

Resource Formation Service

Service Overview

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Huawei Cloud Computing Technologies Co., Ltd.

Address: Huawei Cloud Data Center Jiaoxinggong Road
Qianzhong Avenue
Gui'an New District
Gui Zhou 550029
People's Republic of China

Website: <https://www.huaweicloud.com/intl/en-us/>

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1 Resource Formation Service

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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.

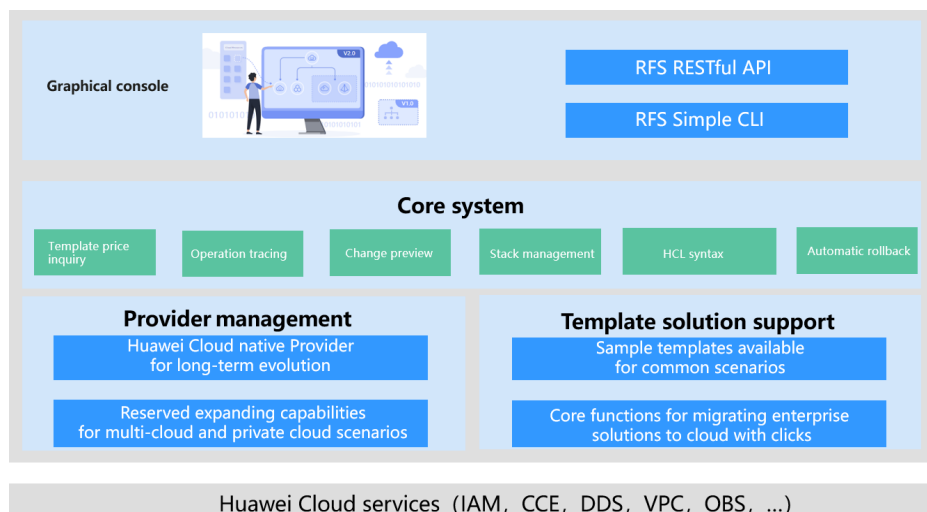
Concept	Description
Execution plan	An execution plan provides a preview of stack changes. It displays the comparison between the current template and online resources, and clearly shows the operations (such as addition, modification, and deletion) to be performed on resources and attributes during resource 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 Huawei 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 Huawei Cloud services (90+ cloud services, 540+ resource objects). For details, see [HuaweiCloud 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

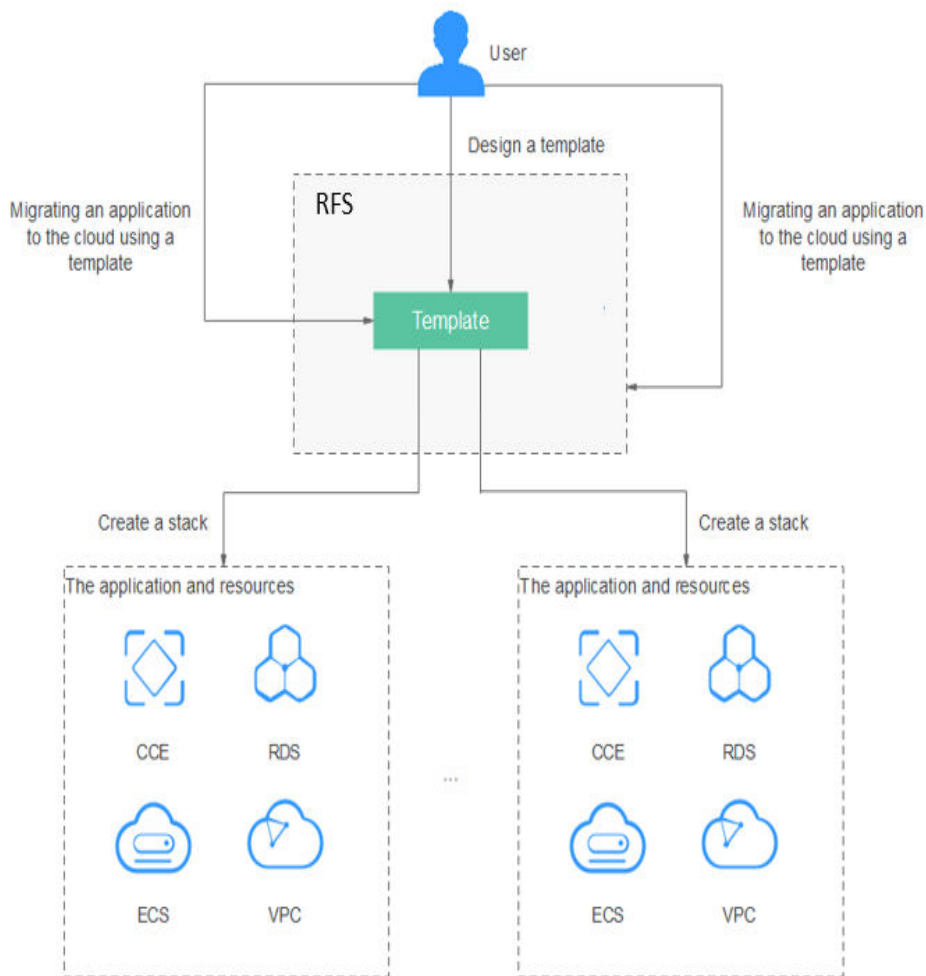
RFS implements tool-based and process-based work for the preceding scenarios. It uses templates to describe resources required by applications in a unified manner. The stack management function enables automatic deployment or destruction for various resources. RFS allows you to define a large number 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.

