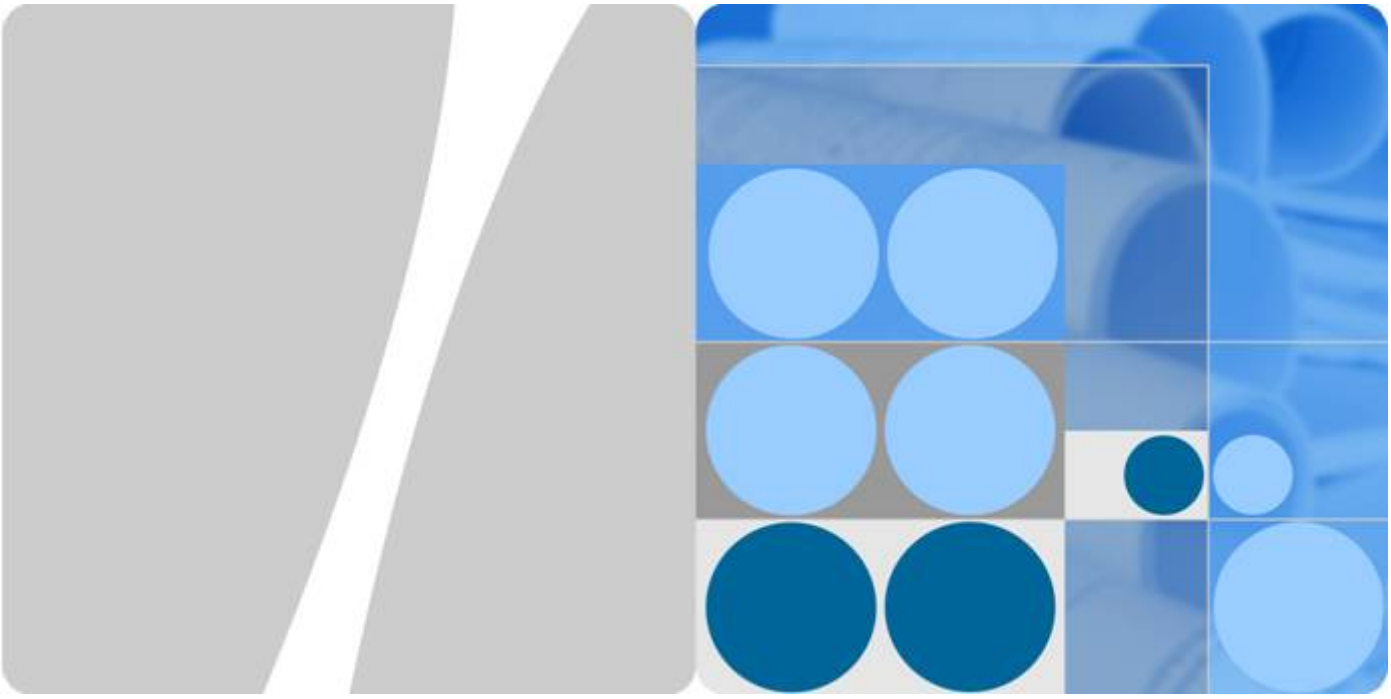

Resource Formation Service

User Guide

Date **2024-12-19**

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1 Service Overview

1.1 Basic Concepts
1.2 What Is RFS?
1.3 Advantages
1.4 Application Scenarios
1.5 Constraints and Limitations
1.6 Supported Provider Versions

1.1 Basic Concepts

Concept	Description
Resource	A cloud service may have multiple types of resources, such as VPCs, VMs, microservice applications, or high-level data models like security policies and DNS records.
Template	A template is a text file written using HCL syntax and describes your cloud resources. Its format can be tf, tf.json, or zip. RFS creates cloud resources based on templates.
Stack	A stack is a collection of cloud service resources. It creates, deletes, updates, and queries all cloud service resources described in a template as a whole.

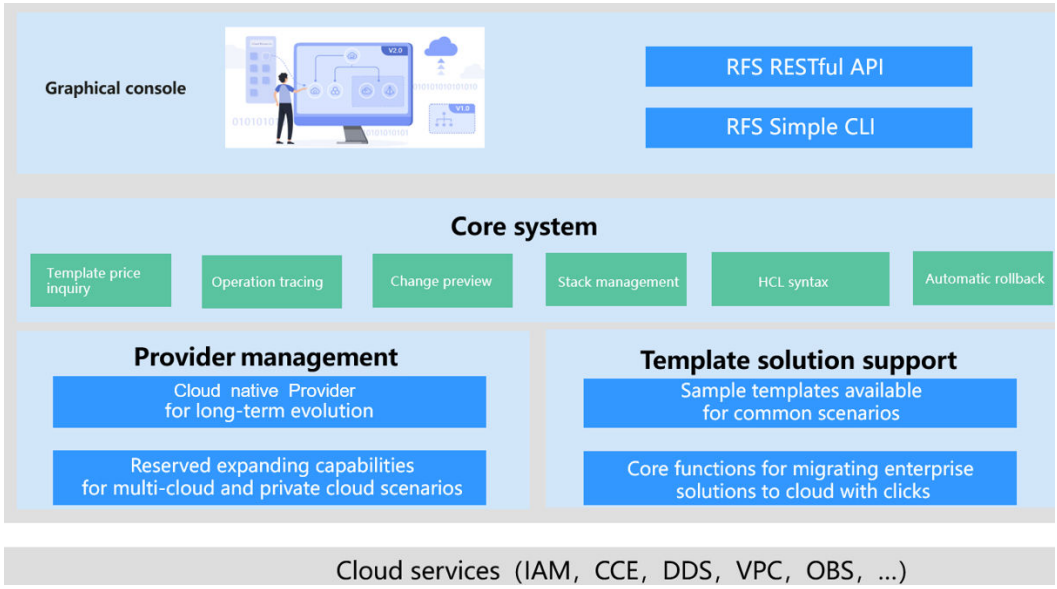
Concept	Description
Execution plan	An execution plan provides a preview of stack changes. It displays the comparison between the current template and online resources, and clearly shows the operations (such as addition, modification, and deletion) to be performed on resources and attributes during resource formation. Before executing a plan, you can preview it to check whether it meets your expectation. During execution, RFS creates and modifies resources as defined in the template.

1.2 What Is RFS?

Resource Formation Service (RFS) is a new final-state orchestration engine from AOS and fully supports Terraform (HCL and Provider), which is a de facto standard. It manages system and service resources (all physical or logical entities that can be located and described, such as databases, VPCs, pipelines, and IAM roles). RFS automatically deploys specified cloud service resources based on the template which uses the HCL (an open ecosystem) syntax.

RFS focuses on automatically building Cloud resources in batches. It helps you create, manage, and upgrade required resources in an efficient, secure, and consistent manner, improving resource management efficiency and reducing security risks caused by resource management changes.

Product architecture



1.3 Advantages

Declarative: You only need to intuitively describe the final state of required resources, freeing you from the complex request process and simplifying resource management.

Idempotent: The idempotent effect of invoking the resource description code for multiple times ensures that resources are not repeatedly applied for.

Secure and reliable: Visualized audit, security, and compliance control policies prevent security risks caused by resource changes.

Rich ecosystem: The southbound ecosystem supports mainstream Cloud services (90+ cloud services, 540+ resource objects). For details, see **Provider**. The northbound ecosystem is fully compatible with the HCL syntax, eliminating a learning curve.

Easy to use: Wizard-based operations, comprehensive documentation, and sample auxiliary system help you to manage resources in five steps.

Full hosting and cloud-based services: You do not need to install any software, prepare executors, or manage underlying files and data.

Automatic rollback: If deployment fails for resources, RFS automatically returns the status of all resources to that of the previous successful deployment.

1.4 Application Scenarios

Migrating Applications to the Cloud

Description

Migrating applications to the cloud involves repetitive manual work, such as the destruction and rebuild of environments and configuring new instances one by one when scaling out applications. These manual operations are error-prone.

Some operations, such as creating databases or VMs, could be time-consuming. You may have to wait for a long time when these demanding operations need to be performed one by one.

Solution

RFS implements tool-based and process-based work for the preceding scenarios. It uses templates to describe resources required by applications in a unified manner. The stack management function enables automatic deployment or destruction for various resources. RFS allows you to define a large number of resource instances of different services and specifications in a template. You can also use RFS to realize automatic creation, quick deployment, and flexible configuration of resources.

Advantages

- **Easy to use**

  Design your applications and schedule resources by writing templates. Organize and manage the service easily and efficiently.

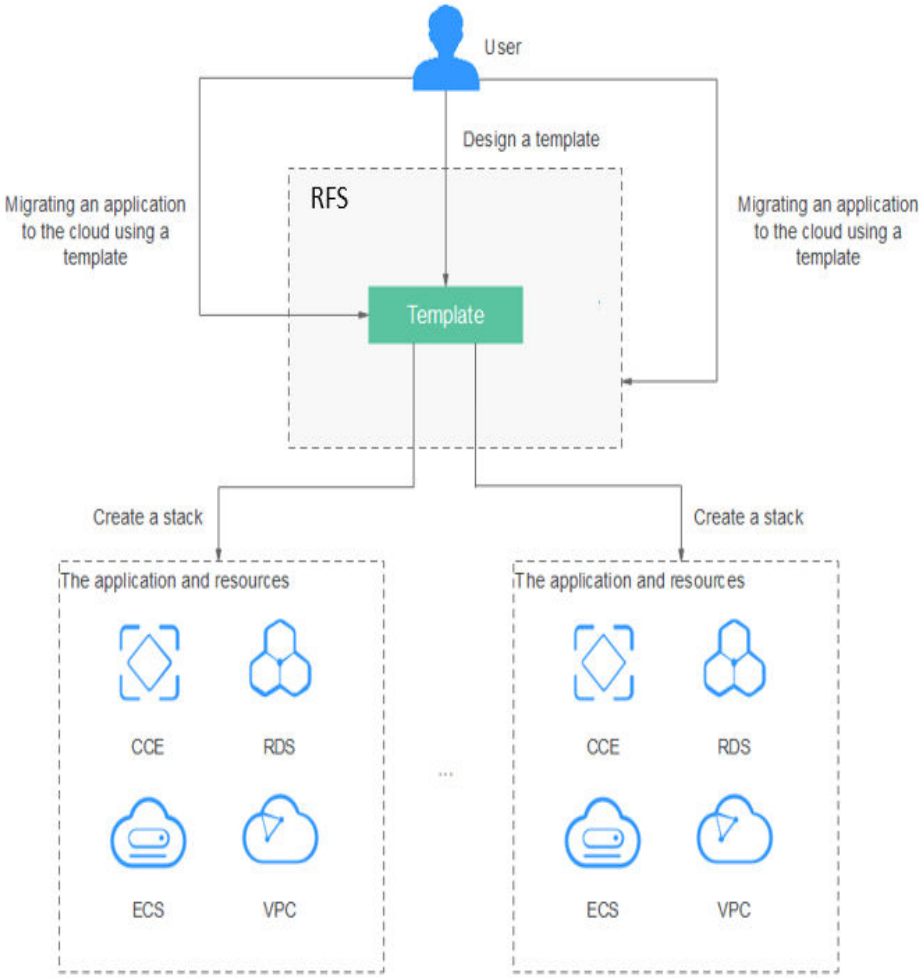
- **Highly efficient**

  Automatically deploy or delete a template with a wizard to reduce repetitive work and manual misoperations.

- **Quick replication of applications**

  Replicate a template to automatically deploy the same applications and resources to different data centers, improving efficiency.

Figure 1-1 Migrating applications to the cloud



ISV Resource Provisioning

Description

Independent software vendors (ISVs) need to deploy resources required by software on the cloud for their customers to use. The traditional delivery method is that ISVs provide the software code and platform building guides on their official websites for customers to download. This could be time demanding and costly, because ISVs have to configure networks, deliver resources, and deploy software all on themselves.

Solution

RFS enables ISVs to deliver software and required resources in a standard manner. ISVs can convert software services to templates. The stack deployment capability of RFS enables quick service provisioning and streamlines the delivery process. RFS uses a code template to describe the entire delivery environment, facilitating ISVs to integrate delivery with the CI/CD process.

