-----
```

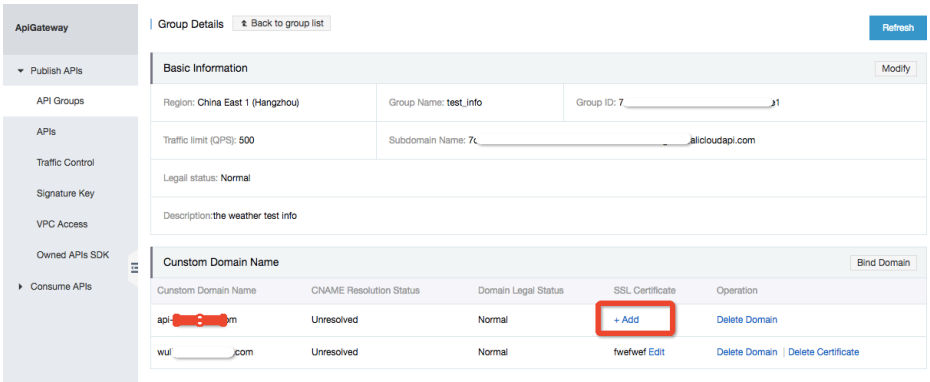
PEM

```
-----BEGIN CERTIFICATE-----
MIIFtDCCBJygAwIBAgIQRgWF1j00cozRl1pZ+ultKTANBgkqhkiG9w0BAQsFADBP
...
-----END CERTIFICATE-----
```

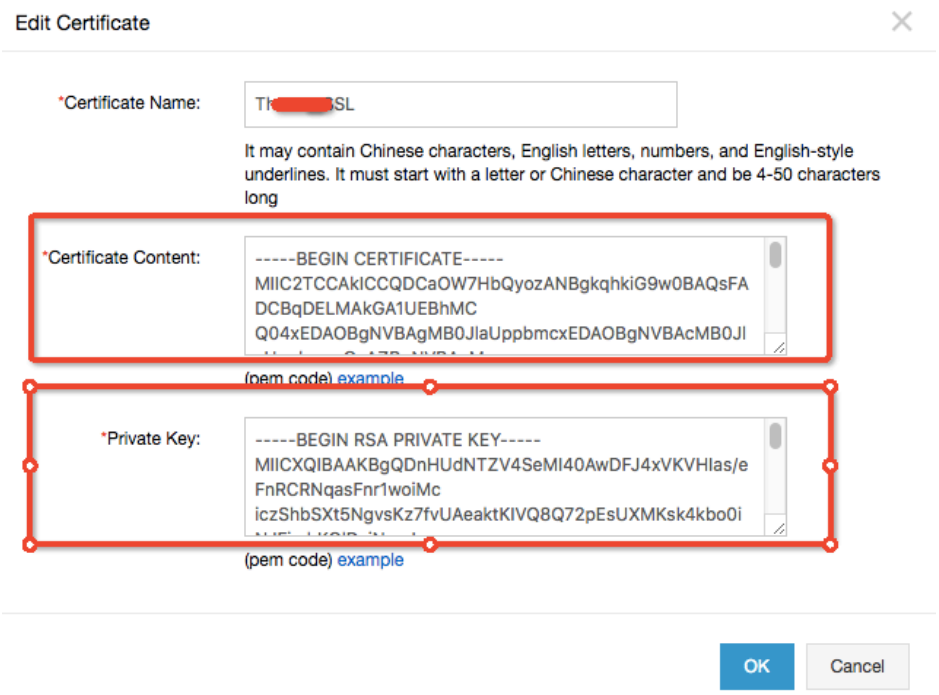
Step 2: Bind the SSL certificate

After preparing the preceding materials, log on to the API gateway console and click **Open API** > **Group Management**. Click the group to which the SSL certificate is to be bound and check the group details.

Before binding the SSL certificate, bind an **Independent domain name** to the API group.



Independent domain name - Add an SSL certificate.

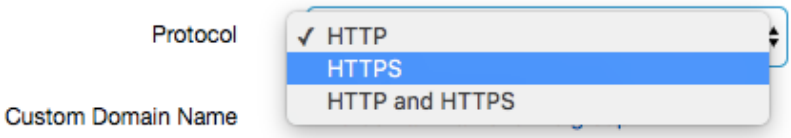


- Certificate name: Indicates the custom name for further identification.
