Elastic Cloud Server

Best Practices

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Contents

1 Best Practices Summary

This section describes common application scenarios of Elastic Cloud Server (ECS) and provides solution details and an operation guide for each scenario, so you can easily deploy services using ECS.

Best Practices for Using ECSs

Table 1-1 Best Practices for Using ECSs

Category	Scenario	Reference	Description
Environment setup	Setting up an LNMP environment	**Manually Deploying LNMP (CentOS 7.2)**	An ECS running CentOS 7.2 64-bit is used as an example to describe how to set up an LNMP environment.
		Manually Deploying LNMP (CentOS 8.0)	An ECS running CentOS 8.0 64-bit is used as an example to describe how to set up an LNMP environment.
		Manually Deploying LNMP (Ubuntu 20.04)	An ECS running Ubuntu 20.04 64-bit is used as an example to describe how to set up an LNMP environment.
	Setting up an LAMP environment	**Manually Deploying LAMP (CentOS 7.8 PHP 7.0)**	An ECS running CentOS 7.8 64-bit is used as an example to describe how to set up an LAMP environment.

Category	Scenario	Reference	Description
	Setting up a Java web environment	**Setting Up Tomcat-based Java Web Environment (CentOS 7.4)**	An ECS running CentOS 7.4 64-bit is used as an example to describe how to set up a Java Web environment.
	Setting up a Node.js environment	**Manually Deploying Node.js**	An ECS running CentOS 7.2 64-bit is used as an example to describe how to set up a Node.js environment.
Website setup	Setting up a WordPress website	**Setting Up a WordPress Website (Linux)**	An ECS running CentOS 7.2 64-bit is used as an example to describe how to set up a WordPress website.
	Setting up a Discuz forum	**Setting Up a Discuz Forum**	An ECS running CentOS is used as an example to describe how to set up a Discuz forum.
	Setting up a Magento e-commerce website	**Manually Setting Up a Magento E-Commerce Website (Linux)**	An ECS running CentOS 7.2 64-bit is used as an example to describe how to set up a Magento e-commerce website.
	Deploying a Ghost blog	**Manually Deploying a Ghost Blog (Ubuntu 20.04)**	An ECS running Ubuntu 20.04 64-bit is used as an example to describe how to deploy a Ghost blog.
Application setup	Setting up an FTP site	**Setting Up an FTP Site (Windows 2012)**	An ECS running Windows Server 2012 Datacenter 64-bit is used as an example to describe how to set up an FTP site.
		Setting Up an FTP Site (Windows 2019)	An ECS running Windows Server 2019 Datacenter 64-bit is used as an example to describe how to set up an FTP site.
		Setting Up an FTP Site (Linux)	An ECS running CentOS 7.2 64-bit is used as an example to describe how to set up an FTP website.

Category	Scenario	Reference	Description
	Building Microsoft SharePoint Server	**Building Microsoft SharePoint Server 2016**	An ECS running Windows Server 2012 Datacenter 64-bit is used as an example to describe how to build Microsoft SharePoint Server 2016.
	Deploying Docker	**Manually Deploying Docker (CentOS 7.5)**	An ECS running CentOS 7.5 64-bit is used as an example to describe how to deploy Docker.
	Deploying an ECS as an official WeChat account server	**Deploying an ECS for Handling Text Messages from an Official WeChat Account**	An ECS running CentOS 7.4 64-bit is used as an example to describe how to deploy an ECS as an official WeChat account server.
	Installing the BT panel	**Manually Installing a BT Panel (CentOS 7.2)**	An ECS running CentOS 7.2 64-bit is used as an example to describe how to install the BT panel.
	Deploying GitLab	**Manually Deploying GitLab (CentOS 7.2)**	An ECS running CentOS 7.2 64-bit is used as an example to describe how to deploy GitLab.
	Deploying RabbitMQ	**Manually Deploying RabbitMQ (CentOS 7.4)**	An ECS running CentOS 7.4 64-bit is used as an example to describe how to deploy RabbitMQ.
	Setting up a ThinkPHP framework	**Setting Up a ThinkPHP Framework**	An ECS running CentOS 7.2 64-bit is used as an example to describe how to set up a ThinkPHP framework.
	Setting up master-slave replication on PostgreSQL	**Setting Up Master-Slave Replication on PostgreSQL**	An ECS running CentOS 7.6 64-bit is used as an example to describe how to set up master-slave replication on PostgreSQL.
	Deploying Jenkins	**Installing and Deploying Jenkins on an ECS**	An ECS running CentOS 7.6 64-bit is used as an example to describe how to deploy Jenkins.

Category	Scenario	Reference	Description
	Configuring auditd	**Using auditd to Record File Changes (Linux)**	An ECS running CentOS 7.4 64-bit is used as an example to describe how to install and configure auditd.
	Restoring data using Extundelete quickly	**Restoring Accidentally Deleted Data Using Extundelete (Linux)**	An ECS running CentOS 7.5 64-bit is used as an example to describe how to use the open-source tool Extundelete to quickly restore accidentally deleted data.
ECS security	Enhancing security for SSH logins to Linux ECSs	**Enhancing Security for SSH Logins to Linux ECSs**	An ECS running CentOS 7.6 64-bit is used as an example to describe how to enhance security for SSH logins.
Cloud server migration	Migrating servers to the cloud	**Migrating Servers to the Cloud**	It describes how to use Server Migration Service (SMS) and image import to migrate applications and data from your existing servers to Huawei Cloud.
Other	Accessing OBS from an ECS over an intranet	**Accessing OBS over Intranet by Using OBS Browser+ on a Windows ECS**	It describes how to use OBS Browser+ to access OBS over intranet on a Windows ECS.
		Accessing OBS over Intranet by Using obsutil on a Linux ECS	It describes how to use obsutil to access OBS over intranet on a Linux ECS.
	Using VNC Viewer to access a Linux ECS	**Using VNC Viewer to Access a Linux ECS**	Ubuntu 20.04 OS is used as an example to describe how to install VNC Server on a Linux ECS and how to use VNC Viewer to access the ECS.

2 Setting Up Websites on ECSs

Overview

This section provides guidance on how to set up frequently used websites by using Huawei Cloud services. In addition, this section provides links to desired operation guides and images, facilitating your website setup.

Summary

Table 2-1 Summary on website setups

Website Setup Solution	How to Set Up	OS	Image and Resources	Description
Setting Up a Discuz Forum	Manual setup	Linux	Public image	Discuz! is a common community forum software system. Its basic architecture is based on the popular web programming combination of PHP +MySQL.
Setting Up an FTP Site (Windows 2012)	Manual setup	Windows	Public image	Use FTP delivered with Windows to set up an FTP site.
Setting Up an FTP Site (Linux)	Manual setup	Linux	Public image	Use the very secure FTP daemon (vsftpd) software to set up an FTP site. vsftpd is an FTP server software that is widely used in Linux releases.

Website Setup Solution	How to Set Up	OS	Image and Resources	Description
Setting Up Tomcat-based Java Web Environment	Manual setup	Linux	Public image • Tomcat 8.5.31 • JDK 8u171	Tomcat is a commonly used open source web application that is free of charge. It can be used to host common Java web applications.
Manually Setting Up a Magento E-Commerce Website (Linux)	Manual setup	Linux	Public image • MySQL 5.7 • PHP 7.0 • Magento 2.1	Magento is an open source e-commerce system that features flexible design, modular architecture, and rich functions. It is suitable for building medium- and large-sized sites.
Building Microsoft SharePoint Server 2016	Manual setup	Windows	Public image • Microsoft SQL Server 2014 • SharePoint Server 2016	Microsoft SharePoint Server is a portal that enables enterprises to develop intelligent portal websites. These sites are seamlessly accessible to users, teams, and knowledge libraries.
Manually Deploying LNMP (CentOS 7.2)	Manual setup	Linux	Public image • Nginx 1.14.0 • MySQL 5.7 • PHP 7.0.31	LNMP indicates the Nginx+MySQL+PHP website server architecture in Linux. Nginx is compact, efficient web server software in Linux.
Setting Up a WordPress Website (Linux)	Manual setup	Linux	Public image • Nginx 1.14.0 • MySQL 5.7 • PHP 7.0.31 • WordPress 4.9.8	A Linux ECS is used to manually set up an LNMP website and deploy WordPress on it. WordPress (WP for short) is initially a blog system and gradually evolved to a free CMS or website setup system.

Website Setup Solution	How to Set Up	OS	Image and Resources	Description
Manually Deploying Docker (CentOS 7.5)	Manual setup	Linux	Public image	Docker is deployed on a Linux ECS. Additionally, common Docker operations and the process of creating a Docker image are provided.
Deploying an ECS for Handling Text Messages from an Official WeChat Account	Manual setup	Linux	Public image	An ECS is deployed as an official WeChat account server so that it receives text messages from the WeChat server and sends processing results to end users. On this ECS, Python is used to compile the logic code for processing WeChat messages.
Manually Deploying GitLab (CentOS 7.2)	Manual setup	Linux	Public image	A Linux ECS is used for manually deploying GitLab. GitLab is an open source version management system that uses Git as the code management tool.

Website Setup Solution	How to Set Up	OS	Image and Resources	Description
Manually Deploying RabbitMQ (CentOS 7.4)	Manual setup	Linux	Public image ● Erlang 8.3 ● RabbitMQ 3.6.9	A Linux ECS is used for deploying RabbitMQ. RabbitMQ is a message middleware that uses the Erlang programming language for the Advanced Message Queuing Protocol (AMQP). It originates from the financial system and is used to store and forward messages in the distributed system. Featuring high reliability, scalability, availability, and rich functions, RabbitMQ is widely used.
Manually Deploying a Ghost Blog (Ubuntu 20.04)	Manual setup	Linux	Public image ● Nginx 1.14.0 ● MySQL 5.7	Ghost is an open source blog platform based on Node.js and makes writing and release more convenient. This section walks you through the deployment of a Ghost blog on an ECS running Ubuntu 20.04.

Website Setup Solution	How to Set Up	OS	Image and Resources	Description
Manually Deploying Node.js (CentOS 7.2)	Manual setup	Linux	Public image	A Linux ECS is used for deploying Node.js. Node.js is a JavaScript runtime environment based on the Google Chrome V8 engine. It enables simple deployment of network applications that feature fast response and easy-to-expand. Based on the event-driven and non-blocking I/O model, Node.js is lightweight and efficient. It is ideal for running data-intensive real-time applications on distributed devices.

3 Configuring an ECS

To use ECSs more securely, reliably, flexibly, and efficiently, follow the best practices for ECS.

Access and Connection

We recommend that you use the Virtual Network Computing (VNC) when logging in to your ECS for the first time and check that the ECS is running properly.

For details, see:

- **Login Using VNC**

The next time you log in, you can choose a proper login method based on your local environment and whether your ECS has an EIP bound. For details, see **Logging In to an ECS**.

System Updates

- Linux image source updates

  To obtain the latest system updates and software installation dependencies, update the image source before using an ECS.

- Windows patches and drivers updates

  To improve the fault rectification capability and performance of ECSs, periodically update Windows patches and drivers.

  You can enable Windows automatic updates to detect the latest patches and driver versions.

Data Storage

- Storage security

  To ensure data storage security, use the system disk to store OS data and use data disks to store application data. This ensures data security and prevents data loss caused by system faults. As service demand changes, you can expand storage capacity by:

  – Expanding disk capacity: You can expand both system disks and data disks. For details, see **Expanding Capacity for an In-use EVS Disk**.

  - Adding data disks: You can add only data disks. After **adding disks**, you need to **attach** and **initialize** them before they can be used.
- Data encryption

  To further protect data security, both the system and data disks can be encrypted. For details, see **Managing Encrypted EVS Disks**.

Security Management

- Identity authentication

  To securely control access to resources and centrally manage permissions, use IAM users and Enterprise Management for identity authentication, permissions management, and resource group management. For details, see **Assigning Permissions to O&M Personnel** and **Multi-project Management Cases**.
- Access control

  To control inbound and outbound access to ECSs and improve security, set access control policies based on:
  - ECSs: **Configure security group rules** to control access to ECSs.
  - Subnets: **Configure network ACLs** to control access to all ECSs in a given subnet.
- Server security

  In addition to the basic edition of Host Security Service (HSS), use advanced editions to enhance the security of your ECSs. For details about HSS editions, see **Edition details** and **HSS**.

Backup and Restore

- Data backup and restore

  To quickly restore data in case of virus intrusion, mis-deletion, and hardware or software faults, back up data periodically. For details, see **Cloud Backup and Recovery (CBR)**.

  After the backup is successful, you can **restore data using a cloud server backup** or **use a backup to create an image**.
- Service disaster recovery (DR)

  For high service DR capabilities, deploy ECSs in the same region in different AZs. For details about AZs, see **Region and AZ** and **Step 1: Configure Basic Settings**.

Resource Management

- Monitoring

  Use **Cloud Eye** to keep informed of ECS performance metrics and statuses in real time, and receive alarms if any exceptions occur.
- Tracing

  Use **Cloud Trace Service (CTS)** to record operations on your ECSs for later query, auditing, and backtracking.
- Logging

  Use **Log Tank Service (LTS)** to collect ECS logs for centralized management. With LTS, you can analyze large volumes of logs efficiently, securely, and in

real time and gain insights into improving availability and performance of applications.

4 Setting Up an Environment

4.1 Setting Up an LNMP Environment

4.1.1 Manually Deploying LNMP (CentOS 7.2)

Overview

LNMP (Linux, Nginx, MySQL, and PHP) is one of the mainstream website server architectures. It is used for running large-sized and high-concurrency website applications, such as e-commerce websites, social networks, and content management systems. This section describes how to use a CentOS 7.2 64bit Linux ECS to set up an LNMP environment on Huawei Cloud.

The process is as follows:

1. **Install Nginx.**
2. **Install MySQL.**
3. **Install PHP.**
4. **Test the LNMP deployment.**

Prerequisites

1. The ECS has an EIP bound.
2. The rule listed in the following table has been added to the security group which the target ECS belongs to. For details, see **Adding a Security Group Rule**.

Table 4-1 Security group rule

Direction	Priority	Action	Type	Protocol & Port	Source Address
Inbound	1	Allow	IPv4	TCP: 80	0.0.0.0/0

Resource Planning

Table 4-2 lists the resource configuration and software versions used in this practice. The commands and parameters may vary according to the hardware specifications or software versions you would use.

Table 4-2 Resources and costs

Resource	Description	Cost
ECS	• Billing mode: pay-per-use • AZ: AZ1 • Flavor: s6.large.4 • Image: CentOS 7.2 64bit • System disk: 40 GiB • EIP: Auto assign • EIP type: Dynamic BGP • Billed by: Traffic • Bandwidth: 5 Mbit/s	The following resources generate costs: • ECSs • EVS disks • EIPs For billing details, see **Billing Modes**.
Nginx	A high-performance HTTP and reverse proxy server. Download URL: **http://nginx.org/packages/centos/7/noarch/RPMS/nginx-release-centos-7-0.el7.ngx.noarch.rpm**	Free
MySQL	An open-source relational database software. Download URL: **https://dev.mysql.com/get/mysql80-community-release-el7-11.noarch.rpm**	Free
PHP	An open-source software used for web development. Download URL: **https://mirrors.huaweicloud.com/remi/enterprise/remi-release-7.rpm**	Free

Procedure

Step 1 Install Nginx.

1. Log in to the ECS.
2. Run the following command to download the Nginx package:

   wget http://nginx.org/packages/centos/7/noarch/RPMS/nginx-release-centos-7-0.el7.ngx.noarch.rpm
3. Run the following command to create the Nginx yum repository:

   rpm -ivh nginx-release-centos-7-0.el7.ngx.noarch.rpm
4. Run the following command to install Nginx:

   yum -y install nginx
5. Run the following command to check the Nginx version:

   nginx -v

   Information similar to the following is displayed:

   ```
   nginx version: nginx/1.26.1
   ```
6. Run the following commands to start Nginx and enable it to start automatically upon ECS startup:

   systemctl start nginx

   systemctl enable nginx
7. Check the startup status.

   systemctl status nginx.service
8. Enter **http://***IP address of the Nginx server* in the address bar to access Nginx. If the following page is displayed, Nginx has been installed.

   Figure 4-1 Accessing Nginx

Step 2 Install MySQL.

1. Run the following commands in sequence to install MySQL:

   rpm -Uvh https://dev.mysql.com/get/mysql80-community-release-el7-11.noarch.rpm

   yum -y install mysql-community-server
2. Run the following command to check the MySQL version:

   mysql -V

   Information similar to the following is displayed:

   ```
   mysql  Ver 8.0.39 for Linux on x86_64 (MySQL Community Server - GPL)
   ```
3. Run the following commands in sequence to start MySQL and enable it to start automatically upon ECS startup:

   systemctl start mysqld

systemctl enable mysqld

4. Run the following command to check the MySQL status:

   systemctl status mysqld.service

   Information similar to the following is displayed.

```
[root@[redacted] ~]# systemctl status mysqld.service
● mysqld.service - MySQL Server
   Loaded: loaded (/usr/lib/systemd/system/mysqld.service; enabled; vendor preset: disabled)
   Active: active (running) since Wed 2024-08-14 17:01:17 CST; 19s ago
     Docs: man:mysqld(8)
           http://dev.mysql.com/doc/refman/en/using-systemd.html
 Main PID: 8482 (mysqld)
   Status: "Server is operational"
   CGroup: /system.slice/mysqld.service
           └─8482 /usr/sbin/mysqld

Aug 14 17:01:11 [redacted] systemd[1]: Starting MySQL Server...
Aug 14 17:01:17 [redacted] systemd[1]: Started MySQL Server.
```

5. Run the following command to obtain the **root** user's password that is automatically set during MySQL installation:

   grep 'temporary password' /var/log/mysqld.log

   Information similar to the following is displayed:

```
2018-08-29T07:27:37.541944Z 1 [Note] A temporary password is generated for root@localhost: 2YY?3uHUA?Ys
```

6. Run the following command and follow the prompts to harden MySQL:

   mysql_secure_installation

```
Securing the MySQL server deployment.

Enter password for user root:    #Enter the obtained password of user root.
The existing password for the user account root has expired. Please set a new password.

New password:  #Enter a new password of user root.

Re-enter new password:   #Enter the new password again.
The 'validate_password' plugin is installed on the server.
The subsequent steps will run with the existing configuration of the plugin.
Using existing password for root.

Estimated strength of the password: 100
Change the password for root ? ((Press y|Y for Yes, any other key for No) : N   #Press N.

 ... skipping.
By default, a MySQL installation has an anonymous user,
allowing anyone to log into MySQL without having to have
a user account created for them. This is intended only for
testing, and to make the installation go a bit smoother.
You should remove them before moving into a production
environment.

Remove anonymous users? (Press y|Y for Yes, any other key for No) : Y   #Press Y to remove anonymous users.
Success.

Normally, root should only be allowed to connect from 'localhost'. This ensures that someone cannot guess at the root password from the network.

Disallow root login remotely? (Press y|Y for Yes, any other key for No) : Y   #Press Y to disallow remote logins of user root.
Success.

By default, MySQL comes with a database named 'test' that anyone can access. This is also intended only for testing, and should be removed before moving into a production environment.

Remove test database and access to it? (Press y|Y for Yes, any other key for No) : Y   #Press Y to delete the test database and remove access to it.
 - Dropping test database...
Success.
```

```
 - Removing privileges on test database...
Success.

Reloading the privilege tables will ensure that all changes
made so far will take effect immediately.

Reload privilege tables now? (Press y|Y for Yes, any other key for No) : Y   #Press Y to reload privilege tables.
Success.

All done!
```

Step 3 Install PHP.

1. Run the following commands to install the EPEL and REMI repositories:

   yum install -y epel-release

   rpm -Uvh https://mirrors.huaweicloud.com/remi/enterprise/remi-release-7.rpm

2. Run the following command to install the Yum repository management tool:

   yum -y install yum-utils

3. Run the following command to enable the PHP 8.0 repository:

   yum-config-manager --enable remi-php80

4. Run the following commands to install PHP:

   yum install -y php php-cli php-fpm php-mysqlnd php-zip php-devel php-gd php-mcrypt php-mbstring php-curl php-xml php-pear php-bcmath php-json

5. Run the following command to check the version of the installed PHP:

   php -v

   If information similar to the following is displayed, PHP has been installed:

   ```
   [root@[redacted] ~]# php -v
   PHP 8.0.30 (cli) (built: Jun  4 2024 15:19:49) ( NTS gcc x86_64 )
   Copyright (c) The PHP Group
   Zend Engine v4.0.30, Copyright (c) Zend Technologies
   ```

6. Run the following commands to start PHP and enable it to start automatically upon ECS startup:

   systemctl start php-fpm

   systemctl enable php-fpm

7. Modify the Nginx configuration file to support PHP.

   a. Run the following command to open the **/etc/nginx/nginx.conf** file:

      vim /etc/nginx/nginx.conf

Figure 4-2 nginx.conf

```
user  nginx;
worker_processes  auto;

error_log  /var/log/nginx/error.log notice;
pid        /var/run/nginx.pid;


events {
    worker_connections  1024;
}


http {
    include       /etc/nginx/mime.types;
    default_type  application/octet-stream;

    log_format  main  '$remote_addr - $remote_user [$time_local] "$request" '
                      '$status $body_bytes_sent "$http_referer" '
                      '"$http_user_agent" "$http_x_forwarded_for"';

    access_log  /var/log/nginx/access.log  main;

    sendfile        on;
    #tcp_nopush     on;

    keepalive_timeout  65;

    #gzip  on;

    include /etc/nginx/conf.d/*.conf;
}
```

According to the nginx.conf, the configuration file is directed to **/etc/nginx/conf.d/*.conf**.

b. Enter **:quit** to exit nginx.conf.

c. Run the following command to open the **/etc/nginx/conf.d/default.conf** file:

vim /etc/nginx/conf.d/default.conf

d. Press **i** to enter insert mode.

e. Modify the **default.conf** file.

Find the **server** paragraph and configure it as follows:

```
server {
    listen       80;
    server_name  localhost;

    #access_log /var/log/nginx/host.access.log  main;

location / {
    root   /usr/share/nginx/html;
    index  index.html index.htm index.php;
}

location ~ \.php$ {
    root           /usr/share/nginx/html;
    fastcgi_pass   127.0.0.1:9000;
    fastcgi_index  index.php;
    fastcgi_param  SCRIPT_FILENAME  $document_root$fastcgi_script_name;
    include        fastcgi_params;
}
}
```

Figure 4-3 shows the configuration after modification.

Figure 4-3 Configuration after modification

```
server {
    listen       80;
    server_name  localhost;

    #access_log  /var/log/nginx/host.access.log  main;

    location / {
        root   /usr/share/nginx/html;
        index  index.html index.htm  index.php;
    }

    location ~ \.php$ {
        root           /usr/share/nginx/html;
        fastcgi_pass   127.0.0.1:9000;
        fastcgi_index  index.php;
        fastcgi_param  SCRIPT_FILENAME  $document_root$fastcgi_script_name;
        include        fastcgi_params;
    }


    #error_page  404              /404.html;

    # redirect server error pages to the static page /50x.html
    #
    error_page   500 502 503 504  /50x.html;
    location = /50x.html {
        root   /usr/share/nginx/html;
    }
```

f. Press **Esc** to exit the editing mode. Then, enter **:wq** to save the settings and exit the file.

8. Run the following command to reload the Nginx configuration file:

   service nginx reload

Step 4 Test the LNMP deployment.

1. Create the **info.php** test file in **/usr/share/nginx/html/**.

   a. Run the following command to create and open the **info.php** test file:

      vim /usr/share/nginx/html/info.php

   b. Press **i** to enter insert mode.

   c. Modify the **info.php** file and add the following to the file:

      ```
      <?php
       phpinfo();
      ?>
      ```

   d. Press **Esc** to exit the editing mode. Then, enter **:wq** to save the settings and exit the file.

2. Enter **http://***Server IP address***/info.php** in the address bar. If the following page is displayed, the LNMP environment has been set up.

PHP Version 8.0.30

System	Linux [redacted] 3.10.0-1160.53.1.el7.x86_64 #1 SMP Fri Jan 14 13:59:45 UTC 2022 x86_64
Build Date	Jun 4 2024 15:19:49
Build System	Red Hat Enterprise Linux Server release 7.9 (Maipo)
Build Provider	Remi's RPM repository <https://rpms.remirepo.net/> #StandWithUkraine
Compiler	gcc (GCC) 8.3.1 20190311 (Red Hat 8.3.1-3)
Architecture	x86_64
Server API	FPM/FastCGI
Virtual Directory Support	disabled
Configuration File (php.ini) Path	/etc
Loaded Configuration File	/etc/php.ini
Scan this dir for additional .ini files	/etc/php.d
Additional .ini files parsed	/etc/php.d/20-bcmath.ini, /etc/php.d/20-bz2.ini, /etc/php.d/20-calendar.ini, /etc/php.d/20-ctype.ini, /etc/php.d/20-curl.ini, /etc/php.d/20-dom.ini, /etc/php.d/20-exif.ini, /etc/php.d/20-fileinfo.ini, /etc/php.d/20-ftp.ini, /etc/php.d/20-gd.ini, /etc/php.d/20-gettext.ini, /etc/php.d/20-iconv.ini, /etc/php.d/20-mbstring.ini, /etc/php.d/20-mysqlnd.ini, /etc/php.d/20-pdo.ini, /etc/php.d/20-phar.ini, /etc/php.d/20-posix.ini, /etc/php.d/20-shmop.ini, /etc/php.d/20-simplexml.ini, /etc/php.d/20-sockets.ini, /etc/php.d/20-sodium.ini, /etc/php.d/20-sqlite3.ini, /etc/php.d/20-sysvmsg.ini, /etc/php.d/20-sysvsem.ini, /etc/php.d/20-sysvshm.ini, /etc/php.d/20-tokenizer.ini, /etc/php.d/20-xml.ini, /etc/php.d/20-xmlwriter.ini, /etc/php.d/20-xsl.ini, /etc/php.d/30-mcrypt.ini, /etc/php.d/30-mysqli.ini, /etc/php.d/30-pdo_mysql.ini, /etc/php.d/30-pdo_sqlite.ini, /etc/php.d/30-xmlreader.ini, /etc/php.d/30-zip.ini
PHP API	20200930
PHP Extension	20200930
Zend Extension	420200930
Zend Extension Build	API420200930,NTS
PHP Extension Build	API20200930,NTS
Debug Build	no
Thread Safety	disabled
Zend Signal Handling	enabled
Zend Memory Manager	enabled
Zend Multibyte Support	provided by mbstring
IPv6 Support	enabled
DTrace Support	available, disabled
Registered PHP Streams	https, ftps, compress.zlib, php, file, glob, data, http, ftp, compress.bzip2, phar, zip
Registered Stream Socket Transports	tcp, udp, unix, udg, ssl, sslv3, tls, tlsv1.0, tlsv1.1, tlsv1.2
Registered Stream Filters	zlib.*, string.rot13, string.toupper, string.tolower, convert.*, consumed, dechunk, bzip2.*, convert.iconv.*, mcrypt.*, mdecrypt.*

----End

4.1.2 Manually Deploying LNMP (CentOS 8.0)

Overview

LNMP (Linux, Nginx, MySQL, and PHP) is one of the mainstream website server architectures. It is used for running large-sized and high-concurrency website applications, such as e-commerce websites, social networks, and content management systems. This section describes how to use a CentOS 8.0 64bit Linux ECS to set up the LNMP environment on Huaei Cloud.

The process is as follows:

1. **Install Nginx.**
2. **Install MySQL.**
3. **Install PHP.**
4. **Test the LNMP deployment.**

Prerequisites

1. The ECS has an EIP bound.
2. The rule listed in the following table has been added to the security group which the target ECS belongs to. For details, see **Adding a Security Group Rule**.

Table 4-3 Security group rules

Direction	Priority	Action	Type	Protocol & Port	Source Address
Inbound	1	Allow	IPv4	TCP: 80	0.0.0.0/0

Resource Planning

Table 4-4 lists the resource configuration and software versions used in this practice. The commands and parameters may vary according to the hardware specifications or software versions you would use.

Table 4-4 Resources and costs

Resource	Description	Cost
ECS	• Billing mode: pay-per-use • AZ: AZ1 • Flavor: s6.large.4 • Image: CentOS 8.0 64bit • System disk: 40 GiB • EIP: Auto assign • EIP type: Dynamic BGP • Billed by: Traffic • Bandwidth: 5 Mbit/s	The following resources generate costs: • ECSs • EVS disks • EIPs For billing details, see **Billing Modes**.
Nginx	A high-performance HTTP and reverse proxy server. Example: Nginx 1.20.1	Free
MySQL	An open-source relational database software Example: MySQL 8.0.26	Free
PHP	An open-source software used for web development Example: PHP 7.4.19	Free

Procedure

Step 1 Install Nginx.

1. Log in to the ECS.
2. Run the following command to install Nginx:

   sudo dnf -y install https://nginx.org/packages/centos/8/x86_64/RPMS/nginx-1.20.1-1.el8.ngx.x86_64.rpm

3. Run the following command to check the Nginx version:

   nginx -v

   Information similar to the following is displayed:

   ```
   nginx version: nginx/1.20.1
   ```

4. Run the following commands to start Nginx and enable it to start automatically upon ECS startup:

   systemctl start nginx

   systemctl enable nginx

5. Run the following command to check the startup status:

   systemctl status nginx.service

   Information similar to the following is displayed.

   ```
   [root@[redacted] ~]# systemctl status nginx.service
   ● nginx.service - nginx - high performance web server
      Loaded: loaded (/usr/lib/systemd/system/nginx.service; enabled; vendor preset: disabled)
      Active: active (running) since Wed 2024-08-14 10:47:48 CST; 25s ago
        Docs: http://nginx.org/en/docs/
    Main PID: 1793 (nginx)
       Tasks: 3 (limit: 49517)
      Memory: 3.0M
      CGroup: /system.slice/nginx.service
              ├─1793 nginx: master process /usr/sbin/nginx -c /etc/nginx/nginx.conf
              ├─1794 nginx: worker process
              └─1795 nginx: worker process

   Aug 14 10:47:48 [redacted] systemd[1]: Starting nginx - high performance web server...
   Aug 14 10:47:48 [redacted] systemd[1]: Started nginx - high performance web server.
   ```

6. Enter **http://***IP address of the Nginx server* in the address bar to access Nginx. If the following page is displayed, Nginx has been installed.

   Figure 4-4 Accessing Nginx

   Welcome to nginx!

   If you see this page, the nginx web server is successfully installed and working. Further configuration is required.

   For online documentation and support please refer to nginx.org.
   Commercial support is available at nginx.com.

   Thank you for using nginx.

Step 2 Install MySQL.