Advantages

- **Standardized delivery**

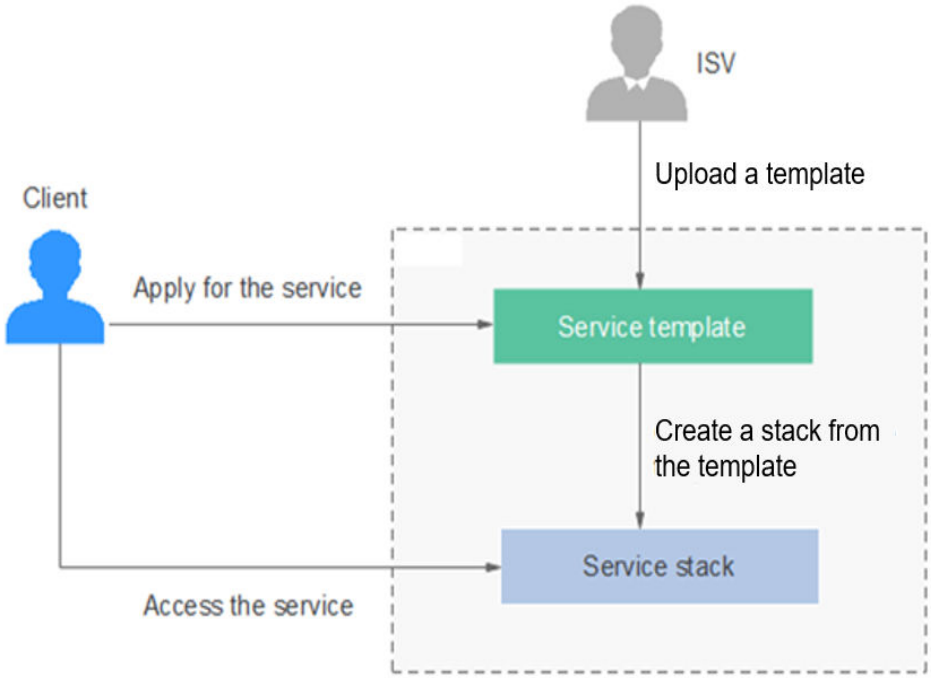
  Templates and stacks standardize software delivery processes, which can be summarized into best practices for wider use.
- **Better efficiency**

  Templates are used to automatically provision resources. ISVs only need to deploy stacks to complete service delivery, improving delivery efficiency.
- **Error-proof creation**

  ISV software and resources required for the software are defined in a template to prevent mistakes introduced through manual work.
- **CI/CD integration**

  RFS can be integrated into the existing tool chain to improve automation.

Figure 1-2 ISV resource provisioning scenario



1.5 Constraints and Limitations

Permissions

To use RFS, create an agency.

Quotas

RFS limits the number of stacks for a single user, as shown in the following table.

Resource	Item	Quota
Template	Maximum number of templates that can be created by a Cloud account	100
	Maximum length of a template name	128 characters
	Maximum length of a template file name	255 bytes
	Maximum length of a template URL	2048 bytes
	Maximum size of the file pointed to by the **template_uri** used in APIs for creating a template or a template version	1 MB after decompression
	Maximum size of the file containing **template_body** used in APIs for creating a template or template version	50 KB
Stack	Maximum number of stacks that can be created by a Cloud account	100
	Timeout interval for creating a stack	6 hours
	Maximum length of a stack name	128 characters
Execution plan	Maximum length of an execution plan name	255 bytes
	Maximum number of execution plans that can be created in each stack	100
Stack set	Maximum number of stack sets that can be created by a Cloud account	100

Resource	Item	Quota
	Maximum number of stack instances that can be created in each stack set	100
	Maximum run time of a stack set operation	6 hours

1.6 Supported Provider Versions

A Provider is a plug-in that encapsulates various resource APIs (such as CRUD APIs of resources) for the resource formation engine to call.

The following table lists the Provider types and versions supported by RFS.

Type	Introduction	Version	Number of Supported Services	Number of Supported Resources
terraform-provider-huaweicloud	Users can use HuaweiCloud Provider to interact with various resources on Cloud. Before using the provider, configure the corresponding permissions.	1.63.0	94	541
		1.61.1	94	525
		1.59.1	92	474
		1.58.0	92	461
		1.57.0	91	426
		1.56.0	91	413
		1.54.1	88	388
		1.52.0	87	367
		1.50.0	86	350
		1.49.0	83	346
		1.48.0	82	324
		1.47.1	82	296
		1.46.0	83	282
		1.44.1	80	270
		1.43.0	71	252

Type	Introduction	Version	Number of Supported Services	Number of Supported Resources
		1.42.0	68	236
		1.41.0	63	225
		1.40.2	63	225
		1.40.1	63	225
		1.40.0	63	225
		1.39.0	63	221
		1.38.2	33	117
		1.38.1	33	117

2 Getting Started

2.1 Accessing Resource Formation Service (RFS)
2.2 Viewing the Stack Status
2.3 Creating a Stack
2.4 Querying a Stack
2.5 Updating a Template or Parameter
2.6 Creating an Execution Plan
2.7 Viewing Estimated Fees
2.8 Deleting a Stack
2.9 Viewing Stack Details

2.1 Accessing Resource Formation Service (RFS)

1. Log in to the console

choose **Service List** > **Management & Governance** > **Resource Formation Service**.

2.2 Viewing the Stack Status

You can manage stack lifecycle (such as creation, update, deletion, and query) and the lifecycle of execution plans of a stack (such as creation, deletion, and query).

Table 1 describes stack statuses.

Table 2 describes execution plan statuses.

Table 2-1 Stack statuses

Status	Description
Creation Complete	The stack has been created but not deployed.
Deployment In Progress	Stack deployment is in progress.
Deployment Complete	The stack has been deployed.
Deployment Failed	The stack deployment failed.
Deletion In Progress	Stack deletion is in progress.
Deletion Failed	Stack deletion failed.
Rollback In Progress	Stack rollback is in progress.
Rollback Failed	Stack rollback failed.
Rollback Complete	The stack has been rolled back.

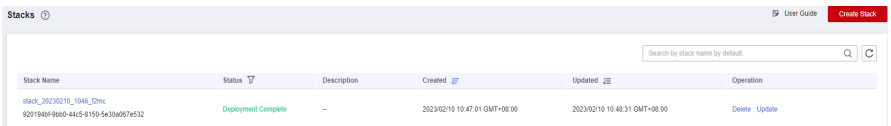
Table 2-2 Execution plan statuses

Status	Description
Creation In Progress	Execution plan creation is in progress.
Creation Failed	Execution plan creation failed.
Available	The execution plan is created and to be deployed.
Applied	The execution plan has been deployed.

2.3 Creating a Stack

On the stack list page, click **Create Stack** in the upper right corner, as shown in **Figure 2-1**.

Figure 2-1 Creating a stack

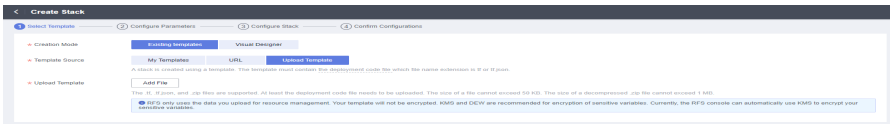


Procedure:

1. Select a template.

   There are three ways to select a template, as shown in **Figure 2-2**: (1). Enter a URL of an OBS template. (2). Upload a local template file. (3). Select a template from **My Templates**.

Figure 2-2 Selecting a template



You can upload template files in either **.tf** or **.tf.json** format.

Sample of the **.tf** template for creating a VPC and an ECS:

```
terraform {
  required_providers {
    huaweicloud = {
      source  = "huawei.com/provider/huaweicloud"
      version = "1.41.0"
    }
  }
}

provider "huaweicloud" {
  cloud      = "myhuaweicloud.com"
  endpoints = {
    iam = "iam.my-kualalumpur-1.myhuaweicloud.com"
  }
  insecure    = true
  region      = "my-kualalumpur-1"
  auth_url    = "https://iam.my-kualalumpur-1.myhuaweicloud.com:31943/v3"
}

variable "vpc_name" {
  type        = string
  description = "vpc name"
  default     = "rf_teststack_vpc"
  sensitive   = true
  nullable    = false
}

variable "subnet_name" {
  type        = string
  description = "subnet name"
  default     = "rf_teststack_subnet"
}

variable "ecs_name" {
  type        = string
  description = "ecs name"
  default     = "rf_teststack_ecs"
}

variable "ecs_admin_passwd" {
  type        = string
  description = "ecs passwd"
}

resource "huaweicloud_vpc" "rf_doc_vpc" {
  name   = var.vpc_name
  cidr   = "192.168.0.0/16"
}

resource "huaweicloud_vpc_subnet" "rf_doc_subnet" {
  name       = var.subnet_name
  vpc_id     = huaweicloud_vpc.rf_doc_vpc.id
  cidr       = "192.168.1.0/24"
  gateway_ip = "192.168.1.1"
}

resource "huaweicloud_compute_instance" "rf_doc_ecs" {
  name               = var.ecs_name
```

```
  flavor_id           = "c7.large.2"
  admin_pass          = var.ecs_admin_passwd
  image_id            = "cecc4bcf-b055-4d35-bd5f-693d4412eaef"
  network {
    uuid = huaweicloud_vpc_subnet.rf_doc_subnet.id
  }
  system_disk_type    = "SAS"
  system_disk_size    = 100
  stop_before_destroy = false
  delete_disks_on_termination = true
  charging_mode       = "postPaid"
  auto_renew          = false
}

output "ecs_address" {
  value = huaweicloud_compute_instance.rf_doc_ecs.access_ip_v4
  description = "The ecs private address."
}

output "ecs_id" {
  value = huaweicloud_compute_instance.rf_doc_ecs.id
  description = "The ecs resource id."
}
```

Sample of the **.tf.json** template for creating a VPC and an ECS:

```
{
  "terraform": {
    "required_providers": {
      "huaweicloud": {
        "source": "huawei.com/provider/huaweicloud",
        "version": "1.41.0"
      }
    }
  },
  "provider": {
    "huaweicloud": {
      "cloud": "myhuaweicloud.com",
      "endpoints": {
        "iam":"iam.my-kualalumpur-1.myhuaweicloud.com"
      },
      "insecure": true,
      "region": "my-kualalumpur-1",
      "auth_url": "https://iam.my-kualalumpur-1.myhuaweicloud.com:31943/v3"
    }
  },
  "variable": {
    "vpc_name": {
      "type": "string",
      "description": "vpc name",
      "default": "rf_teststack_vpc",
      "sensitive": true,
      "nullable": false
    },
    "subnet_name": {
      "type": "string",
      "description": "subnet name",
      "default": "rf_teststack_subnet"
    },
    "ecs_name": {
      "type": "string",
      "description": "ecs name",
      "default": "rf_teststack_ecs"
    },
    "ecs_admin_passwd": {
      "type": "string",
      "description": "ecs passwd"
    }
  },
  "resource": {
```

```
  "huaweicloud_vpc": {
    "rf_doc_vpc": {
      "name": "${var.vpc_name}",
      "cidr": "192.168.0.0/16"
    }
  },
  "huaweicloud_vpc_subnet": {
    "rf_doc_subnet": {
      "name": "${var.subnet_name}",
      "vpc_id": "${huaweicloud_vpc.rf_doc_vpc.id}",
      "cidr": "192.168.1.0/24",
      "gateway_ip": "192.168.1.1"
    }
  },
  "huaweicloud_compute_instance": {
    "rf_doc_ecs": {
      "name": "${var.ecs_name}",
      "flavor_id": "c7.large.2",
      "admin_pass": "${var.ecs_admin_passwd}",
      "image_id": "cecc4bcf-b055-4d35-bd5f-693d4412eaef",
      "network": {
        "uuid": "${huaweicloud_vpc_subnet.rf_doc_subnet.id}"
      },
      "system_disk_type": "SAS",
      "system_disk_size": 100,
      "stop_before_destroy": false,
      "delete_disks_on_termination": true,
      "charging_mode": "postPaid",
      "auto_renew": false
    }
  }
 },
 "output": {
  "ecs_address": {
    "value": "${huaweicloud_compute_instance.rf_doc_ecs.access_ip_v4}",
    "description": "The ecs private address."
  },
  "ecs_id": {
    "value": "${huaweicloud_compute_instance.rf_doc_ecs.id}",
    "description": "The ecs resource id."
  }
 }
}
```

CAUTION

The sample template contains charged resources. Check whether resources need to be enabled before using the template.

The template consists of five parts:

a. **huaweicloud_vpc** in **resource** indicates VPC information.

b. **huaweicloud_vpc_subnet** in **resource** indicates information about a subnet defined in the VPC. A subnet is a segment within the IP address range of the VPC.

c. **huaweicloud_compute_instance** in **resource** indicates information about an ECS defined in the template.

d. **variable** indicates variables defined by users in templates during stack creation and deployment.

e. **output** defines the outputs of templates. After a stack is created, its output is generated based on the definition and displayed on the **Outputs** tab page.

2. Configure parameters.

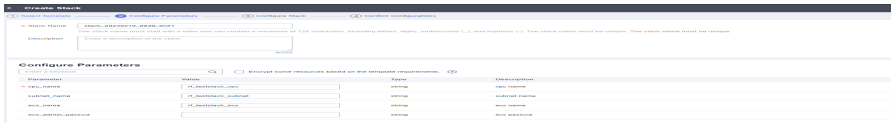
   Click **Next** to go to the parameter configuration page, where you can modify the stack name and description, as shown in **Figure 2-3**.