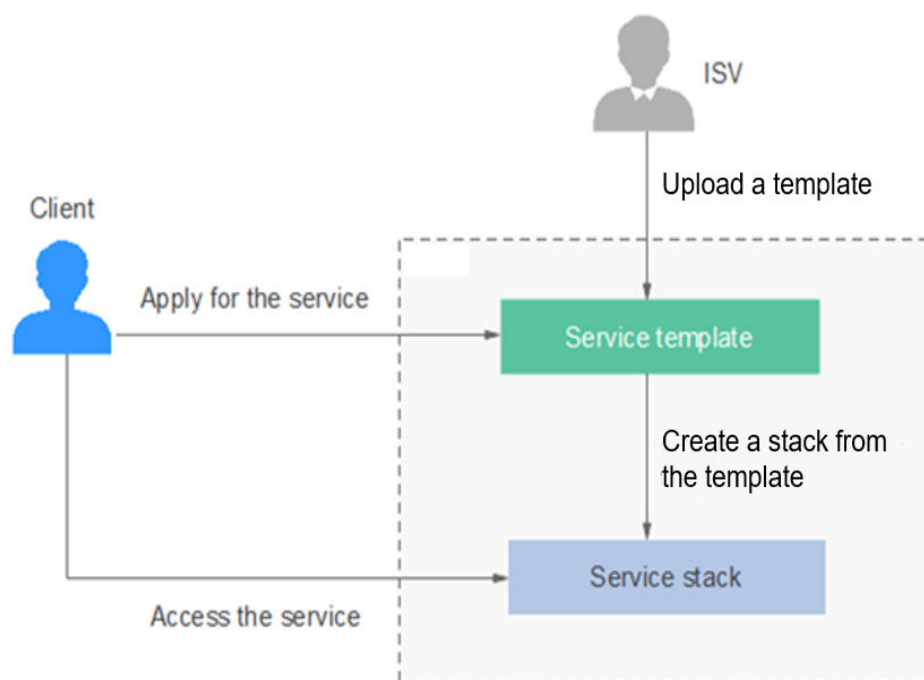
Solution

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.

To increase the quota, [create a service ticket](#). For more information on quotas, see [Quotas](#).

Resource	Item	Quota
Template	Maximum number of templates that can be created by a Huawei 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 Huawei 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

Resource	Item	Quota
Stack set	Maximum number of stack sets that can be created by a Huawei Cloud account	100
	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 Huawei Cloud. Before using the provider, configure the corresponding permissions.	1.67.1	96	664
		1.66.3	96	641
		1.66.2	96	637
		1.66.0	96	634
		1.64.4	95	603
		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		

Type	Introduction	Version	Number of Supported Services	Number of Supported Resources
		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
		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

1.7 Security

1.7.1 Shared Responsibilities

Huawei guarantees that its commitment to cyber security will never be outweighed by the consideration of commercial interests. To cope with emerging cloud security challenges and pervasive cloud security threats and attacks, Huawei Cloud builds a comprehensive cloud service security assurance system for different regions and industries based on Huawei's unique software and hardware advantages, laws, regulations, industry standards, and security ecosystem.

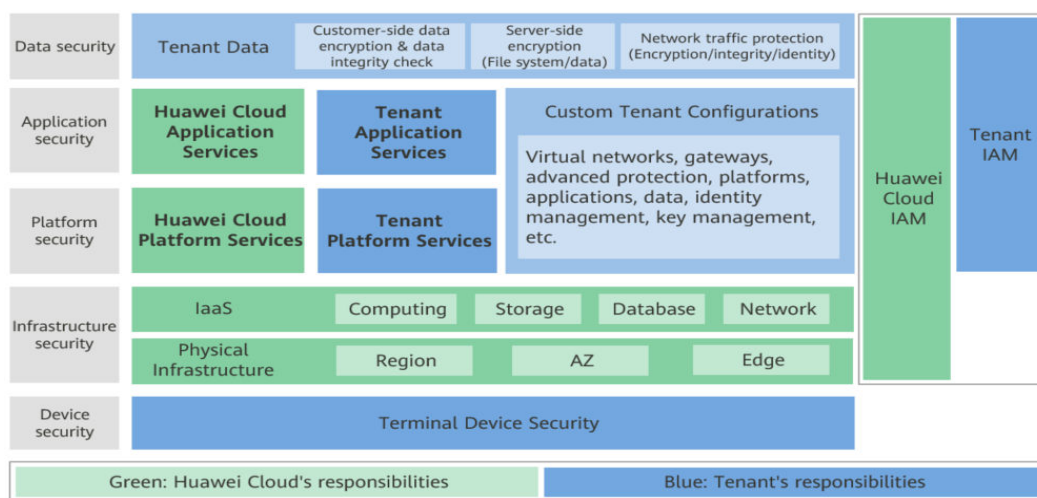
Figure 1 illustrates the responsibilities shared by Huawei Cloud and users.

- Huawei Cloud: ensures the security of cloud services and provides secure clouds. Huawei Cloud's security responsibilities include ensuring the security of our IaaS, PaaS, and SaaS services, as well as the physical environments of the Huawei Cloud data centers where our IaaS, PaaS, and SaaS services operate. Huawei Cloud is responsible for not only the security functions and performance of our infrastructure, cloud services, and technologies, but also for the overall cloud O&M security and, in the broader sense, the security compliance of our infrastructure and services.