1. Run the following command to install MySQL:

   sudo dnf -y install @mysql

2. Run the following command to check the MySQL version:

   mysql -V

   Information similar to the following is displayed:

   ```
   mysql  Ver 8.0.26 for Linux on x86_64 (Source distribution)
   ```

3. Run the following commands in sequence to start MySQL and enable it to start automatically upon ECS startup:

   systemctl start mysqld

   systemctl enable mysqld

4. Check the MySQL status.

   systemctl status mysqld.service

   Information similar to the following is displayed.

```
[root@[redacted] ~]# systemctl status mysqld.service
● mysqld.service - MySQL 8.0 database server
   Loaded: loaded (/usr/lib/systemd/system/mysqld.service; enabled; vendor preset: disabled)
   Active: active (running) since Wed 2024-08-14 10:55:34 CST; 21s ago
 Main PID: 2088 (mysqld)
   Status: "Server is operational"
    Tasks: 38 (limit: 49517)
   Memory: 527.8M
   CGroup: /system.slice/mysqld.service
           └─2088 /usr/libexec/mysqld --basedir=/usr

Aug 14 10:55:28 [redacted] systemd[1]: Starting MySQL 8.0 database server...
Aug 14 10:55:28 [redacted] mysql-prepare-db-dir[2004]: Initializing MySQL database
Aug 14 10:55:34 [redacted] systemd[1]: Started MySQL 8.0 database server.
```

5. Run the following command and follow the prompts to harden MySQL:

   mysql_secure_installation

```
Securing the MySQL server deployment.

Connecting to MySQL using a blank password.

VALIDATE PASSWORD COMPONENT can be used to test passwords
and improve security. It checks the strength of password
and allows the users to set only those passwords which are
secure enough. Would you like to setup VALIDATE PASSWORD component?

Press y|Y for Yes, any other key for No: Y    #Press Y to set the password validation policy.

There are three levels of password validation policy:

LOW    Length >= 8
MEDIUM Length >= 8, numeric, mixed case, and special characters
STRONG Length >= 8, numeric, mixed case, special characters and dictionary                file

Please enter 0 = LOW, 1 = MEDIUM and 2 = STRONG: 2       #Enter 2 to select the password
validation policy.
Please set the password for root here.

New password:  #Enter a new password of user root.

Re-enter new password:   #Enter the new password again.

Estimated strength of the password: 100
Do you wish to continue with the password provided?(Press y|Y for Yes, any other key for No) : Y
#Press Y to confirm the new password.
By default, a MySQL installation has an anonymous user,
allowing anyone to log into MySQL without having to have
a user account created for them. This is intended only for
testing, and to make the installation go a bit smoother.
You should remove them before moving into a production
environment.

Remove anonymous users? (Press y|Y for Yes, any other key for No) : Y   #Press Y to remove
anonymous users.
Success.


Normally, root should only be allowed to connect from
'localhost'. This ensures that someone cannot guess at
the root password from the network.

Disallow root login remotely? (Press y|Y for Yes, any other key for No) : Y   #Press Y to disallow
remote logins of user root.
Success.

By default, MySQL comes with a database named 'test' that
anyone can access. This is also intended only for testing,
```

```
and should be removed before moving into a production
environment.


Remove test database and access to it? (Press y|Y for Yes, any other key for No) : Y   #Press Y to delete the test database and remove access to it.
 - Dropping test database...
Success.

 - Removing privileges on test database...
Success.

Reloading the privilege tables will ensure that all changes
made so far will take effect immediately.

Reload privilege tables now? (Press y|Y for Yes, any other key for No) : Y   #Press Y to reload privilege tables.
Success.

All done!
```

Step 3 Install PHP.

1. Run the following commands to add and update the EPEL repository:

   sudo dnf -y install epel-release

   sudo dnf -y update epel-release

2. Run the following commands to delete unnecessary software packages from the cache and update the software repository:

   sudo dnf clean all

   sudo dnf makecache

3. Run the following command to start the PHP 7.4 module:

   dnf module enable php:7.4

4. Run the following command to install the required PHP module:

   sudo dnf -y install php php-curl php-dom php-exif php-fileinfo php-fpm php-gd php-hash php-json php-mbstring php-mysqli php-openssl php-pcre php-xml libsodium

5. Run the following command to check the version of the installed PHP:

   php -v

   Information similar to the following is displayed.

   ```
   [root@[illegible] ~]# php -v
   PHP 7.4.19 (cli) (built: May  4 2021 11:06:37) ( NTS )
   Copyright (c) The PHP Group
   Zend Engine v3.4.0, Copyright (c) Zend Technologies
       with Zend OPcache v7.4.19, Copyright (c), by Zend Technologies
   ```

6. Run the following commands to start PHP and enable it to start automatically upon ECS startup:

   systemctl start php-fpm

   systemctl enable php-fpm

7. Modify the Nginx configuration file to support PHP.

   a. Run the following command to open the **/etc/nginx/nginx.conf** file:

      vim /etc/nginx/nginx.conf

Figure 4-5 nginx.conf

```
user  nginx;
worker_processes  auto;

error_log  /var/log/nginx/error.log notice;
pid        /var/run/nginx.pid;


events {
    worker_connections  1024;
}


http {
    include       /etc/nginx/mime.types;
    default_type  application/octet-stream;

    log_format  main  '$remote_addr - $remote_user [$time_local] "$request" '
                      '$status $body_bytes_sent "$http_referer" '
                      '"$http_user_agent" "$http_x_forwarded_for"';

    access_log  /var/log/nginx/access.log  main;

    sendfile        on;
    #tcp_nopush     on;

    keepalive_timeout  65;

    #gzip  on;

    include /etc/nginx/conf.d/*.conf;
}
```

According to the nginx.conf, the configuration file is directed to **/etc/nginx/conf.d/*.conf**.

b. Enter **:quit** to exit nginx.conf.

c. Run the following command to open the **/etc/nginx/conf.d/default.conf** file:

vim /etc/nginx/conf.d/default.conf

d. Press **i** to enter the editing mode.

e. Modify the **default.conf** file.

Find the **server** paragraph and configure it as follows:

```
server {
    listen       80;
    server_name  localhost;

    #access_log /var/log/nginx/host.access.log  main;

location / {
    root   /usr/share/nginx/html;
    index  index.html index.htm index.php;
}

location ~ \.php$ {
    root           /usr/share/nginx/html;
    fastcgi_pass   unix:/run/php-fpm/www.sock;
    fastcgi_index  index.php;
    fastcgi_param  SCRIPT_FILENAME  $document_root$fastcgi_script_name;
    include        fastcgi_params;
}
}
```

Figure 4-6 shows the configuration after modification.

Figure 4-6 Configuration after modification

```
server {
    listen       80;
    server_name  localhost;

    #access_log  /var/log/nginx/host.access.log  main;

    location / {
        root   /usr/share/nginx/html;
        index  index.html index.htm  index.php;
    }

    location ~ \.php$ {
        root           /usr/share/nginx/html;
        fastcgi_pass   unix:/run/php-fpm/www.sock;
        fastcgi_index  index.php;
        fastcgi_param  SCRIPT_FILENAME  $document_root$fastcgi_script_name;
        include        fastcgi_params;
    }

    #error_page  404              /404.html;

    # redirect server error pages to the static page /50x.html
    #
    error_page   500 502 503 504  /50x.html;
    location = /50x.html {
        root   /usr/share/nginx/html;
    }

    # proxy the PHP scripts to Apache listening on 127.0.0.1:80
    #
    #location ~ \.php$ {
    #    proxy_pass   http://127.0.0.1;
    #}
```

f. Press **Esc** to exit the editing mode. Then, enter **:wq** to save the settings and exit the file.

8. Run the following command to reload the Nginx configuration file:

   service nginx reload

Step 4 Test the LNMP deployment.

1. Create the **info.php** test file in **/usr/share/nginx/html/**.

   a. Run the following command to create and open the **info.php** test file:

      vim /usr/share/nginx/html/info.php

   b. Press **i** to enter the editing mode.

   c. Modify the **info.php** file and add the following to the file:

```
<?php
 phpinfo();
?>
```

   d. Press **Esc** to exit the editing mode. Then, enter **:wq** to save the settings and exit the file.

2. Enter **http://***Server IP address***/info.php** in the address bar. If the following page is displayed, the environment has been set up.

PHP Version 7.4.19

System	Linux [redacted] 4.18.0-348.7.1.el8_5.x86_64 #1 SMP Wed Dec 22 13:25:12 UTC 2021 x86_64
Build Date	May 4 2021 11:06:37
Server API	FPM/FastCGI
Virtual Directory Support	disabled
Configuration File (php.ini) Path	/etc
Loaded Configuration File	/etc/php.ini
Scan this dir for additional .ini files	/etc/php.d
Additional .ini files parsed	/etc/php.d/10-opcache.ini, /etc/php.d/20-bz2.ini, /etc/php.d/20-calendar.ini, /etc/php.d/20-ctype.ini, /etc/php.d/20-curl.ini, /etc/php.d/20-dom.ini, /etc/php.d/20-exif.ini, /etc/php.d/20-fileinfo.ini, /etc/php.d/20-ftp.ini, /etc/php.d/20-gd.ini, /etc/php.d/20-gettext.ini, /etc/php.d/20-iconv.ini, /etc/php.d/20-json.ini, /etc/php.d/20-mbstring.ini, /etc/php.d/20-mysqlnd.ini, /etc/php.d/20-pdo.ini, /etc/php.d/20-phar.ini, /etc/php.d/20-simplexml.ini, /etc/php.d/20-sockets.ini, /etc/php.d/20-sqlite3.ini, /etc/php.d/20-tokenizer.ini, /etc/php.d/20-xml.ini, /etc/php.d/20-xmlwriter.ini, /etc/php.d/20-xsl.ini, /etc/php.d/30-mysqli.ini, /etc/php.d/30-pdo_mysql.ini, /etc/php.d/30-pdo_sqlite.ini, /etc/php.d/30-xmlreader.ini
PHP API	20190902
PHP Extension	20190902
Zend Extension	320190902
Zend Extension Build	API320190902,NTS
PHP Extension Build	API20190902,NTS
Debug Build	no
Thread Safety	disabled
Zend Signal Handling	enabled
Zend Memory Manager	enabled
Zend Multibyte Support	provided by mbstring
IPv6 Support	enabled
DTrace Support	available, disabled
Registered PHP Streams	https, ftps, compress.zlib, php, file, glob, data, http, ftp, compress.bzip2, phar
Registered Stream Socket Transports	tcp, udp, unix, udg, ssl, tls, tlsv1.0, tlsv1.1, tlsv1.2, tlsv1.3
Registered Stream Filters	zlib.*, string.rot13, string.toupper, string.tolower, string.strip_tags, convert.*, consumed, dechunk, bzip2.*, convert.iconv.*

This program makes use of the Zend Scripting Language Engine:
Zend Engine v3.4.0, Copyright (c) Zend Technologies
with Zend OPcache v7.4.19, Copyright (c), by Zend Technologies

----End

4.1.3 Manually Deploying LNMP (Ubuntu 20.04)

Overview

The best practices for Huawei Cloud ECS guide you through the deployment of LNMP on a Linux ECS. This section uses the Ubuntu 20.04 64bit as an example.

The process is as follows:

1. **Install Nginx.**
2. **Install MySQL.**
3. **Install PHP.**
4. **Test the LNMP deployment.**

Prerequisites

1. The ECS has an EIP bound.
2. The rule listed in the following table has been added to the security group which the target ECS belongs to. For details, see **Adding a Security Group Rule**.

Table 4-5 Security group rule

Direction	Priority	Action	Type	Protocol & Port	Source Address
Inbound	1	Allow	IPv4	TCP: 80	0.0.0.0/0

Resource Planning

Table 4-6 lists the resource configuration and software versions used in this practice. The commands and parameters may vary according to the hardware specifications or software versions you would use.

Table 4-6 Resources and costs

Resource	Description	Cost
ECS	• Billing mode: pay-per-use • AZ: AZ1 • Flavor: s6.large.2 • Image: Ubuntu 20.04 64bit • System disk: 40 GiB • EIP: Auto assign • EIP type: Dynamic BGP • Billed by: Traffic • Bandwidth: 5 Mbit/s	The following resources generate costs: • ECSs • EVS disks • EIPs For billing details, see **Billing Modes**.
Nginx	A high-performance HTTP and reverse proxy server.	Free
MySQL	An open-source relational database software.	Free
PHP	An open-source software used for web development.	Free

Procedure

Step 1 Install Nginx.

1. Log in to the ECS.
2. Run the following commands to install Nginx:

   sudo apt-get update

   sudo apt-get install nginx

   If **Do you want to continue? [Y/n]** is displayed, enter **y** or **Y** to continue the installation.

3. (Optional) Configure the firewall.

   Uncomplicated Firewall (UFW) is an iptables interface that simplifies the firewall configuration. By default, Ubuntu has UFW installed. Run the following command to check the firewall status:

   sudo ufw status

   If you do not want to enable the firewall, skip this step. If you want to enable the firewall, run the following command:

   sudo ufw enable

   Verify that the firewall is enabled.

   Before testing Nginx, you need to reconfigure the firewall to allow access to Nginx. Run the following command to automatically register Nginx with UFW:

   sudo ufw app list

   Information similar to the following is displayed:

```
Available applications:
  Nginx Full
  Nginx HTTP
  Nginx HTTPS
  ...
```

   - **Nginx Full**: Port 80 is enabled to distribute normal and unencrypted web traffic, and port 443 to distribute TLS/SSL-encrypted traffic.
   - **Nginx HTTP**: Port 80 is enabled to distribute normal and unencrypted web traffic.
   - **Nginx HTTPS**: Port 443 is enabled to distribute TLS/SSL-encrypted traffic.

   Run the following command to ensure that the firewall allows HTTP and HTTPS connections:

   sudo ufw allow 'Nginx Full'

4. Verify that Nginx can work properly.

   Use the domain name or IP address to access Nginx. The **Welcome to nginx** page is displayed if Nginx is started normally.

   Enter **http://***IP address of the Nginx server* in the address bar to access Nginx. If the following page is displayed, Nginx has been installed.

   Figure 4-7 Accessing Nginx

Step 2 Install MySQL.

1. Run the following command to install MySQL:

sudo apt -y install mysql-server

2. Check the MySQL status.

   sudo systemctl status mysql

```
● mysql.service - MySQL Community Server
     Loaded: loaded (/lib/systemd/system/mysql.service; enabled; vendor preset: enabled)
     Active: active (running) since Wed 2023-07-26 15:57:29 CST; 22min ago
   Main PID: 10770 (mysqld)
     Status: "Server is operational"
       Tasks: 37 (limit: 4217)
     Memory: 364.9M
     CGroup: /system.slice/mysqld.service
             └─10770 /usr/sbin/mysqld

Jul 26 15:57:29 ecs-ubuntu systemd[1]: Starting MySQL Community Server...
Jul 26 15:57:29 ecs-ubuntu systemd[1]: Started MySQL Community Server.
```

3. Run the following command to access MySQL:

   sudo mysql

4. Run the following command to set the password for user **root**:

   ALTER USER 'root'@'localhost' IDENTIFIED WITH mysql_native_password by 'xxxxx';

   In the preceding command, *xxxxx* indicates the password you set for user **root**.

5. Run the following command to exit MySQL:

   exit;

6. Run the following command and follow the prompts to harden MySQL:

   mysql_secure_installation

```
Securing the MySQL server deployment.

Enter password for user root:         #Enter the password of user root set in step 4.

VALIDATE PASSWORD COMPONENT can be used to test passwords
and improve security. It checks the strength of password
and allows the users to set only those passwords which are
secure enough. Would you like to setup VALIDATE PASSWORD component?

Press y|Y for Yes, any other key for No: Y    #Press Y to set the password validation policy.

There are three levels of password validation policy:

LOW    Length >= 8
MEDIUM Length >= 8, numeric, mixed case, and special characters
STRONG Length >= 8, numeric, mixed case, special characters and dictionary                  file

Please enter 0 = LOW, 1 = MEDIUM and 2 = STRONG: 2       #Enter 2 to select the password
validation policy.
Using existing password for root.

Estimated strength of the password: 25
Change the password for root ? ((Press y|Y for Yes, any other key for No) : Y   #Press Y to change the
password of user root.

New password:  #Enter a new password of user root.

Re-enter new password:   #Enter the new password again.

Estimated strength of the password: 100
Do you wish to continue with the password provided?(Press y|Y for Yes, any other key for No) : Y
#Press Y to confirm the new password.
By default, a MySQL installation has an anonymous user,
allowing anyone to log into MySQL without having to have
```

```
a user account created for them. This is intended only for
testing, and to make the installation go a bit smoother.
You should remove them before moving into a production
environment.

Remove anonymous users? (Press y|Y for Yes, any other key for No) : Y   #Press Y to remove
anonymous users.
Success.


Normally, root should only be allowed to connect from
'localhost'. This ensures that someone cannot guess at
the root password from the network.

Disallow root login remotely? (Press y|Y for Yes, any other key for No) : Y   #Press Y to disallow
remote logins of user root.
Success.

By default, MySQL comes with a database named 'test' that
anyone can access. This is also intended only for testing,
and should be removed before moving into a production
environment.


Remove test database and access to it? (Press y|Y for Yes, any other key for No) : Y   #Press Y to
delete the test database and remove access to it.
 - Dropping test database...
Success.

 - Removing privileges on test database...
Success.

Reloading the privilege tables will ensure that all changes
made so far will take effect immediately.

Reload privilege tables now? (Press y|Y for Yes, any other key for No) : Y   #Press Y to reload privilege
tables.
Success.

All done!
```

Step 3 Install PHP.

1. Run the following commands to install PHP:

   sudo apt update

   sudo apt install php-fpm

2. Run the following command to check the version of the installed PHP:

   php -v

   Information similar to the following is displayed:

```
PHP 7.4.3-4ubuntu2.19 (cli) (built: Jun 27 2023 15:49:59) ( NTS )
Copyright (c) The PHP Group
Zend Engine v3.4.0, Copyright (c) Zend Technologies
    with Zend OPcache v7.4.3-4ubuntu2.19, Copyright (c), by Zend Technologies
```

3. Run the following command to check the runtime status of PHP:

   systemctl status php7.4-fpm

   Information similar to the following is displayed:

```
● php7.4-fpm.service - The PHP 7.4 FastCGI Process Manager
    Loaded: loaded (/lib/systemd/system/php7.4-fpm.service; enabled; vendor preset: enabled)
    Active: active (running) since Mon 2023-07-31 17:33:35 CST; 3min 50s ago
      Docs: man:php-fpm7.4(8)
```

NOTE

If **lines 1-16/16 (end)** is displayed in the command output, press **q** to exit.

4. Modify the Nginx configuration file to support PHP.
   a. Run the following command to open the default Nginx configuration file:
      sudo vim /etc/nginx/sites-enabled/default
   b. Press **i** to enter insert mode.
   c. Modify the opened Nginx configuration file.
      In **server{}**, find the line starting with **index** and add **index.php** to this line.

```
# Default server configuration
#
server {
        listen 80 default_server;
        listen [::]:80 default_server;

        # SSL configuration
        #
        # listen 443 ssl default_server;
        # listen [::]:443 ssl default_server;
        #
        # Note: You should disable gzip for SSL traffic.
        # See: https://bugs.debian.org/773332
        #
        # Read up on ssl_ciphers to ensure a secure configuration.
        # See: https://bugs.debian.org/765782
        #
        # Self signed certs generated by the ssl-cert package
        # Don't use them in a production server!
        #
        # include snippets/snakeoil.conf;

        root /var/www/html;

        # Add index.php to the list if you are using PHP
        index index.php index.html index.htm index.nginx-debian.html;

        server_name _;

        location / {
                # First attempt to serve request as file, then
```

      Find **location ~ \.php$ {}** in **server{}** and delete the comments from the lines in the following red box:

```
location / {
        # First attempt to serve request as file, then
        # as directory, then fall back to displaying a 404.
        try_files $uri $uri/ =404;
}

# pass PHP scripts to FastCGI server
#
location ~ \.php$ {
        include snippets/fastcgi-php.conf;
#
#       # With php-fpm (or other unix sockets):
        fastcgi_pass unix:/var/run/php/php7.4-fpm.sock;
#       # With php-cgi (or other tcp sockets):
#       fastcgi_pass 127.0.0.1:9000;
}

# deny access to .htaccess files, if Apache's document root
# concurs with nginx's one
```

d. Press **Esc** to exit insert mode. Then, enter **:wq** to save the settings and exit.

5. Run the following command to reload the Nginx configuration file:

   sudo systemctl restart nginx

Step 4 Test the LNMP deployment.

1. In the root directory of the Nginx website, create the **phpinfo.php** file.

   sudo vim /var/www/html/phpinfo.php

2. Press **i** to enter insert mode.
3. Modify the **phpinfo.php** file and add the following to the file:

   ```
   <?php echo phpinfo(); ?>
   ```

4. Press **Esc** to exit insert mode. Then, enter **:wq** to save the settings and exit.
5. Enter **http://***IP address of the Nginx server***/phpinfo.php** in the address bar. If the following page is displayed, the LNMP environment has been deployed.

PHP Version 7.4.3-4ubuntu2.19

System	Linux ecs-lnmp 5.4.0-153-generic #170-Ubuntu SMP Fri Jun 16 13:43:31 UTC 2023 x86_64
Build Date	Jun 27 2023 15:49:59
Server API	FPM/FastCGI
Virtual Directory Support	disabled
Configuration File (php.ini) Path	/etc/php/7.4/fpm
Loaded Configuration File	/etc/php/7.4/fpm/php.ini
Scan this dir for additional .ini files	/etc/php/7.4/fpm/conf.d
Additional .ini files parsed	/etc/php/7.4/fpm/conf.d/10-opcache.ini, /etc/php/7.4/fpm/conf.d/10-pdo.ini, /etc/php/7.4/fpm/conf.d/20-calendar.ini, /etc/php/7.4/fpm/conf.d/20-ctype.ini, /etc/php/7.4/fpm/conf.d/20-exif.ini, /etc/php/7.4/fpm/conf.d/20-ffi.ini, /etc/php/7.4/fpm/conf.d/20-fileinfo.ini, /etc/php/7.4/fpm/conf.d/20-ftp.ini, /etc/php/7.4/fpm/conf.d/20-gettext.ini, /etc/php/7.4/fpm/conf.d/20-iconv.ini, /etc/php/7.4/fpm/conf.d/20-json.ini, /etc/php/7.4/fpm/conf.d/20-phar.ini, /etc/php/7.4/fpm/conf.d/20-posix.ini, /etc/php/7.4/fpm/conf.d/20-readline.ini, /etc/php/7.4/fpm/conf.d/20-shmop.ini, /etc/php/7.4/fpm/conf.d/20-sockets.ini, /etc/php/7.4/fpm/conf.d/20-sysvmsg.ini, /etc/php/7.4/fpm/conf.d/20-sysvsem.ini, /etc/php/7.4/fpm/conf.d/20-sysvshm.ini, /etc/php/7.4/fpm/conf.d/20-tokenizer.ini
PHP API	20190902
PHP Extension	20190902
Zend Extension	320190902
Zend Extension Build	API320190902,NTS
PHP Extension Build	API20190902,NTS
Debug Build	no
Thread Safety	disabled
Zend Signal Handling	enabled
Zend Memory Manager	enabled
Zend Multibyte Support	disabled
IPv6 Support	enabled
DTrace Support	available, disabled
Registered PHP Streams	https, ftps, compress.zlib, php, file, glob, data, http, ftp, phar
Registered Stream Socket Transports	tcp, udp, unix, udg, ssl, tls, tlsv1.0, tlsv1.1, tlsv1.2, tlsv1.3
Registered Stream Filters	zlib.*, string.rot13, string.toupper, string.tolower, string.strip_tags, convert.*, consumed, dechunk, convert.iconv.*

----End

4.2 Setting Up an LAMP Environment

4.2.1 Manually Deploying LAMP (CentOS 7.8 PHP 7.0)

Overview

LAMP is a web application platform consisting of Linux, Apache, MySQL, and PHP.

The best practices for Huawei Cloud ECS guide you through the deployment of LAMP on a Linux ECS. The CentOS 7.8 64bit OS is used as an example in this section.

Prerequisites

1. The ECS has an EIP bound.
2. The rule listed in the following table has been added to the security group which the target ECS belongs to. For details, see **Adding a Security Group Rule**.

Table 4-7 Security group rule

Direction	Priority	Action	Type	Protocol & Port	Source Address
Inbound	1	Allow	IPv4	TCP: 80	0.0.0.0/0

Resource Planning

Table 4-8 lists the resource configuration and software versions used in this practice. The commands and parameters may vary according to the hardware specifications or software versions you would use.

Table 4-8 Resources and costs

Resource	Description	Cost
ECS	• Billing mode: pay-per-use • AZ: AZ1 • Flavor: c7.large.2 • Image: CentOS 7.8 64bit • System disk: 40 GiB • EIP: Auto assign • EIP type: Dynamic BGP • Billed by: Traffic • Bandwidth: 5 Mbit/s	The following resources generate costs: • ECSs • EVS disks • EIPs For billing details, see **Billing Modes**.
Apache	An open-source web server	Free
MySQL	An open-source relational database software Download URL: **http://dev.mysql.com/get/mysql57-community-release-el7-10.noarch.rpm**	Free
PHP	An open-source software used for web development Download URL: **https://mirror.webtatic.com/yum/el7/epel-release.rpm** **https://mirror.webtatic.com/yum/el7/webtatic-release.rpm**	Free

Procedure

Step 1 Install Apache.

1. Log in to the ECS.
2. Run the following commands as user **root** to update the software package and install Apache:

   yum -y update

   yum -y install httpd
3. Run the following command to check the version of the installed Apache:

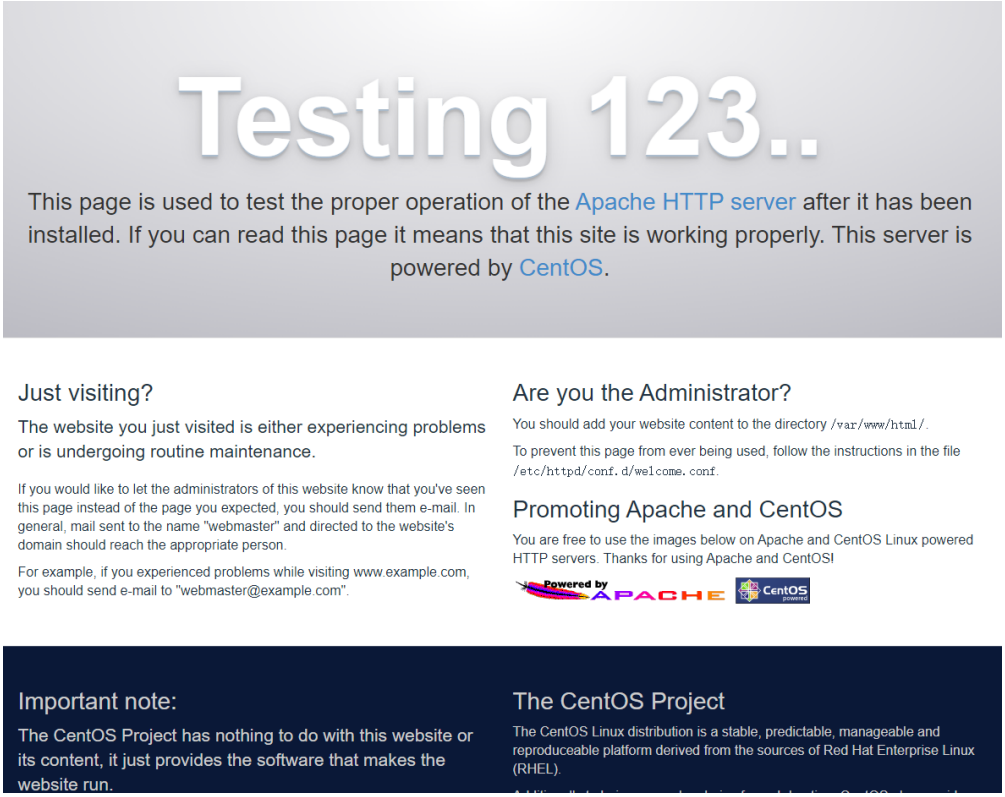
   httpd -v

   Information similar to the following is displayed:

   ```
   Server version: Apache/2.4.6 (CentOS)
   Server built:  May 30 2023 14:01:11
   ```
4. Run the following commands in sequence to start Apache and enable it to start automatically upon ECS startup:

   systemctl start httpd

   systemctl enable httpd
5. Enter **http://***Server IP address* in the address bar of the browser to access Apache. If the following page is displayed, Apache has been installed.



Step 2 Install MySQL.

1. Run the following commands in sequence to install MySQL:

   wget -i -c http://dev.mysql.com/get/mysql57-community-release-el7-10.noarch.rpm

   yum -y install mysql57-community-release-el7-10.noarch.rpm

yum -y install mysql-community-server --nogpgcheck

2. Run the following command to check the version of the installed MySQL:

   mysql -V

   Information similar to the following is displayed:

```
mysql  Ver 14.14 Distrib 5.7.44, for Linux (x86_64) using  EditLine wrapper
```

3. Run the following commands in sequence to start MySQL and enable it to start automatically upon ECS startup:

   systemctl start mysqld

   systemctl enable mysqld

4. Run the following command to check the MySQL status:

   systemctl status mysqld.service

```
[root@ecs-adc3 ~]# systemctl status mysqld.service
● mysqld.service - MySQL Server
   Loaded: loaded (/usr/lib/systemd/system/mysqld.service; enabled; vendor preset: disabled)
   Active: active (running) since Tue 2023-10-31 19:33:40 CST; 36s ago
     Docs: man:mysqld(8)
           http://dev.mysql.com/doc/refman/en/using-systemd.html
 Main PID: 7916 (mysqld)
   CGroup: /system.slice/mysqld.service
           └─7916 /usr/sbin/mysqld --daemonize --pid-file=/var/run/mysqld/mysqld.pid

Aug 16 19:33:35 ecs-adc3 systemd[1]: Starting MySQL Server...
Aug 16 19:33:40 ecs-adc3 systemd[1]: Started MySQL Server.
```

5. Run the following commands to obtain the **root** user's password that is automatically set during MySQL installation:

   grep 'temporary password' /var/log/mysqld.log

   Information similar to the following is displayed:

```
2023-10-31T11:53:08.691748Z 1 [Note] A temporary password is generated for root@localhost: 2YY?
3uHUA?Ys
```

6. Run the following command and follow the prompts to harden MySQL:

   mysql_secure_installation

```
Securing the MySQL server deployment.

Enter password for user root:    #Enter the obtained password of user root.
The existing password for the user account root has expired. Please set a new password.

New password:  #Enter a new password of user root.

Re-enter new password:   #Enter the new password again.
The 'validate_password' plugin is installed on the server.
The subsequent steps will run with the existing configuration of the plugin.
Using existing password for root.

Estimated strength of the password: 100
Change the password for root ? ((Press y|Y for Yes, any other key for No) : N   #Press N.

 ... skipping.
By default, a MySQL installation has an anonymous user,
allowing anyone to log into MySQL without having to have
a user account created for them. This is intended only for
testing, and to make the installation go a bit smoother.
You should remove them before moving into a production
environment.

Remove anonymous users? (Press y|Y for Yes, any other key for No) : Y   #Press Y to remove
anonymous users.
Success.
```

```
Normally, root should only be allowed to connect from 'localhost'. This ensures that someone cannot
guess at the root password from the network.

Disallow root login remotely? (Press y|Y for Yes, any other key for No) : Y   #Press Y to disallow
remote logins of user root.
Success.

By default, MySQL comes with a database named 'test' that anyone can access. This is also intended
only for testing, and should be removed before moving into a production environment.

Remove test database and access to it? (Press y|Y for Yes, any other key for No) : Y   #Press Y to
delete the test database and remove access to it.
 - Dropping test database...
Success.

 - Removing privileges on test database...
Success.

Reloading the privilege tables will ensure that all changes
made so far will take effect immediately.

Reload privilege tables now? (Press y|Y for Yes, any other key for No) : Y   #Press Y to reload privilege
tables.
Success.

All done!
```

Step 3 Install PHP.