   CAUTION

   The stack name must start with a letter and can contain a maximum of 128 characters, including letters, digits, underscores (_), and hyphens (-). The name must be unique.

   A stack description can contain a maximum of 1024 characters.

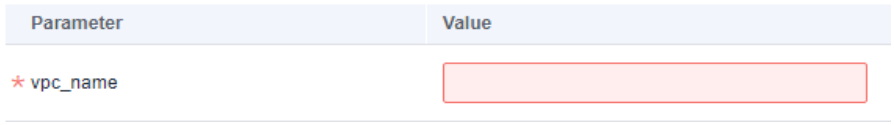
   Figure 2-3 Configuring parameters

   Parameters marked with a red asterisk (*) are mandatory. Set these parameters to valid values.

   If a value is invalid, the corresponding text box will turn red (as shown in **Figure 2-4**) and page redirection will not be triggered after you click **Next**.

   Figure 2-4 Text box with an invalid value

   Click **Next**. The **Configure Stack** page is displayed.

   CAUTION

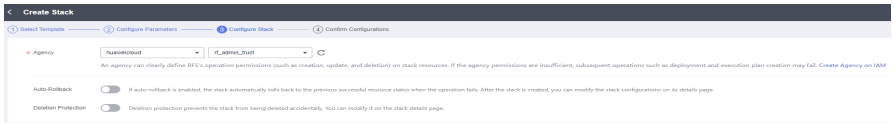
   If the stack name or description is imported using a URL and contains special characters, the characters must be encoded following the HTTP encoding rules first.

   Check whether the default VPC, subnet, and ECS names used on this page already exist on the corresponding consoles. If the names already exist, change them to unique ones to prevent creation failures.

3. Configure the stack.

   Click **Next** to go to the **Advanced Settings** page, as shown in **Figure 2-5**.

   Figure 2-5 Configuring the stack

Mandatory parameter (marked with *)

IAM Permission Agency: An agency can clearly define operation permissions of RFS (such as creation, update, and deletion) on stack resources. If the agency permissions are insufficient, subsequent operations may fail.

Optional parameters:

Deletion Protection: prevents the stack from being deleted accidentally. After a stack is created, you can update this configuration by clicking **Update** in the **Operation** column.

Auto-Rollback: If auto-rollback is enabled, the stack automatically rolls back to the previous successful resource status when an operation fails.

Click **Next** to go to the **Confirm Configurations** page.

4. Confirm the configurations.

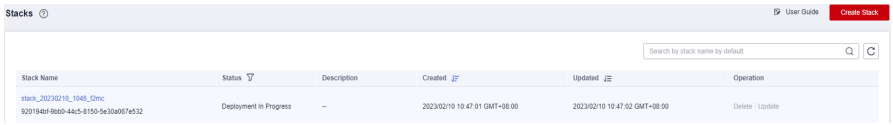
   After you confirm the configurations, you can click either **Create Execution Plan** or **Directly Deploy Stack**.

   a. If you click **Directly Deploy Stack**, a confirmation dialog box will be displayed.

   Figure 2-6 Directly deploy stack

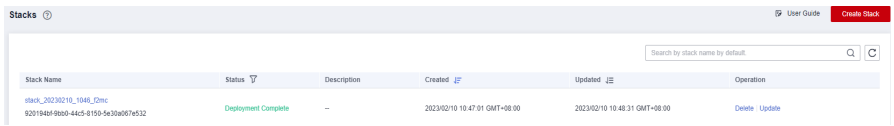
   Click **Yes**. A new stack is generated and its status is **Deployment In Progress**, as shown in **Figure 2-7**.

   Figure 2-7 Deployment in progress

   Then, the status changes to **Deployment Complete**, as shown in **Figure 2-8**.

   Figure 2-8 Deployment complete

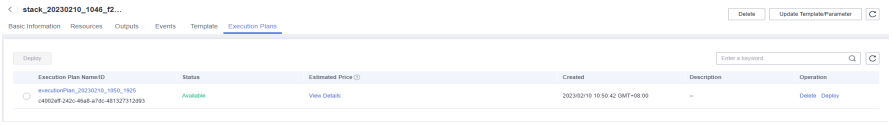
   b. If you click **Create Execution Plan**, a dialog box of creating execution plan will be displayed. In this dialog box, you can set the name and description of the execution plan, as shown in **Figure 2-9**.

   Figure 2-9 Create Execution Plan dialog box

Click **OK**. The **Execution Plans** tab page is displayed.

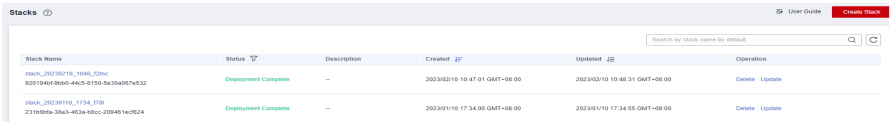
Wait until the execution plan is created and refresh the page. The execution plan status changes to **Available**, as shown in **Figure 2-10**.

Figure 2-10 Available



Return to the stack list page. The stack status is **Creation Complete**, as shown in **Figure 2-11**.

Figure 2-11 Stack list

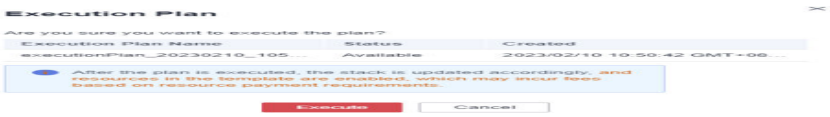


CAUTION

Creating an execution plan can preview the resource attribute changes of the entire stack and evaluate the impact. If the execution plan meets your expectations, you can execute the plan. Creating an execution plan does not incur fees. The system changes your stack only when you execute the plan.

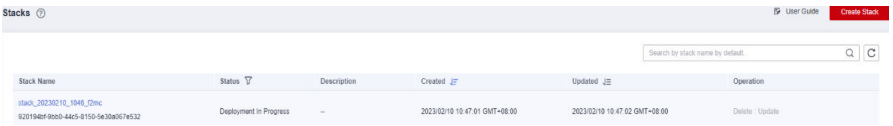
Click **Deploy** in the **Operation** column of the execution plan to deploy it, as shown in **Figure 2-12**.

Figure 2-12 Execution plan dialog box



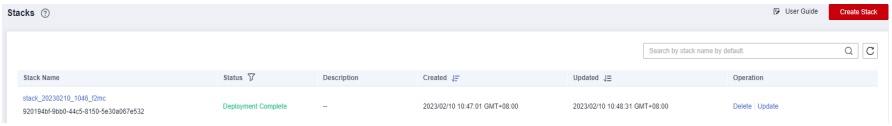
In the **Execution Plan** dialog box, click **Execute**. A message indicating that the execution plan is being deployed is displayed in the upper right corner. Return to the stack list page. A new stack is generated and its status is **Deployment In Progress**, as shown in **Figure 2-13**.

Figure 2-13 Deployment in progress



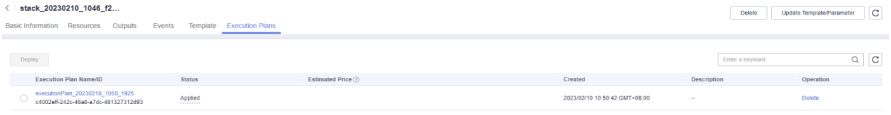
Then, the stack status changes to **Deployment Complete**, as shown in **Figure 2-14**.

Figure 2-14 Deployment complete



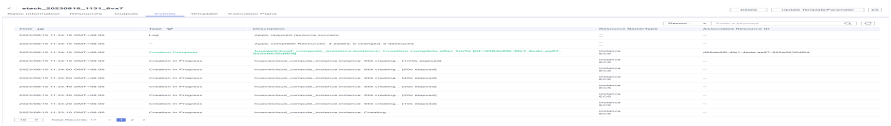
On the **Execution Plans** tab page of the stack details page, the execution plan status is **Applied**, as shown in **Figure 2-15**.

Figure 2-15 Applied



Click the **Events** tab. The event list shows that resources of the stack are deployed, as shown in **Figure 2-16**.

Figure 2-16 Resources deployed



You can view details on the console of the corresponding cloud service.

i. In the service list, locate and click **Elastic Cloud Server**. On the displayed page, view the deployed ECS, as shown in **Figure 2-17**.

   Figure 2-17 ECS

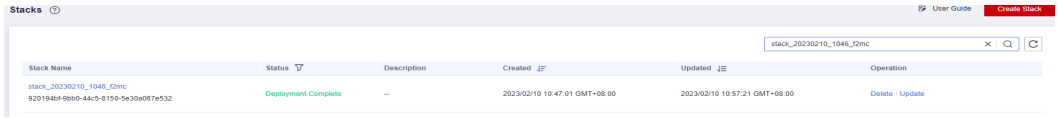
   Resources of the stack are deployed.

2.4 Querying a Stack

Log in to the RFS console and click **Stacks** in the navigation pane on the left. The stack list page is displayed.

In the search box above the stack list, enter the name of the target stack and click the search button, as shown in **Figure 2-18**.

Figure 2-18 Querying a stack



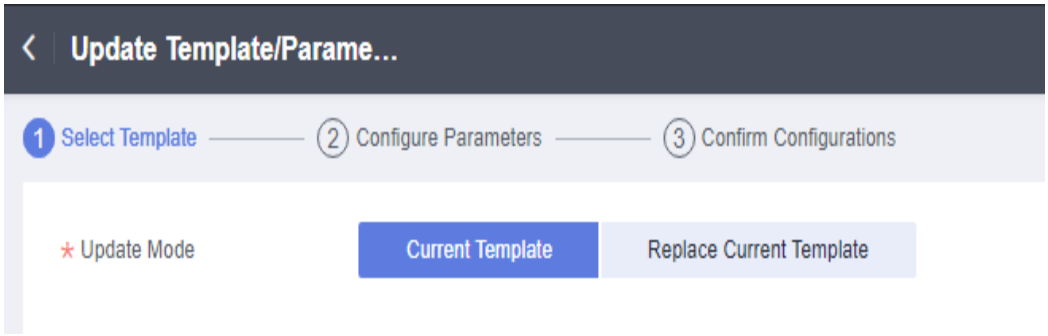
2.5 Updating a Template or Parameter

CAUTION

Stack change records are not available. If you want to view change details, you are recommended to create an execution plan.

You can add cloud service resources or change resource specifications in either of the following ways: Go to the stack list page, locate the target stack, and click **Update** in the **Operation** column. Alternatively, go to the stack details page and click **Update Template/Parameter** in the upper right corner to enter the page for updating the resource stack, as shown in **Figure 2-19**.

Figure 2-19 Selecting a template

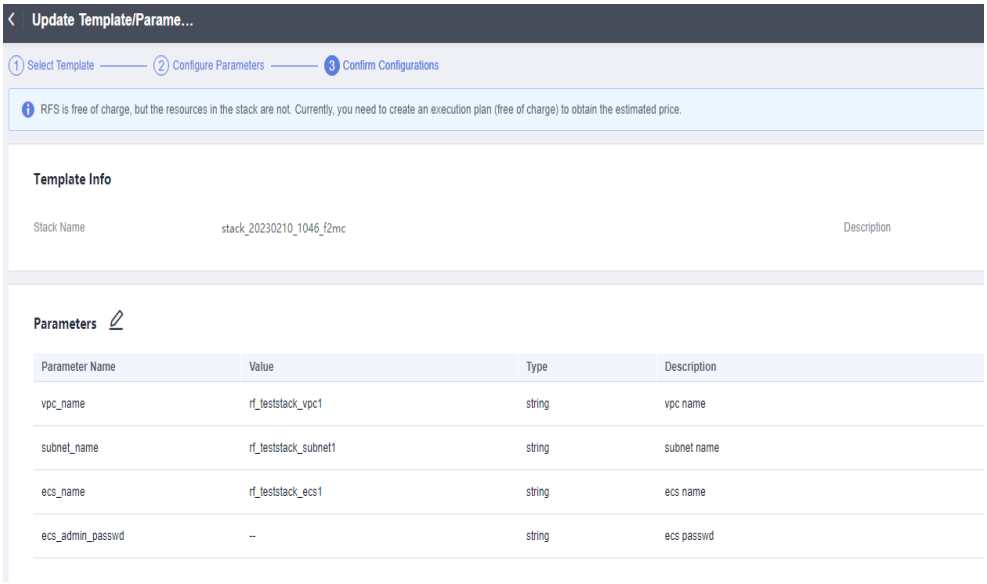


You can select **Current Template** or **Replace Current Template** (use a new template) to update the stack.