- Certificate content: Indicates the complete content of the certificate. You must copy all content in XXXXX.pem.
- Private key: Indicates the private key of the certificate. You must copy the content in XXXXX.key.

Click **OK** to complete binding of the SSL certificate.

Step 3: Adjust the API configuration

After binding the SSL certificate, you can enable access over HTTP, HTTPS, or HTTP and HTTPS for APIs. For security considerations, we recommend that you configure all APIs to support access over HTTPS.



You can select **Open API** > **API list** to locate the corresponding API and click **API definition** > **Edit** > **Basic request definition** to modify the API.

The API supports the following protocols:

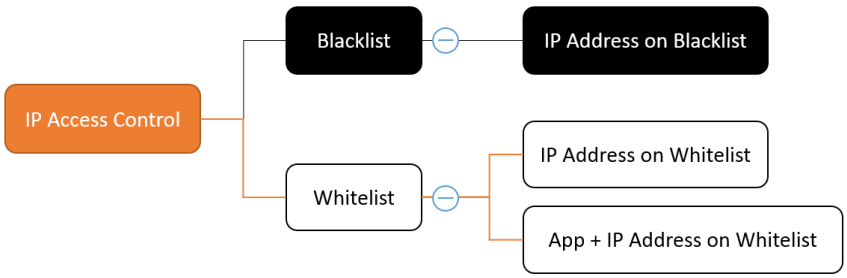
- HTTP: The API only supports access over HTTP.

- HTTPS: The API only supports access over HTTPS.
- HTTP and HTTPS: The API supports access over both HTTP and HTTPS.

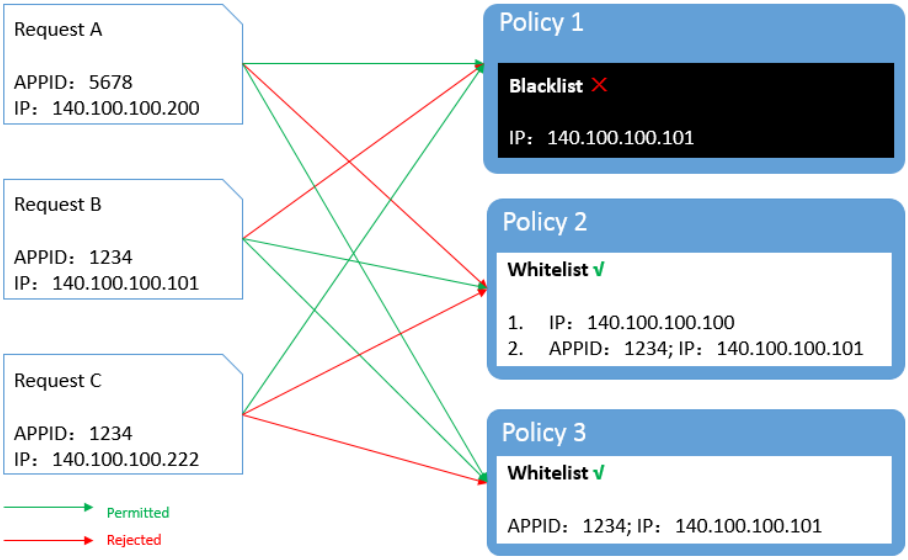
After the adjustment, the API configuration is complete. Your API supports access over HTTPS.

IP access control

IP access control is one of the API security components provided by the API Gateway and controls the source IP addresses (or IP address segments) that can call APIs. You can add an IP address to the whitelist or blacklist of an API to permit or reject the API requests from this IP address.



- A whitelist can contain IP addresses or its combination with application IDs. Requests from IP addressed not listed on whitelist will be rejected.
  - For IP addresses, only IP addresses from specified source are allowed to visit.
  - For IP address and application ID combinations, application IDs can only visit from their combined IP addresses. Visits from other IP addresses will be rejected.
- Requests from IP addresses on the blacklist will be rejected by API Gateway.