1. Run the following commands to install PHP 7 and required PHP extensions:

   rpm -Uvh https://mirror.webtatic.com/yum/el7/epel-release.rpm

   rpm -Uvh https://mirror.webtatic.com/yum/el7/webtatic-release.rpm

   yum -y install php70w-devel php70w.x86_64 php70w-cli.x86_64 php70w-common.x86_64 php70w-gd.x86_64 php70w-ldap.x86_64 php70w-mbstring.x86_64 php70w-mcrypt.x86_64 php70w-pdo.x86_64 php70w-mysqlnd php70w-fpm php70w-opcache php70w-pecl-redis php70w-pecl-mongodb

2. Run the following command to check the version of the installed PHP:

   php -v

   Information similar to the following is displayed:

   ```
   PHP 7.0.33 (cli) (built: Dec 6 2018 22:30:44) ( NTS )
   Copyright (c) 1997-2017 The PHP Group
   Zend Engine v3.0.0, Copyright (c) 1998-2017 Zend Technologies
   ```

3. Run the following commands to start PHP and enable it to start automatically upon ECS startup:

   systemctl start php-fpm

   systemctl enable php-fpm

Step 4 Test the LAMP deployment.

1. Create the **info.php** test file in **/var/www/html/**.

   a. Run the following command to create and open the **info.php** test file:

      vim /var/www/html/info.php

   b. Press **i** to enter insert mode.

   c. Modify the **info.php** file and add the following to the file:

      ```
      <?php
       phpinfo();
      ?>
      ```

d. Press **Esc** to exit insert mode. Then, enter **:wq** to save the settings and exit.

2. Run the following command to restart Apache:

   systemctl restart httpd

3. Enter **http://***Server IP address***/info.php** in the address bar. If the following page is displayed, the LAMP environment has been set up.

PHP Version 7.0.33

System	Linux ecs-maxiaorui-wx1058652-20231103 3.10.0-1160.92.1.el7.x86_64 #1 SMP Tue Jun 20 11:48:01 UTC 2023 x86_64
Build Date	Dec 6 2018 22:31:47
Server API	Apache 2.0 Handler
Virtual Directory Support	disabled
Configuration File (php.ini) Path	/etc
Loaded Configuration File	/etc/php.ini
Scan this dir for additional .ini files	/etc/php.d
Additional .ini files parsed	/etc/php.d/bz2.ini, /etc/php.d/calendar.ini, /etc/php.d/ctype.ini, /etc/php.d/curl.ini, /etc/php.d/dom.ini, /etc/php.d/exif.ini, /etc/php.d/fileinfo.ini, /etc/php.d/ftp.ini, /etc/php.d/gd.ini, /etc/php.d/gettext.ini, /etc/php.d/gmp.ini, /etc/php.d/iconv.ini, /etc/php.d/igbinary.ini, /etc/php.d/json.ini, /etc/php.d/ldap.ini, /etc/php.d/mbstring.ini, /etc/php.d/mcrypt.ini, /etc/php.d/mongodb.ini, /etc/php.d/mysqlnd.ini, /etc/php.d/mysqlnd_mysqli.ini, /etc/php.d/opcache.ini, /etc/php.d/pdo.ini, /etc/php.d/pdo_mysqlnd.ini, /etc/php.d/pdo_sqlite.ini, /etc/php.d/phar.ini, /etc/php.d/posix.ini, /etc/php.d/redis.ini, /etc/php.d/shmop.ini, /etc/php.d/simplexml.ini, /etc/php.d/sockets.ini, /etc/php.d/sqlite3.ini, /etc/php.d/sysvmsg.ini, /etc/php.d/sysvsem.ini, /etc/php.d/sysvshm.ini, /etc/php.d/tokenizer.ini, /etc/php.d/xml.ini, /etc/php.d/xml_wddx.ini, /etc/php.d/xmlreader.ini, /etc/php.d/xmlwriter.ini, /etc/php.d/xsl.ini, /etc/php.d/zip.ini
PHP API	20151012
PHP Extension	20151012
Zend Extension	320151012
Zend Extension Build	API320151012,NTS
PHP Extension Build	API20151012,NTS
Debug Build	no
Thread Safety	disabled
Zend Signal Handling	disabled
Zend Memory Manager	enabled
Zend Multibyte Support	provided by mbstring
IPv6 Support	enabled
DTrace Support	available, disabled
Registered PHP Streams	https, ftps, compress.zlib, php, file, glob, data, http, ftp, compress.bzip2, phar, zip
Registered Stream Socket Transports	tcp, udp, unix, udg, ssl, sslv3, tls, tlsv1.0, tlsv1.1, tlsv1.2
Registered Stream Filters	zlib.*, string.rot13, string.toupper, string.tolower, string.strip_tags, convert.*, consumed, dechunk, bzip2.*, convert.iconv.*, mcrypt.*, mdecrypt.*

This program makes use of the Zend Scripting Language Engine:
Zend Engine v3.0.0, Copyright (c) 1998-2017 Zend Technologies
with Zend OPcache v7.0.33, Copyright (c) 1999-2017, by Zend Technologies

----End

4.3 Setting Up a Java Web Environment

4.3.1 Setting Up Tomcat-based Java Web Environment (CentOS 7.4)

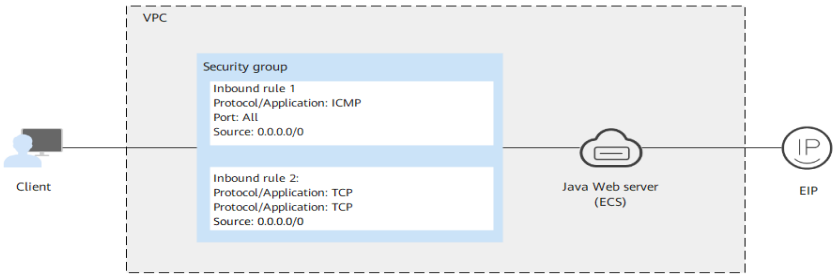
Application Scenarios

Tomcat is a widely used Java Web application server. This section describes how to set up Java Web environment on an ECS. To do so, you need to download the Java Web installation packages, upload the packages to the ECS, and set security rules for the ECS. After installing Java Web, you need to configure related software.

The ECS in this chapter uses CentOS 7.4 64bit as OS.

Architecture

Figure 4-8 Setting up Tomcat-based Java web environment



Resource and Cost Planning

Table 4-9 Resources and costs

Resource	Description	Cost
VPC	VPC CIDR block: 192.168.0.0/16	Free
Subnet	• AZ: AZ1 • CIDR block: 192.168.0.0/24	Free
Security group	Inbound rule 1: • **Priority**: Set it to **1**. • **Action**: Select **Allow**. • **Type**: Select **IPv4**. • **Protocol & Port**: Set it to **ICMP: All**. • **Source**: Set it to **0.0.0.0/0**. Inbound rule 2: • **Priority**: Set it to **1**. • **Action**: Select **Allow**. • **Type**: Select **IPv4**. • **Protocol & Port**: Set it to **TCP: 8080**. • **Source**: Set it to **0.0.0.0/0**.	Free

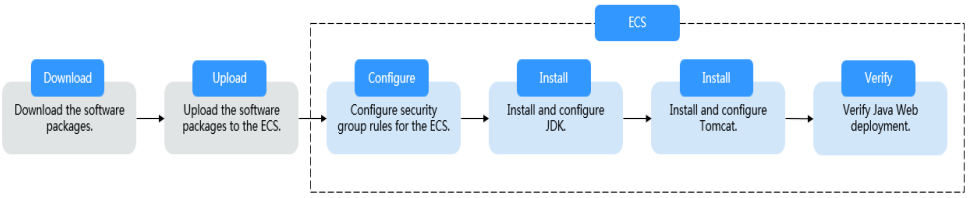
Resource	Description	Cost
ECS	• Billing mode: Yearly/Monthly • AZ: AZ1 • Flavor: c7.large.2 • Image: CentOS 7.4 64bit • System disk: 40 GiB • EIP: Auto assign • EIP type: Dynamic BGP • Billed by: Traffic • Bandwidth: 5 Mbit/s	The following resources generate costs: • ECSs • EVS disks • EIPs For billing details, see **Billing Modes**.
jdk	A Java development tool software. You can download it from: **http://www.oracle.com/technetwork/java/javase/downloads**	Free
tomcat	An open-source web application server. You can download it from: **http://tomcat.apache.org/download-80.cgi**	Free
PuTTY	A cross-platform remote access tool, which is used to access various nodes from a Windows OS during software installation. You can download it from: **https://www.chiark.greenend.org.uk/~sgtatham/putty/latest.html**	Free
WinSCP	A file transfer across platform, which is used for transferring files between Windows and Linux systems. You can download it from: **http://winscp.net/**	Free

NOTE

Table 4-9 lists the official paths to download JDK and Tomcat installation packages. You can also obtain the packages from open-source image paths.

Process

Figure 4-9 Deployment Process



Procedure

Preparations

- An ECS is created and has an EIP bound.
- The **jdk** and **tomcat** directories have been created on the ECS using the following commands:

  cd /home/

  mkdir webDemo

  cd webDemo/

  mkdir jdk

  mkdir tomcat
- The installation packages have been downloaded to the local PC and uploaded to the ECS through the file transfer tool. Alternatively, you can run the **wget** command to download the installation packages to the ECS. The details of both methods are described as follows:
  - Method 1: Upload the installation packages to the ECS using the file transfer tool.
    - Use WinSCP to upload the JDK software package to the **jdk** directory.
    - Use WinSCP to upload the Tomcat software package to the **tomcat** directory.
  - Method 2: Run the **wget** command to download the installation packages to the ECS.

    i. Run the following command to go to the **jdk** directory:

    cd /home/webDemo/jdk

    ii. Run the following command to download the JDK installation package:

    wget *JDK package download address*

    Download the JDK installation package from the path listed in **Table 4-9** or from other open-source image paths.

    For example, to check the available versions of the **jdk17** software package (**jdk-17_linux-x64_bin.tar.gz** used as an example), run the following command:

    wget https://download.oracle.com/java/17/latest/jdk-17_linux-x64_bin.tar.gz

iii. Run the following command to go to the **tomcat** directory:

cd /home/webDemo/tomcat

iv. Run the following command to download the Tomcat installation package:

Download the Tomcat installation package from the path listed in **Table 4-9** or from other open-source image paths.

wget http://mirrors.tuna.tsinghua.edu.cn/apache/tomcat/tomcat-*x*/v*x.x.xx*/bin/apache-tomcat-x.x.xx.tar.gz

Find the required version from **the open-source image path**. The Tomcat installation package of version 8.5.*xx* is used as an example. Run the following commands to download the package:

wget https://mirrors.tuna.tsinghua.edu.cn/apache/tomcat/tomcat-8/v8.5.*xx*/bin/apache-tomcat-8.5.*xx*.tar.gz --no-check-certificate

Configuring Security Group Rules for the ECS

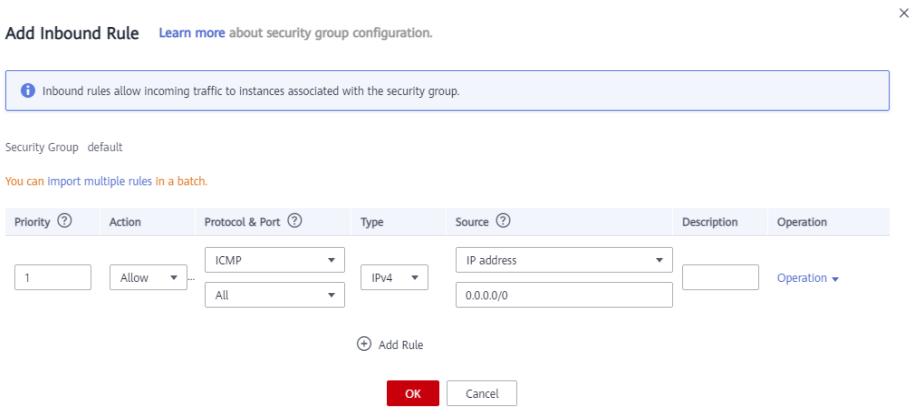
1. Click the ECS name to switch to the ECS details page and click **Security Groups**.
2. In the upper right corner of the security group rule list, click **Modify Security Group Rule**.
3. On the displayed page showing security group details, click **Add Rule**.
4. In the **Add Inbound Rule** dialog box, add a security group rule as prompted.

   To deploy the Java Web environment, you need to add two security group rules for the ECS.

   a. Set **Protocol** to **ICMP**.

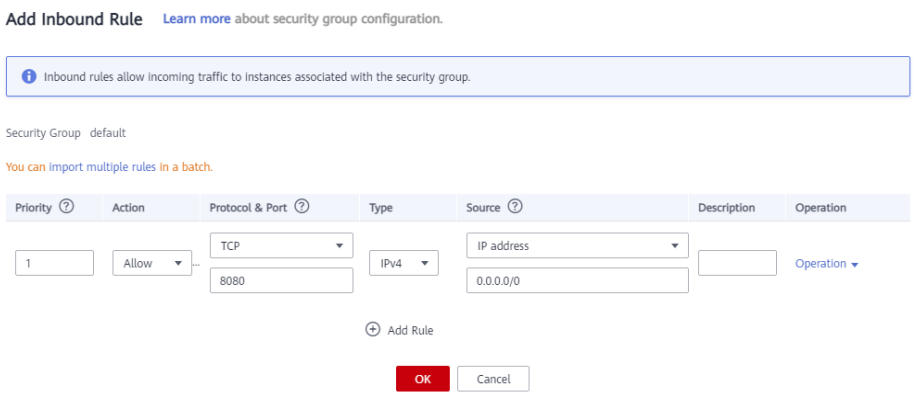
      If ICMP traffic to an ECS is disabled by default, pinging the ECS EIP will time out. Add a rule to allow ICMP traffic to the ECS first.

      Figure 4-10 Adding a rule to allow ICMP traffic



   b. Set an appropriate port. Port **8080** is used as an example here.

Figure 4-11 Adding port 8080



Installing JDK

1. Run the following command to go to the **jdk** directory:

   cd /home/webDemo/jdk

2. Run the following command to decompress the JDK installation package to the **jdk** directory:

   tar -xvf jdk-17_linux-x64_bin.tar.gz -C /home/webDemo/jdk/

3. Run the following command to configure environment variables:

   vim /etc/profile

4. Add the following content to the end of the file:

```
#set java environment
JAVA_HOME=/home/webDemo/jdk/jdk-17.0.x
JRE_HOME=$JAVA_HOME
PATH=$JAVA_HOME/bin:$PATH
CLASSPATH=.:$JAVA_HOME/lib/dt.jar:$JRE_HOME/lib/tools.jar
export JAVA_HOME JRE_HOME PATH CLASSPATH
```

   NOTE

   In the preceding command, *jdk-17.0.x* indicates the version of the JDK installation package that is obtained from the command output in **2**.

   Example value: jdk-17.0.9

5. Run the following command to save the settings and exit:

   :wq

6. Run the following command to make the **/etc/profile** configurations take effect:

   source /etc/profile

7. Run the following command to verify the installation.

   java -version

   If the following information is displayed, JDK is installed.

```
[root@ecs-c525-web ~]# java -version
java version "17.0.9" 2023-10-17 LTS
Java(TM) SE Runtime Environment (build 17.0.9+11-LTS-201)
Java HotSpot(TM) 64-Bit Server VM (build 17.0.9+11-LTS-201, mixed mode, sharing)
```

Installing Tomcat

1. Run the following command to go to the **tomcat** directory:

cd /home/webDemo/tomcat

2. Run the following command to decompress the Tomcat installation package to the **tomcat** directory:

   tar -xvf apache-tomcat-*x.x.xx*.tar.gz -C /home/webDemo/tomcat/

   For example, to decompress the Tomcat installation package of version 8.5.*xx*, run the following commands:

   tar -xvf apache-tomcat-8.5.*xx*.tar.gz -C /home/webDemo/tomcat/

3. Run the following commands to install Tomcat:

   cd /home/webDemo/tomcat/apache-tomcat-*x.x.xx*/

   cd bin/

   For example, to install the Tomcat installation package of version 8.5.*xx*, run the following commands:

   cd /home/webDemo/tomcat/apache-tomcat-8.5.*xx*/

   cd bin/

4. Run the following command to edit the **setclasspath.sh** script:

   vi setclasspath.sh

   Add the following content to the end of the **setclasspath.sh** script:

   Use the java version in **Resource and Cost Planning** to replace the JDK version in the following script:

```
export JAVA_HOME=/home/webDemo/jdk/jdk-17.0.9
export JRE_HOME=$JAVA_HOME
```

5. Run the following command to save the settings and exit:

   :wq

6. Run the following command to start Tomcat:

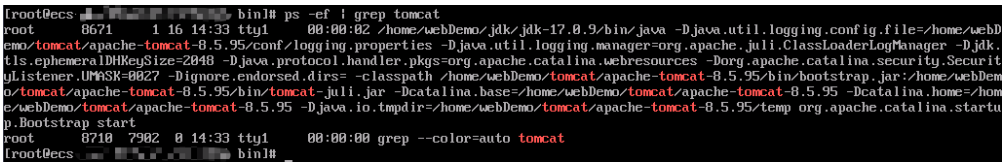
   ./startup.sh

7. Run the following command to check the Tomcat process:

   ps -ef | grep tomcat

   If the following information is displayed, Tomcat is started successfully.

   Figure 4-12 Checking the Tomcat process



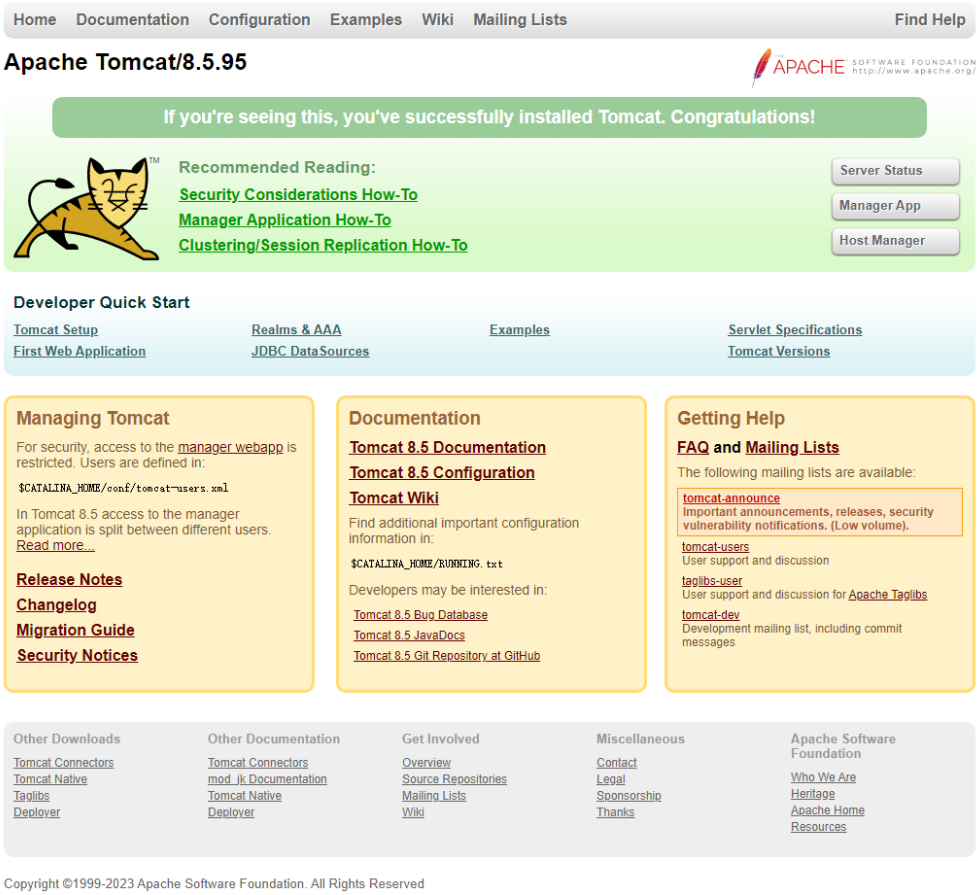
Verifying Java Web Deployment

Enter the following URL in the address bar of the browser:

http://*EIP bound to the ECS*:8080

If the Tomcat page is displayed, Java Web has been set up. Port 8080 can be accessed over the public network.

Figure 4-13 Accessing port 8080



4.4 Manually Deploying Node.js (CentOS 7.2)

Overview

The best practices for Huawei Cloud ECS guide you through the manual deployment of Node.js on a Linux ECS.

Node.js is a JavaScript runtime environment based on the Google Chrome V8 engine for building fast and scalable network applications. Based on the event-driven and non-blocking I/O model, Node.js is lightweight and efficient. It is ideal for running data-intensive real-time applications on distributed devices.

For more information about Node.js, see **https://nodejs.org**.

This section uses CentOS 7.2 64bit (40 GB) and Node.js installation packages **node-v10.14.1-linux-x64.tar** and **node-v10.14.2-linux-x64.tar** as an example to describe how to deploy Node.js.

Prerequisites

- An ECS has been created. For details, see **Purchasing an ECS**.
- The target ECS has an EIP bound. For instructions about how to bind an EIP to an ECS, see **Assigning an EIP**.

- A tool (for example, **PuTTY**) for accessing the Linux ECS has been installed on the local computer.

Procedure

Step 1 Install the Node.js software packages.

- Using the binary file
  a. Log in to the ECS.
  b. Run the following command to download the **Node.js installation package**:

     wget https://nodejs.org/dist/v10.14.1/node-v10.14.1-linux-x64.tar.xz
  c. Run the following command to decompress the file:

     tar xvJf node-v10.14.1-linux-x64.tar.xz
  d. Run the following commands in any directory to set up a soft connection for node and NPM, respectively:

     ln -s /root/node-v10.14.1-linux-x64/bin/node /usr/local/bin/node

     ln -s /root/node-v10.14.1-linux-x64/bin/npm /usr/local/bin/npm
  e. Run the following commands to check the node and NPM versions:

     node -v

     npm -v
- Using the NVM version manager
  a. Log in to the ECS.
  b. Run the following command to install git:

     yum install git
  c. Run the following command to copy the source code to the local **~/.nvm** directory using git and check the version:

     git clone https://github.com/cnpm/nvm.git ~/.nvm && cd ~/.nvm && git checkout `git describe --abbrev=0 --tags`
  d. Run the following command to activate NVM and add it to the **profile** file:

     echo ". ~/.nvm/nvm.sh" >> /etc/profile
  e. Run the following command for the environment variables to take effect:

     source /etc/profile
  f. Run the following command to list available Node.js versions:

     nvm ls-remote
  g. Run the following command to install multiple Node.js versions:

     nvm install v10.14.1

     nvm install v10.14.2
  h. Run the following command to check the installed versions:

     nvm ls
  i. Run the following command to switch the Node.js version to V10.14.2:

     nvm use v10.14.2

NOTE

- Run the **nvm alias default v10.14.2** command to set the default version to **10.14.2**.
- Run the **nvm help** command to obtain more information about NVM.

Step 2 Verify the deployment.

1. Run the following command to go to the home directory:

   cd

2. Run the following command to create a **test.js** project file:

   touch test.js

3. Use VIM to edit the **test.js** file.

   a. Run the following command to open the **test.js** file:

   vim test.js

   b. Press **i** to enter insert mode.

   Modify the file as follows:

```
const http = require('http');
const hostname = '0.0.0.0';
const port = 3000;
const server = http.createServer((req, res) => {
  res.statusCode = 200;
  res.setHeader('Content-Type', 'text/plain');
  res.end('Hello World\n');
});
server.listen(port, hostname, () => {
  console.log(`Server running at http://${hostname}:${port}/`);
});
```

   The port number can be customized.

   c. Press **Esc** to exit insert mode. Then, enter **:wq** to save the settings and exit.

4. Run the following command to view enabled port:

   netstat -lntp

   If the port is unavailable, log in to the ECS console and change the security group rule. For details, see **Adding a Security Group Rule**.

5. Add exception ports in the firewall configuration.

   a. For example, to add port 3000, run the following command:

   firewall-cmd --zone=public --add-port=3000/tcp --permanent

   If the following information is displayed, the firewall is disabled. Then, go to step **Step 2.6**.

```
[root@ecs-centos7 ~]# firewall-cmd --zone=public --add-port=3000/tcp --permanent
FirewallD is not running
```

   If the following information is displayed, the firewall is enabled, and the exception port has been added:

```
[root@ecs-centos7 ~]# firewall-cmd --zone=public --add-port=3000/tcp --permanent
success
```

   b. Reload the policy configuration for the new configuration to take effect.

   firewall-cmd --reload

   c. Run the following command to view all enabled ports:

   firewall-cmd --list-ports

```
[root@ecs-centos7 ~]# firewall-cmd --list-ports
3000/tcp
```

6. Run the following command to run the project:

   node ~/test.js

7. Enter **http://***EIP***:3000** in the address bar to access Node.js. If the following page is displayed, Node.js has been deployed.

   Figure 4-14 Deployment and testing

----End

5 Setting Up a Website

5.1 Setting Up a WordPress Website

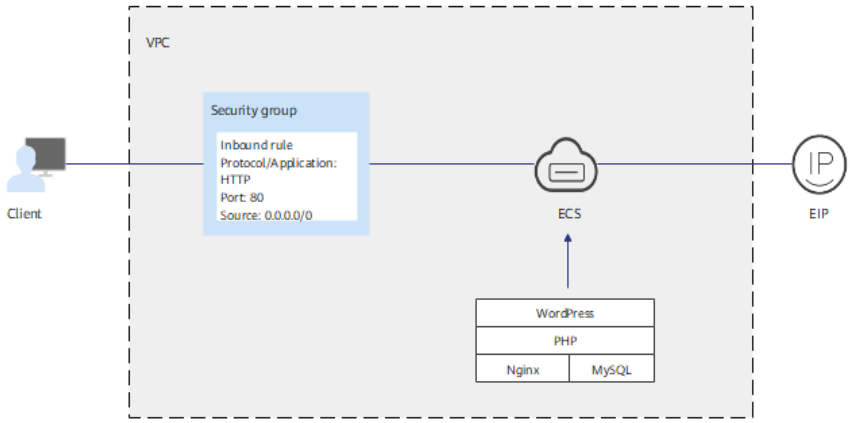
5.1.1 Setting Up a WordPress Website (Linux)

Application Scenarios

WordPress (WP for short) is initially a blog system and gradually evolved to a free CMS or website setup system. The best practices for ECS guide you through the setup of LNMP on a Linux ECS running the CentOS 7.2 64bit OS and deploy WordPress on the website.

Architecture

Figure 5-1 Setting up a WordPress website (Linux)



Advantages

- A website with a simple networking architecture can be quickly set up.
- The website is secure and easy to use.

Resources and Costs

Table 5-1 Resources and costs

Resource	Description	Cost
VPC	VPC CIDR block: 192.168.0.0/16	Free
VPC subnet	• AZ: AZ1 • CIDR block: 192.168.0.0/24	Free
Security group	Inbound rule: • **Priority**: Set it to **1**. • **Action**: Select **Allow**. • **Type**: Select **IPv4**. • **Protocol & Port**: Set it to **TCP: 80**. • **Source**: Set it to **0.0.0.0/0**.	Free
ECS	• Billing mode: Yearly/Monthly • AZ: AZ1 • Flavor: s6.large.4 • Image: CentOS 7.2 64bit • System disk: 40 GiB • EIP: Auto assign • EIP type: Dynamic BGP • Billed by: Traffic • Bandwidth: 5 Mbit/s	The following resources generate costs: • ECSs • EVS disks • EIPs For billing details, see **Billing Modes**.
Nginx	A high-performance HTTP and reverse proxy server. Download URL: **http://nginx.org/packages/centos/7/noarch/RPMS/nginx-release-centos-7-0.el7.ngx.noarch.rpm**	Free
MySQL	An open-source relational database software Download URL: **https://dev.mysql.com/get/mysql80-community-release-el7-11.noarch.rpm**	Free

Resource	Description	Cost
PHP	An open-source software used for web development Download URL: **https://mirrors.huaweicloud.com/remi/enterprise/remi-release-7.rpm**	Free
WordPress	An open-source blogging software. Download URL: **https://wordpress.org/download/releases/**	Free
Domain name	Used to access the created website.	The price of a domain name is subject to that provided by the domain name registrar. For details, see the help document of the domain name registrar.

Process

The process of manually setting up a WordPress website on a Linux ECS is as follows:

1. **Set up the LNMP environment.**
2. **Create a database.**
3. **Install WordPress.**
4. **Purchase a domain name.**
5. **Configure DNS records.**

Procedure

Preparations

- A VPC and an EIP are available.
- A domain name is available if you plan to configure a domain name for the website.
- The rule listed in **Table 5-2** has been added to the security group which the target ECS belongs to. For details, see **Configuring Security Group Rules**.

Table 5-2 Security group rules

Direction	Priority	Action	Type	Protocol & Port	Source Address
Inbound	1	Allow	IPv4	TCP: 80	0.0.0.0/0

Procedure

Step 1 Log in to the ECS.

Step 2 Set up the LNMP environment. For details, see **Manually Deploying LNMP (CentOS 7.2)**.

Step 3 Create a database.

1. Run the following command and enter the **root** user password of MySQL as prompted to log in to the MySQL CLI:

   mysql -u root -p

2. Run the following command to create a database:

   CREATE DATABASE *wordpress*;

   In the preceding command, *wordpress* is the database name, which can be customized.

3. Run the following command to create a user:

   CREATE USER *'user'*@'localhost' IDENTIFIED BY '*xxxxx*';

   In the preceding command, *user* is the name of the database user, and *xxxxx* is the configurable user password.

4. Run the following command to grant all permissions on the WordPress database to the user:

   GRANT ALL PRIVILEGES ON wordpress.* TO *'user'*@'localhost';

5. Run the following command to make all configurations take effect:

   FLUSH PRIVILEGES;

6. Run the following command to exit the MySQL CLI:

   exit

7. (Optional) Run the following commands to verify the creation of the database and user and then exit the MySQL CLI:

   mysql -u *user* **-p**

   SHOW DATABASES;

   exit

   In the preceding command, *user* is the created username for logging in to the database.

Step 4 Install WordPress.

1. Run the following commands to go to the root directory of the Nginx website and download the WordPress package:

   cd /usr/share/nginx/html

   wget https://cn.wordpress.org/wordpress-6.6.1-zh_CN.tar.gz

2. Run the following command to decompress the WordPress software package:

   tar zxvf wordpress-6.6.1-zh_CN.tar.gz

   After the decompression, the folder **wordpress** is obtained.