Solution 1: Using the current template

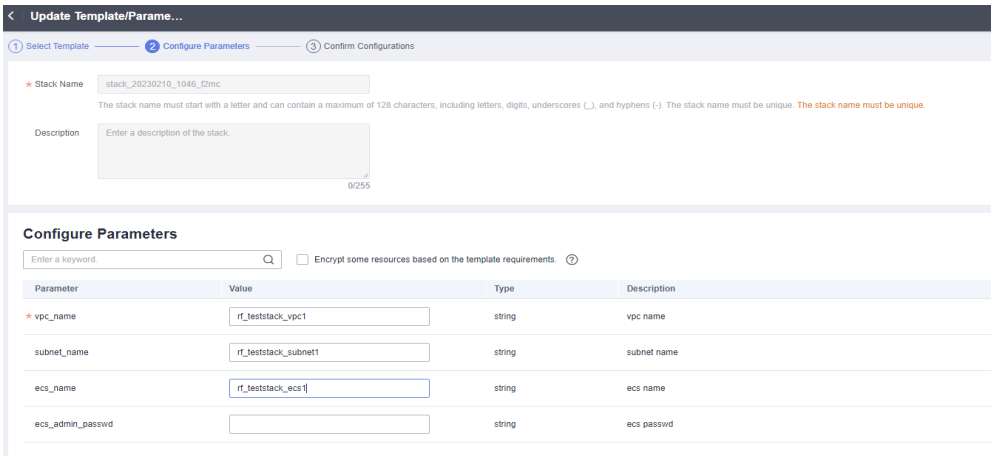
1. Click **Next** to go to the **Configure Parameters** page and modify parameters on it, as shown in **Figure 2-20**.

Figure 2-20 Configuring parameters



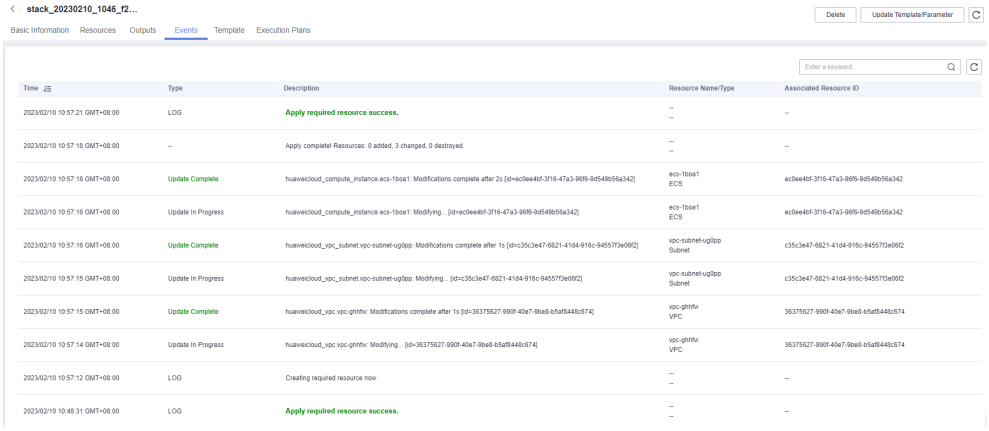
2. Click **Next** to go to the **Confirm Configurations** page, as shown in **Figure 2-21**.

Figure 2-21 Confirming configurations



3. Click **Directly Deploy Stack**. The **Events** page is displayed.
   The status changes to **Update Complete**, as shown in **Figure 2-22**.

Figure 2-22 Update complete

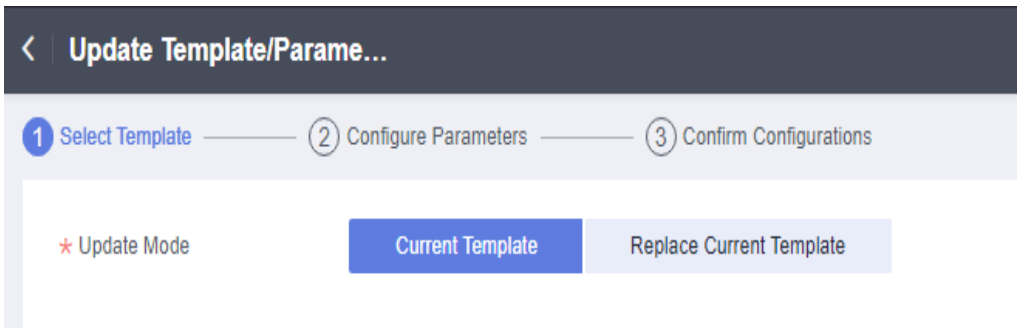


Solution 2: Replacing the current template (see **Creating a Stack**)

2.6 Creating an Execution Plan

On the stack list page, click the name of the stack to go to its details page. Click **Update Template/Parameter** in the upper right corner to go to the page for creating an execution plan, as shown in **Figure 2-23**.

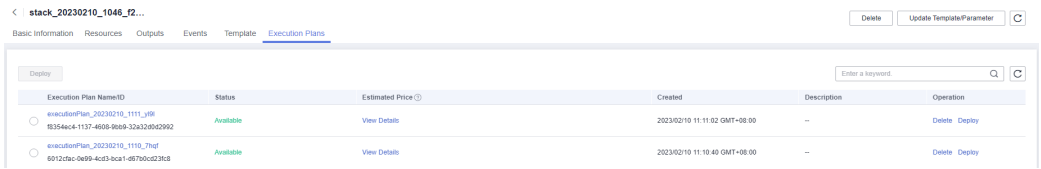
Figure 2-23 Page for creating an execution plan



The subsequent steps are the same as those for creating a stack, except for one difference that you need to click **Create Execution Plan** instead of **Directly Deploy Stack**.

Then, an execution plan is generated, but the stack is not directly deployed. If you create multiple execution plans, they will exist in the same stack, as shown in **Figure 2-24**.

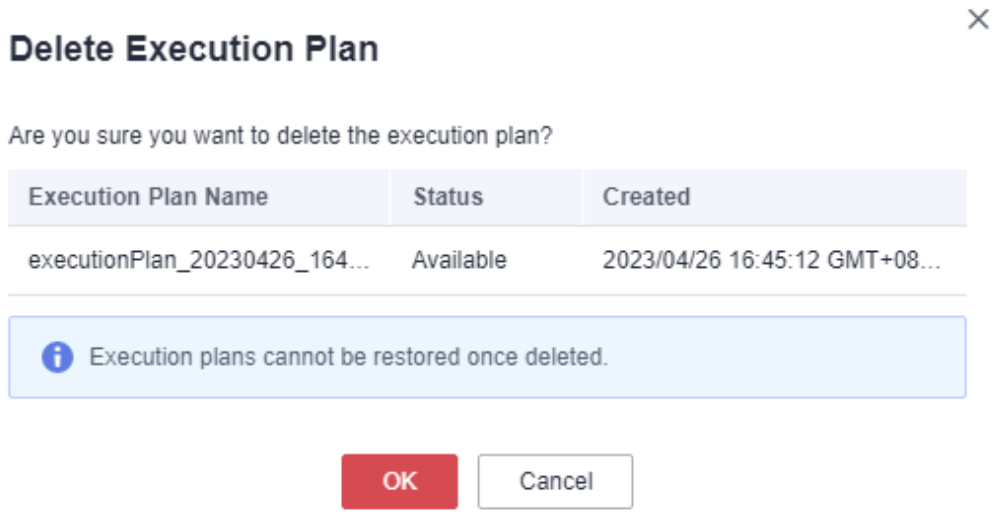
Figure 2-24 Execution plan list



Locate the row that contains the generated execution plan and click **Deploy** in the **Operation** column if you want to deploy tour execution plan.

If an execution plan is no longer used, click **Delete** in the **Operation** column. Click **OK** in the dialog box displayed, as shown in **Figure 2-25**.

Figure 2-25 Deleting an execution plan



2.7 Viewing Estimated Fees

On page of the created execution plan , click **View Details**. The **Price Details** dialog box is displayed and you can see the estimated price.

Table 2-3 lists the resources that support price inquiry.

Table 2-3 Cloud services/Resources that support price inquiry and billing modes

Cloud Service	Resource Type	Billing Mode
Elastic Cloud Server (ECS)	**huaweicloud_compute_instance**	pay-per-use
Elastic Volume Service (EVS)	**huaweicloud_evs_volume**	pay-per-use
Elastic IP (EIP)	**huaweicloud_vpc_eip**	pay-per-use
Bandwidth	**huaweicloud_vpc_bandwidth**	Pay-per-use
Elastic Load Balance (ELB)	**huaweicloud_elb_loadbalancer**	Pay-per-use
NAT Gateway	**huaweicloud_nat_gateway**	Pay-per-use
Relational Database Service (RDS)	**huaweicloud_rds_instance**	pay-per-use
Cloud Container Engine (CCE)	**huaweicloud_cce_cluster**	pay-per-use

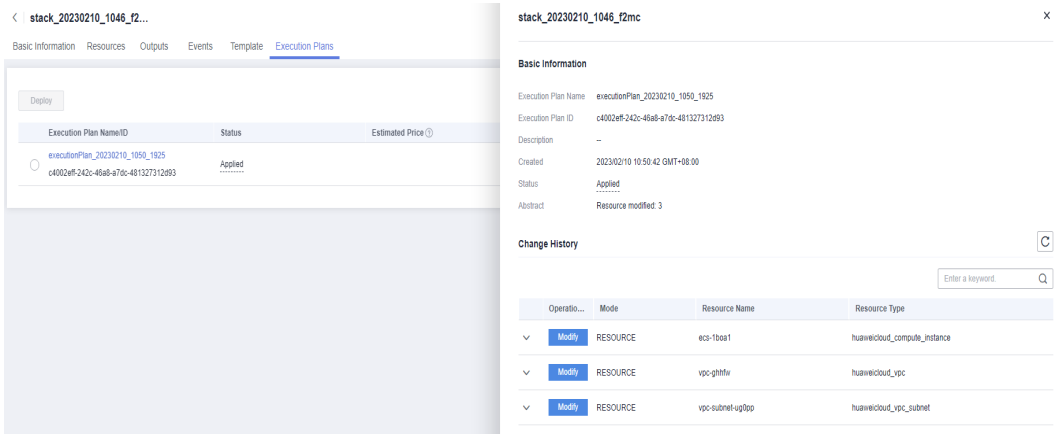
Cloud Service	Resource Type	Billing Mode
Cloud Search Service (CSS)	huaweicloud_css_cluster	Pay-per-use
GaussDB(for Redis)	huaweicloud_gaussdb_redis_instance	pay-per-use
GaussDB(for MySQL)	huaweicloud_gaussdb_mysql_instance	pay-per-use
Scalable File Service (SFS)	huaweicloud_sfs_turbo	Pay-per-use
Distributed Cache Service (DCS)	huaweicloud_dcs_instance	pay-per-use
Distributed Message Service (DMS) for Kafka	huaweicloud_dms_kafka_instance	Pay-per-use

CAUTION

Price estimation will fail if mandatory fields are not specified or a field is invalid in the template used for price estimation.

After the price inquiry completes, the estimated price is displayed in the basic information on the execution plan details page, as shown in **Figure 2-26**.

Figure 2-26 Execution plan details



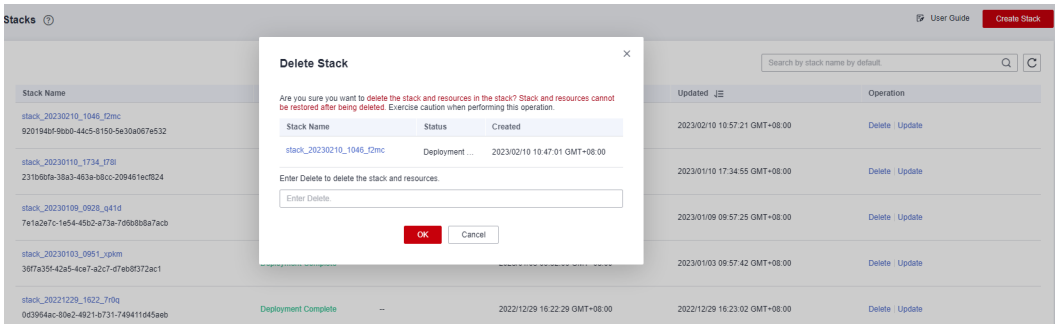
2.8 Deleting a Stack

1. When **Deletion Protection** is disabled:

On the stack list page, locate the created stack and click **Delete** in the **Operation** column. In the dialog box displayed, enter **Delete** in the text box and click **OK**.

Alternatively, go to the stack details page and click **Delete** in the upper right corner, as shown in **Figure 2-27**.