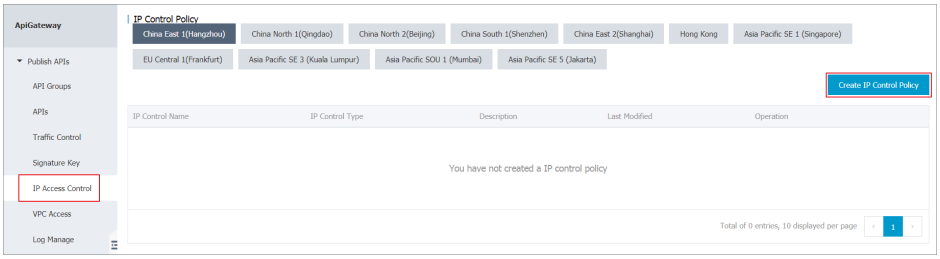
How to use this function

Add an IP access control policy

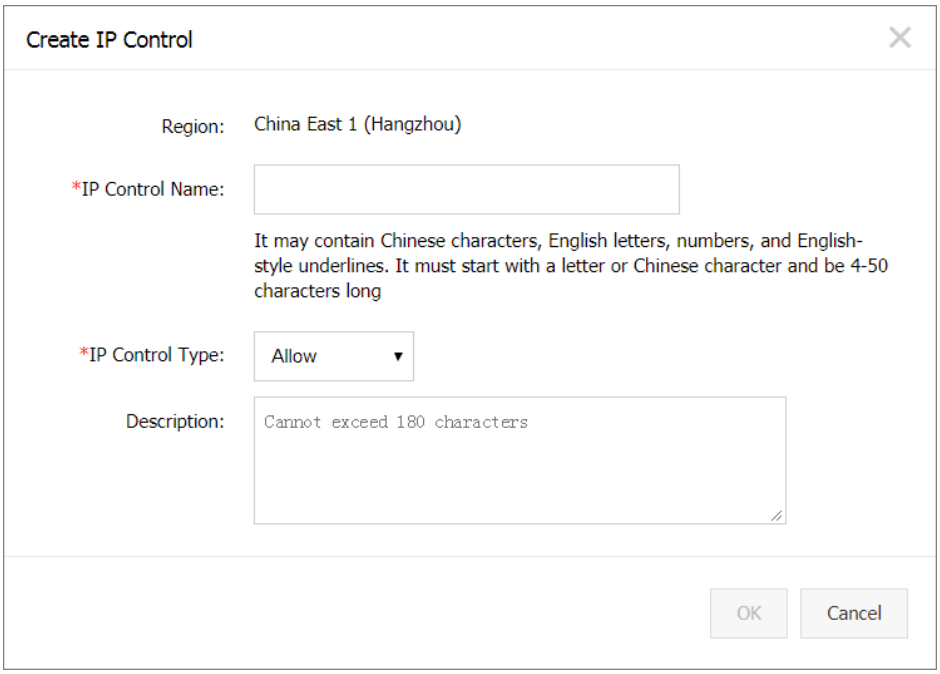
Create an IP access control policy and bind it to the API to which the access needs to be controlled.

Create an IP access control policy

Open **API Gateway Console** and choose "Publish APIs" > "IP Access Control".



Click "Create IP Control Policy" to display the access control creation window.

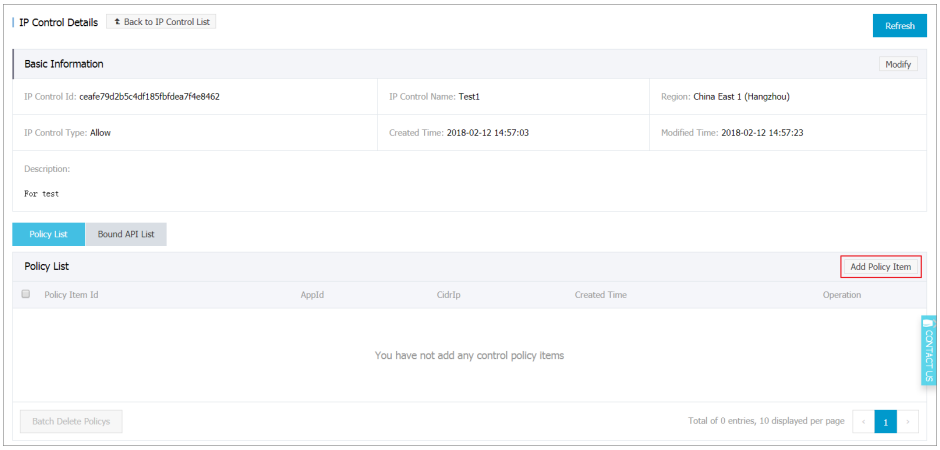


Enter the required information and click "OK".