3. Run the following commands to go to the WordPress installation directory, copy the **wp-config-sample.php** file to the **wp-config.php** file, and retain the original sample configuration file as a backup:

   cd /usr/share/nginx/html/wordpress

   cp wp-config-sample.php wp-config.php

4. Run the following command to open and edit the created configuration file:

   vim wp-config.php

5. Press **i** to enter insert mode. Find MySQL configurations in the file and modify them to information in **Step 3**.

   Figure 5-2 Modifying MySQL configurations

6. Press **Esc** to exit the editing mode. Then, enter **:wq** to save the settings and exit the file.

7. Enter **http://***Server IP address***/wordpress** in the address bar of the browser to access the installation wizard.

8. Set the site title, administrator username, password, and email address. Then, click **Install WordPress**.

   Table 5-3 Configuration parameters

Parameter	Description
Site title	Name of the WordPress website.
Username	Name of the WordPress administrator.

Parameter	Description
Password	Default or user-defined password. Do not reuse an existing password and keep your password secure.
Email address	Email address for receiving notifications.

9. Check that the installation is successful.
10. Click **Log In**. Alternatively, enter **http://***Server IP address***/wordpress/wp-login.php** in the address bar of the browser, enter the username or email address and password, and click **Log In**.

Step 5 Purchase a domain name.

Configure a unique domain name for website access. You need to obtain an authorized domain name from the domain name registrar first.

Step 6 Configure DNS records.

Your website can be visited using the registered domain name only after DNS records are configured. For details, see **Routing Internet Traffic to a Website**.

For example, if the domain name is www.example.com, enter **http://www.***example***.com** in the address bar of the browser to access the website.

----End

5.2 Setting Up a Discuz Forum

5.2.1 Overview

Application Scenarios

This guide describes how you can build a website using HUAWEI CLOUD.

Small websites are often deployed on a single server, which handles requests from users, stores static and dynamic content, and processes data. As the number of website users increase, database access drastically increases, and a single server fails to meet the service requirements. In this case, two or more servers are required to run the website, and a load balancing service is also required to balance their loads.

To build a website (a forum is used as an example in this guide), the following requirements must be met:

- Database nodes and service nodes are deployed on different servers.
- The number of servers is dynamically adjusted as incoming traffic changes over time.
- Traffic is automatically distributed across multiple servers.
- The website must be licensed.

According to China's regulations, Internet Content Provider (ICP) licensing is required if the servers used to deploy the website are located in the Chinese mainland. A domain name that is not licensed cannot be used to access the website.

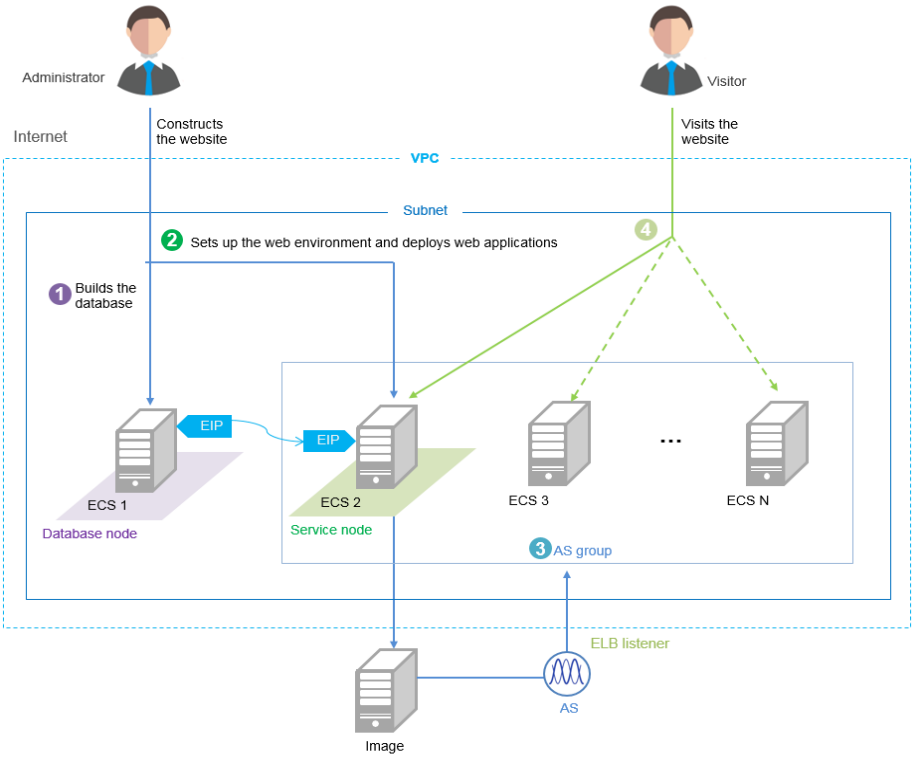
Solution

You can use the following solution to build a website.

Table 5-4 Solution details

Requirement	Solution	Service
Database nodes and service nodes are deployed on different servers.	**Building the website** ● Buy two Elastic Cloud Servers (ECSs) to replace the physical server. One ECS works as the database node, and the other as the service node. ● Create a Virtual Private Cloud (VPC) to provide network resources for the two ECSs. ● Buy an Elastic Volume Service (EVS) disk for each ECS and attach it to each ECS as the data disk if required.	ECS VPC (Optional) EVS
The number of servers is dynamically adjusted as incoming traffic changes over time.	**Configuring features**: Configure Auto Scaling (AS) policies based on service requirements. AS dynamically adds and removes ECSs created from the image of the service node as required to ensure stable and efficient service running.	AS
Traffic is automatically distributed across multiple servers.	**Configuring features**: Configure Elastic Load Balance (ELB) to automatically distribute the traffic across multiple servers, achieving better fault tolerance and expanding service capabilities for applications.	ELB

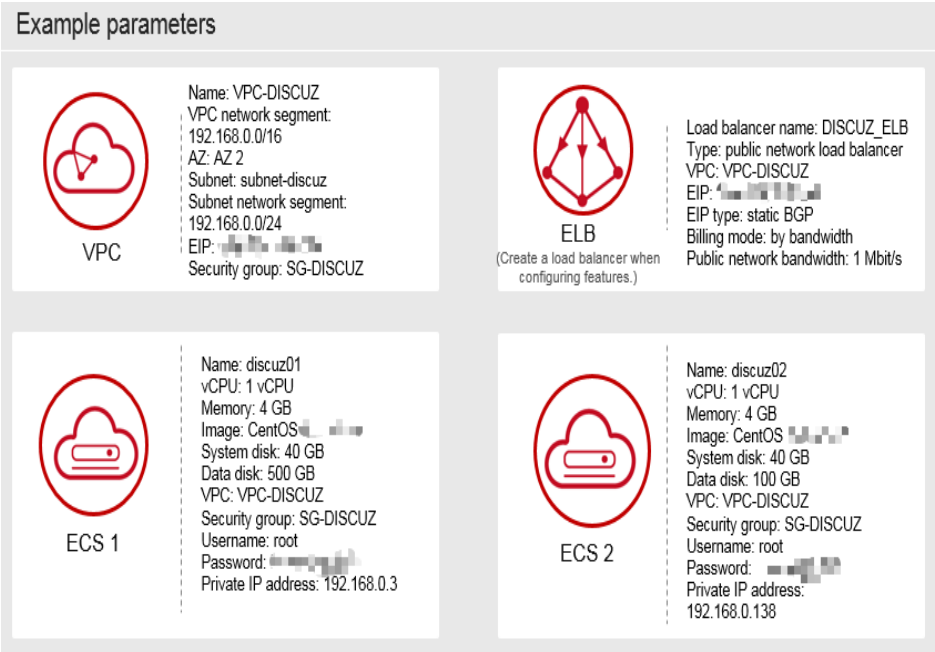
Logical Architecture



1. Bind an elastic IP address (EIP) to ECS 1 and build the database.
2. Unbind the EIP from ECS 1, bind it to ECS 2, set up the web environment, and deploy web applications.
3. As the traffic increases, AS adds ECSs created from the image of ECS 2 to the AS group.
4. Visitors access the website using the EIP of the load balancer, which automatically distributes traffic across multiple ECSs.

5.2.2 Requesting Cloud Resources

Required Cloud Resources



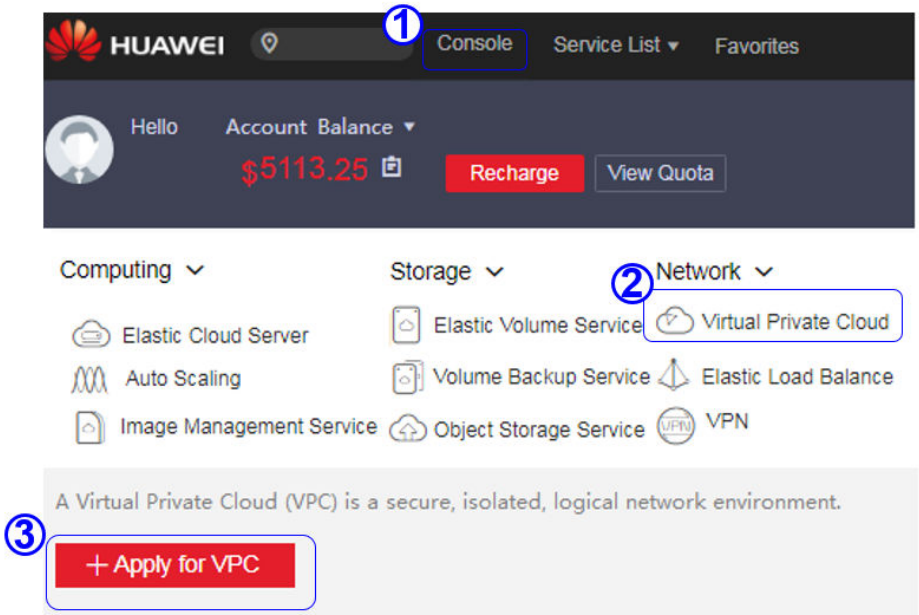
NOTE

Retain default settings for parameters not highlighted in the figures when creating or purchasing cloud resources and configuring features.

Applying for a VPC

1. On the displayed page, click **Apply for VPC**.

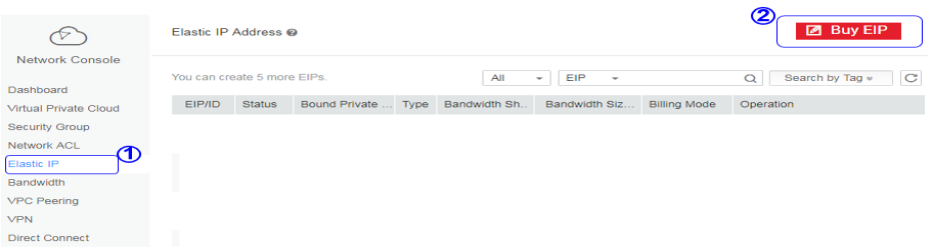
Figure 5-3 Applying for a VPC

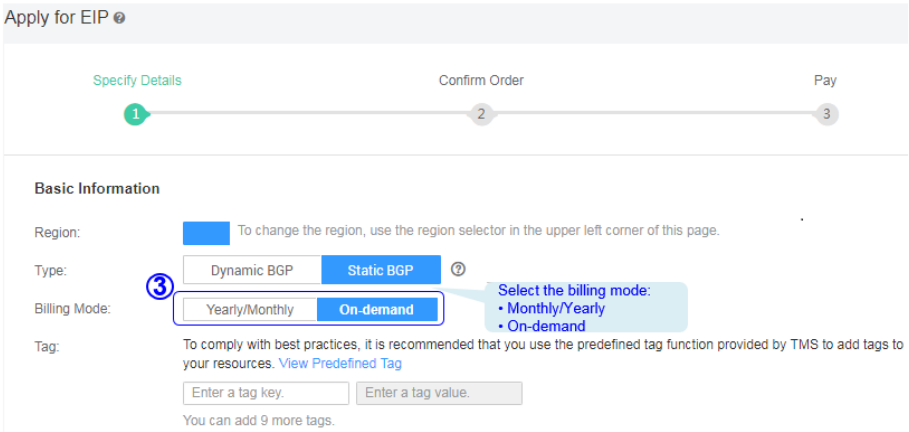


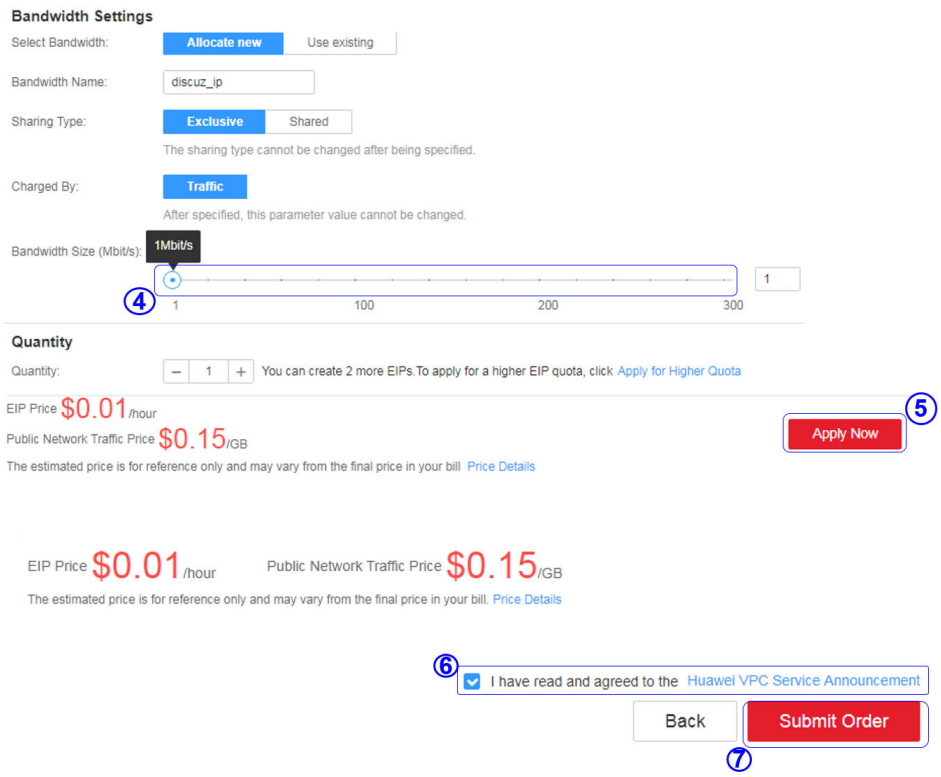
2. Configure the parameters and click **Create Now**.

Figure 5-4 Configuring parameters

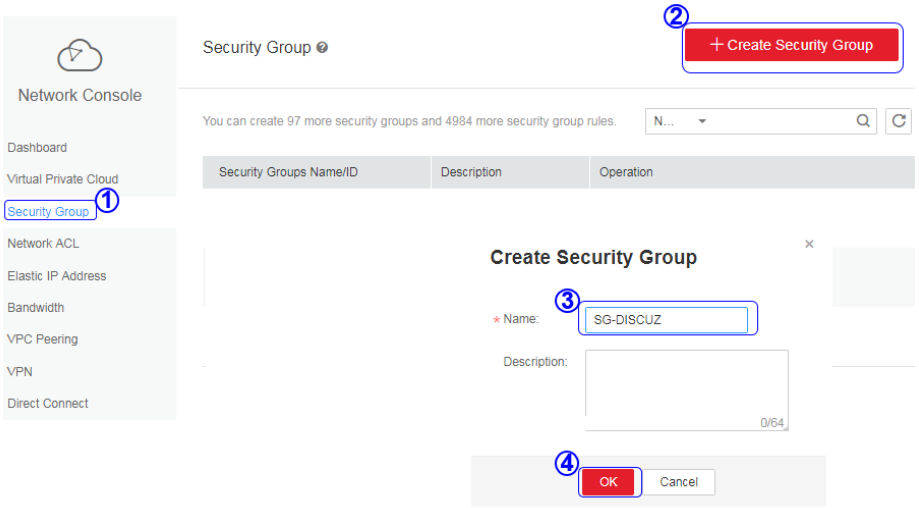
Buying an EIP

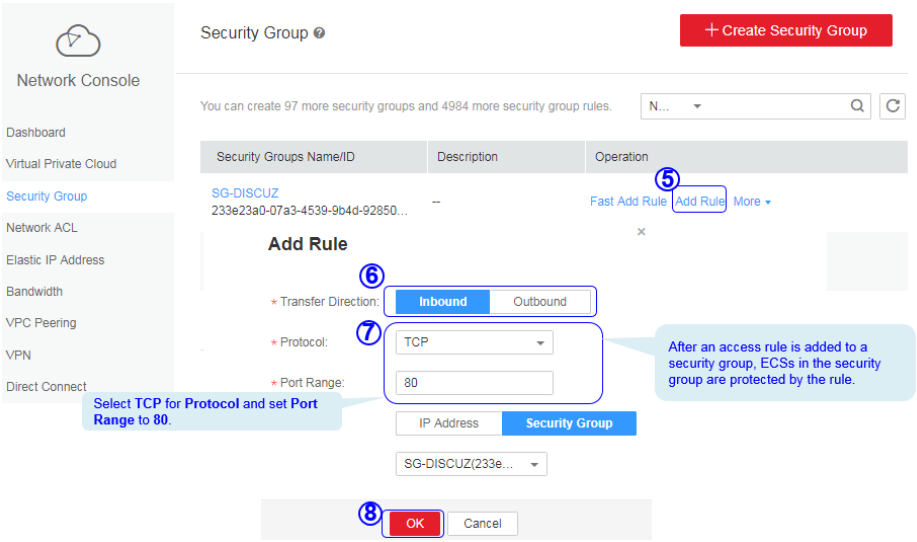






Creating a Security Group and Adding Rules



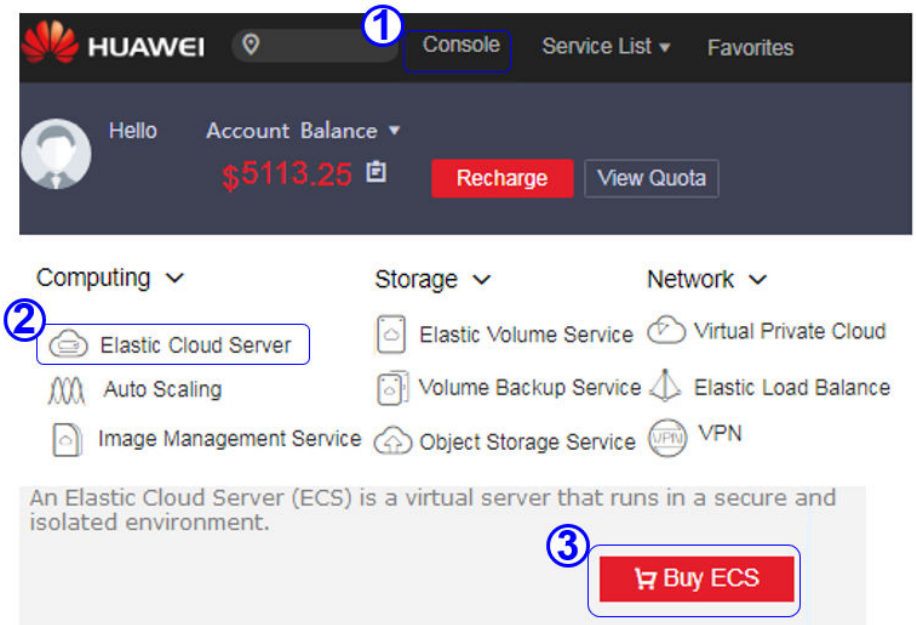


NOTE

Default security group rules cannot be deleted. Otherwise, two servers cannot communicate with each other.

Purchasing ECSs

1. Under **Computing**, click **Elastic Cloud Server**. On the page that is displayed, click **Buy ECS**.



2. Configure the parameters and submit your request.

Figure 5-5 Basic configuration

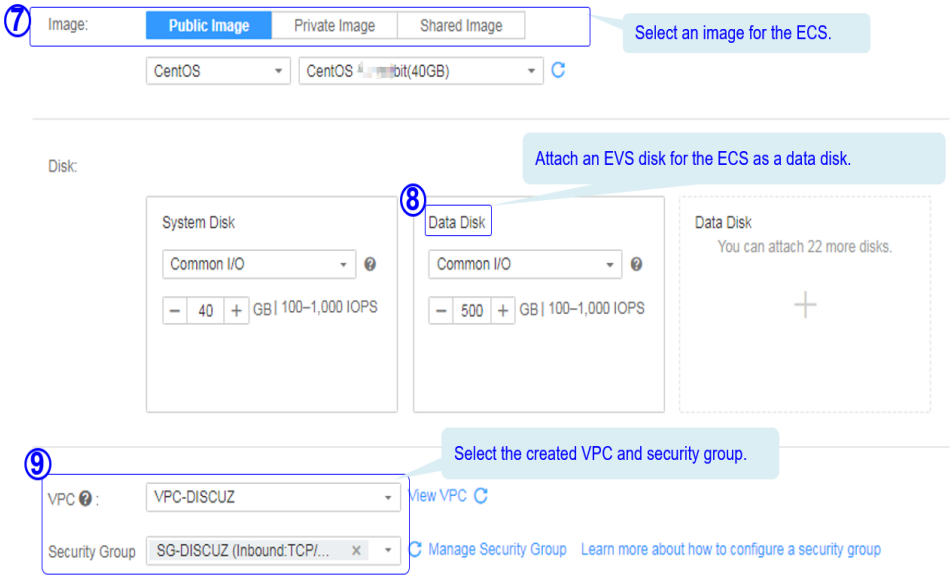


Figure 5-6 Network configuration

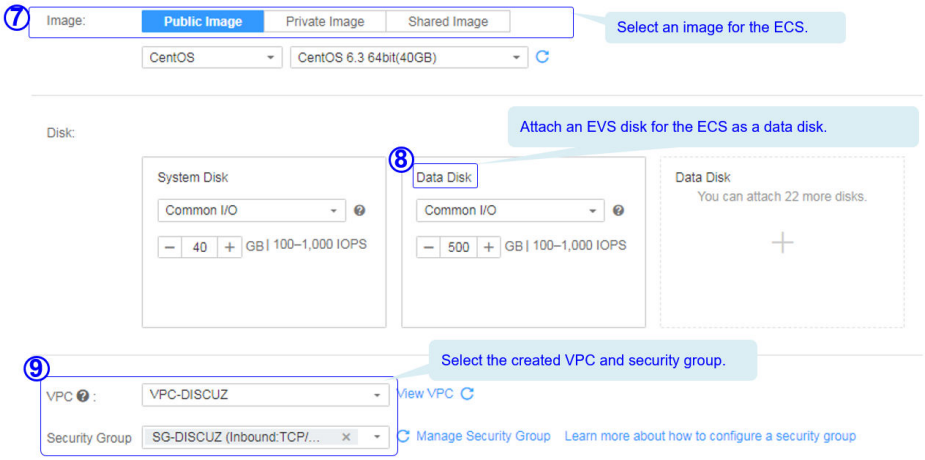


Figure 5-7 Advanced settings

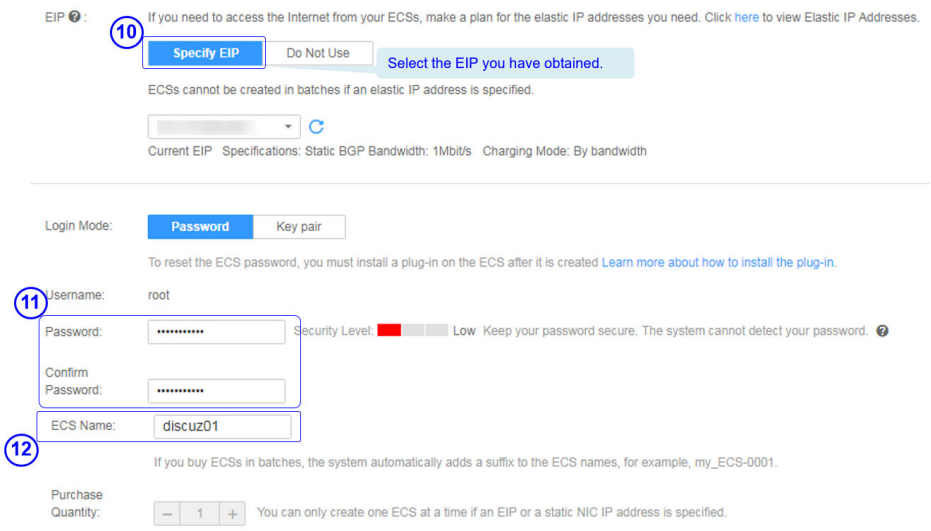
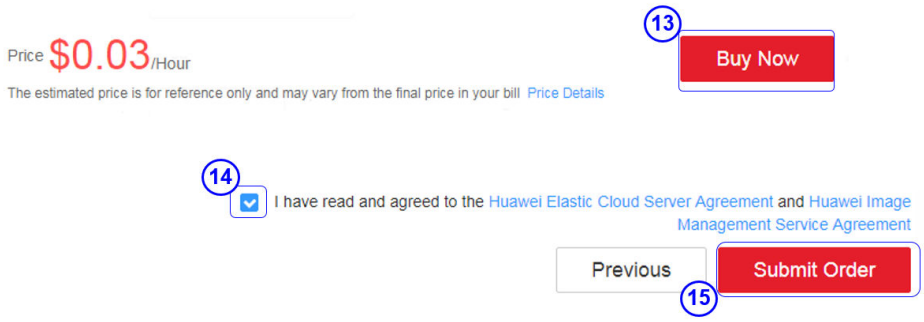


Figure 5-8 Confirming the configurations

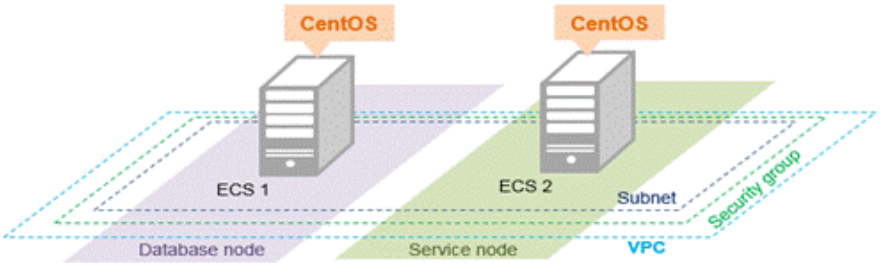


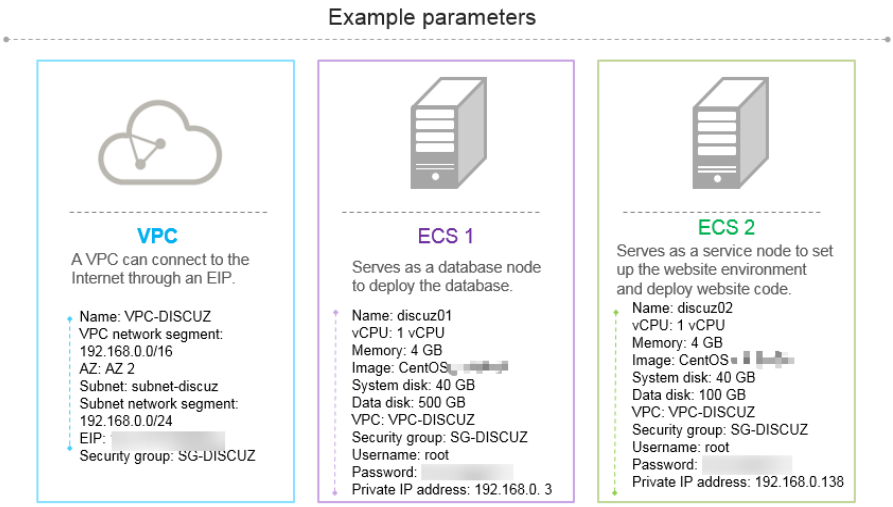
NOTE

You need to buy two ECSs. For details about their configuration, see "Example parameters".

5.2.3 Building the Website

Requested Cloud Resources





Building Process

Obtaining the Software

1. **WinSCP**

   WinSCP is a free and open-source SFTP, FTP, WebDAV and SCP client for Microsoft Windows. It is mainly used to transfer files between a local and a remote computer in a secure manner. **Download the required version of WinSCP**.

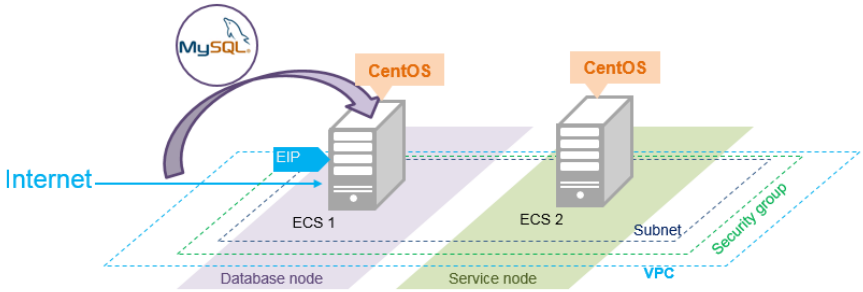
2. **Discuz X3.5 (UTF-8)**

   Discuz X3.5 (UTF-8) is used to deploy website applications. Download the software package of the required version from the official website.

   NOTE

   - The recommended English version of Discuz X3.5 (UTF-8) is not free of charge. Refer to the provided page for payment details.
   - The software packages are only used to construct the forum. To deploy a commercial website, download the applications as needed.

Building the Database



Install MySQL.

CentOS 7.2 is used as an example to describe how to install MySQL.

1. Log in to ECS **discuz01** remotely and enter the username and password.
2. Install MySQL.

   wget -i -c http://dev.mysql.com/get/mysql57-community-release-el7-10.noarch.rpm

   yum -y install mysql57-community-release-el7-10.noarch.rpm

   yum -y install mysql-community-server --nogpgcheck

Configure MySQL.