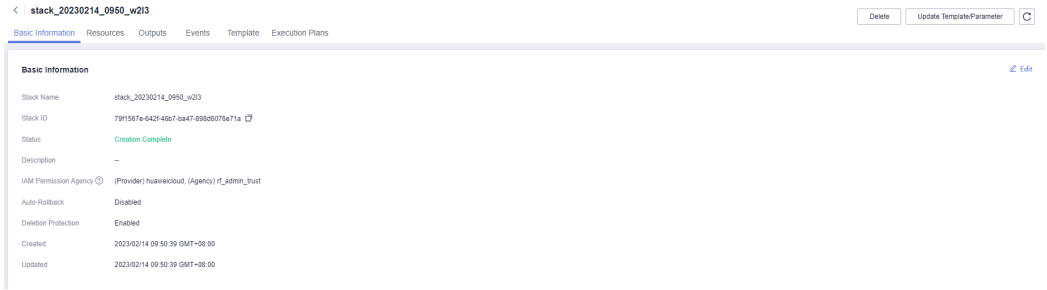
Figure 2-27 Dialog box for deleting a stack



2. When **Deletion Protection** is enabled:

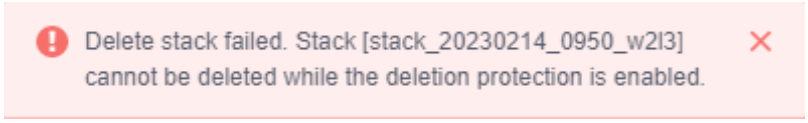
Figure 2-28 shows that the **Enabled** status of **Deletion Protection**.

Figure 2-28 Deletion protection



If you delete a resource stack with deletion protection enabled, an error message will be displayed, as shown in **Figure 2-29**.

Figure 2-29 Deletion failed



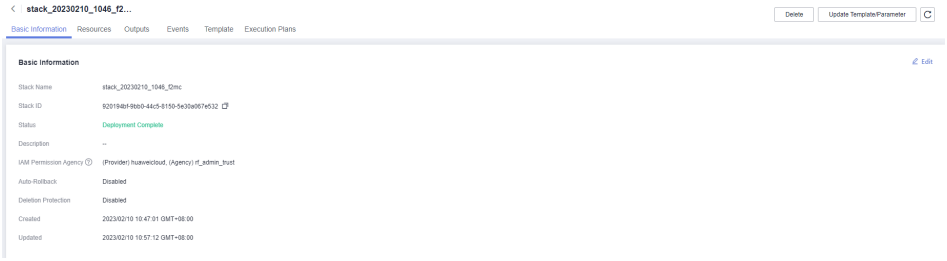
2.9 Viewing Stack Details

1. Viewing Stack Details

   There are six function modules on the stack details page (The stack named **stack_20221206_0933_uiyn** is an example here.):

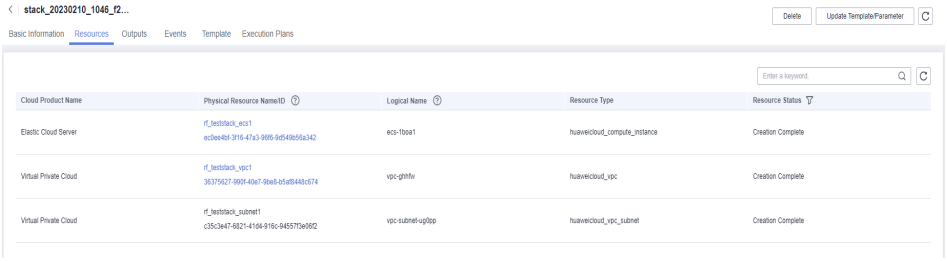
   a. **Basic Information**: displays basic information about the stack, as shown in **Figure 1**.

Figure 2-30 Basic information



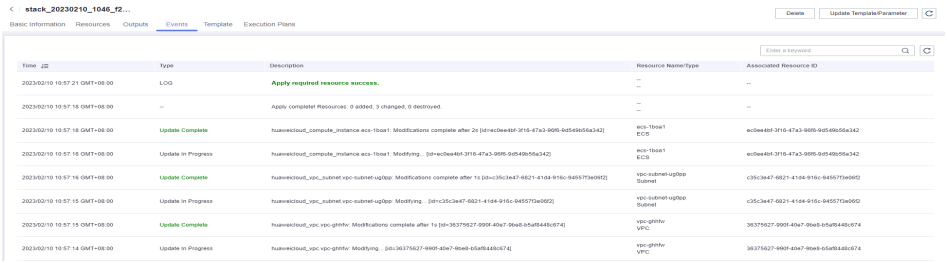
b. **Resources**: displays information about cloud services or resources generated during plan execution and stack deployment, as shown in **Figure 2-31**.

Figure 2-31 Resources



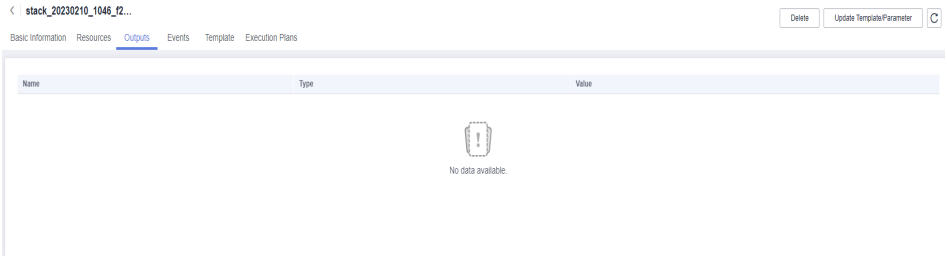
c. **Events**: displays log information generated during plan execution and stack deployment. Events are updated in real time based on the stack status. For example, **Figure 2-32** shows that three resources are created.

Figure 2-32 Events



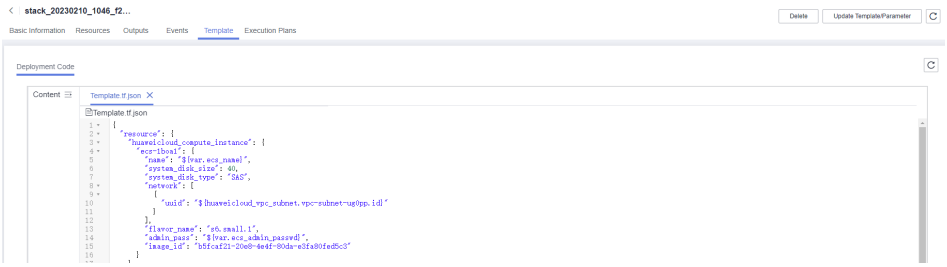
d. **Outputs**: displays output parameters in the template, as shown in **Figure 2-33**:

Figure 2-33 Outputs



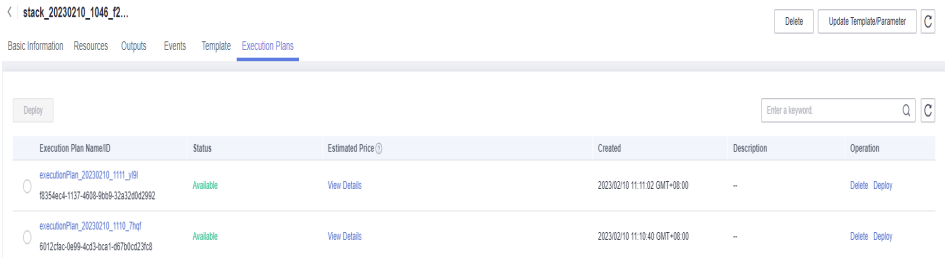
e. **Template**: displays the template content used for creating a stack, as shown in **Figure 2-34**.

Figure 2-34 Template



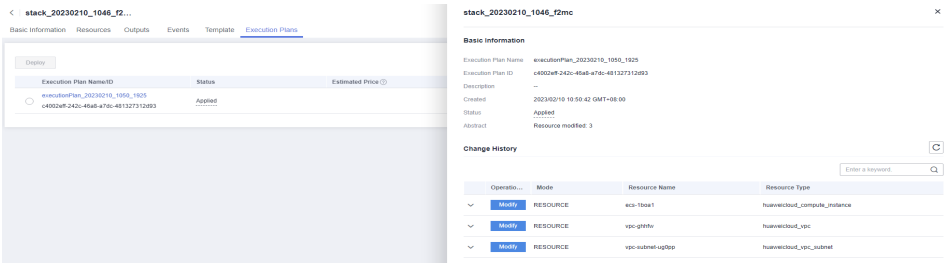
f. **Execution Plans**: displays different execution plans. After an execution plan is generated, you need to click **Deploy** to create resources in the template. After an execution plan is executed, its status changes from **Available** to **Applied** and the **Deploy** button disappears, as shown in **Figure 2-35**.

Figure 2-35 Execution plans



Click the execution plan name. The execution plan details page is displayed, as shown in **Figure 2-36**.

Figure 2-36 Execution plan details



3 Visual Designer

3.1 Introduction

3.2 Visual Designer UI

3.3 Cloud Services or Elements

3.4 Shortcut Keys of Visual Designer

3.5 Compiling a Template to Create an EVS Disk

3.1 Introduction

The RFS Visual Designer is a graphic tool for creating, viewing, and modifying templates. Using the designer, you can drag elements to the canvas, directly connect them, and then edit their details in a visual form.

The designer can help you quickly understand the relationships between elements in templates and modify templates easily.

The designer has the following advantages:

- Visualizing template resources

  The Visual Designer visualizes template resources to offer you a better insight.

  The Visual Designer defines resources in the template metadata, such as resource size. When you open a template, the designer automatically adds the metadata and the layout is saved. Therefore, when you re-open the template, the last-saved template is displayed.
- Simplifying template compiling

  When you compile template resources in a JSON or TF file, the process is complex and error-prone. In the designer, you can add resources to the template by dragging resources to the canvas and drawing lines between resources to create a relationship.
- Simplifying editing with the Visual Designer

  The designer allows you to modify templates. Text designer is not required. The designer also supports autocomplete and lists all property names for a resource.

3.2 Visual Designer UI

The RFS Visual Designer UI includes six parts: control pane, resource bar, log area, design console, template pane, and attribute pane. For details about each part, see .

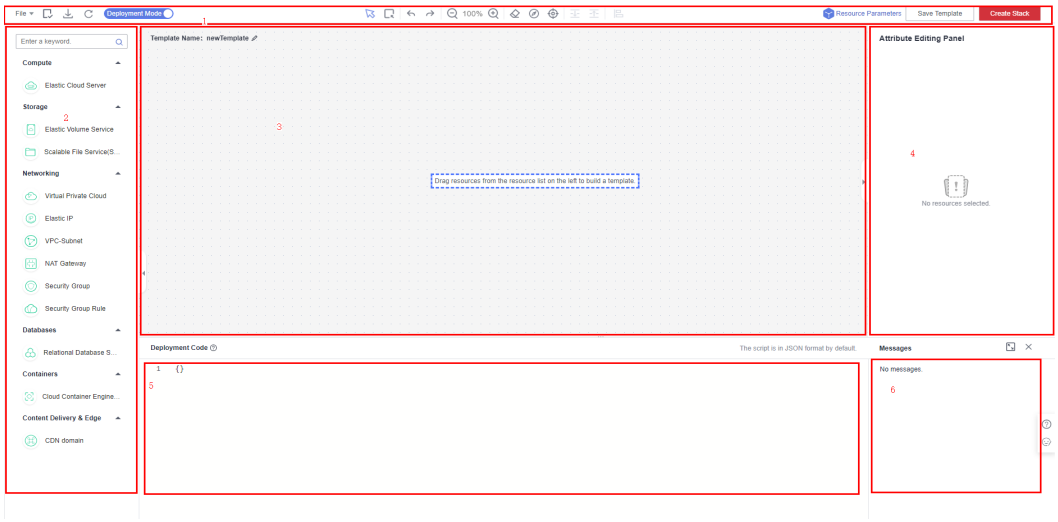


Table 3-1 Visual Designer UI description

No. (in the Above Figure)	Description
1	Control pane, which displays the control operation shortcuts of the design console.
2	Resource pane, which displays available resources for orchestration. Resources are categorized by service. You can drag resources and orchestrate them on the canvas and use lines to connect them and define their relationships.
3	Design console, which is the canvas for you to design templates and connect resources.
4	Attribute panel, which displays the attribute name and type of the selected resource.
5	Template area, which allows you to modify templates and define attributes.
6	Log area, which displays error information and messages triggered during your operation. For example, non-compliant parameters are displayed during syntax verification.