- **Tenant:** uses the cloud securely. Tenants of Huawei Cloud are responsible for the secure and effective management of the internal security as well as the tenant-customized configurations of cloud services including IaaS, PaaS, and SaaS. This includes but is not limited to operating systems like virtual networks, virtual machine host and guest virtual machines, virtual firewall, API Gateway and advanced security services, all types of cloud services, tenant data, identity accounts, and key management.

Huawei Cloud Security White Paper elaborates on the ideas and measures for building Huawei Cloud security, including cloud security strategies, the shared responsibility model, compliance and privacy, security organizations and personnel, infrastructure security, tenant service and security, engineering security, O&M security, and ecosystem security.

Figure 1-3 Huawei Cloud shared security responsibility model



1.7.2 Identity Control and Access Control

Identity authentication

Tenants can use RFS through the console or by calling APIs.

1. Identity authentication on the console

RFS is interconnected with Identity and Access Management (IAM) to manage tenant identity authentication and access using IAM permissions.

IAM is a basic service of Huawei Cloud that provides permissions management to help you securely control access to RFS. With IAM, you can add users to a user group and configure policies to control their access to RFS resources. IAM permissions define which actions on your cloud resources are allowed and which actions are denied in a fine-grained manner, to control access to your RFS resources.

2. Identity authentication by calling APIs

All APIs can only be accessed by authenticated requests. An authenticated request must contain a signature value. The signature value is calculated based on the access key (AK/SK) of the requester and the specific information carried in the request body. AOS supports AK/SK authentication. It uses AK/SK-based encryption

to authenticate requests. For details about access keys and how to obtain them, see [Authentication](#).

1.7.3 Audit and Logging

Audit

Cloud Trace Service (CTS) records operations on the cloud resources in your account. You can use the logs generated by CTS to perform security analysis, trace resource changes, audit compliance, and locate faults.

For details about AOS operations supported by CTS, see [RFS Operations Supported by CTS](#).

Logging

After you enable CTS and configure a tracker, CTS can record RFS operations for auditing. You can search for RFS traces in the trace list on the CTS console to view RFS audit logs.

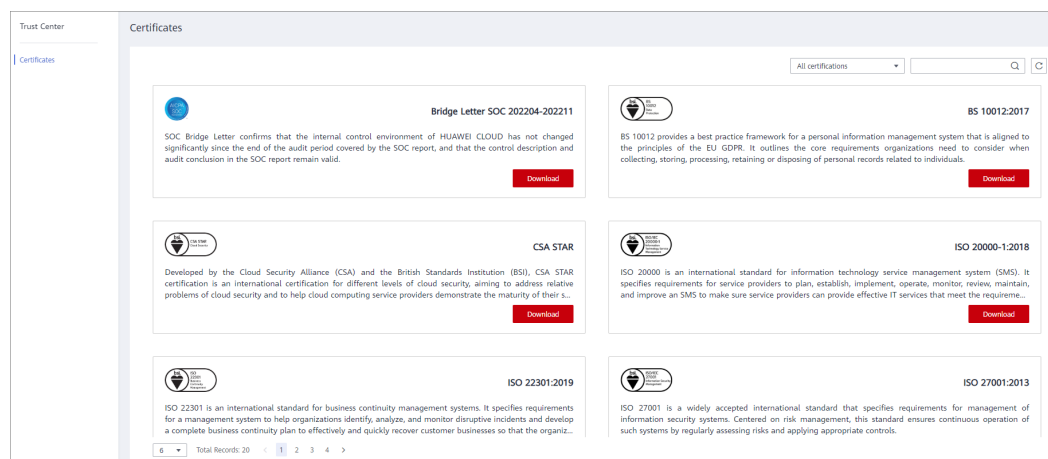
For details about how to view audit logs, see [Viewing Logs in CTS](#).

1.7.4 Certificates

Compliance Certificates

Huawei Cloud services and platforms have obtained various security and compliance certifications from authoritative organizations, such as International Organization for Standardization (ISO), system and organization controls (SOC), and Payment card industry (PCI) compliance standards. These certifications are available for [download](#).

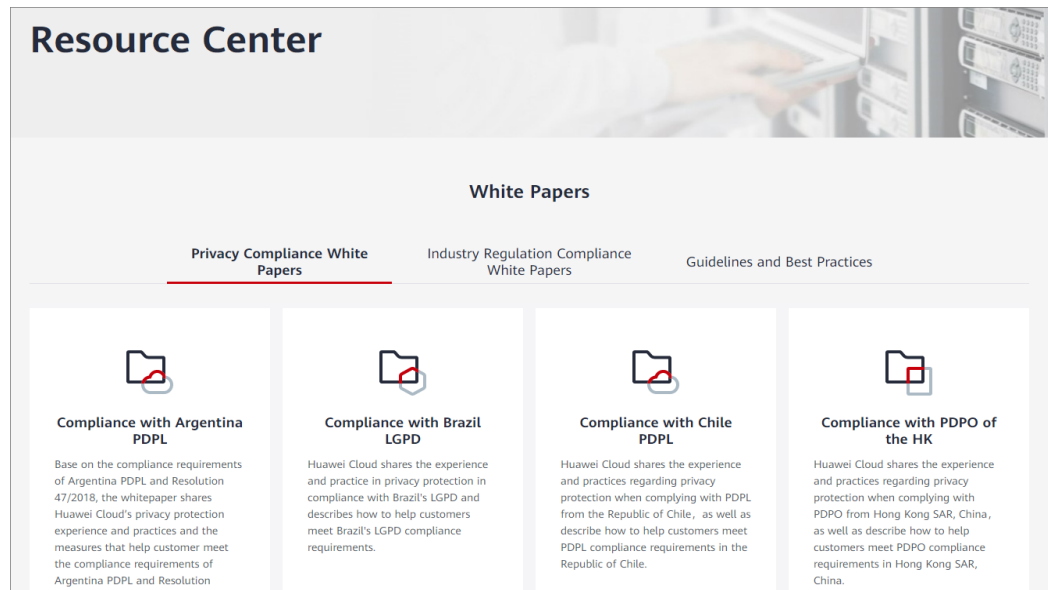
Figure 1-4 Downloading compliance certificates