1. Start and enable MySQL.

   systemctl start mysqld

   systemctl enable mysqld
2. Query the running status of MySQL.

   systemctl status mysqld.service

   Information similar to the following is displayed:

```
# systemctl status mysqld.service
● mysqld.service - MySQL Server
   Loaded: loaded (/usr/lib/systemd/system/mysqld.service; enabled; vendor preset: disabled)
   Active: active (running) since Mon 2021-08-23 10:54:55 CST; 7s ago
     Docs: man:mysqld(8)
           http://dev.mysql.com/doc/refman/en/using-systemd.html
 Main PID: 7873 (mysqld)
   CGroup: /system.slice/mysqld.service
           └─7873 /usr/sbin/mysqld --daemonize --pid-file=/var/run/mysqld/mysqld.pid

Aug 23 10:54:49 ecs-adc3-420652-aed6 systemd[1]: Starting MySQL Server...
Aug 23 10:54:55 ecs-adc3-420652-aed6 systemd[1]: Started MySQL Server.
```

3. Obtain the password of user **root**, which was automatically set during MySQL installation:

   grep 'temporary password' /var/log/mysqld.log

   Information similar to the following is displayed:

```
2021-08-16T11:33:37.790533Z 1 [Note] A temporary password is generated for
root@localhost: ;8nPd29lhs,k
```

4. Harden MySQL.

   mysql_secure_installation

```
Securing the MySQL server deployment.

Enter password for user root:    #Enter the obtained password of user root.
The existing password for the user account root has expired. Please set a new password.

New password:  #Enter the new password.

Re-enter new password:   #Enter the new password again.
The 'validate_password' plugin is installed on the server.
The subsequent steps will run with the existing configuration of the plugin.
Using existing password for root.

Estimated strength of the password: 100
Change the password for root ? ((Press y|Y for Yes, any other key for No) : N   #Asks you whether to
change the password of user root. Press N.

 ... skipping.
By default, a MySQL installation has an anonymous user,
allowing anyone to log into MySQL without having to have
a user account created for them. This is intended only for
testing, and to make the installation go a bit smoother.
You should remove them before moving into a production
environment.

Remove anonymous users? (Press y|Y for Yes, any other key for No) : Y   #Asks you whether to
remove anonymous users. Press Y.
Success.

Normally, root should only be allowed to connect from 'localhost'. This ensures that someone cannot
guess at the root password from the network.

Disallow root login remotely? (Press y|Y for Yes, any other key for No) : Y   #Asks you whether to
forbid remote login of user root. Press Y.
Success.

By default, MySQL comes with a database named 'test' that anyone can access. This is also intended
only for testing, and should be removed before moving into a production environment.

Remove test database and access to it? (Press y|Y for Yes, any other key for No) : Y   #Asks you
whether to delete the test database and cancel access permissions to it. Press Y.
 - Dropping test database...
Success.

 - Removing privileges on test database...
Success.

Reloading the privilege tables will ensure that all changes
made so far will take effect immediately.

Reload privilege tables now? (Press y|Y for Yes, any other key for No) : Y   #Asks you whether to
reload privilege tables. Press Y.
Success.

All done!
```

5. Enter the password of user **root** to log in to the database.

   mysql -u root -p

6. Set the MySQL database as the default database.

   use mysql;

7. Query the user list.

   select host,user from user;

   NOTE

   This command and the following database commands must end with a semicolon (;).

8. Refresh the user list and allow all IP addresses to access the database.

   update user set host='%' where user='root' LIMIT 1;

9. Forcibly update the permissions to allow ECSs in the same subnet to access the MySQL database using private IP addresses.

   flush privileges;

10. Exit the database.

    quit

11. Restart MySQL.

    systemctl restart mysqld

12. Enable MySQL to automatically start upon system boot.

    systemctl enable mysqld

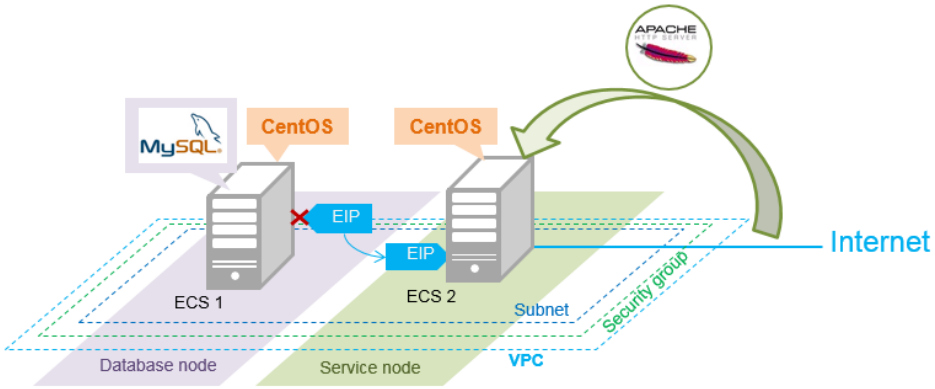
13. Disable the firewall.

    systemctl stop firewalld.service

14. Check the firewall status.

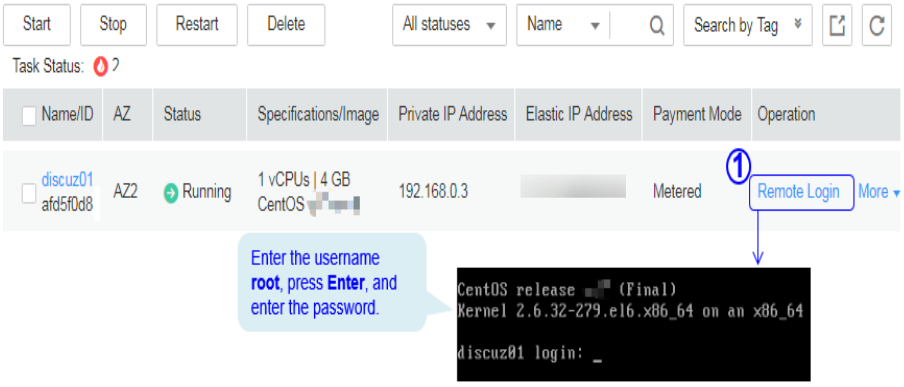
    systemctl status firewalld

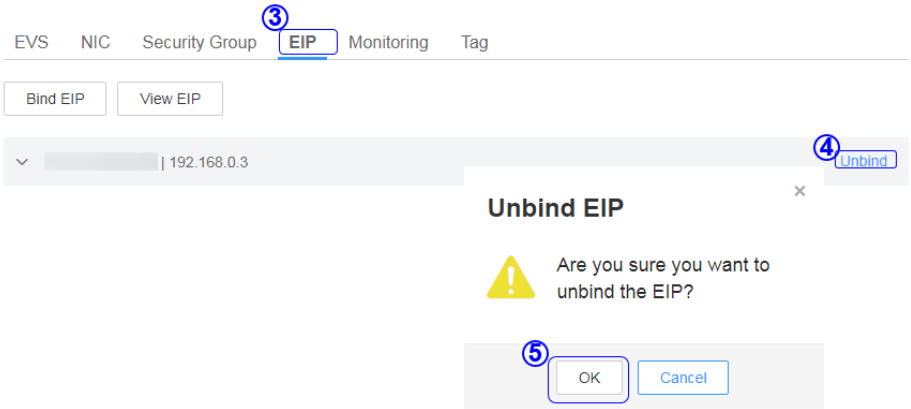
Setting Up the Web Environment

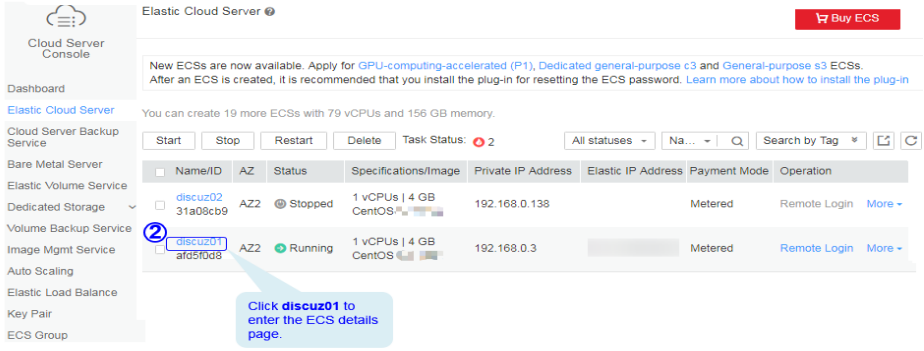


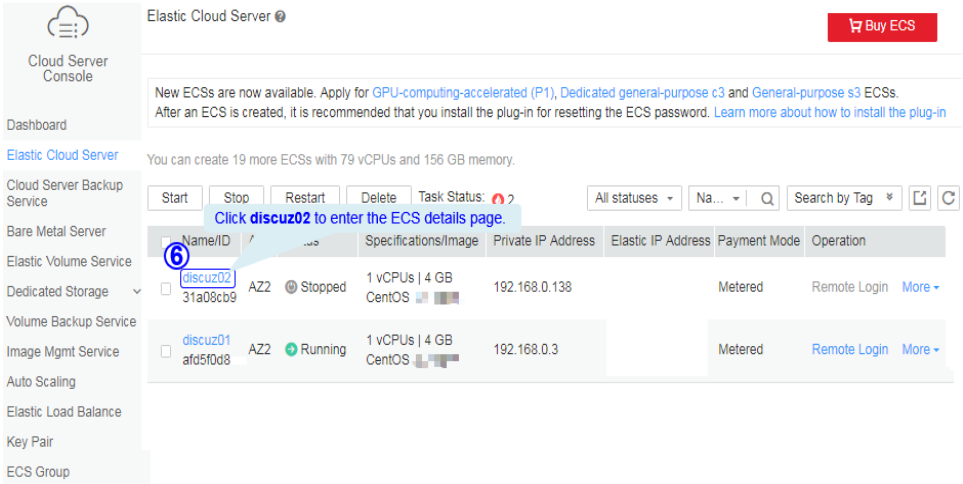
Install the web environment.

1. Unbind the EIP from ECS **discuz01** and bind it to ECS **discuz02**.









2. Log in to ECS **discuz02** remotely and enter the username and password.
3. Install MySQL.

   wget -i -c http://dev.mysql.com/get/mysql57-community-release-el7-10.noarch.rpm

   yum -y install mysql57-community-release-el7-10.noarch.rpm

   yum -y install mysql-community-server --nogpgcheck
4. Install the Apache HTTP Server (httpd), PHP FastCGI Process Manager (php-fpm), MySQL client (mysql), and MySQL server (mysql-server).

   yum install -y httpd php php-fpm mysql mysql-server php-mysql

If the following information is displayed, the installation is successful.

```
Complete!
```

5. Reinstall the Apache HTTP Server (httpd), PHP FastCGI Process Manager (php-fpm), MySQL client (mysql), and MySQL server (mysql-server).

   yum reinstall -y httpd php php-fpm mysql mysql-server php-mysql

   If the following information is displayed, the installation is successful.

```
Complete!
```

Configure the web environment.

1. Start httpd.

   service httpd start

2. Enable httpd to automatically start upon system boot.

   chkconfig httpd on

3. Start php-fpm.

   service php-fpm start

4. Enable php-fpm to automatically start upon system boot.

   chkconfig php-fpm on

5. Disable the firewall.

   systemctl stop firewalld.service

6. Check the firewall status again.

   systemctl status firewalld

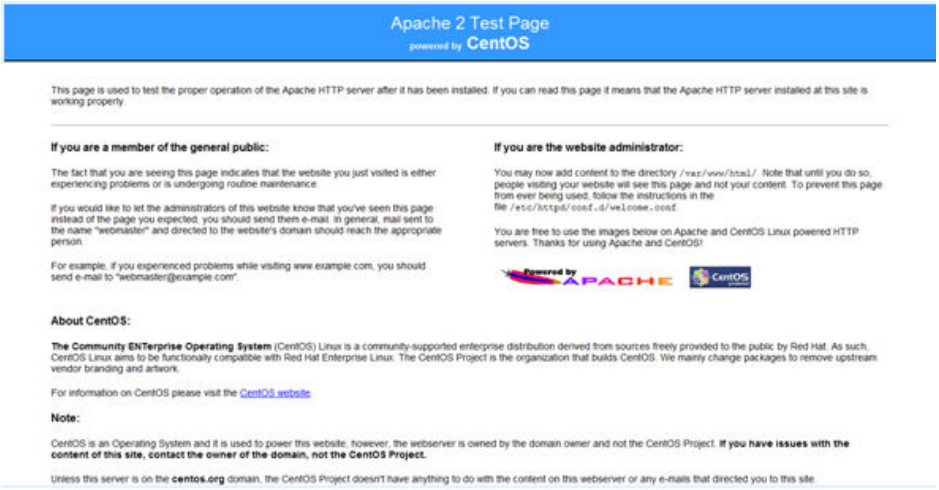
7. Start MySQL.

   systemctl start mysqld

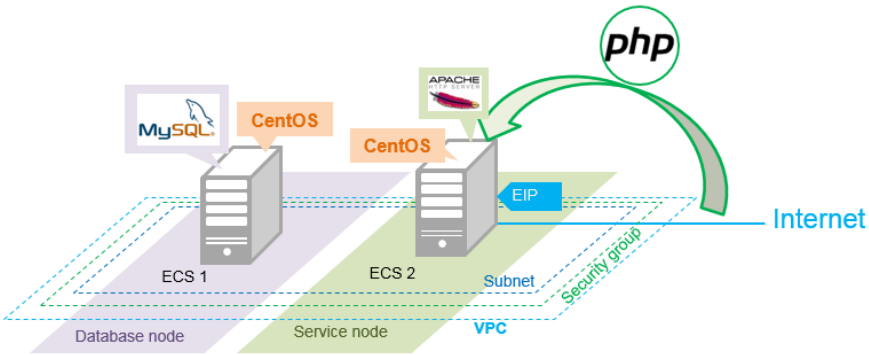
8. Enable MySQL to automatically start upon system boot.

   systemctl enable mysqld.service

9. Enter **http://***EIP* in a browser to query the default page of the ECS.



Deploying the Website Code

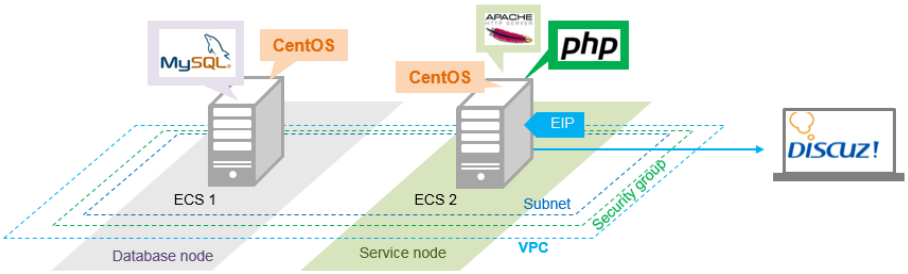


1. Decompress the **Discuz_X3.5_SC_UTF8_20231001.zip** package to the **Discuz_X3.5_SC_UTF8_20231001** folder.
2. Use WinSCP to upload the **upload** file in the **Discuz_X3.5_SC_UTF8_20231001** folder to the **/var/www/html** directory on ECS discuz02. For details, see WinSCP documents.
3. Log in to **discuz02** and run the following command to grant the write permission to other users:

   chmod -R 777 /var/www/html
4. Enter **http://***Elastic IP address* in the address bar of a browser. Follow the installation wizard to install Discuz.
   - The database address if the private IP address of **discuz01**.
   - The database password is the password of the database administrator's root account configured on **discuz01**.

Verifying the Website

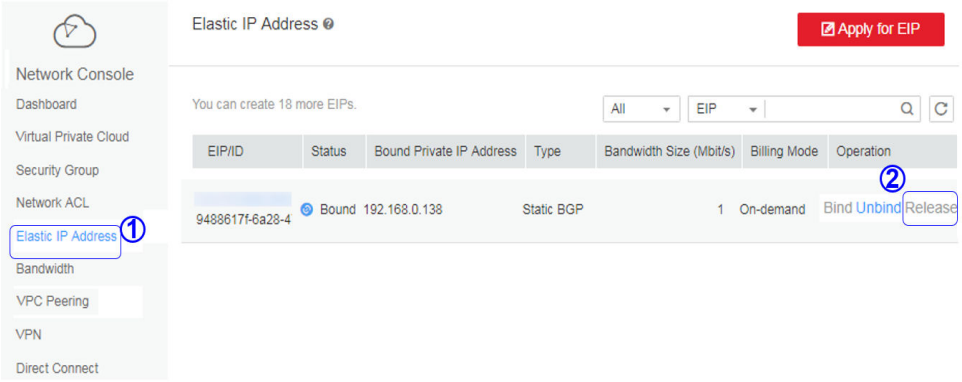
In the browser address bar, enter **http://***Elastic IP address***/forum.php**. If the forum homepage is displayed, the website is successfully built.



5.2.4 Configuring Features

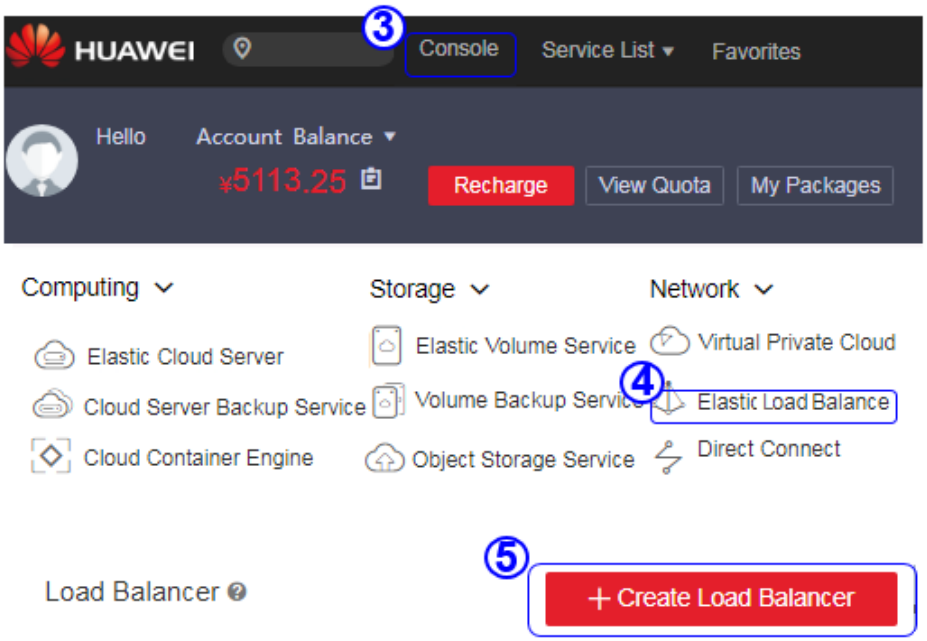
Unbinding the EIP

By default, you can use only one EIP. You can apply for more as needed. If you create a load balancer on a public network, the system will automatically bind an EIP to the load balancer. To ensure that an EIP can be bound to the load balancer, unbind the EIP bound to the ECS before you create the load balancer if you have only one EIP.

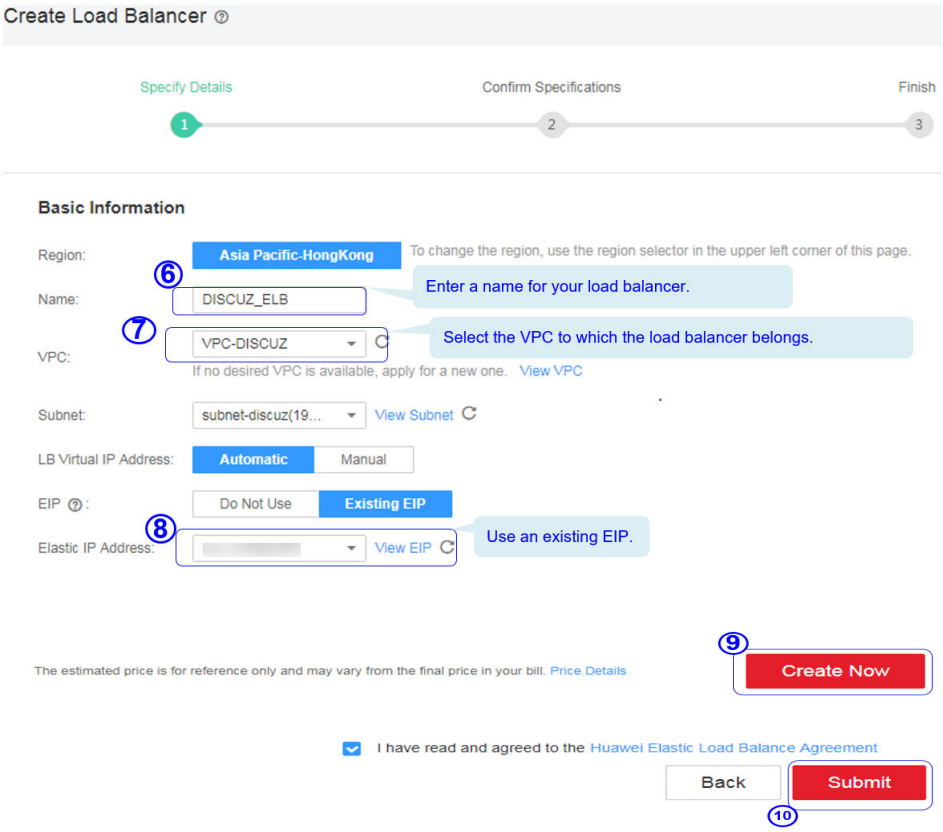


Creating a Load Balancer

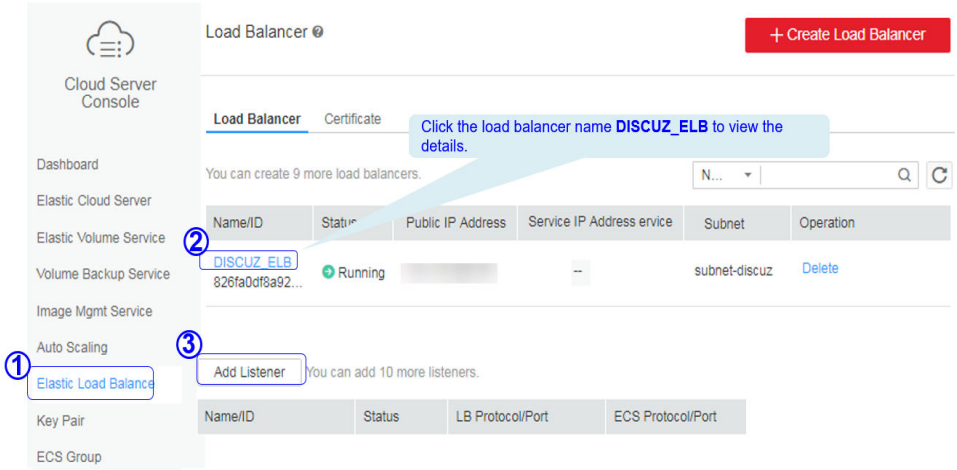
1. On the displayed page, click **Create Load Balancer**.

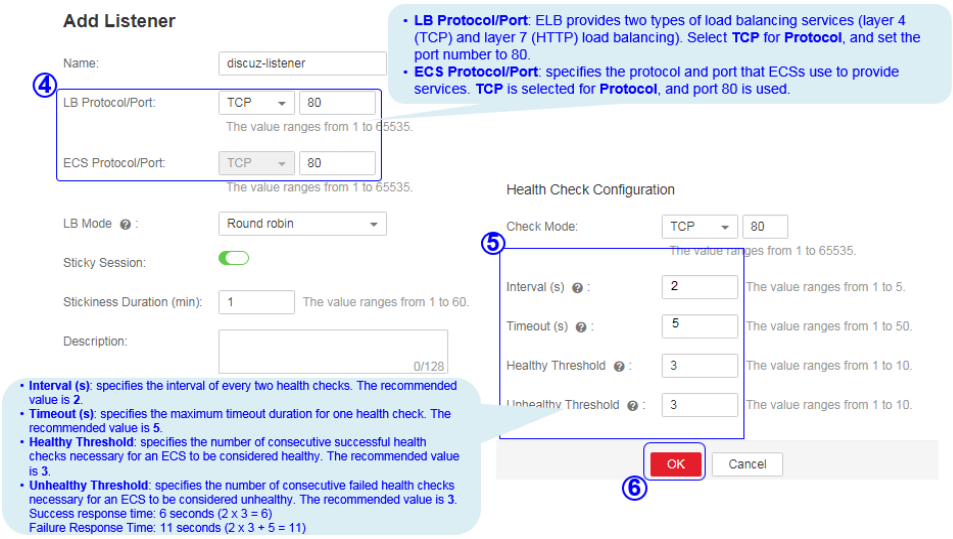


2. Specify the parameters and submit the application.



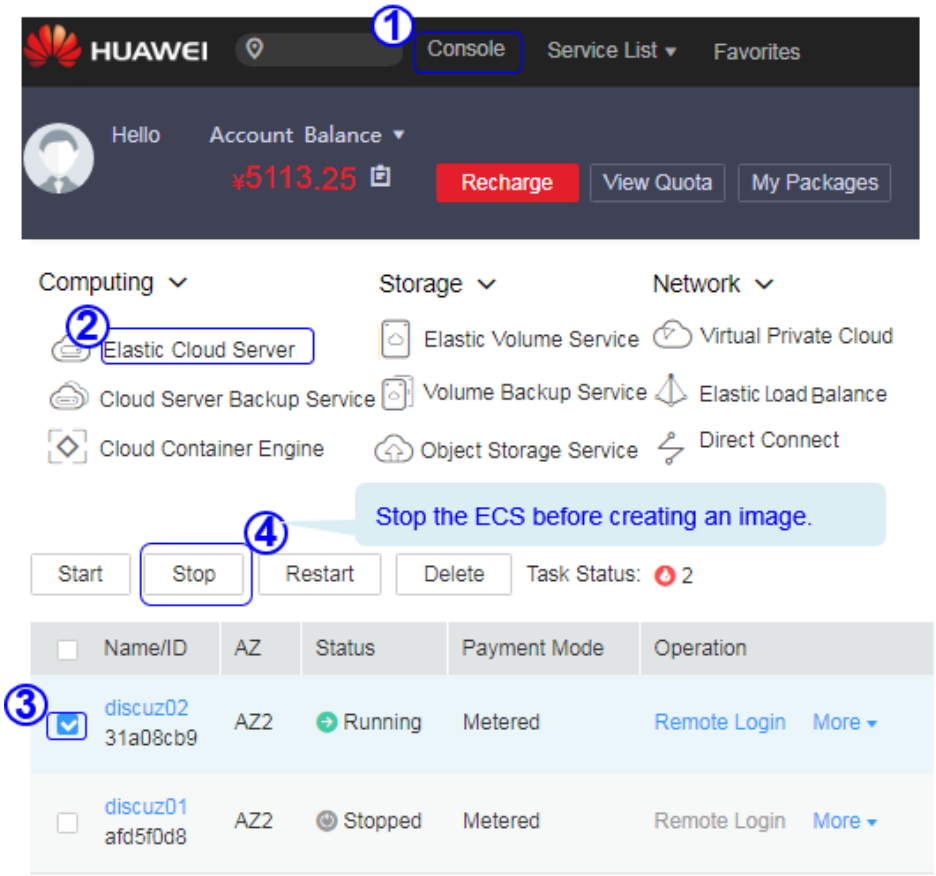
Configuring the Load Balancer



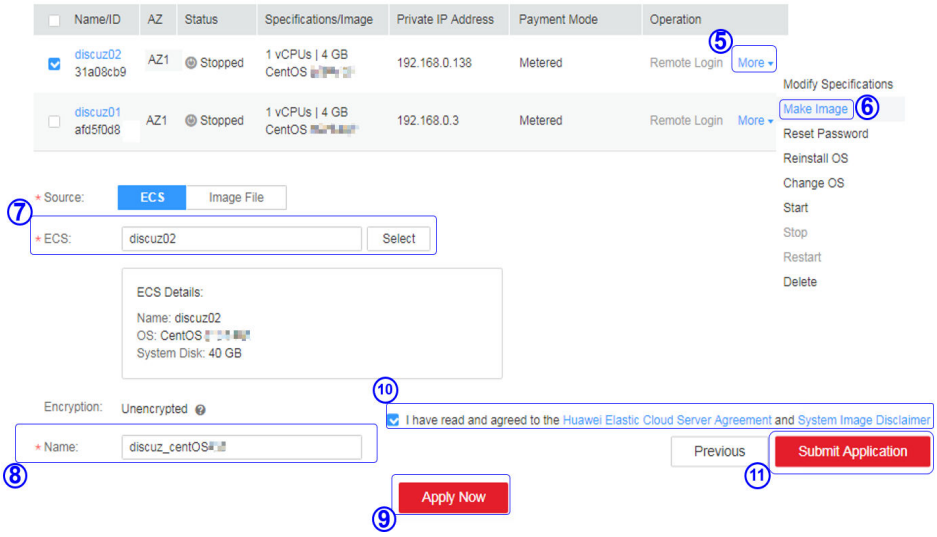


Creating Images

1. Under **Computing**, click **Elastic Cloud Server**. On the page that is displayed, locate and stop the ECS.

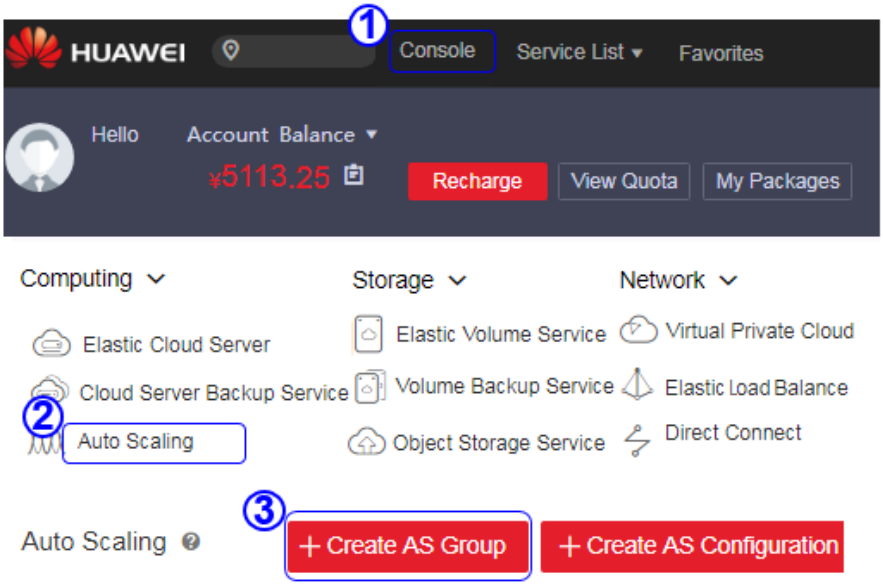


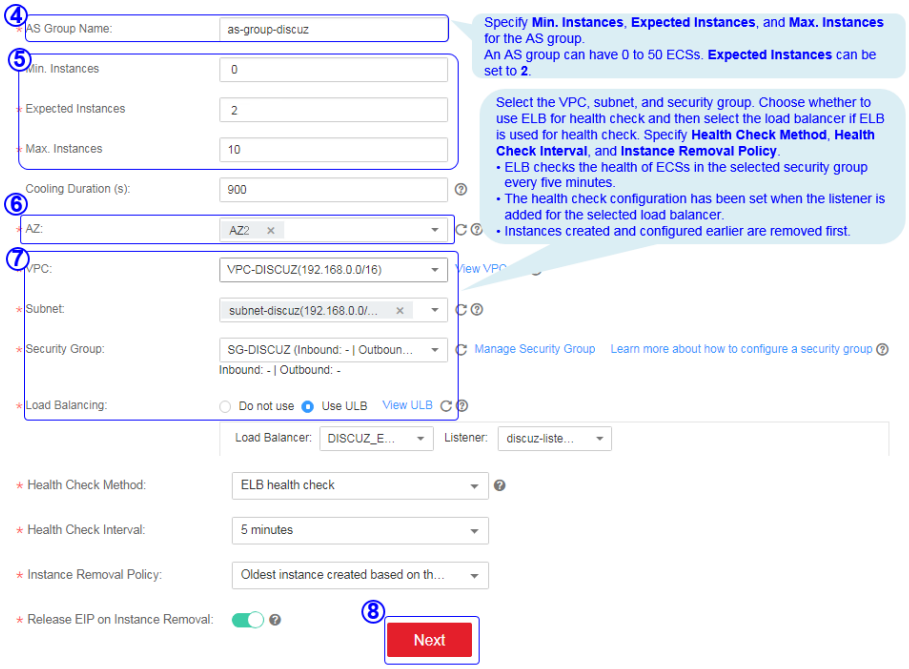
2. Configure the parameters and submit your request.