3.3 Cloud Services or Elements

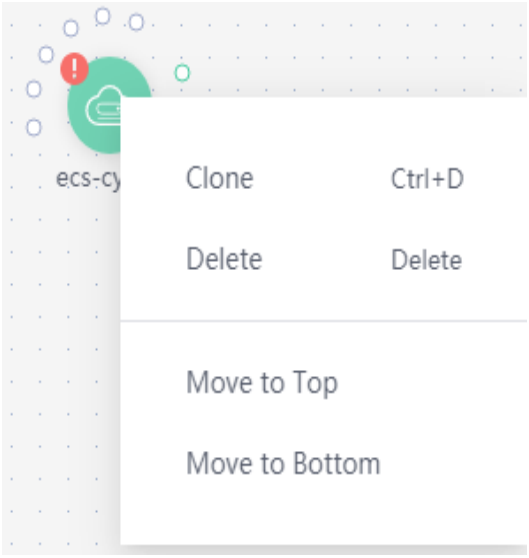
A cloud service is an element and a basic unit to be orchestrated in Visual Designer. Each element contains all attributes of the resource type it belongs to.

Resources are classified on the left of the designer UI and can be dragged to the canvas on the right.

Copying or Deleting a Cloud Service

Drag a cloud service to the canvas. Right-click the cloud service.

Figure 3-1 Right-clicking the cloud service



Two icons are displayed. Click **Clone** to copy the cloud service. Click **Delete** to delete the cloud service.

Cloud Service Block Diagrams

There are two types of cloud service resource block diagrams in Visual Designer:

- Type 1: Non-scalable elements

  A non-scalable element generally represents a terminal service or an entity resource. The block diagram size is fixed.

  Figure 3-2 Non-scalable elements

- Type 2: Scalable elements

  A scalable element is a container element. The containers and elements can be put into containers. You can adjust the size of the block diagram by dragging.

  Figure 3-3 Scalable elements

Connecting Resources Using Hollow Points/Lines

When some elements are dragged to the canvas, a hollow point is displayed on the resource. There are **green hollow points** and **gray hollow points**.

Hollow points can be used to connect resources. The connection line between two resources represents their association or dependency. There are green lines and gray lines.

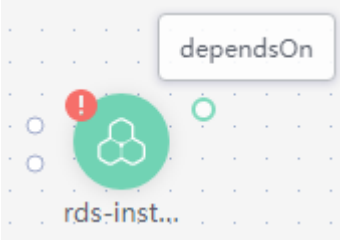
- Green hollow points

  A resource displayed with a green hollow point can depend on other resources.

  You can connect resources as required and the resources to be depended on are created by RFS first.

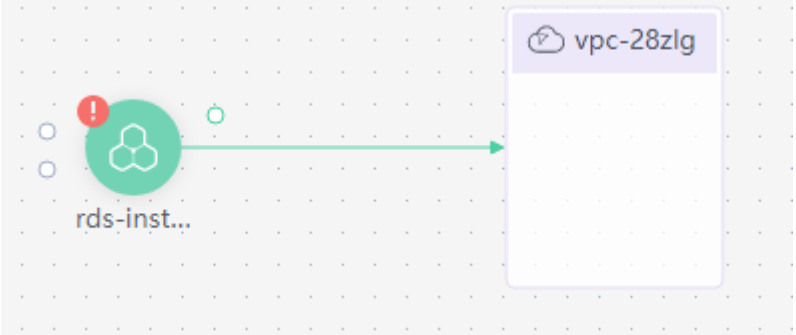
  For example, when you drag an RDS resource to the canvas, a green hollow point is displayed as shown in the following figure.

  Figure 3-4 RDS green hollow point



When you move the cursor to the green hollow point of the left resource and click the green hollow point, an arrow is displayed. Drag the cursor to the resource on the right and release the cursor. The left resource depends on the right resource.

Figure 3-5 Green hollow point: an element to be connected

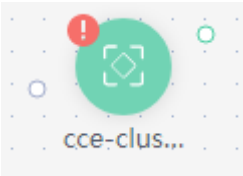


- Gray hollow point

  A resource with a gray hollow point can be associated with other resources.

  For example, when you drag a CCE resource to the canvas, a gray hollow point is displayed as shown in the following figure.

Figure 3-6 CCE gray hollow point

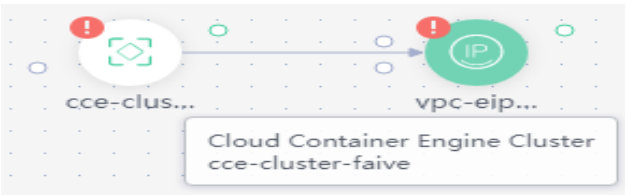


When you move the cursor to the gray hollow point, you can view an attribute value as shown in the following figure, which indicates that the CCE resource can only be connected to the EIP resource.

Figure 3-7 CCE attribute

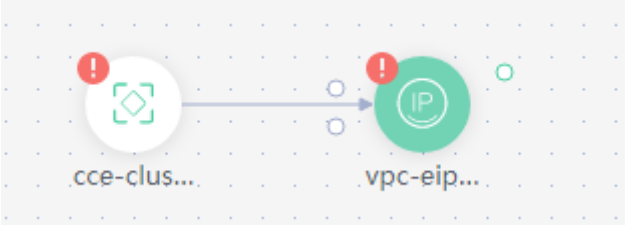
Assume that the CCE resource needs to be connected to a VPC resource. Drag the VPC element to the canvas first.

Figure 3-8 EIP



Move the cursor to the gray hollow point of the CCE resource and click the gray hollow point. An arrow is displayed. Drag the mouse to move the arrow to the EIP resource. When the hollow point of EIP resource turns green, release the mouse. The two resources are associated.

Figure 3-9 Hollow point: an element to be connected



- Green hollow points and connection lines

  The line from a resource with a green hollow point to another resource represents the dependencies between two resources. For more information, see **•Green hollow points**.

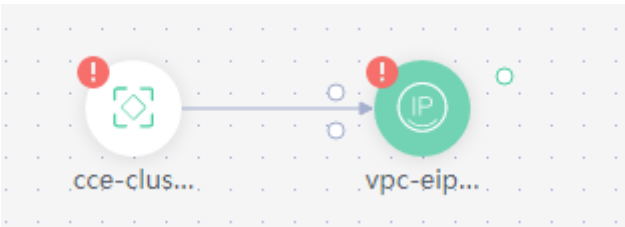
  Figure 3-10 Green hollow points and connection lines

- Gray hollow points and connection lines

  The line from a resource with a hollow gray point to another resource indicates that the two resources are associated using an attribute value. In addition, a dependency relationship exists between the two resources. For more information, see **•Green hollow points**.

  A resource with a gray hollow point can be associated with other resources. For example, when you drag a CCE resource to the canvas, a gray hollow point is displayed as shown in the following figure. When you move the cursor to the gray hollow point, you can view an attribute value as shown in the following figure, which indicates that the CCE resource can only be connected to the EIP resource. Assume that the CCE resource needs to be connected to a EIP resource. Drag the EIP element to the canvas first. Move the cursor to the gray hollow point of the CCE resource and click the gray hollow point. An arrow is displayed. Drag the mouse to move the arrow to the EIP resource. When the hollow point of EIP resource turns green, release the mouse. The two resources are associated. Hollow point: an element to be connected

  Figure 3-11 Gray hollow points and connection lines

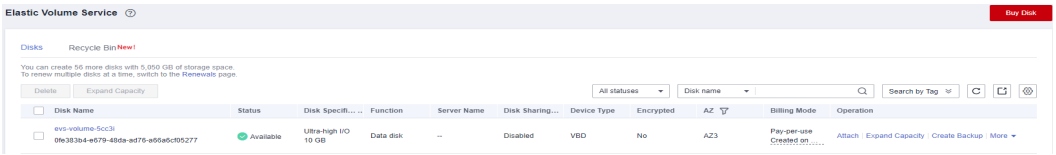
3.4 Shortcut Keys of Visual Designer

Operation	Windows OS	macOS
Copy	Ctrl-C	Command-C
Paste	Ctrl-V	Command-V
Cut	Ctrl-X	Command-X
All	Ctrl-A	Command-A
Find	Ctrl-F	Command-F
Go to the beginning of the text	Ctrl-Home	Command-Home|Command-Up
Go to the previous line	Up	Up|Ctrl-P
Go to the end of the text	Ctrl-End	Command-End|Command-Down
Go to the next line	Down	Down|Ctrl-N
Go to the end of the current page	PageDown	PageDown|Ctrl-V
Copy the current element	Ctrl-D	Command-D
Undo	Ctrl-Z	Command-Z
Delete	Delete	Delete|Ctrl-D|Shift-Delete
Zoom in	Ctrl-=	Command-=
Zoom out	Ctrl--	Command--

3.5 Compiling a Template to Create an EVS Disk

This section describes how to **compile a template on the Visual Designer** to create an EVS disk. At the end of this walkthrough, you will see the newly created EVS disk on the Cloud Server Console, as shown in **Figure 3-12**.

Figure 3-12 Created EVS disk



1. **Step 1: Use the Visual Designer to Compile a Template**: Use the Visual Designer to add elements and configure parameters for each element.

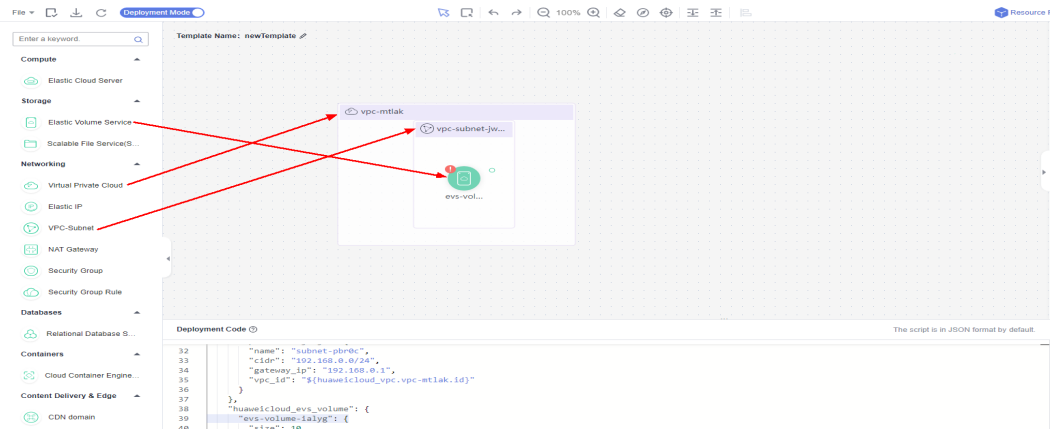
2. **Step 2: Create an EVS Disk**: Use the Visual Designer to create an ECS, a VPC, and a subnet.
3. **Step 3: Delete Unnecessary Resources**: Delete unnecessary stacks to avoid unwanted charges.

Step 1: Use the Visual Designer to Compile a Template

Step 1 Log in to the RFS console. In the navigation pane on the left, click **Visual Designer**.

Step 2 Add and connect elements. Drag elements, such as VPC, VPC subnet, and EVS, to the canvas, and establish relationships between them, as shown in **Figure 3-13**.

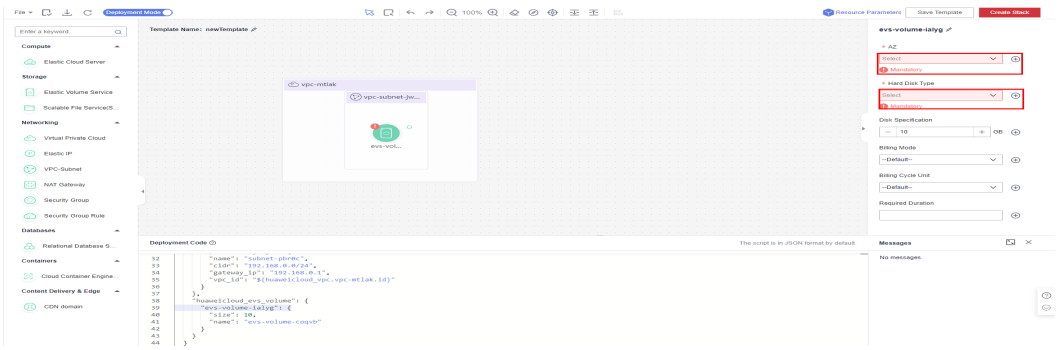
Figure 3-13 Adding an element



Step 3 Configure the template parameters. Set the attributes in the **Attribute Editing Panel** panel on the right.

1. Click the **vpc** element in the canvas. The attributes of the element will be automatically displayed in the attribute pane. The CIDR can use the default value **192.168.0.0/16**.
2. Click the **subnet** element in the canvas. The attributes of the element will be automatically displayed in the attribute pane. You can set the default value for the attributes.
3. Click the **evs** element in the canvas. The attributes of the element will be automatically displayed in the attribute pane. The attributes with red text boxes are mandatory, as shown in **Figure 3-14**.