Resource Center

Huawei Cloud also provides the following resources to help users meet compliance requirements. For details, see [Resource Center](#).

Figure 1-5 Resource center



2 Application Orchestration Service

[2.1 Introduction](#)

[2.2 Advantages](#)

[2.3 Application Scenarios](#)

[2.4 Basic Concepts](#)

[2.5 Constraints and Limitations](#)

[2.6 Security](#)

[2.7 Cloud Services and Resources that Can Be Orchestrated in AOS](#)

2.1 Introduction

Application Orchestration Service (AOS) enables enterprises to automate application cloudification. By orchestrating mainstream cloud services of HUAWEI CLOUD, you can create, replicate, and migrate your applications and provision required cloud resources with a few clicks.

To work with AOS, all you need to do is create a template describing the applications and cloud resources that you would like, including their dependencies and references. AOS will then set up these applications and resources as specified in your template. For example, suppose you want to create an Elastic Cloud Server (ECS), together with a Virtual Private Cloud (VPC) and a subnet on which the ECS runs, you simply create a template defining an ECS, a VPC, a subnet, and their dependencies. AOS will then create a stack, namely, a collection of resources you specified in the template. After the stack has been successfully created, the ECS, VPC, and subnet are available to use.

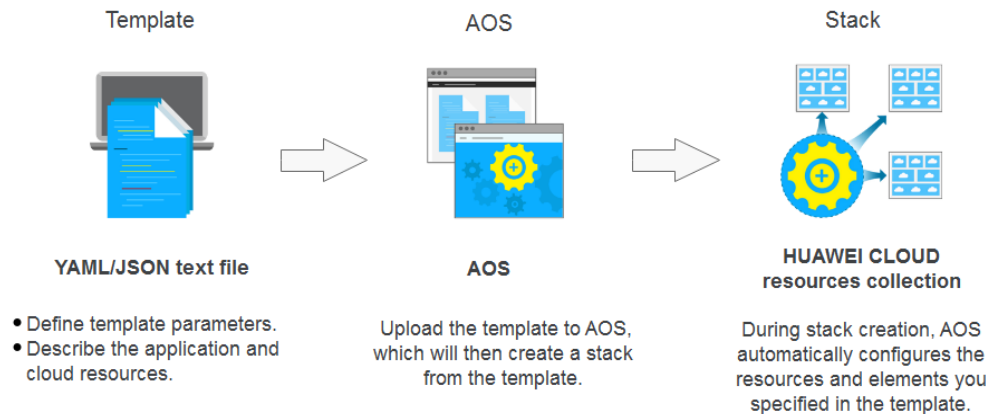
AOS templates are text files that are easy to read and write. You can directly edit template files in YAML or JSON format. In addition, AOS Template Market provides a large volume of free templates, covering common application scenarios, for you to use directly or as references.

AOS manages applications and cloud resources through stacks. Operations like creation, deletion, and replication can be performed on the whole stack as a unit. When creating stacks, AOS automatically set up your applications and required cloud resources as described in your template. The statuses, alarms, and other

information on each of the application or resource in your stack can be easily viewed.

You can work with AOS on [Console](#) or through [API](#).

Figure 2-1 AOS



Features

- **Automatic orchestration of resources**

AOS provides automatic orchestration of mainstream HUAWEI CLOUD services. For details, see [Cloud Services and Resources that Can Be Orchestrated in AOS](#). AOS also provides lifecycle management including resource scheduling, application design, deployment, and modification to reduce O&M costs through automation.
- **Hybrid orchestration of applications and cloud service resources**

You can use standard languages, namely YAML and JSON, to describe required basic resources, application systems, upper-layer services, and their relationships. Based on your description, resource provision, application deployment, and service loading can be automatically performed in the order specified by dependencies with a few clicks. You can perform unified management on deployed resources and applications like deletion, scaling, replication, and migration.
- **Abundant application templates provided**

AOS Template Market provides abundant templates for free, including basic resource templates, service combination templates, and industry templates, covering common application scenarios. You can use these public templates directly to deploy cloud-based services in seconds.