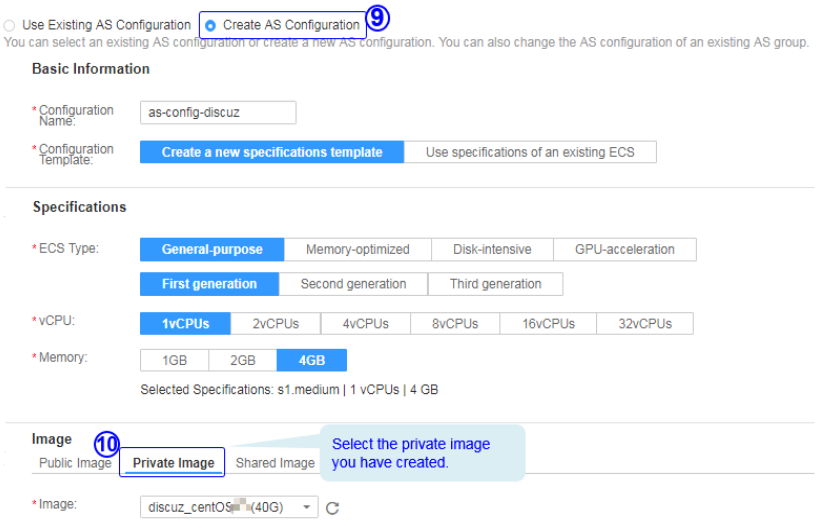


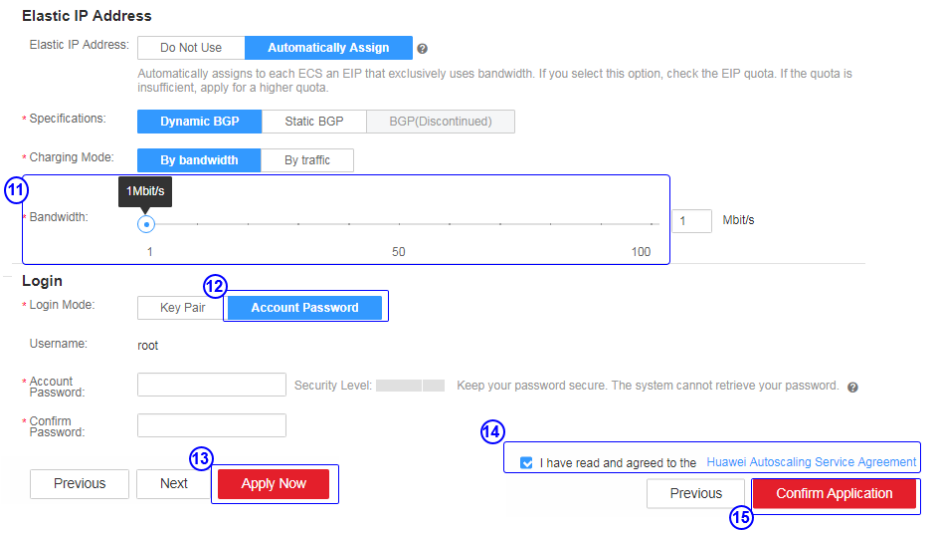
Configuring AS

1. Under **Computing**, click **Auto Scaling**. Create an AS group and AS configuration.

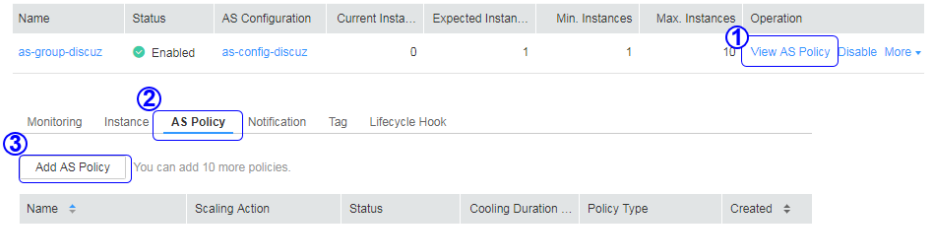


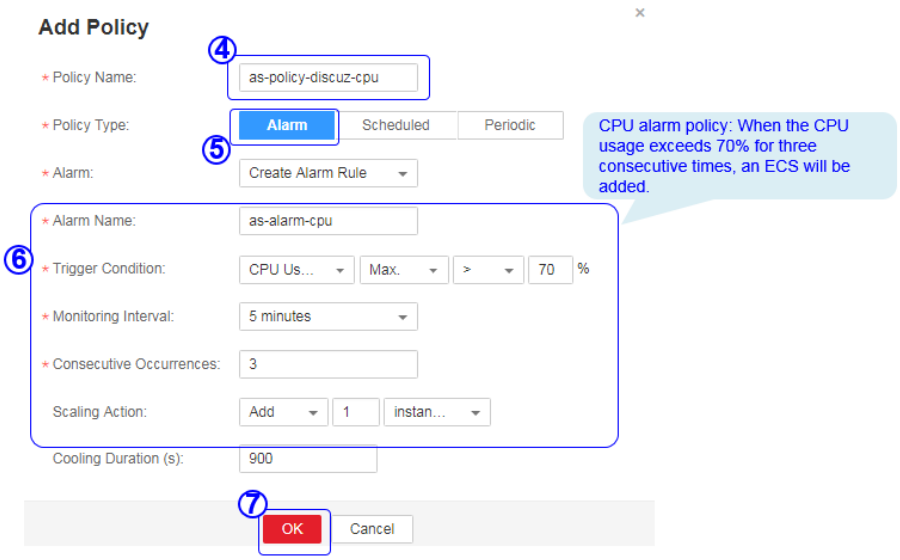


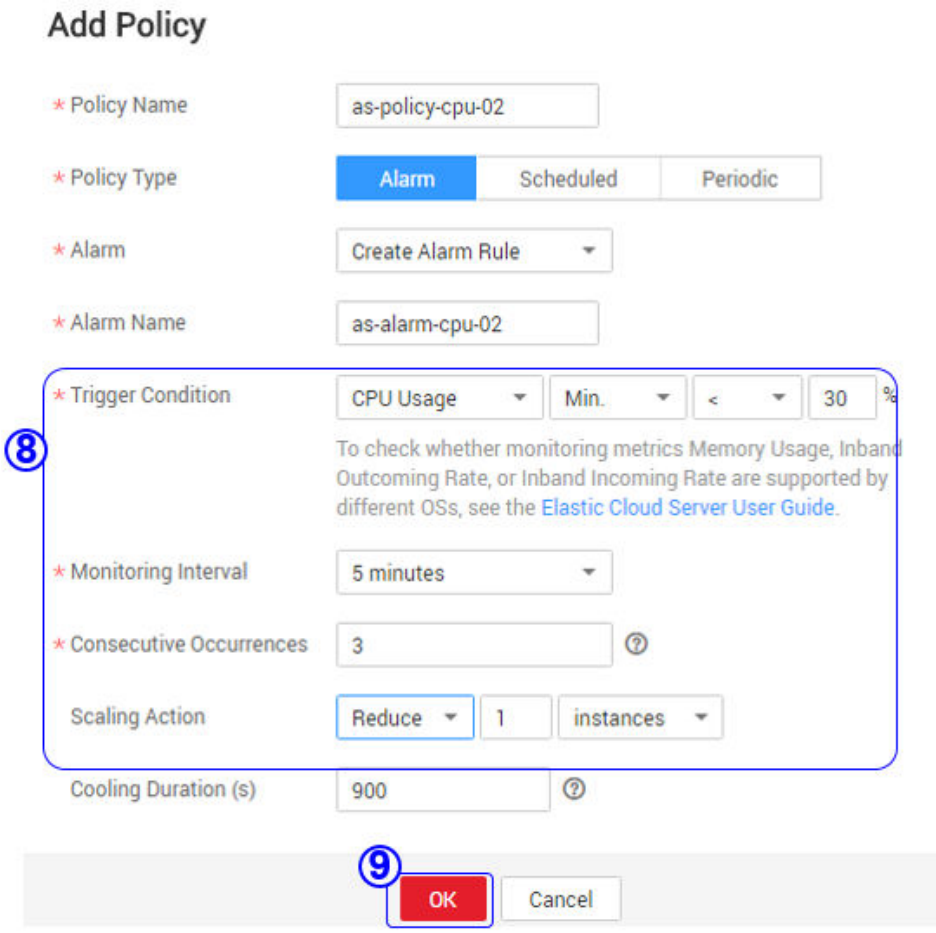




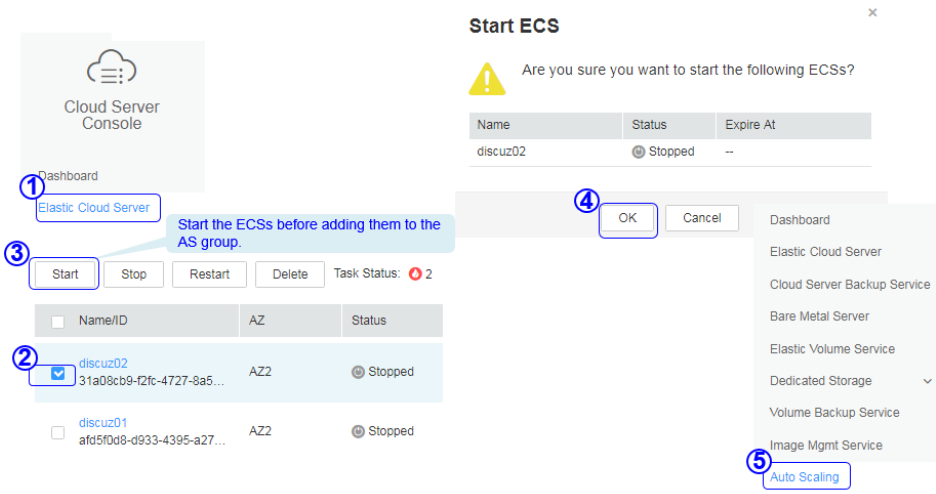
2. Configure AS policies.

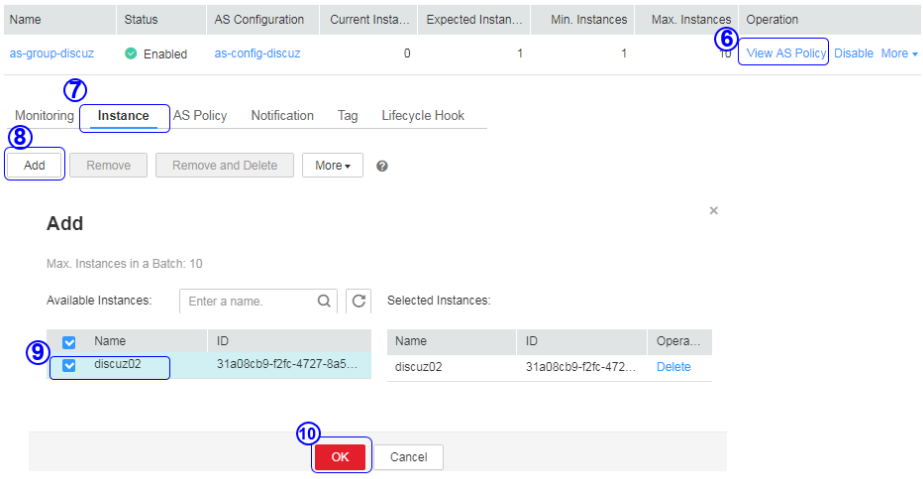




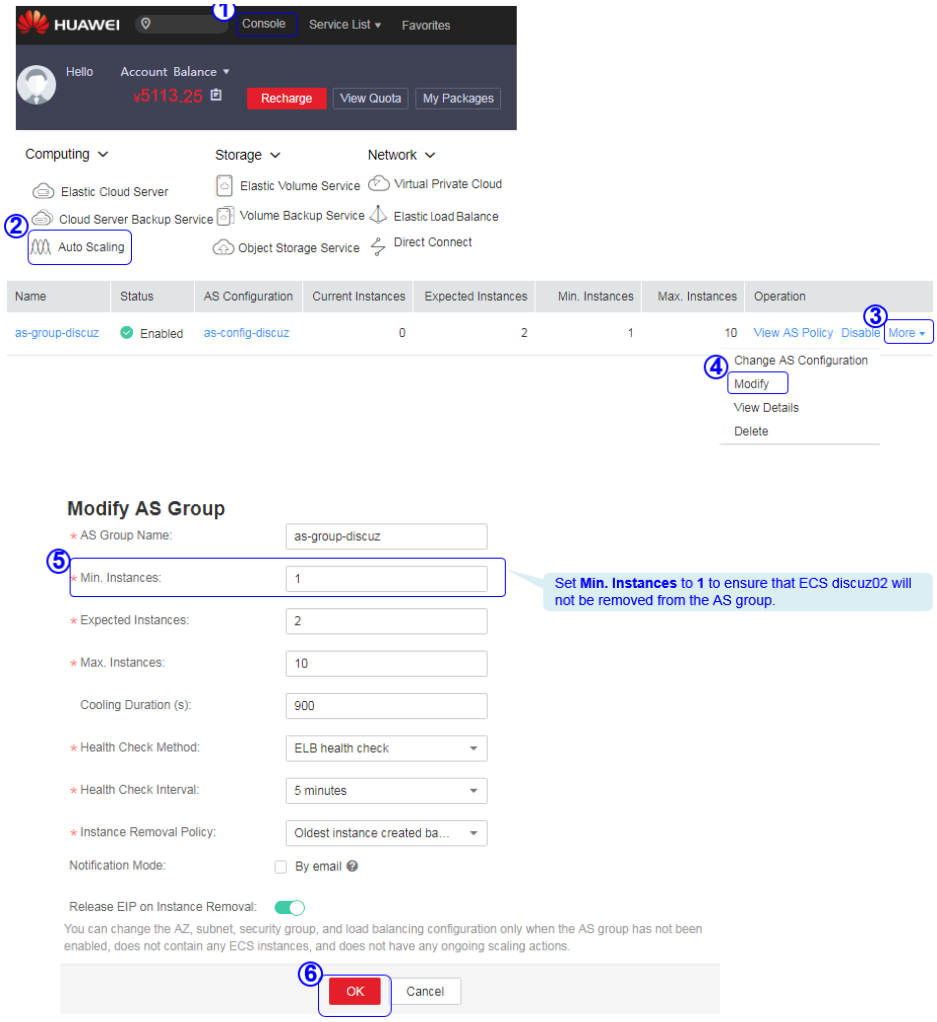


3. Add AS instances.



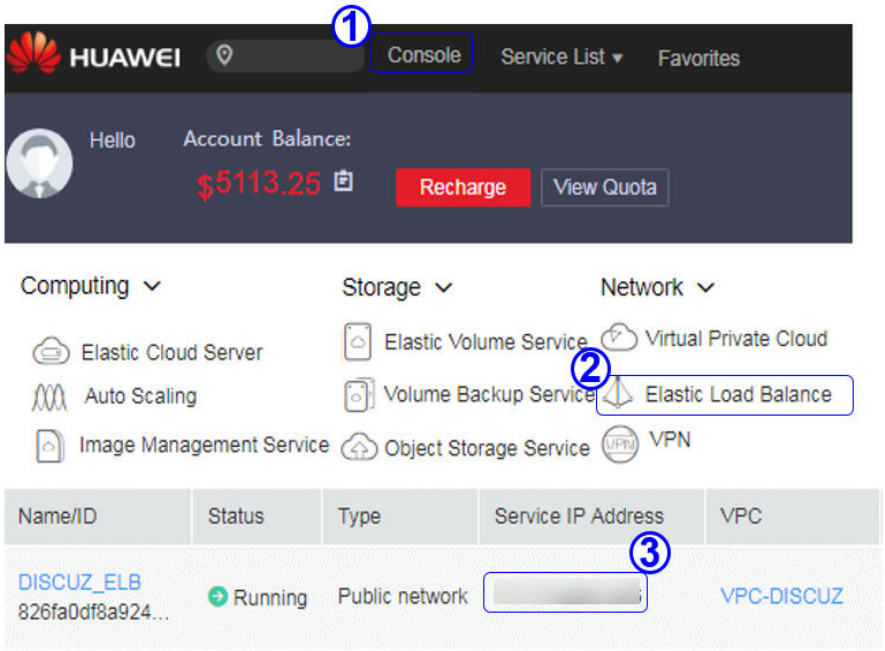


4. Modify AS policies.



Verifying the Configuration

1. Obtain the EIP of the load balancer.



2. In the browser address box, enter **http://***EIP of the load balancer*/**forum.php** to access the website, for example, **http://114.115.138.223/forum.php**.

5.2.5 Visiting the Website

Filing the Website

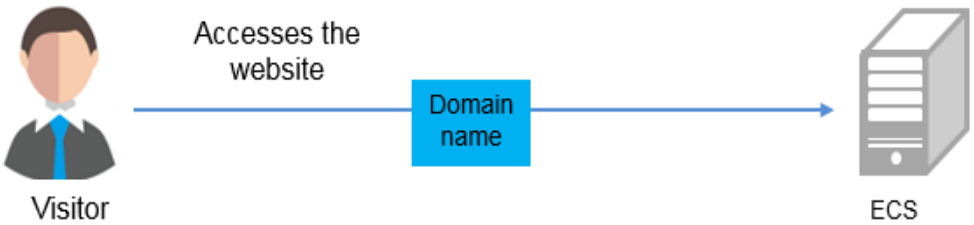
According to national regulations, if the servers used to deploy the website are located in the Chinese mainland, Internet Content Provider (ICP) licensing is required. The domain name that is not licensed cannot be used to access the website.

The prerequisites for ICP licensing are as follows:

- The domain name has been registered.
- Ensure that the IP address is possessed by Huawei.
- The website is a non-operating one.

Accessing the Website

Visitors can access the Internet using the domain name.



5.3 Setting Up a Magento E-Commerce Website

5.3.1 Manually Setting Up a Magento E-Commerce Website (Linux)

Overview

The section guides you through the manual setup of a Magento e-commerce website on a Linux ECS. Magento is an open source e-commerce system that features flexible design, modular architecture, and rich functions. It is suitable for building medium- and large-sized sites. Magento is written in PHP and employs the MySQL database management system for data storage.

Prerequisites

- You have purchased an ECS and bound an EIP to it.
- The rules listed in the following table have been added to the security group which the target ECS belongs to. For details, see **Adding a Security Group Rule**.

Table 5-5 Security group rules

Direction	Priority	Action	Type	Protocol & Port	Source Address
Inbound	1	Allow	IPv4	TCP: 22	IP address of the client that is allowed to remotely connect to Linux ECSs using SSH. If the source IP is set to **0.0.0.0/0**, access from all IP addresses is allowed. For security purposes, **0.0.0.0/0** is not recommended.
Inbound	1	Allow	IPv4	TCP: 80	IP address of the client that is allowed to access Magento. If the source IP is set to **0.0.0.0/0**, access from all IP addresses is allowed.

Direction	Priority	Action	Type	Protocol & Port	Source Address
Inbound	1	Allow	IPv4	TCP : 3306	IP address of the client that is allowed to remotely access MySQL databases. If the source IP is set to **0.0.0.0/0**, access from all IP addresses is allowed. For security purposes, **0.0.0.0/0** is not recommended.

Resource Planning

Table 5-6 lists the resource configuration and software versions used in this practice. The commands and parameters may vary according to the hardware specifications or software versions you would use.

Table 5-6 Resource planning

Resource	Type	Specification/Version
ECS configuration	Flavor	c6s.large.2
	vCPUs	2 vCPUs
	Memory	4 GiB
	OS	CentOS 7.2
Software resources	Apache	2.4.6
	MySQL	5.7 Download URL: **http://dev.mysql.com/get/mysql57-community-release-el7-8.noarch.rpm**
	PHP	7.0.33 Download URL: **https://mirror.webtatic.com/yum/el7/webtatic-release.rpm**

Resource	Type	Specification/Version
	Composer	1.10.19 Download URL: **https://getcomposer.org/installer**
	Magento	2.1.0 Download URL: **https://github.com/magento/magento2.git**

NOTE

To make sure that the website works properly, use an ECS whose memory is 2 GiB or higher.

Step 1: Install and Configure Apache

Step 1 Remotely log in to the ECS by referring to **Logging In to a Linux ECS**.

Step 2 Run the following commands as user **root** to update the software package and install Apache:

```
yum -y update
yum -y install httpd
```

NOTE

If an error message is displayed, indicating that the domain name cannot be resolved, add a DNS server to the **/etc/resolv.conf** file.

Step 3 Open the Apache configuration file.

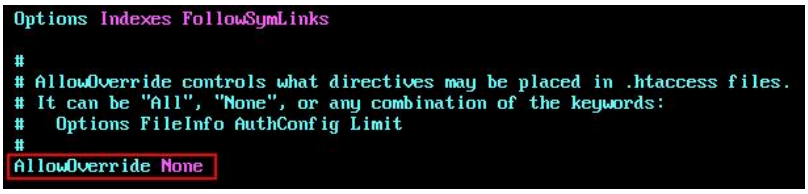
```
vim /etc/httpd/conf/httpd.conf
```

NOTE

If vim is not installed, run the **yum install -y vim*** command to install it.

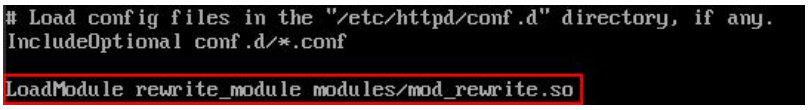
Step 4 Press **i** to enter insert mode and modify the file as follows:

- Change **AllowOverride None** to **AllowOverride all**.



- Add the following parameters to the end of the configuration file:

```
LoadModule rewrite_module modules/mod_rewrite.so
```



Step 5 Press **Esc** to exit insert mode. Then, enter **:wq** to save the settings and exit.

Step 6 Run the following commands in sequence to start Apache and enable it to start automatically upon ECS startup:

```
systemctl start httpd
systemctl enable httpd
```

----End

Step 2: Install and Configure MySQL

Step 1 Run the following command as the **root** user to add a yum repository:

```
rpm -Uvh http://dev.mysql.com/get/mysql57-community-release-el7-8.noarch.rpm
```

Step 2 Run the following command to Install MySQL:

```
yum -y install mysql-community-server --nogpgcheck
```

Step 3 Run the following commands in sequence to start MySQL and enable it to start automatically upon ECS startup:

```
systemctl start mysqld
systemctl enable mysqld
```

Step 4 Run the following command to obtain the **root** user's password that is automatically set during MySQL installation:

```
grep 'temporary password' /var/log/mysqld.log
```

Information similar to the following is displayed, in which **(n?K7jP#cirM** is the temporary password.

```
2019-05-09T11:29:42.365419Z 1 [Note] A temporary password is generated for root@localhost: (n?K7jP#cirM
```

Step 5 Run the following command to harden MySQL:

```
mysql_secure_installation
```

Perform operations as prompted.

```
Securing the MySQL server deployment.

Enter password for user root:    #Enter the obtained password of user root.
The existing password for the user account root has expired. Please set a new password.

New password:                    #Set a new password for user root.

Re-enter new password:           #Enter the new password again.
The 'validate_password' plugin is installed on the server.
The subsequent steps will run with the existing configuration of the plugin.
Using existing password for root.

Estimated strength of the password: 100
Change the password for root ? ((Press y|Y for Yes, any other key for No) : Y   #Press Y to change the
password of user root.

New password:    #Enter a new password that consists of 8 to 30 characters, including letters, digits, and
special characters (` ~!@#$%^&*-+=|(){}[]:;'<>,.?/).
Re-enter new password:    #Enter the new password again.
Estimated strength of the password: 100
Do you wish to continue with the password provided?(Press y|Y for Yes, any other key for No) : Y    #Press Y.
By default, a MySQL installation has an anonymous user, allowing anyone to log into MySQL without
having to have a user account created for them. This is intended only for testing, and to make the
installation go a bit smoother. You should remove them before moving into a production environment.

Remove anonymous users? (Press y|Y for Yes, any other key for No) : Y   #Press Y to remove anonymous
users.
Success.
```

```
Normally, root should only be allowed to connect from 'localhost'. This ensures that someone cannot guess
at the root password from the network.

Disallow root login remotely? (Press y|Y for Yes, any other key for No) : Y   #Press Y to disallow remote
logins of user root.
Success.

By default, MySQL comes with a database named 'test' that anyone can access. This is also intended only
for testing, and should be removed before moving into a production environment.

Remove test database and access to it? (Press y|Y for Yes, any other key for No) : Y   #Press Y to delete the
test database and remove access to it.
 - Dropping test database...
Success.

 - Removing privileges on test database...
Success.

Reloading the privilege tables will ensure that all changes
made so far will take effect immediately.

Reload privilege tables now? (Press y|Y for Yes, any other key for No) : Y   #Press Y to reload privilege tables.
Success.

All done!
```

Step 6 Log in to the MySQL database as the **root** user.

```
mysql -u root -p
```

Step 7 Run the following command to create a database named **magento**.

```
CREATE DATABASE magento;
```

Step 8 Run the following command to create a user for the database and assign full permissions to the user:

```
GRANT ALL ON magento.* TO magentouser@localhost IDENTIFIED BY 'xxxxx';
```

In this command, **magento** is the name of the database created in the previous step, **magentouser** is the name of the database user, and **xxxxx** is the password of the database user.

Step 9 Run the following command to exit the MySQL CLI:

```
exit
```

Step 10 (Optional) Perform the following operations to check whether the database and account have been created and then exit the MySQL CLI:

1. Run the following command to log in to the MySQL CLI as user **magentouser**:

   ```
   mysql -u magentouser -p
   ```

2. Run the following command to view the created database:

   ```
   SHOW DATABASES;
   ```

   In the displayed information, **magento** is the newly created database.

   ```
   +--------------------+
   | Database           |
   +--------------------+
   | information_schema |
   | magento            |
   +--------------------+
   2 rows in set (0.00 sec)
   ```

3. Run the following command to exit the MySQL CLI:

   ```
   exit
   ```

----End

Step 3: Install and Configure PHP

Step 1 Run the following command to add the IUS and EPEL repositories:

```
yum install \
https://repo.ius.io/ius-release-el7.rpm \
https://dl.fedoraproject.org/pub/epel/epel-release-latest-7.noarch.rpm
```

Step 2 Run the following command to add a webtatic repository:

```
rpm -Uvh https://mirror.webtatic.com/yum/el7/webtatic-release.rpm
```

Step 3 Run the following command to install PHP7 and required PHP extensions for Magento:

```
yum -y install php70w php70w-pdo php70w-mysqlnd php70w-opcache php70w-xml php70w-gd php70w-mcrypt php70w-devel php70w-intl php70w-mbstring php70w-bcmath php70w-json php70w-iconv
```

Step 4 Run the following command to check the version of the installed PHP:

```
php -v
```

Information similar to the following is displayed:

```
PHP 7.0.33 (cli) (built: Dec  6 2018 22:30:44) ( NTS )
Copyright (c) 1997-2017 The PHP Group
Zend Engine v3.0.0, Copyright (c) 1998-2017 Zend Technologies
    with Zend OPcache v7.0.33, Copyright (c) 1999-2017, by Zend Technologies
```

Step 5 Run the following command to open the PHP configuration file **php.ini**:

```
vim /etc/php.ini
```

Step 6 Press **i** to enter insert mode and modify the file as follows:

- Set **memory_limit** to a proper value.

```
; Maximum amount of memory a script may consume (128MB)
; http://php.net/memory-limit
memory_limit = 256M
```

- Uncomment and set **date.timezone**.

```
[Date]
; Defines the default timezone used by the date functions
; http://php.net/date.timezone
date.timezone = Asia/Shanghai
```

Step 7 Press **Esc** to exit insert mode. Then, enter **:wq** to save the settings and exit.

Step 8 Run the following command to restart the web service process:

```
systemctl restart httpd
```

----End

Step 4: Install Composer

Composer is a package manager for the PHP programming language that provides a standard format for managing dependencies of PHP software and required libraries.

Step 1 Install composer 1.*x* for the dependency of Magento 2.

Run the following commands to install the Composer of the specified version and set the installation path to **/usr/bin/** for global use:

```
php -r "copy('https://getcomposer.org/installer', 'composer-setup.php');"
php composer-setup.php --install-dir=/usr/bin/ --filename=composer --version=1.10.19
```

The command output is as follows:

```
All settings correct for using Composer
Downloading...

Composer (version 1.10.19) successfully installed to: /usr/bin/composer
Use it: php /usr/bin/composer
```

Step 2 Run the following command to check whether the Composer is successfully installed:

```
composer -v
```

The command output is as follows:

```
  _____
  / ___/___  ___ ___  ___  ___  _______  ____
 / /   / __ \/ __ `__ \/ __ \/ __ \/ ___/ _ \/ ___/
/ /___/ /_/ / / / / / / /_/ / /_/ (__  )  __/ /
\____/\____/_/ /_/ /_/ .___/\____/____/\___/_/
                    /_/
Composer version 1.10.19 2020-12-04 09:14:16
...
```

----End

Step 5: Install Magento

When installing Magento, you can determine whether to install sample data. If Magento is only used for testing, it is optional for you to install sample data. If Magento is used in production environments, you are advised to perform initial configuration instead of installing sample data.

Step 1 Run the following command to install git:

```
yum -y install git
```

Step 2 Run the following commands to go to the default root directory **/var/www/html/** of the web server and use git to download Magento:

```
cd /var/www/html/
git clone https://github.com/magento/magento2.git
```

Step 3 Switch Magento to a stable version.

By default, Magento of the latest version is installed. In the production environment, you are advised to switch to a stable version.

```
cd magento2 && git checkout tags/2.1.0 -b 2.1.0
```

The command output is as follows:

```
Switched to a new branch '2.1.0'
```

Step 4 Run the following command to move the installation file to the root directory **/var/www/html/** of the web server. **/var/www/html/magento2/** is the directory where Magento is installed.

```
shopt -s dotglob nullglob && mv /var/www/html/magento2/* /var/www/html/ && cd ..
```

Then, you can access the Magento site from **http://magento server IP address**. If you do not move the installation file to the root directory, you can access the Magento site only from **http://magento server IP address/magento2**.

Step 5 Run the following commands to set file permissions for Magento:

```
chown -R apache:apache /var/www/html
find /var/www/html -type f -print0 | xargs -r0 chmod 640
```

```
find /var/www/html -type d -print0 | xargs -r0 chmod 750
chmod -R g+w /var/www/html/{pub,var}
chmod -R g+w /var/www/html/{app/etc,vendor}
chmod 750 /var/www/html/bin/magento
```

Step 6 Run the following command to install unzip and zip.

```
yum install -y unzip zip
```

Step 7 Run the following commands to go to the default root directory **/var/www/html/** of the web server and use Composer to install Magento:

```
cd /var/www/html/
composer install
```

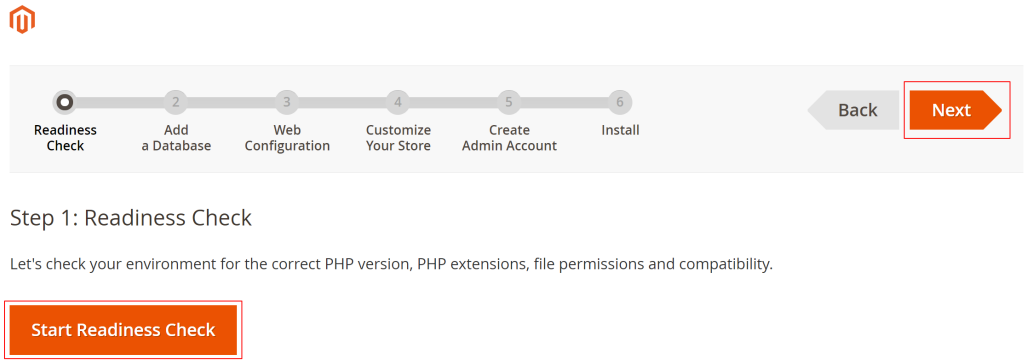
Step 8 After the installation is complete, enter **http://magento server IP address** in the address bar of a browser to visit Magento. If the following page is displayed, Magento is installed successfully.