Figure 3-14 Mandatory attributes

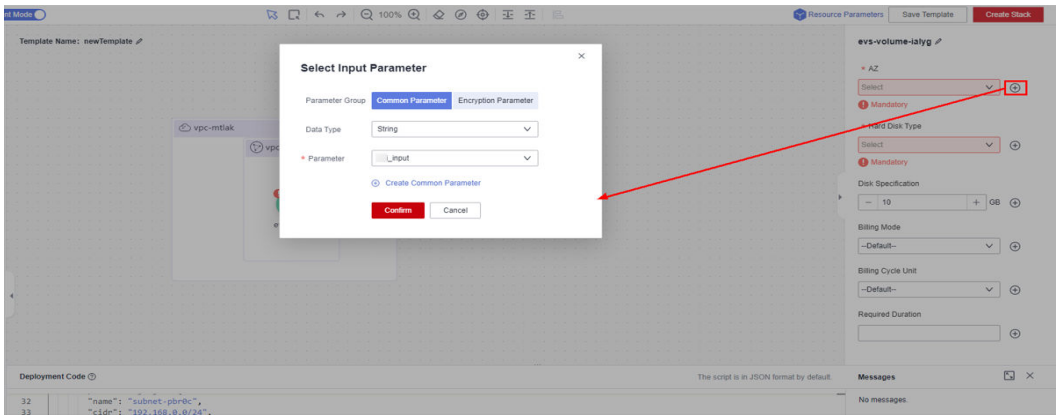


NOTE

To facilitate parameter setting and modification, you are advised to set parameters whose value needs to be frequently changed as input parameters. **get_input** indicates input parameters. You can define the values behind **get_input**.

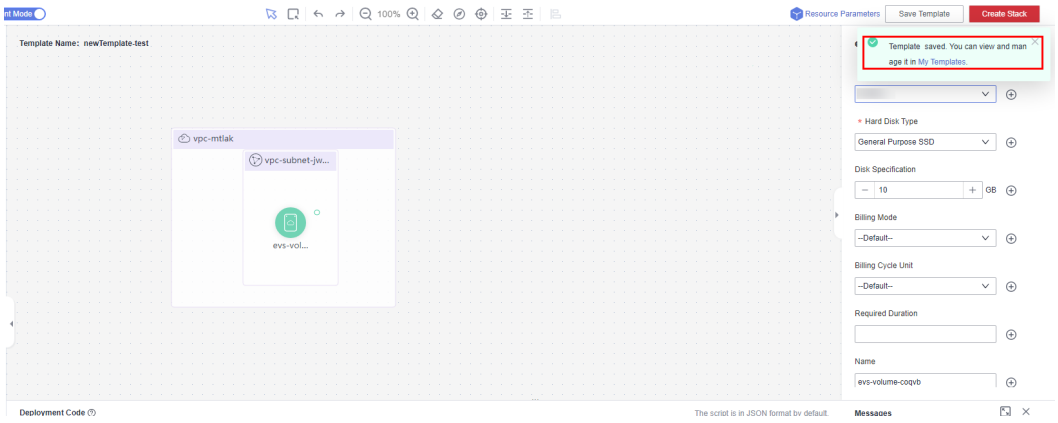
4. Click ⊕ on the right of the attribute editing panel to generate an input parameter, as shown in **Figure 3-15**.

Figure 3-15 Generating an input parameter



Step 4 Click **Save Template** in the upper right corner of the Visual Designer to save the template. If the message "Template saved. You can view and manage it in My Templates." is displayed, the template is saved.

Figure 3-16 Saving a template



----End

Step 2: Create an EVS Disk

Step 1 Close the Visual Designer and go to the RFS console.

Step 2 In the navigation pane on the left, click **Templates** > **My Templates**. The template is displayed in the template list.

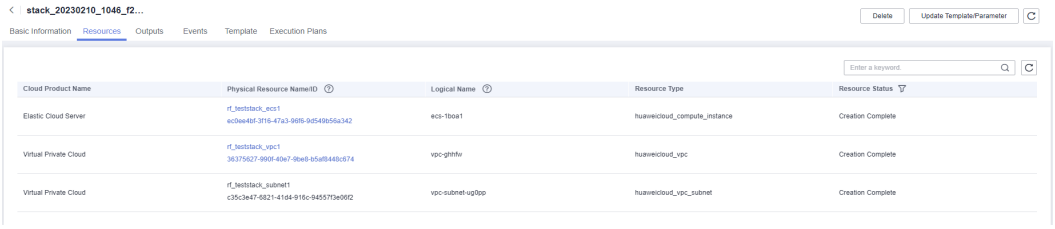
Step 3 Click **Create Stack** in the **Operation** column of the template.

Step 4 Click **Next** to view the stack information. After confirming the information, click **Next**, select an agency, click **Next**, and click **Create Execution Plan**.

The **Execution Plans** tab page is displayed, click **Deploy** in the **Operation** column of the execution plan.

Step 5 When the status of the plan is **Applied**, you can view that three cloud services exist in the **Resources** tab page. A VPC, a subnet, and an EVS disk have been created.

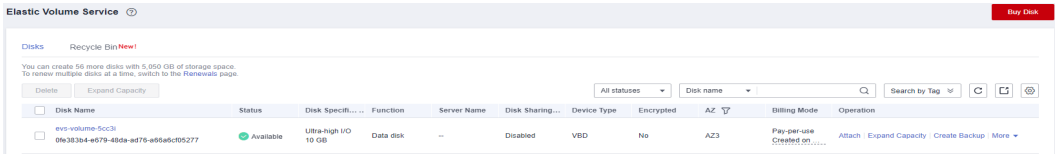
Figure 3-17 Crested stack



Step 6 View the created cloud services.

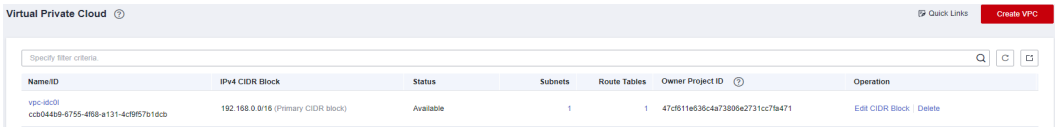
1. Log in to the Huawei Cloud management console.
2. Choose **Cloud Server Console** > **Elastic Volume Service**. You can see the newly created EVS disk.

Figure 3-18 EVS created



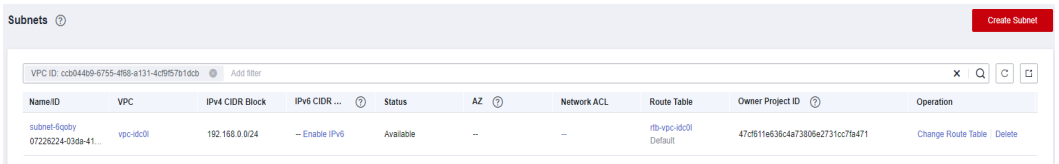
3. Choose **Service List** > **Networking** > **Virtual Private Cloud**. You will see the newly created VPC on the VPC list.

Figure 3-19 Created VPC



4. Click the VPC name to show more details about the VPC. On the VPC details page, you will see that the subnet has been created in the VPC.

Figure 3-20 Created subnet



----End

Step 3: Delete Unnecessary Resources

You are advised to delete unnecessary stacks to avoid unwanted charges.

Step 1 Log in to the RFS console.

Step 2 In the navigation pane on the left, click **Stacks**.

Step 3 Locate the created stack, click **Delete** in the **Operation** column, and delete the stack as prompted.

----End

4 Managing a Stack

Stack management consists of two aspects. One is lifecycle management of created stacks, including deleting and changing. The other is viewing stack details to obtain their running statuses.

Modifying a Stack

After a stack is created successfully (that is, in the normal status), you can change the parameters of the stack as needed.

Step 1 Log in to the RFS console.

Step 2 In the navigation pane on the left, click **Stacks**.

Step 3 In the stack list, click the stack to be changed.

Step 4 On the stack details page, click **Update Template/Parameter**.

Step 5 Change the template version or input parameters, and click **Next**.

Step 6 Confirm the configurations and then click **Create Execution Plan**.

Step 7 On the **Execution Plans** tab page of the stack details page, select the created execution plan and click **Deploy** in the **Operation** column.

On the **Events** tab page, you can view the detailed operation events related to stack changes.

----End

Deleting a Stack

Deleted stacks cannot be restored. Exercise caution when deleting a stack.

Step 1 Log in to the RFS console.

Step 2 In the navigation pane on the left, click **Stacks**.

Step 3 In the stack list, select the stack to be deleted and click **Delete** in the **Operation** column.

Step 4 In the dialog box displayed, enter **Delete** and click **OK**.

Check the stack name carefully. The deletion cannot be revoked.

On the **Events** tab page, you can view the detailed operation events related to stack deletion.

----End

Viewing Stack Details

After a stack is created, you can view its data and resources on the stack details page.

- Resources

  Elements of a stack, such as applications and cloud services
- Outputs

  Output parameters and their values in the stack template
- Template

  Details of the template used to create the stack
- Events

  You can view stack events to monitor the stack operation progress. For example, when you create a stack, all important steps during the stack creation are displayed on the **Events** tab page. The events are sorted in chronological order with the latest event being displayed at the top.

5 Auditing

5.1 RFS Operations Supported by CTS

5.2 Viewing RFS Logs in CTS

5.1 RFS Operations Supported by CTS

Cloud Trace Service (CTS) records all operations performed on cloud services, providing data support for customers in fault locating, resource management, and security auditing. When you enable CTS, it begins to record operations performed on RFS resources.

Table 5-1 RFS operations supported by CTS

Operation	Description
createStack	Creating a stack
deployStack	Deploying a stack
deleteStack	Deleting a stack
updateStack	Updating a stack
parseTemplateVariables	Parsing template variables
continueRollbackStack	Continuing to roll back a stack
continuedeployStack	Continuing to deploy a stack
createExecutionPlan	Creating an execution plan
applyExecutionPlan	Executing an execution plan

Operation	Description
deleteExecution-Plan	Deleting an execution plan
createTemplate	Creating a template
deleteTemplate	Deleting a template
updateTemplate	Updating a template
createTemplateVersion	Creating a template version
deleteTemplateVersion	Deleting a template version
useAgency	Recording user agency
createStackSet	Creating a stack set
deleteStackSet	Deleting a stack set
deployStackSet	Deploying a stack set
updateStackSet	Updating a stack set
createStackInstances	Creating stack instances
deleteStackInstances	Deleting stack instances
updateStackInstances	Updating stack instances

5.2 Viewing RFS Logs in CTS

When you enable CTS, it begins to record operations performed on RFS resources. On the CTS console, you can query operation records from the last 7 days by performing the following operations.

Procedure

Step 1 Log in to the CTS console.

Step 2 In the navigation pane, click **Trace List**.

Step 3 Filter the desired operation events.

The trace list supports four filter types:

- **Trace Source**, **Resource Type**, and **Search By**

  Select the search criteria from the drop-down lists. For example, select **RFS** from the **Trace Source** drop-down list box.

From the **Search By** drop-down list, select a trace name. From the **Search By** drop-down list, select or enter a specific resource ID. From the **Search By** drop-down list, select or enter a specific resource name.

- **Trace Status**: Select one of **All trace statuses**, **Normal**, **Warning**, and **Incident**.
- **Operator**: Select a specific operator (a user other than an account).
- **Time Range**: You can query traces generated during any time range of the last seven days.

Step 4 Click ⌄ on the left of a trace to expand its details.

Step 5 Click **View Trace** in the **Operation** column. A dialog box is displayed to show trace structure details.


```
{
  "trace_id": "4073d5e1-6ee6-11ed-bb00-61c31199dcbc",
  "code": "200",
  "trace_name": "parseTemplateVariables",
  "resource_type": "template",
  "trace_rating": "normal",
  "source_ip": "10.172.131.218",
  "trace_type": "ApiCall",
  "service_type": "RFS",
  "event_type": "system",
  "project_id": "47cf611e636c4a73806e2731cc7fa471",
  "response": "{\"variables\":[{\"default\":\"jiayue_test_ecs\",\"description\":\"Your ECS name\",\"name
\":\"ecs_name\",\"type\":\"\\\"string\\\"\"}]}",
  "resource_id": "",
  "tracker_name": "system",
  "time": "2022/11/28 14:31:12 GMT+08:00",
  "resource_name": "",
  "user": {
    "domain": {
      "name": "iaas_aos_01",
      "id": "fcca06b017704dfcb36dcf1b2a29d151"
    },
    "name": "cto_dev",
    "id": "155ad09309994f92a5147529aa0ceb2f"
  },
  "record_time": "2022/11/28 14:31:12 GMT+08:00"
}
```


----End

6 FAQs

6.1 How Will I Be Charged for Using RFS?

6.2 How Can I Update a Stack?

6.3 What Are the Differences Between Creating an Execution Plan, Creating a Stack, and Updating a Stack?

6.1 How Will I Be Charged for Using RFS?

RFS itself is free of charge. However.

when you use a template to create a stack, RFS will create cloud service resources as specified in the template. These resources are charged at the pricing of the corresponding cloud services.