2.2 Advantages

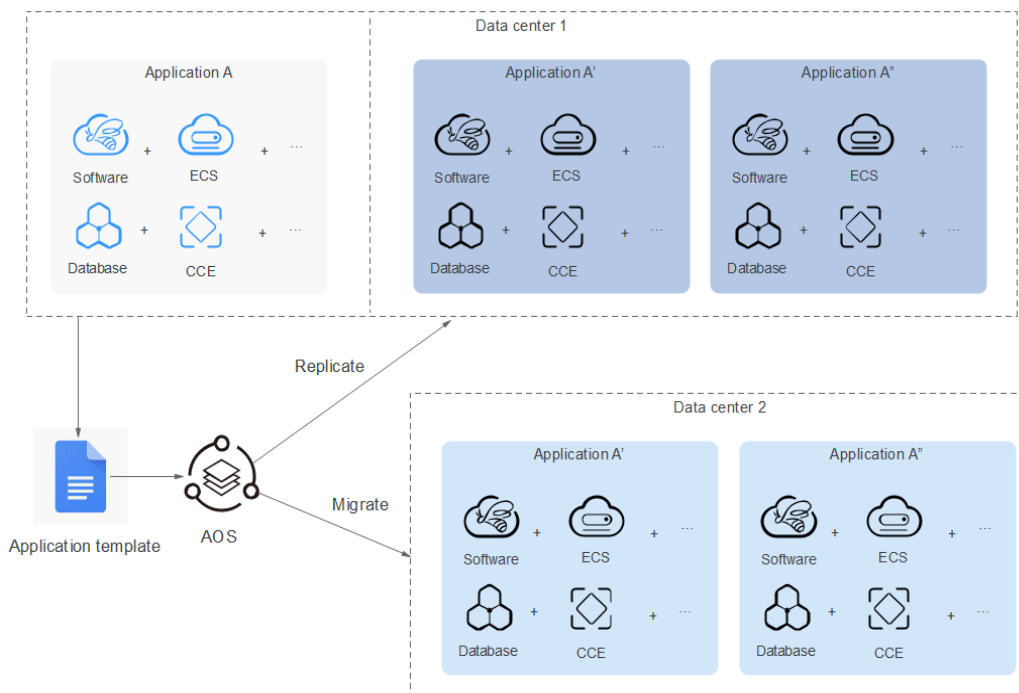
Unified Orchestration of Cloud Services

Currently, AOS allows unified orchestration of HUAWEI CLOUD mainstream services, including more than 20 services and 90 resource objects. By creating stacks, applications and cloud resources of different types and configurations can

be automatically created in batches. In this way, you can perform unified orchestration conveniently and efficiently.

Fast Replication and Migration

AOS allows you to automatically replicate and migrate your business among different regions to ensure your business consistency across different environments. AOS templates allow you to delete and recreate resources and applications freely without any inconsistency. In this way, higher efficiency and reliability can be achieved.



User-Friendly Orchestration Language

- Both YAML and JSON syntax are supported when you are defining template elements.
- To define the configurations, number of instances, and operations of deployed objects, simply modify the input parameters. In this way, AOS enables you to reuse your templates conveniently.
- You can refer to variables, including input parameters, element attributes, and mapping tables during orchestration.
 - Input parameter reference: used to obtain the values of input parameters defined in the **inputs** sections of template files.
 - Element attribute reference: used to obtain the initialization results of the elements other than those in the **inputs** sections in a template. For example, when you are creating an ECS after creating a VPC, you can refer to the ID of the VPC you just created. This method can be used to build dependencies between resources and control the order of resource creation.
 - Mapping table reference: used to obtain the content in mapping tables.

Abundant Public Templates

AOS Template Market provides abundant public templates, covering various scenarios in application cloudification. Handle AOS effortlessly with these public templates.

2.3 Application Scenarios

Migrating Applications to the Cloud

Challenges

Migrating applications to the cloud involves repetitive work, such as the destruction and rebuild of environments and manually configuring new instances one by one when scaling out applications. Some operations could be time-consuming, such as creating databases or VMs, which usually take minutes to finish. You may have to wait longer when these demanding operations need to be performed one by one. In this case, automating the whole process can improve the migrating efficiency and free you from tedious work.