----End

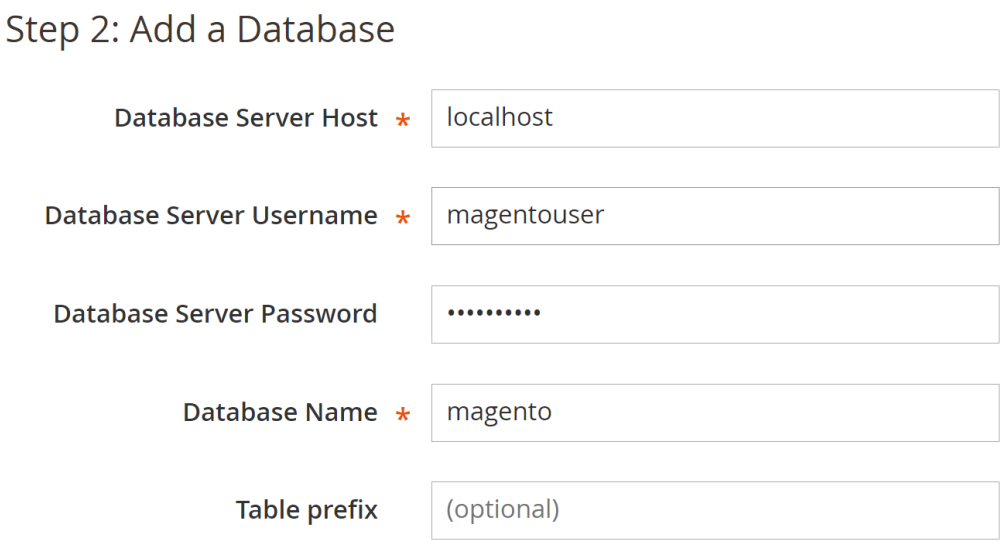
Step 6: Configure Magento

Step 1 Visit **http://magento server IP address** and click **Agree and Setup Magento** to start the configuration.

Step 2 Click **Start Readiness Check** to check the environment. After the check is passed, click **Next**.



Step 3 Enter the MySQL database user **magentouser**, the password of the database user, and the database **magento** created in **Step 2: Install and Configure MySQL**, and click **Next**.

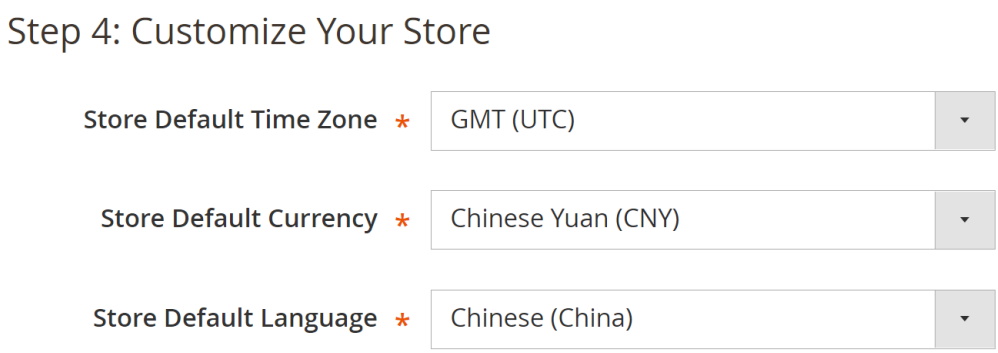


Step 4 Set the website access address and background management address, and click **Next**.

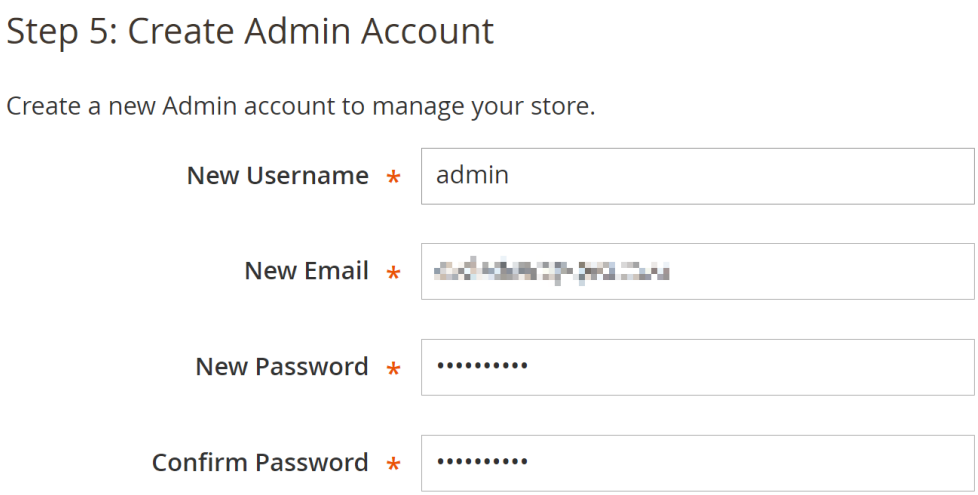
NOTE

The background management address can be customized.

Step 5 Set the time zone and language, and click **Next**.

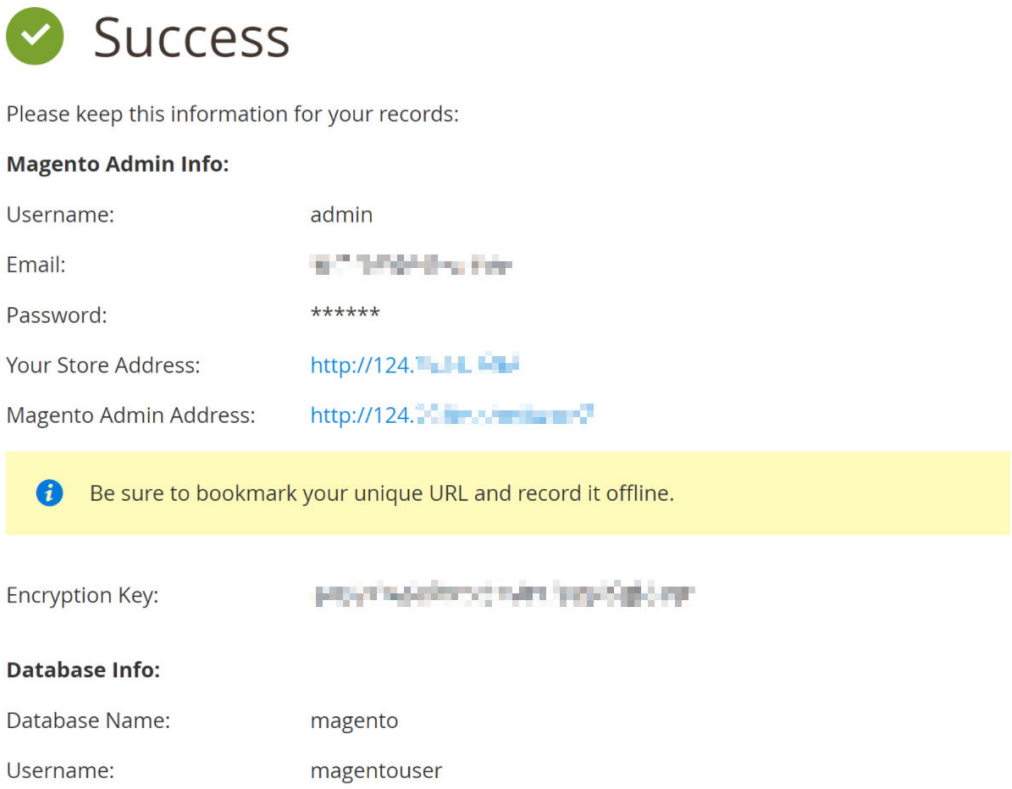


Step 6 Set the admin account and click **Next**.



Step 7 Click **Install Now** and wait until the installation is complete.

If the following information is displayed, the installation is successful.



Step 8 Log in to the Magento server and set up cron jobs.

```
crontab -u apache -e
```

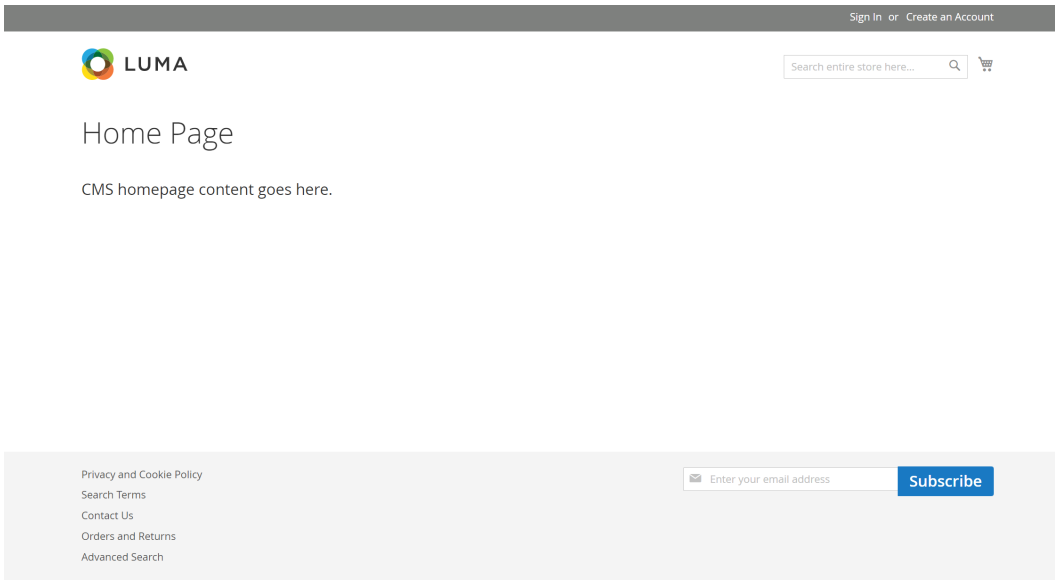
Step 9 Press **i** to enter insert mode and add the following content:

```
*/10 * * * * php -c /etc /var/www/html/bin/magento cron:run
*/10 * * * * php -c /etc /var/www/html/update/cron.php
*/10 * * * * php -c /etc /var/www/html/bin/magento setup:cron:run
```

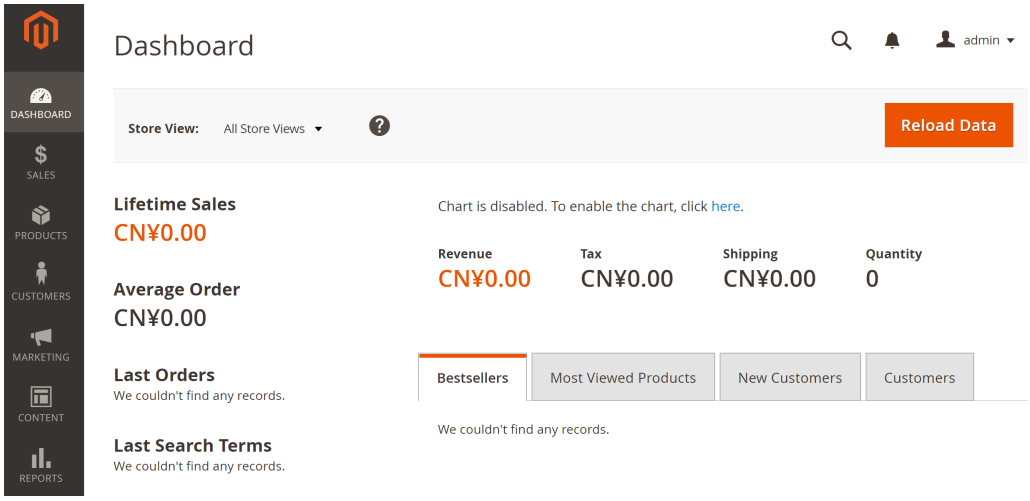
Press **Esc** to exit insert mode. Then, enter **:wq** to save the settings and exit.

For more information about running Magento cron jobs, see **Magento Documentation**.

Step 10 Enter **http://magento server IP address** in the address bar of a browser. The following page is displayed by default.



Step 11 Enter **http://magento background management address** in the address bar of a browser and use the admin account to log in. After the login is successful, the following page is displayed.



NOTE

If the message "One or more indexers are invalid. Make sure your Magento cron job is running" is displayed, run the **php bin/magento indexer:reindex** command in Magento root directory **/var/www/html**.

For more information about Magento configuration, see **Magento Documentation**.

----End

Step 7: Other Operations

Step 1 Purchase a domain name.

Configure a unique domain name for website access. You need to obtain an authorized domain name from the domain name registrar first.

Step 2 Configure DNS records.

Your website can be visited using the registered domain name only after DNS records are configured. For details, see **Routing Internet Traffic to a Website**.

For example, if the domain name is www.example.com, enter **http://www.*example*.com** in the address bar of the browser to access the website.

----End

5.4 Manually Deploying a Ghost Blog (Ubuntu 20.04)

Ghost is an open-source blog platform based on Node.js and makes writing and release more convenient. This section walks you through the deployment of a Ghost blog on an ECS running Ubuntu 20.04.

Creating a User

Performing operations as user **root** is not recommended by Ghost. You need to create a user and grant permissions to it.

1. Run the following command to create a user: The following uses **user** as an example.

   adduser user

   The following information is displayed:

   ```
   Adding user `user' ...
   Adding new group `user' (1000) ...
   Adding new user `user' (1000) with group `user' ...
   Creating home directory `/home/user' ...
   Copying files from `/etc/skel' ...
   New password:
   Retype new password:
   passwd: password updated successfully
   Changing the user information for user
   Enter the new value, or press ENTER for the default
           Full Name []:
           Room Number []:
           Work Phone []:
           Home Phone []:
           Other []:
   Is the information correct? [Y/n] Y
   ```

   a. In the **New password:** and **Retype new password:** lines, enter and confirm the user password (not displayed by default) as prompted, and press **Enter**.

   b. In the **Enter the new value, or press ENTER for the default** line, press **Enter** to retain the default settings. You can also specify the information as needed.

   c. In the **Is the information correct? [Y/n]** line, press **Y** to confirm the information and press **Enter** to complete the settings.

2. Run the following command to add the newly created user to the user group:

   usermod -aG sudo user

3. Run the following command to switch to **user**:

   su - user

Installing Nginx

Before deploying the Ghost blog, you need to install Nginx and use it as an HTTP server. The following uses Nginx 1.18.0 as an example.

1. Run the following commands to update the Linux OS and software package:

   sudo apt-get update

   sudo apt-get upgrade -y

2. Run the following command to install Nginx:

   sudo apt-get install -y nginx

3. Run the following command to check the Nginx version:

   nginx -v

   The following information is displayed:

   ```
   nginx version: nginx/1.18.0 (Ubuntu)
   ```

4. (Optional) Configure the firewall.

   Uncomplicated Firewall (UFW) is an iptables interface that simplifies the firewall configuration. By default, Ubuntu has UFW installed. Run the following command to check the firewall status:

   sudo ufw status

   If you do not want to enable the firewall, skip this step. If you want to enable the firewall, run the following command:

   sudo ufw enable

   Verify that the firewall is enabled.

   Before testing Nginx, you need to reconfigure the firewall to allow access to Nginx. Run the following command to automatically register Nginx with UFW:

   sudo ufw app list

   The following information is displayed:

   ```
   Available applications:
     Nginx Full
     Nginx HTTP
     Nginx HTTPS
     ...
   ```

   – **Nginx Full**: Port 80 is enabled to distribute normal and unencrypted web traffic, and port 443 to distribute TLS/SSL-encrypted traffic.
   – **Nginx HTTP**: Port 80 is enabled to distribute normal and unencrypted web traffic.
   – **Nginx HTTPS**: Port 443 is enabled to distribute TLS/SSL-encrypted traffic.

   Run the following command to ensure that the firewall allows HTTP and HTTPS connections:

   sudo ufw allow 'Nginx Full'

5. Verify that Nginx can work properly.

   Use the domain name or IP address to access Nginx. The **Welcome to nginx** page is displayed if Nginx is started normally.

   Enter **http://***IP address of the Nginx server* in the address bar to access Nginx. If the following page is displayed, Nginx has been installed.

Installing MySQL

MySQL is an open-source database management system, which is usually installed as a part of the popular LAMP (Linux, Apache, MySQL, and PHP/Python/Perl) stack. MySQL uses relational databases and the structured query language (SQL) to manage data.

1. Run the following command to install MySQL:

   sudo apt-get install -y mysql-server

2. Run the following command to check the MySQL version:

   mysql -V

   The following information is displayed:

   ```
   mysql  Ver 8.0.37-0ubuntu0.20.04.3 for Linux on x86_64 ((Ubuntu))
   ```

3. Run the following command to access MySQL:

   sudo mysql

4. Create a database for Ghost. The following uses **ghost_data** as an example.

   CREATE DATABASE *ghost_data***;**

5. Run the following commands to set the password for user **root**:

   ALTER USER 'root'@'localhost' IDENTIFIED WITH mysql_native_password BY 'xxxxx';

   In the preceding command, *xxxxx* indicates the password you set for user **root**.

6. Run the following command to reload the privilege tables of MySQL to check that the change takes effect:

   FLUSH PRIVILEGES;

7. Run the following command to exit MySQL:

   exit

Installing Node.js

1. Run the following commands to install Node.js:

   sudo curl -sL https://deb.nodesource.com/setup_18.x | sudo -E bash -

   sudo apt-get install -y nodejs

2. Run the following commands to view the versions of Node.js and Node Package Manager (npm), respectively:

   node -v

npm -v

The following information is displayed:

```
root@ecs-c47c:~# node -v
v18.20.3
root@ecs-c47c:~# npm -v
10.7.0
```

Installing and Configuring Ghost

Ghost-CLI has been added to Ghost v1.0.0 and later versions. You can directly install and configure Ghost-CLI.

1. Run the following command to install Ghost-CLI:

   sudo npm install ghost-cli@latest -g

2. Create a folder named **ghost** under **/var/www/**.

   sudo mkdir -p /var/www/ghost

   NOTE

   If **ghost** is created under **/root**, Ghost cannot work properly.

3. Run the following command to grant user permissions to **ghost**:

   sudo chown user:user /var/www/ghost

   sudo chmod 775 /var/www/ghost

   NOTE

   user is created in step 1.

4. Run the following command to switch to the created folder:

   cd /var/www/ghost

5. Run the following command to install Ghost using Ghost-CLI:

   ghost install

   NOTE

   If a message is displayed indicating that the node version does not match, obtain the required version on the official website of Node.js and reinstall Ghost.

   https://nodejs.org/en/download/

6. Configure Ghost.

   If **ghost install** is successfully executed in **/var/www/ghost/**, follow the prompts to configure related parameters.


```
◆ Checking system Node.js version - found v18.20.3
◆ Checking current folder permissions
◆ Checking memory availability
◆ Checking free space
◆ Checking for latest Ghost version
◆ Setting up install directory
◆ Downloading and installing Ghost v5.85.1
◆ Finishing install process
? Enter your blog URL: http://example.com
? Enter your MySQL hostname:
? Enter your MySQL username: root
? Enter your MySQL password: [hidden]
? Enter your Ghost database name: ghost_data
◆ Configuring Ghost
◆ Setting up instance
+ sudo useradd --system --user-group ghost
+ sudo chown -R ghost:ghost /var/www/ghost/content
◆ Setting up "ghost" system user
? Do you wish to set up "ghost" mysql user? Yes
◆ Setting up "ghost" mysql user
? Do you wish to set up Nginx? Yes
+ sudo mv /tmp/example-com/example.com.conf /etc/nginx/sites-available/example.com.conf
+ sudo ln -sf /etc/nginx/sites-available/example.com.conf /etc/nginx/sites-enabled/example.com.conf
+ sudo nginx -s reload
◆ Setting up Nginx
? Do you wish to set up SSL? Yes
? Enter your email (For SSL Certificate) [redacted]
+ sudo mkdir -p /etc/letsencrypt
+ sudo ./acme.sh --install --home /etc/letsencrypt
+ sudo /etc/letsencrypt/acme.sh --issue --home /etc/letsencrypt --server letsencrypt --domain example.com --webroot /var/www/gho
st/system/nginx-root --reloadcmd "nginx -s reload" --accountemail [redacted] --keylength 2048
◆ Setting up SSL
? Do you wish to set up Systemd? Yes
+ sudo mv /tmp/example-com/ghost_example-com.service /lib/systemd/system/ghost_example-com.service
+ sudo systemctl daemon-reload
◆ Setting up Systemd
+ sudo systemctl is-active ghost_example-com
? Do you want to start Ghost? Yes
+ sudo systemctl start ghost_example-com
◆ Starting Ghost
```

- **Enter your blog URL**: Enter a resolved domain name, for example, http://example.com.
- **Enter your MySQL hostname**: Enter the database connection address. In this example, the MySQL database and Ghost are deployed on the same ECS. Press **Enter** to retain the default settings.
- **Enter your MySQL username**: Enter the database username **root** and press **Enter**.
- **Enter your MySQL password**: Enter the database password set in step **5** and press **Enter**.
- **Enter your Ghost database name**: Enter the name of the database used by Ghost. Enter **ghost_data** and press **Enter**.

To modify the configuration, run the following command:

vi config.production.json

The following example is for your reference.


```
{
  "url": "[illegible]",
  "server": {
    "port": 2368,
    "host": "127.0.0.1"
  },
  "database": {
    "client": "mysql",
    "connection": {
      "host": "127.0.0.1",
      "user": "root",
      "password": [illegible],
      "database": "ghost"
    }
  },
  "mail": {
    "transport": "Direct"
  },
  "logging": {
    "transports": [
      "file",
      "stdout"
    ]
  },
  "process": "systemd",
  "paths": {
    "contentPath": "/var/www/ghost/content"
  },
  "bootstrap-socket": {
```

Verifying Blog Access

If Ghost is successfully installed, you can access the Ghost blog using the domain name.

6 Setting Up an Application

6.1 Setting Up an FTP Site

6.1.1 Setting Up an FTP Site (Windows 2012)

Overview

The best practices for ECS guide you through the setup of an FTP site on a Windows ECS. The Windows Server 2012 R2 OS is used as an example in this section.

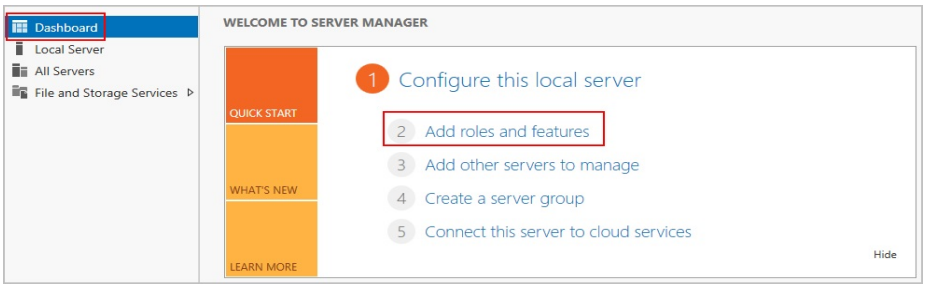
The process is as follows:

1. **Add IIS and FTP service roles.**
2. **Create a username and password.**
3. **Assign permissions to shared files.**
4. **Add and set the FTP site.**
5. **(Optional) Configure the FTP firewall.**
6. **Set the security group and firewall.**
7. **Verify the configuration on the client.**

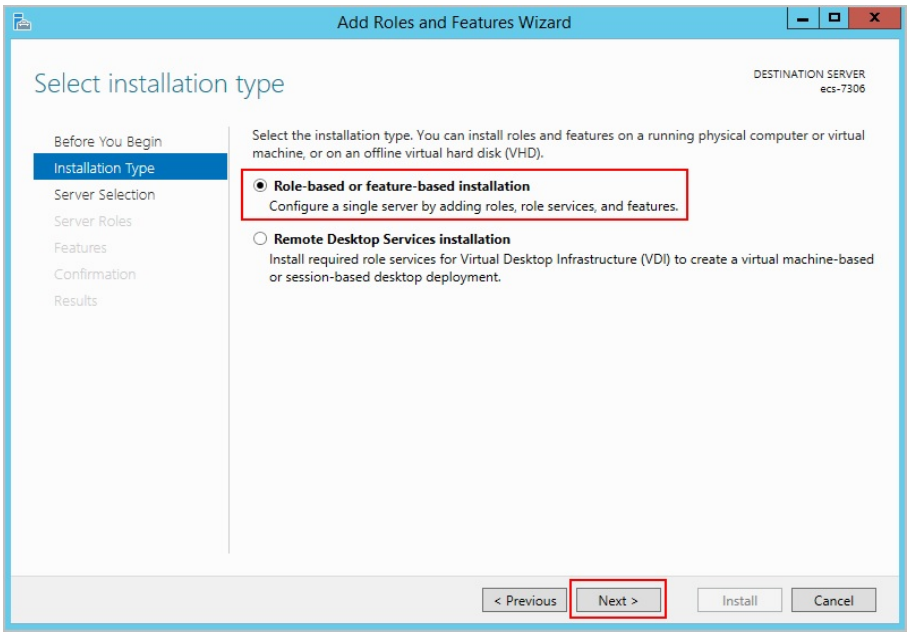
Procedure

Step 1 Add IIS and FTP service roles.

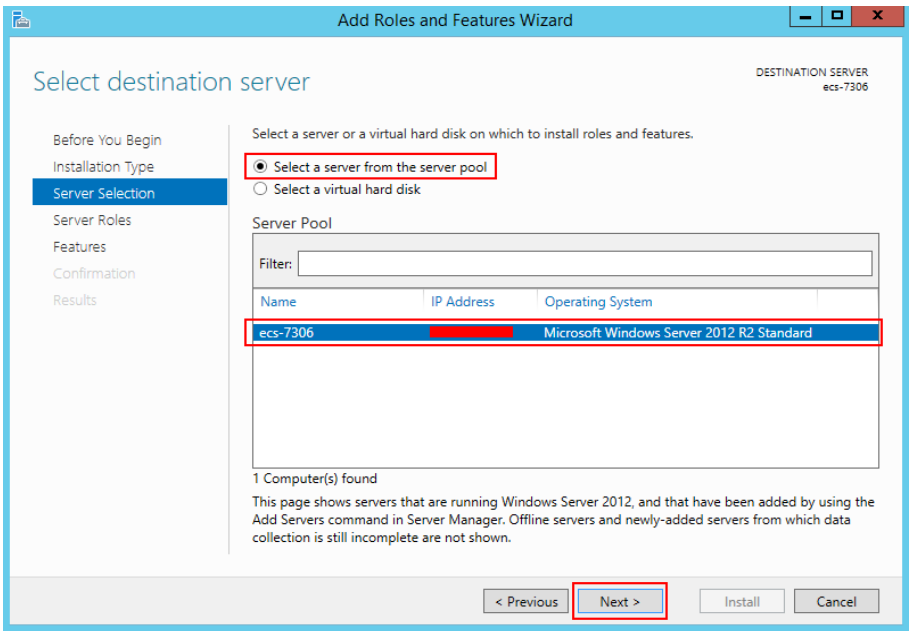
1. Log in to the ECS.
2. Choose **Start** > **Server Manager**.
3. Click **Add roles and features**.



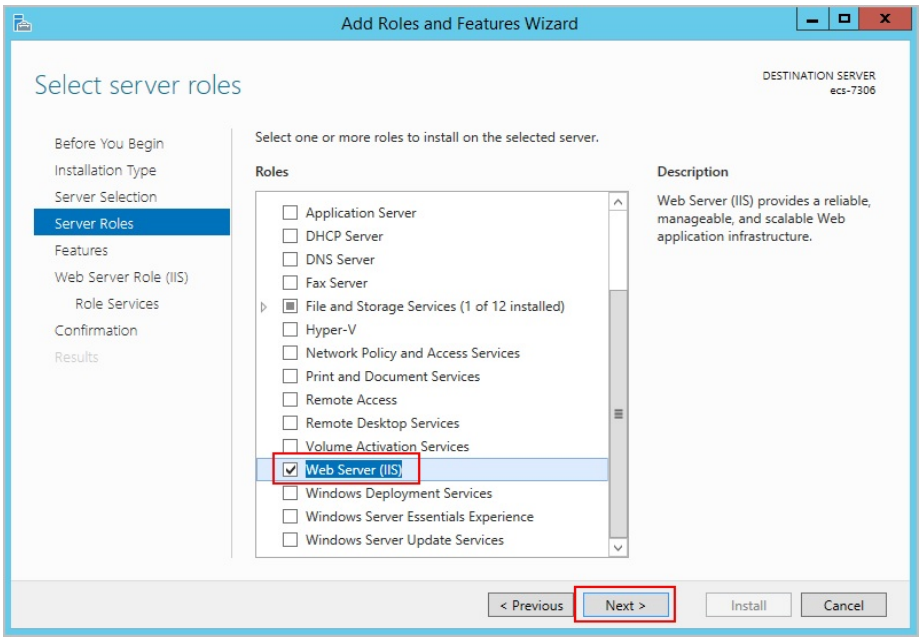
4. In the **Before you begin** dialog box, click **Next**.
5. Select **Role-based or feature-based installation** and click **Next**.