6.2 How Can I Update a Stack?

RFS supports updating stacks.

To update a stack, modify your stack template first by modifying its parameter values, or adding or deleting resources specified in the template. Then, click **Update** and select the modified template to update the stack.

6.3 What Are the Differences Between Creating an Execution Plan, Creating a Stack, and Updating a Stack?

Creating an execution plan: Generate an execution plan. You can browse the entire plan in advance to evaluate the impact on ongoing resources. Creating an execution plan will not change the stack. The system changes the stack only when the execution plan is executed.

Creating a stack: Provide an initial template to create and deploy a stack.

Updating a stack: Provide a new template or new parameters to trigger a new deployment for directly modifying the stack.

7 IAM Agency

By creating an agency, you can share your resources with another account, or delegate an individual or team to manage your resources. You do not need to share your security credentials (the password and access keys) with the delegated party. Instead, the delegated party can log in with its own account credentials and then switches the role to your account and manage your resources.

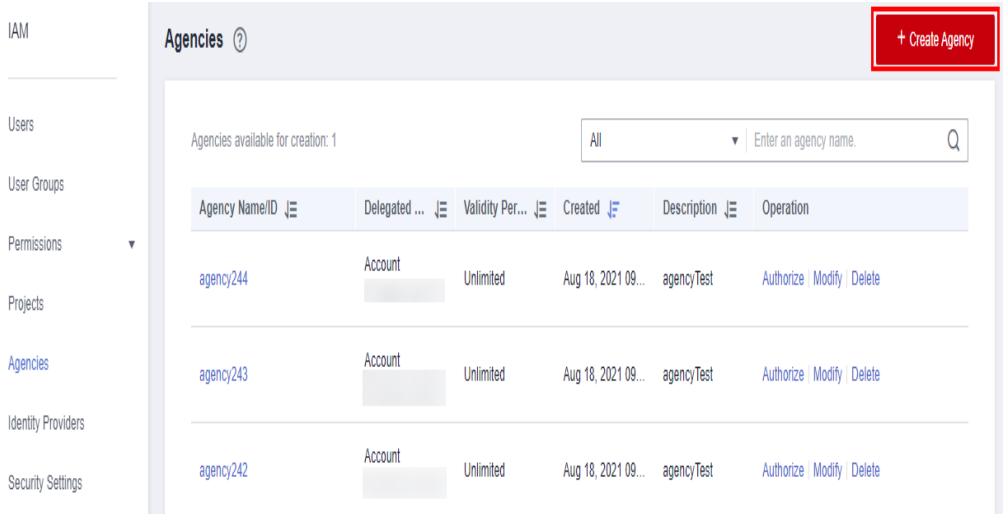
With RFS, you can create a stack to bind an agency with a provider and update the binding relationship by updating the stack.

RFS uses an agency only in resource operation requests, such as creating a stack (triggering deployment), creating an execution plan, deploying a stack, and deleting a stack. The agency applies only to resource operations performed by the bound provider. If the permissions provided by the agency are insufficient, resource operations may fail.

Procedure

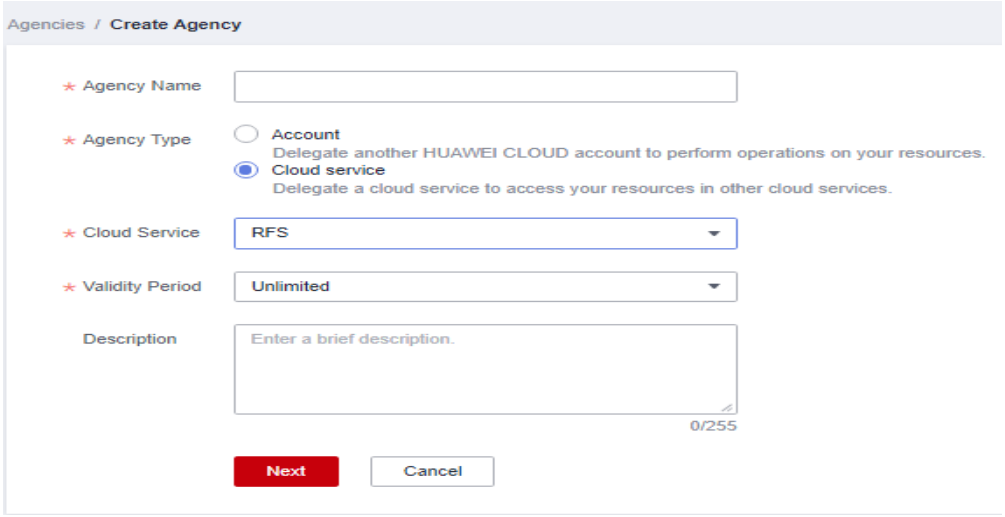
1. Log in to the IAM console.
2. On the IAM console, choose **Agencies** from the navigation pane on the left, and click **Create Agency** in the upper right corner.

Figure 7-1 Creating an agency



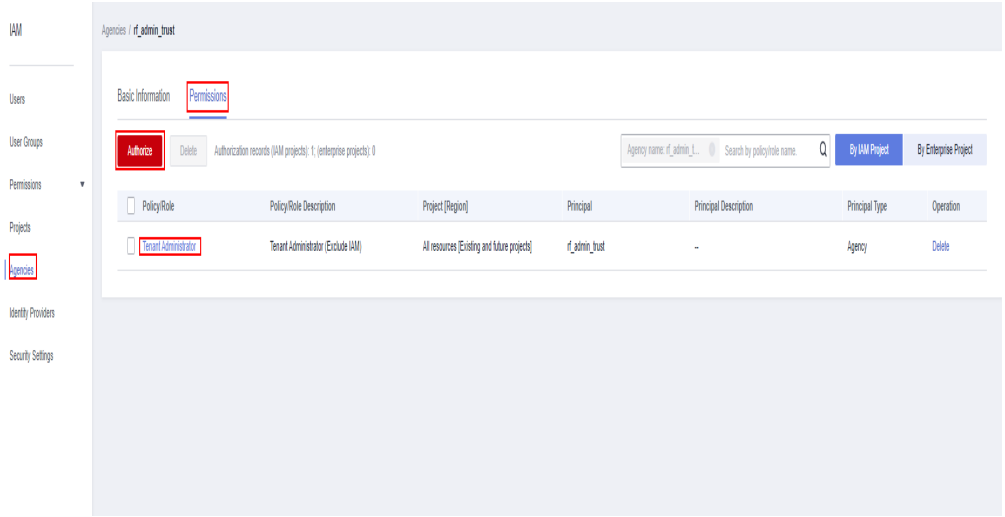
3. Enter an agency name.
   Set **Cloud Service** to **RFS**.

   Figure 7-2 Creating an agency



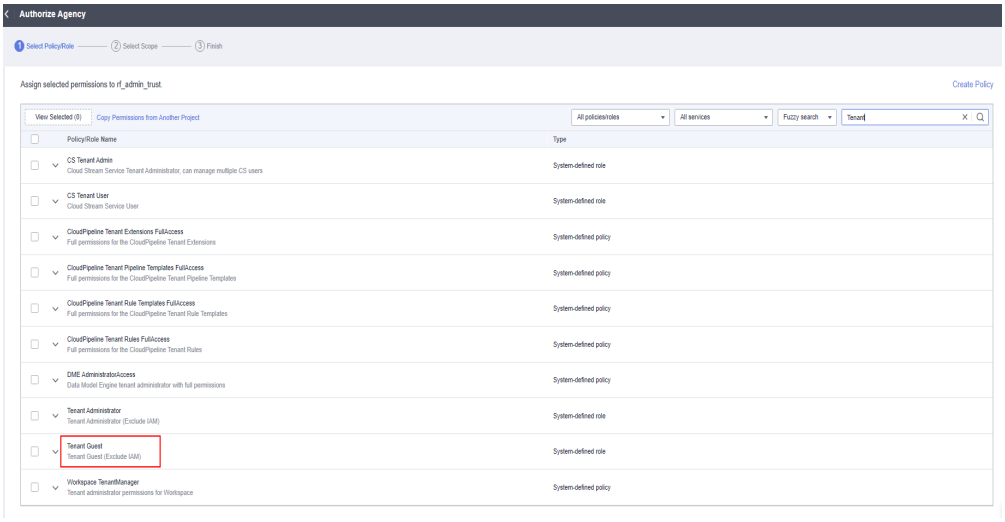
4. Click **Next**. The **Authorize Agency** page is displayed. You can grant permissions to the agency on this page.

   Figure 7-3 Agency authorization



5. Filter specific permissions and grant them to the agency.

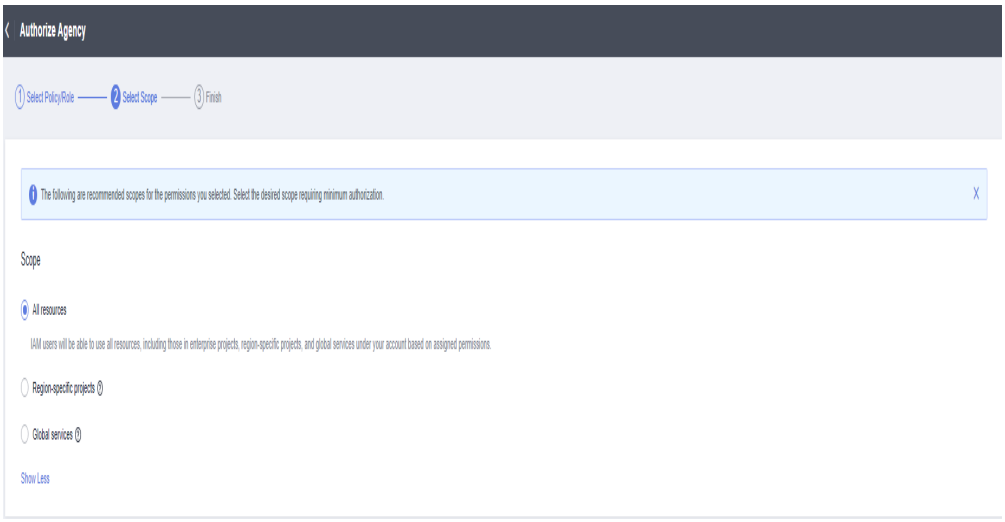
Figure 7-4 Selecting policies



You can determine the permissions to be granted to an agency. Huawei Cloud best practices do not advise you to automatically create agencies with the Tenant Administrator permission for users. The best practice is to grant management permissions (including read and write operations) to resources that may be used in a stack.

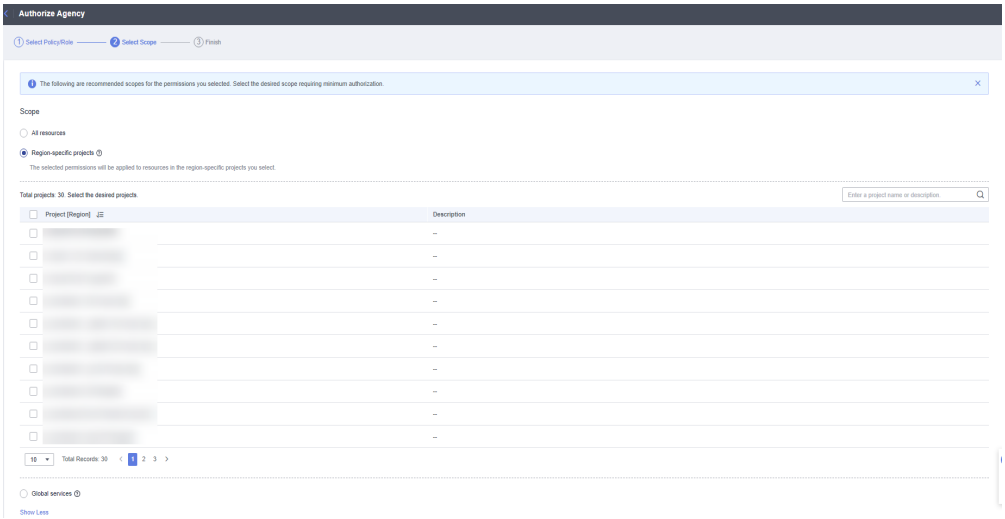
6. Set the authorization scope. You can select **All resources** or **Region-specific projects**.

Figure 7-5 Authorization scope



7. Click **OK**. The agency is created.

Figure 7-6


Authorize Agency
Select Policy/Role
Select Scope
Finish
The following are recommended scopes for the permissions you selected. Select the desired scope requiring minimum authorization.
Scope
All resources
Region-specific projects
The selected permissions will be applied to resources in the region-specific projects you select.
Total projects: 30 Select the desired projects.
Enter a project name or description
Project [Region]
Description
Total Records: 30
Global services
Show Less

A Change History

Table A-1 Change history

Date	Description
2024-12-18	New Designer Content.
2024-05-30	This issue is the first official release.