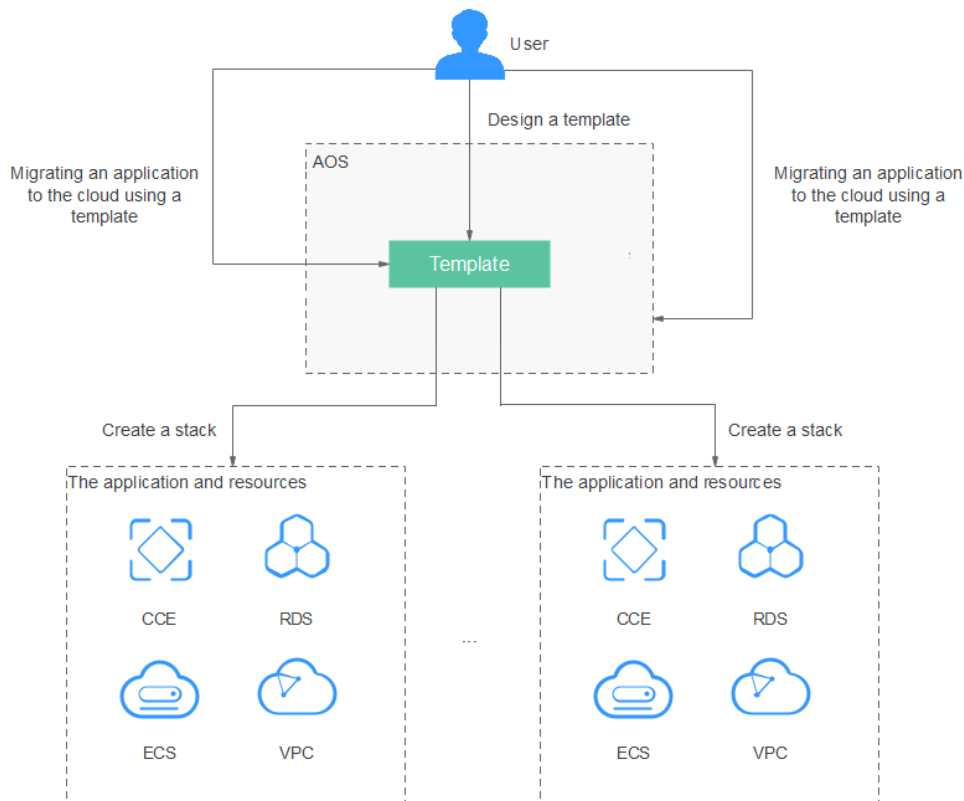
Solution

AOS enables you to schedule resources, define applications, and deploy services at the same time. With a few clicks, operations such as deployment and destruction can be automatically performed. The only thing you need to do is define your applications and corresponding resources through templates.

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 services and destruct environments with a few clicks. Get rid of repetitive work.
- **Quick replication of applications**
Applications and resources can be quickly replicated and deployed across different data centers. Templates allow you to quickly create identical applications.

Figure 2-2 Migrating applications to the cloud



ISV Service Provisioning

Challenges

Independent software vendors (ISVs) deliver software to their customers and have the software deployed in the cloud to provide services. 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 customers have to create resources, configure networks, perform O&M, and manage updates all on themselves. In addition, the traditional method is complex and error-prone, as all the installation is performed manually.

Solution

AOS templates enable ISVs to deliver software and required resources in a standard manner. By writing templates and deploying application through AOS, software can be easily delivered and efficiently deployed with a few clicks.

Advantages

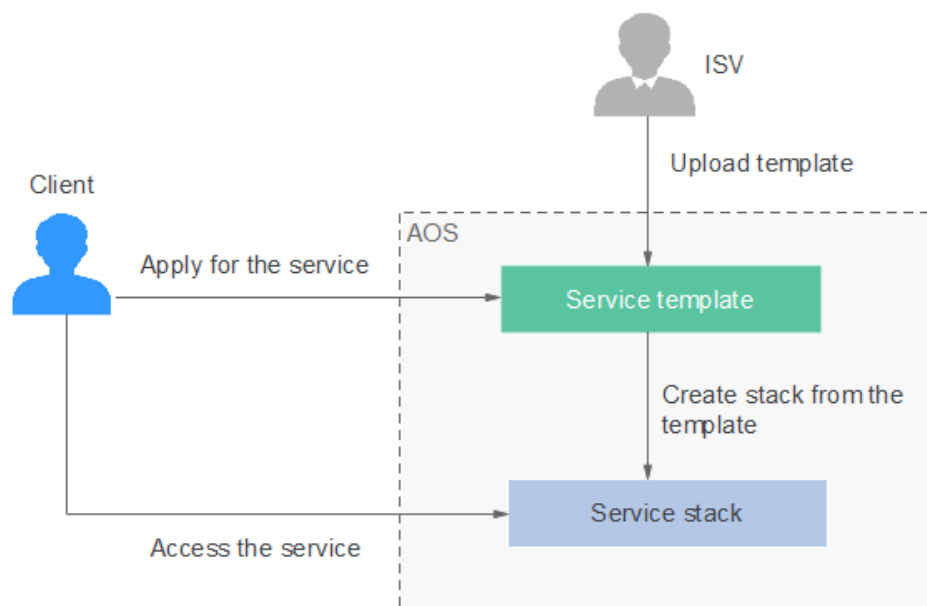
- Fast delivery**
 AOS automatically deploys the software and provisions the resources as specified in the templates you write. The whole process only takes minutes to accomplish.
- Error proofing creation**

All the required resources for the software are defined in the template, which is fixed during delivery and deployment. In this way, mistakes introduced through manual work can be effectively prevented.

- **Unified O&M**

AOS enables you to perform software lifecycle operations, including updating and scaling, in a unified and easy manner.

Figure 2-3 ISV software delivery



Creating Resources in Batches

Challenges

Assume that you need to create a web application which runs on ten ECSs of different specifications, or you want to create ten databases, you have to create each of them one by one separately, and make sure they can properly work together. The whole process could be complicated and time consuming.

Solution

With AOS, you can define multiple resources of different services and different specifications in batches in templates, which highly boost the deployment efficiency and brings much more flexibility during configuration.