- If you set the access control type to Allow, you are configuring a whitelist.
- If you set the access control type to Refuse, you are configuring a blacklist.

Add a policy

After you create a whitelist or blacklist, you must enter the control policies corresponding to the list type. For a whitelist, you can enter the application ID, IP address, or combination of an application ID and an IP address. For a blacklist, enter an IP address.

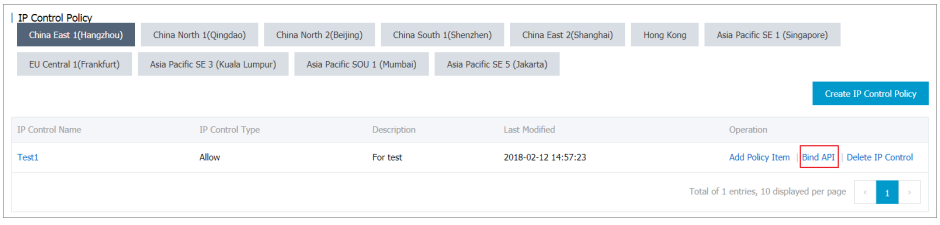


Click “OK” to complete the configuration.

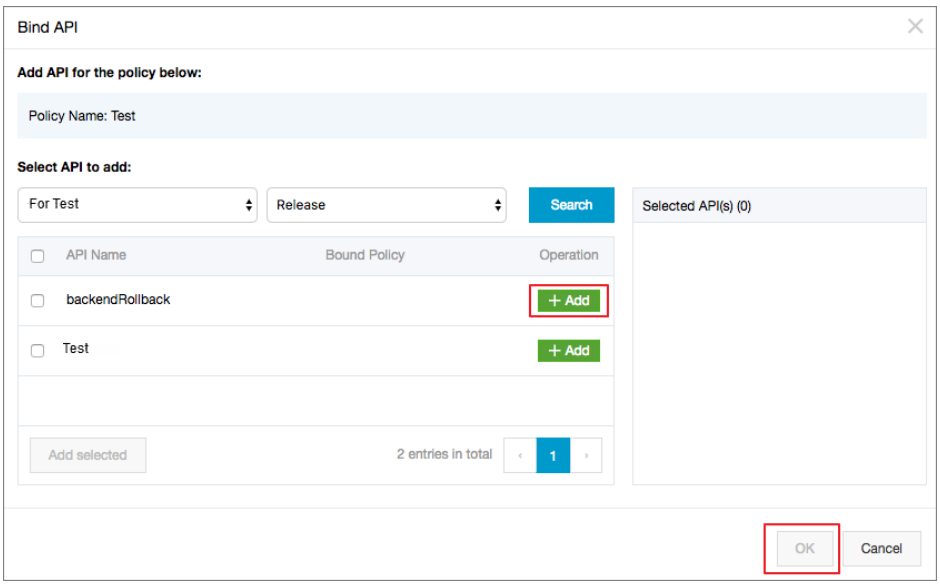
API binding

Bind the IP control policy to an API for the policy to take effect.

On the IP control policy list:



Find the required policy and bind API.



Select the corresponding API to bind the policy to it.

NOTE: Each API can have only one access control policy bound to it, no matter whether the policy is a blacklist or whitelist.

Delete an IP access control policy

Select a policy from the IP control policy list and delete it.

NOTE: If an IP control policy has been bound to an API, unbind it from the API before deleting it.

Check the bound API

You can find the API to which a policy is bound on the IP access control details page.

FAQ

When will the operation of binding or deleting an IP control policy take effect?

On the API Gateway, a policy binding operation takes effect immediately.

Can an API have different IP control policies bound in different environments?

Yes. You can bind different IP control policies to an API in different environments. We recommend that you bind a specified IP address to the test environment and pre-release environment to ensure security of the test environment.

Why is application blacklist not supported?

API calls require application authorization. To prohibit API calls for an application, you only need to delete its authorization. Therefore, application blacklist is not needed.