Advantages

- **Quick deployment**

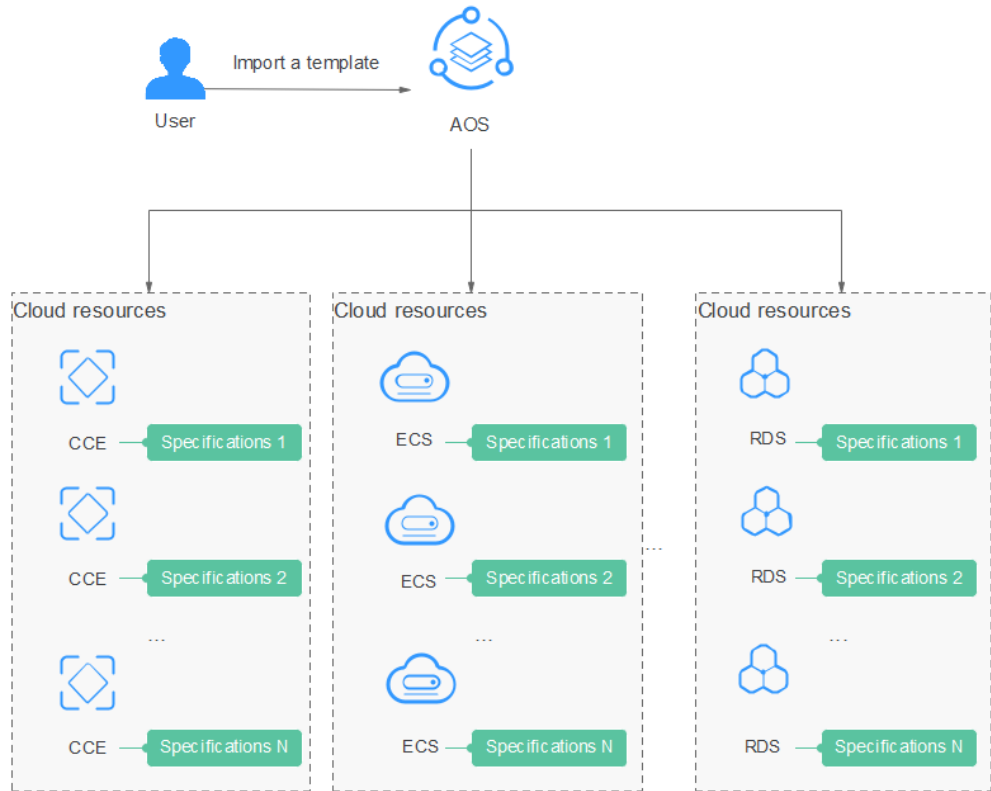
Multiple cloud resources of various types or the same type of resources of different specifications can be created concurrently.

- **Flexible configuration**

A wide variety of template syntax allows you to flexibly create and configure resources of various types and specifications.

- **Automatic rollback**
When the creation of resources in batches fails, you can choose to perform automatic rollback to save costs.

Figure 2-4 Creating resources in batches



2.4 Basic Concepts

Template

Templates are text files in YAML or JSON format. They describe the cloud objects that you want, including applications, resources, and services. AOS creates various cloud objects automatically from AOS templates. For more information about templates, see [Templates \(Cloud-Based Automation Scripts\)](#).

Stack

Stacks are collections of applications and cloud resources. The applications or cloud services in a stack are treated as a unit when being created or deleted.

2.5 Constraints and Limitations

Quota

Quotas are imposed on the number of templates and stacks a user can create. For details, see [Table 2-1](#).

To increase the quota, [create a service ticket](#). For more information on quotas, see [Quotas](#).

Table 2-1 AOS resource quotas

Resource	Quota
Templates	100
Stacks	100

2.6 Security

2.6.1 Shared Responsibilities

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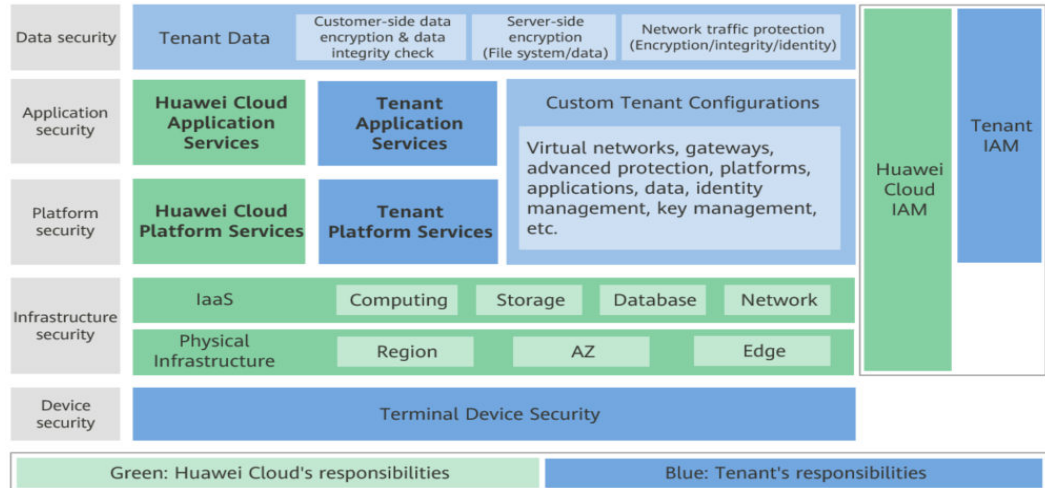
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- **Tenant:** uses the cloud securely. Tenants of Huawei Cloud are responsible for the secure and effective management of the internal security as well as the tenant-customized configurations of cloud services including IaaS, PaaS, and SaaS. This includes but is not limited to operating systems like virtual networks, virtual machine host and guest virtual machines, virtual firewall, API Gateway and advanced security services, all types of cloud services, tenant data, identity accounts, and key management.

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Figure 2-5 Huawei Cloud shared security responsibility model



2.6.2 Identity Control and Access Control

Identity authentication

Tenants can use AOS through the console or by calling APIs.

1. Identity authentication on the console

AOS is interconnected with Identity and Access Management (IAM) to manage tenant identity authentication and access using IAM permissions.

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2.6.3 Audit and Logging

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Logging

After you enable CTS and configure a tracker, CTS can record AOS operations for auditing. You can search for AOS traces in the trace list on the CTS console to view AOS audit logs.

For details about how to view audit logs, see [Viewing Logs in CTS](#).

2.6.4 Resilience

- AOS backend nodes use AZ-level DR. If any AZ is faulty, the remaining AZs still have enough nodes to carry backend traffic.
- The database is in active/standby mode. If the active node is faulty, the standby node automatically takes over services to implement active/standby switchover and ensure system availability.
- Flow control is configured for AOS APIs. If the number of access requests exceeds the threshold, excess access requests will be restricted to ensure AOS service availability.

2.6.5 Stack Resource Management

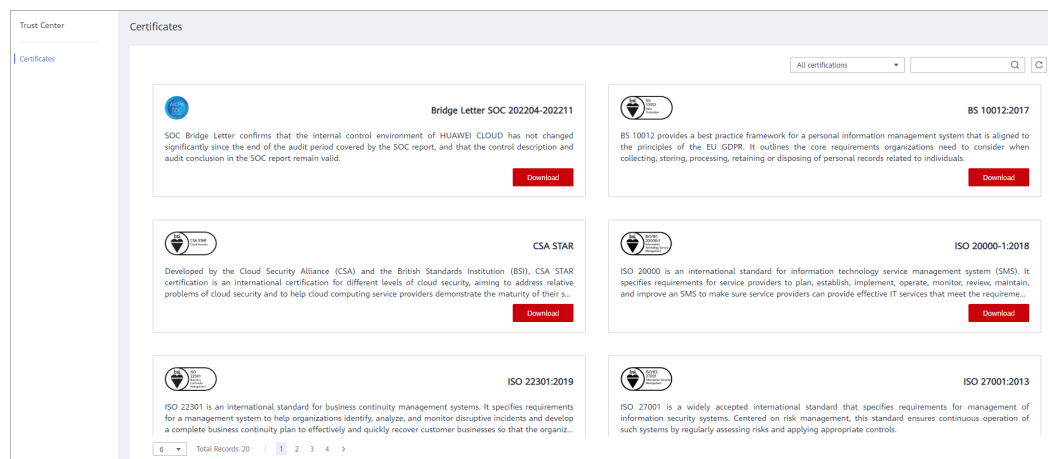
Stack management consists of two aspects. One is lifecycle management of existing stacks, including deleting and changing. The other is viewing stack details to obtain stack running status. For details about stack management, see [Stack Management](#).

2.6.6 Certificates

Compliance Certificates

Huawei Cloud services and platforms have obtained various security and compliance certifications from authoritative organizations, such as International Organization for Standardization (ISO), system and organization controls (SOC), and Payment card industry (PCI) compliance standards. These certifications are available for [download](#).

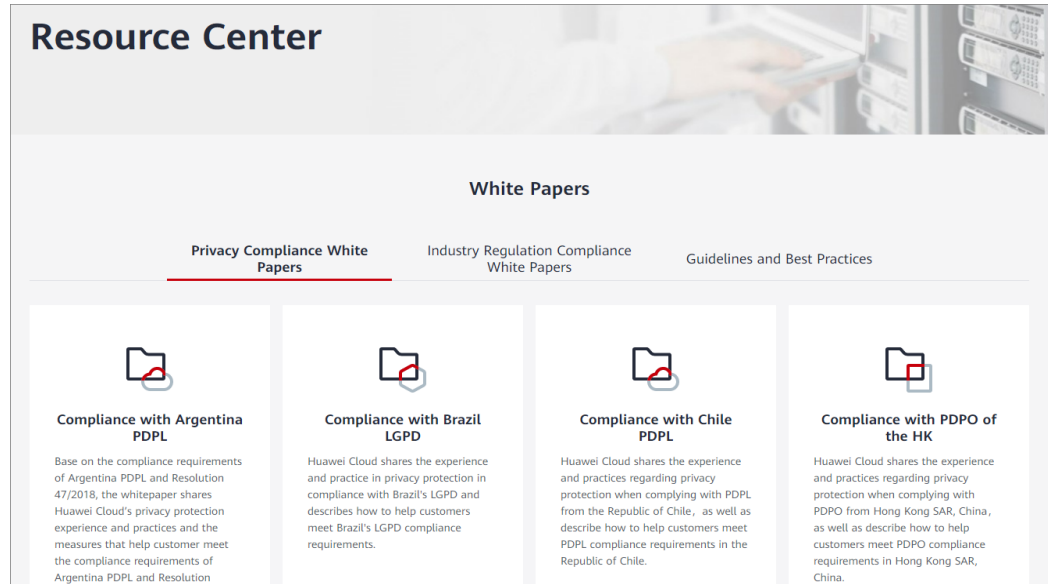
Figure 2-6 Downloading compliance certificates



Resource Center

Huawei Cloud also provides the following resources to help users meet compliance requirements. For details, see [Resource Center](#).

Figure 2-7 Resource center



2.7 Cloud Services and Resources that Can Be Orchestrated in AOS

For list on the cloud resources that can be orchestrated, see [Resource Indexes](#).