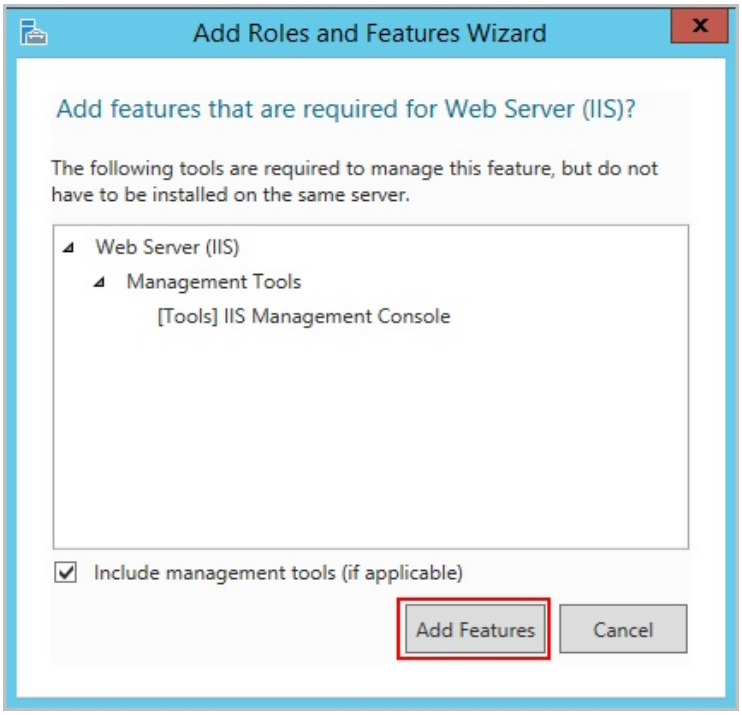


6. Select the ECS where FTP is to be deployed and click **Next**.

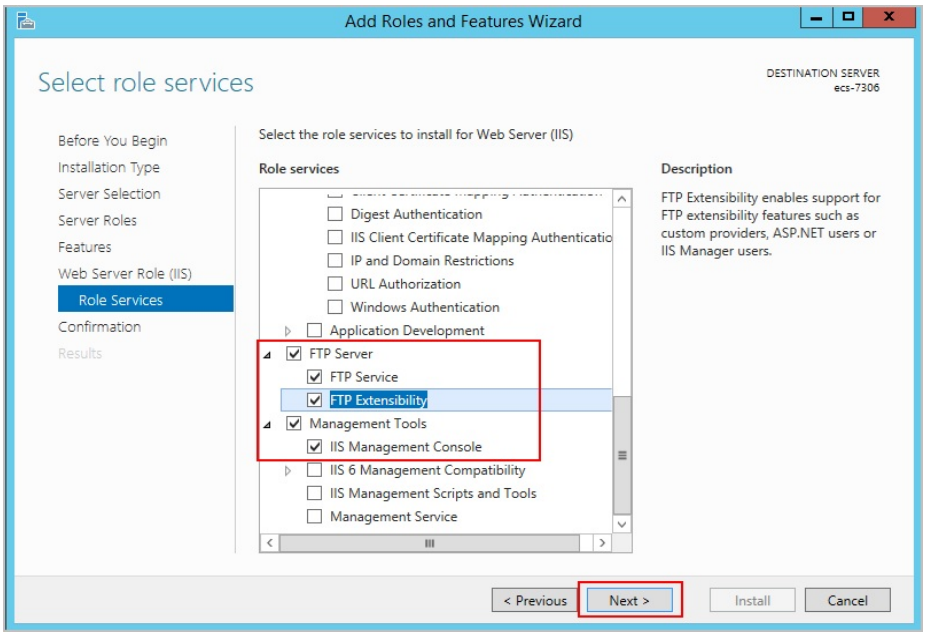


7. Select **Web Server (IIS)**. In the displayed dialog box, click **Add Features** and then **Next**.





8. Click **Next** until the **Role Service** page is displayed.
9. Select **FTP Server** and **IIS Management Console**. Then, click **Next**.

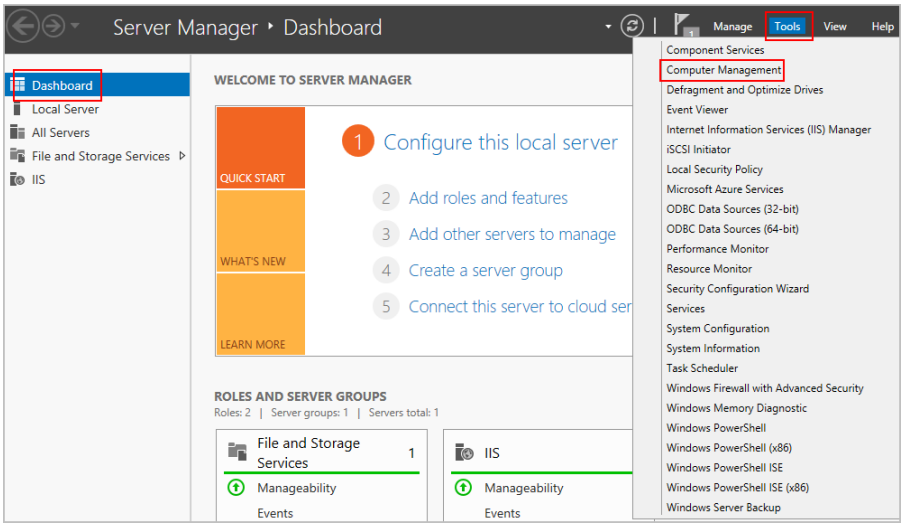


10. Click **Install** to assign the service roles.
11. After the installation is complete, click **Close**.

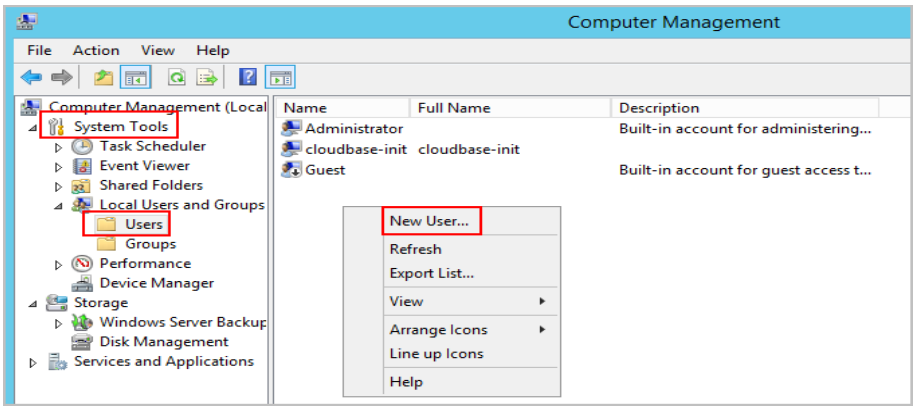
Step 2 Create a username and password.

The Windows username and password are used for FTP. If you allow anonymous users to access FTP, you do not need to create an FTP username and password.

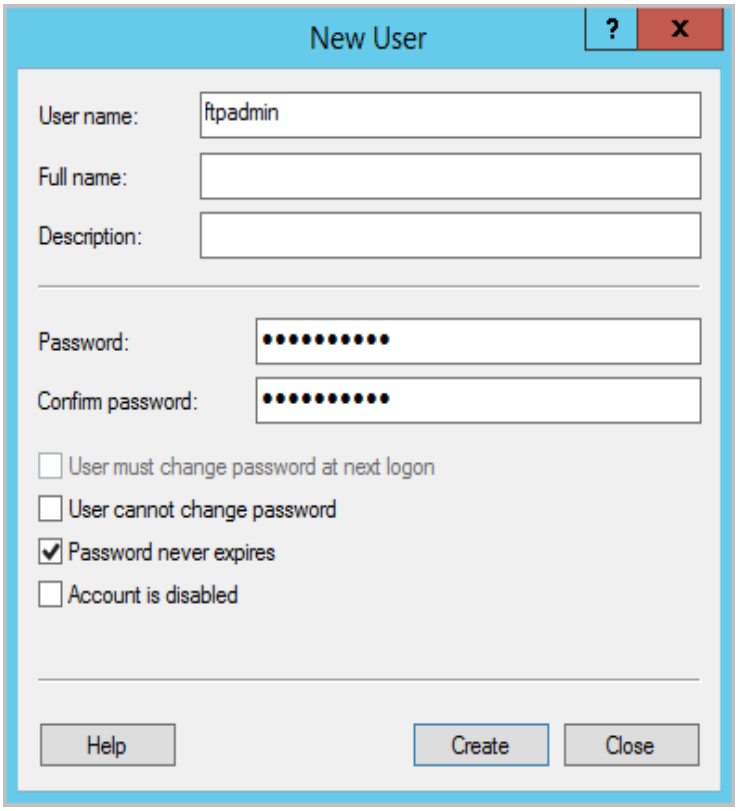
1. In **Server Manager**, choose **Dashboard** > **Tools** > **Computer Management**.



2. Choose **System Tools** > **Local Users and Groups** > **Users**, right-click the blank area on the right, and choose **New User** from the shortcut menu.



3. Set **User name** (**ftpadmin** is used as an example) and **Password**.



Step 3 Assign permissions to shared files.

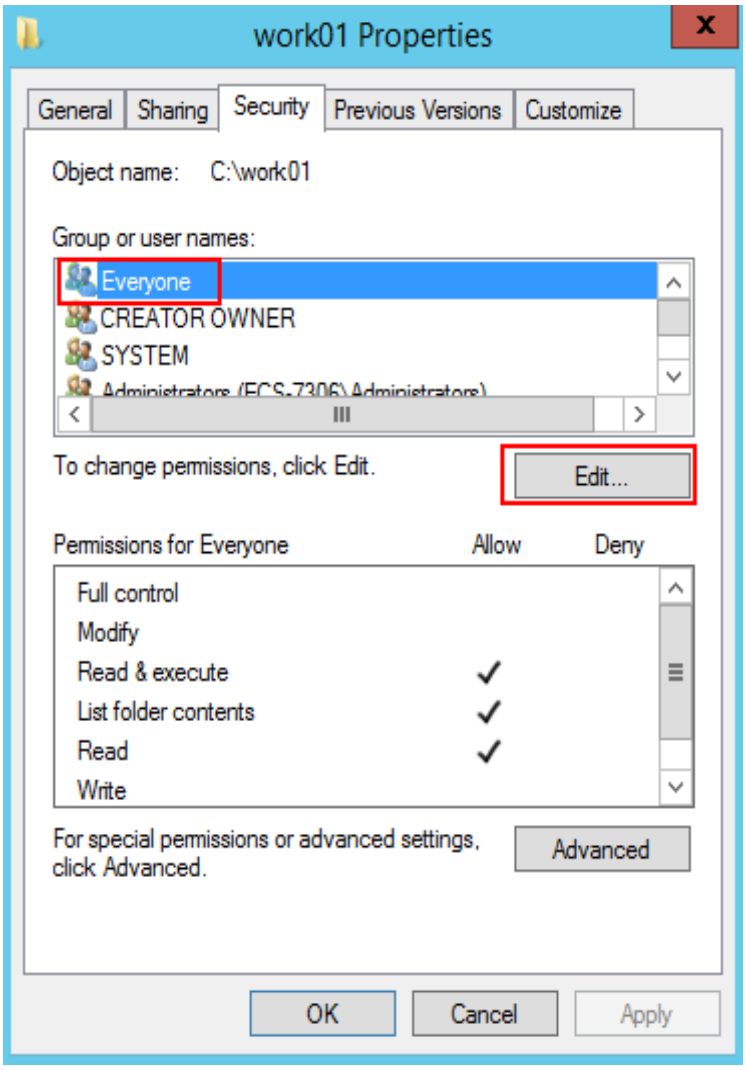
Set access and edit permissions for the files shared to users on the FTP site.

1. Create a folder for FTP on the ECS, right-click the folder, and choose **Properties** from the shortcut menu.

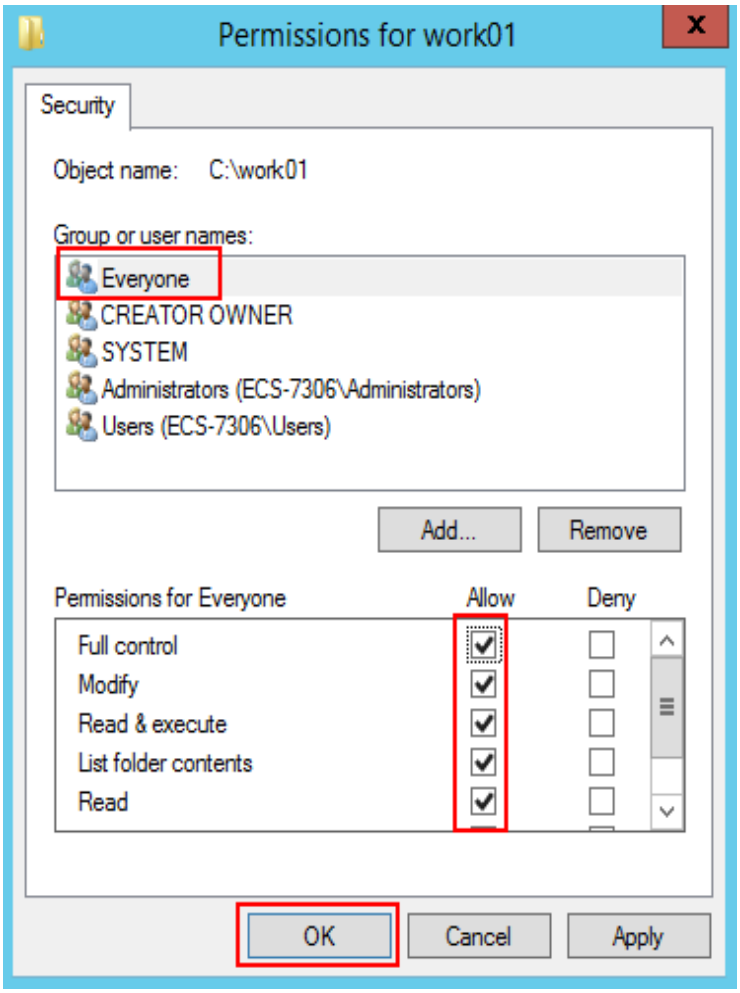
   The **work01** folder is used as an example and it contains the **test.txt** file to be shared.

2. On the **Security** tab, select **Everyone** and click **Edit**.

   If **Everyone** is unavailable, add it. For details, see **FAQs**.

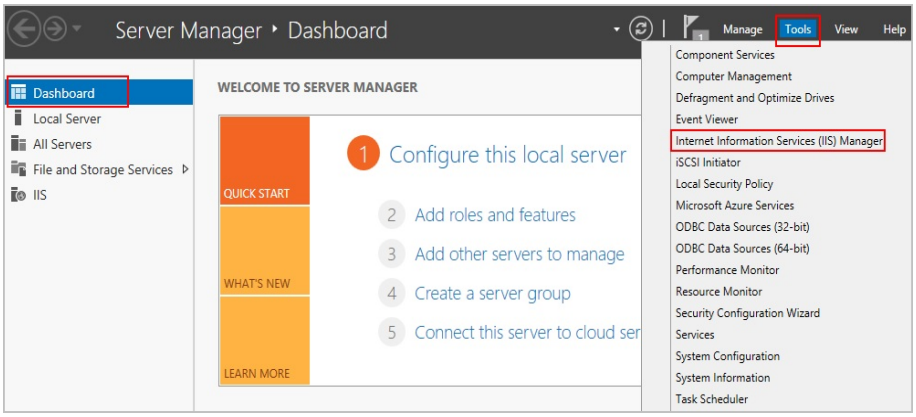


3. Select **Everyone**, assign permissions as needed, and click **OK**.
   In this example, all permissions are allowed.

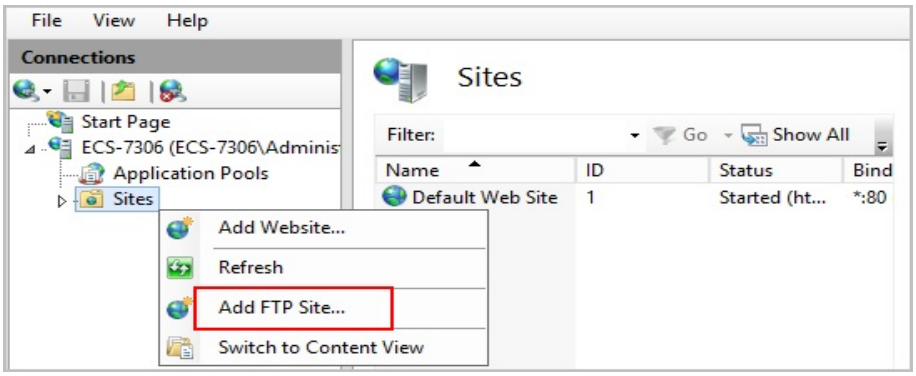


Step 4 Add and set the FTP site.

1. In **Server Manager**, choose **Dashboard** > **Tools** > **Internet Information Services (IIS) Manager**.

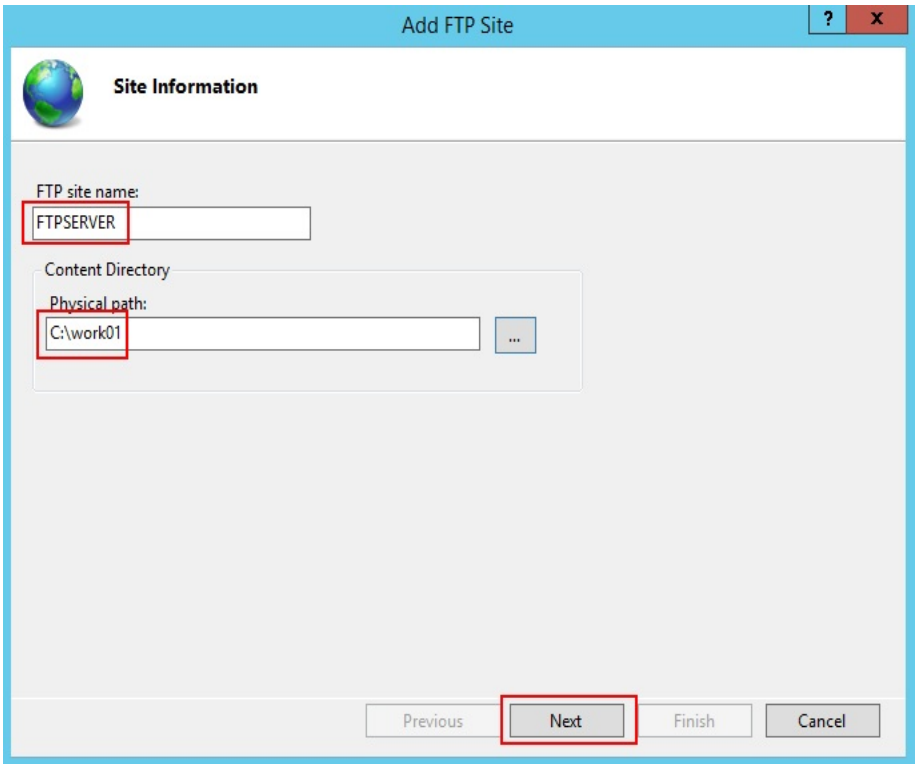


2. Right-click **Sites** and choose **Add FTP Site** from the shortcut menu.



3. In the displayed dialog box, set the FTP site name and the physical path in which the shared folder is stored. Then, click **Next**.

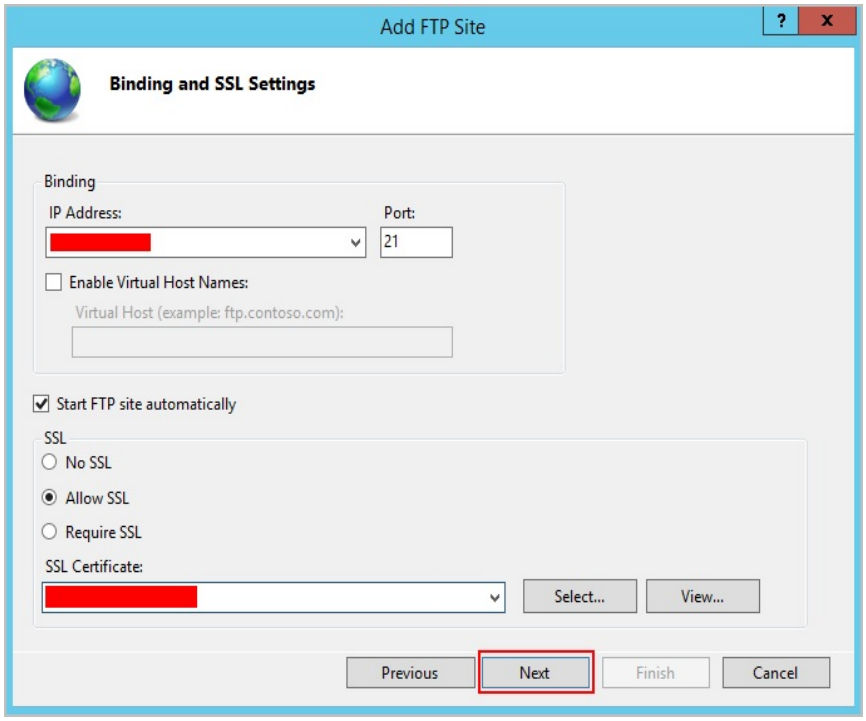
   Site name **FTPSERVER** is used as an example.



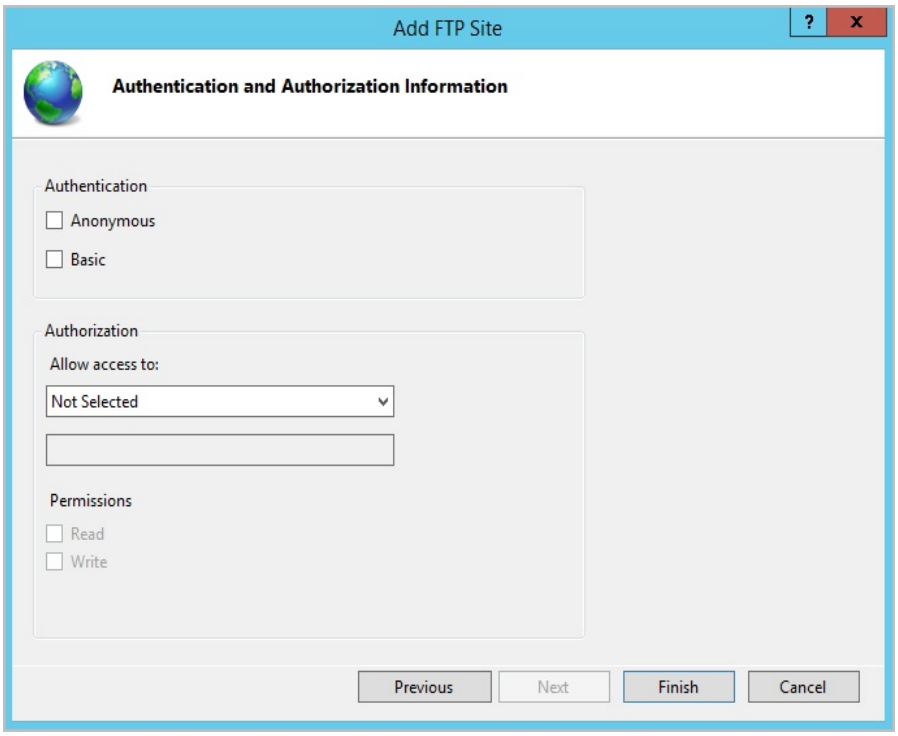
4. Enter the private IP address and port number of the ECS, set SSL, and click **Next**.
   - Port 21 is used by default. You can set it as required.
   - You can also set SSL as required.
     - **No SSL**: SSL encryption is not required.
     - **Allow SSL**: Non-SSL and SSL connections between the FTP server and the client are allowed.
     - **Require SSL**: SSL encryption is required for the communication between the FTP server and the client.

NOTE

When **Allow SSL** and **Require SSL** are selected, select an existing SSL certificate or create one. For details, see 3.

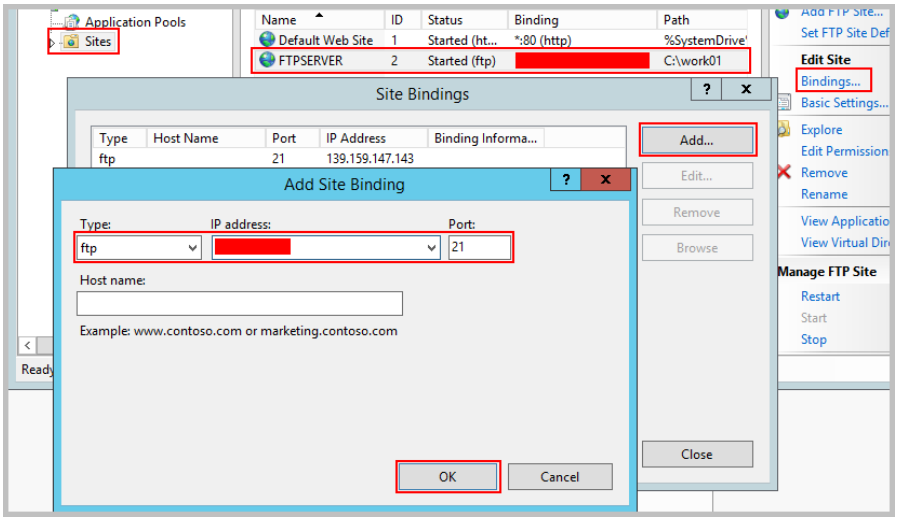


5. Configure authentication and authorization and click **Finish**.
   - Authentication
     - **Anonymous**: allows any user with username **anonymous** or **ftp** to access.
     - **Basic**: allows only users with authorized usernames and passwords to access. However, the passwords transmitted over the network are not encrypted. You are advised to use this authentication method after confirming that the network connection between the client and the FTP server is secure.
   - Authorization
     - Allow access to:
       - **All users**: All users are allowed.
       - **Anonymous users**: Anonymous users are allowed.
       - **Specified roles or user groups**: Only specified roles or user group members are allowed. If you select this option, you are required to enter the specified roles or user groups in the text box.
       - **Specified users**: Only specified users are allowed. If you select this option, you are required to enter the specified users in the text box.
     - **Permissions**: specifies permissions for the authorized users.



6. Add the private IP address of the ECS to the FTP site.

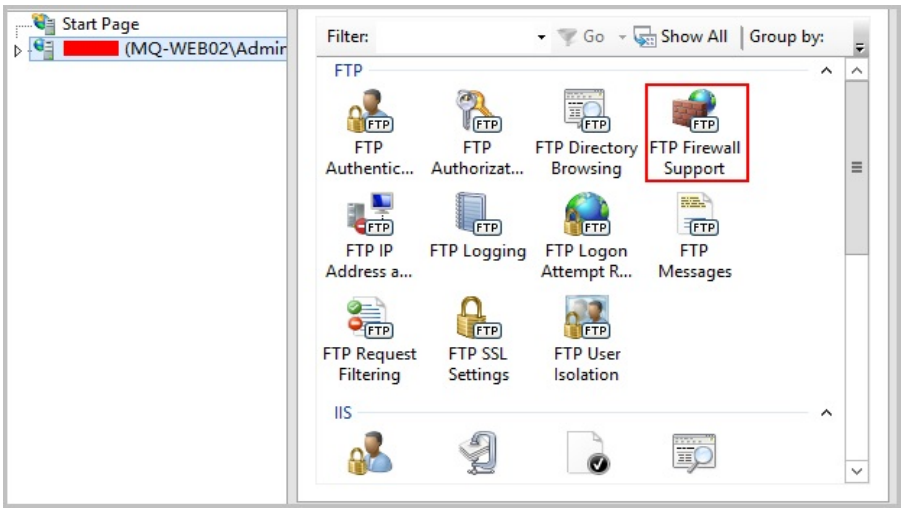
   Choose **Sites**, select the FTP site, and click **Bindings**. In the **Site Bindings** dialog box, click **Add**. Then, add the private IP address of the ECS in the displayed dialog box and click **OK**.



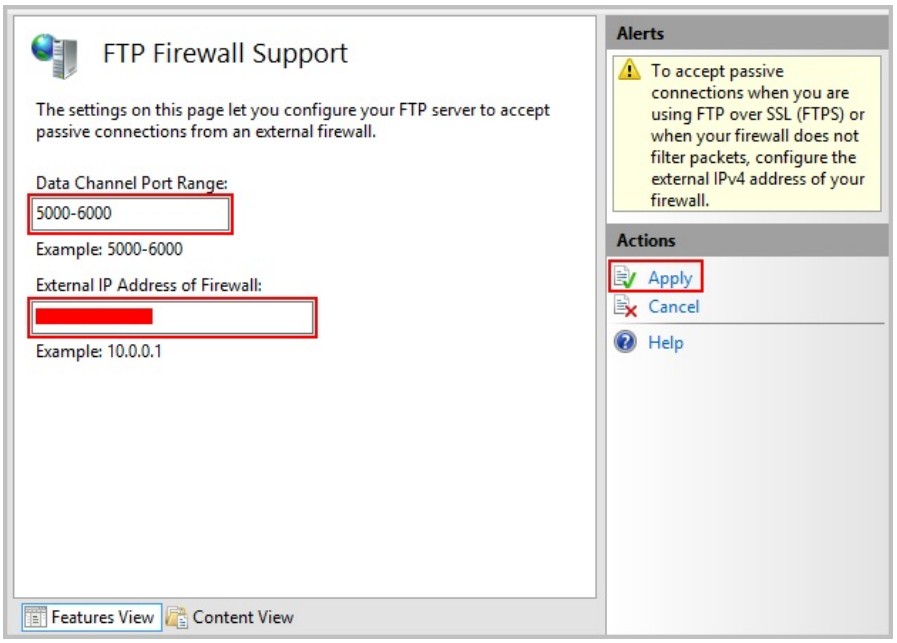
Step 5 (Optional) Configure the FTP firewall.

- To enable the passive mode on the FTP server, the FTP firewall must be configured.
- If Huawei Cloud servers use public IP addresses to access the FTP site that is set up on a Huawei Cloud ECS, the passive mode must be enabled on the FTP server.

1. Double-click **FTP Firewall Support**.



2. Set parameters and click **Apply**.
   - **Data Channel Port Range**: specifies the range of ports used for passive connections. The port range is 1025-65535. Configure this parameter based on site requirements.
   - **External IP Address of Firewall**: specifies the public IP address of the ECS.



3. Restart the ECS for the firewall configuration to take effect.

Step 6 Set the security group and firewall.

After setting up the FTP site, add a rule in the inbound direction of the security group to allow packets to pass through the FTP port. For details, see **Configuring Security Group Rules**. For details about which ports are allowed, see **Table 6-1**.

If **FTP Firewall Support** is configured, enable the ports used by the FTP site and the data channel ports used by the FTP firewall in the security group.

By default, the firewall allows packets to pass through TCP port 21 for FTP. If another port is used, add an inbound rule that allows packets to pass through the port on the firewall.

Table 6-1 Security group rules

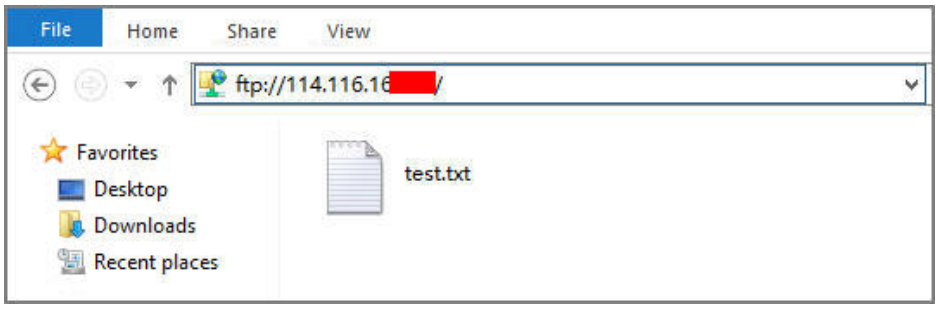
Direction	Priority	Action	Type	Protocol & Port	Source Address
Inbound	1	Allow	IPv4	Protocols/TCP (Custom): 20-21	0.0.0.0/0
Inbound	1	Allow	IPv4	Protocols/TCP (Custom): 1024-65535 (for example, 5000-6000)	0.0.0.0/0

Step 7 Verify the configuration on the client.

On the computer with the client installed, enter **ftp://***IP address of the FTP server*:*FTP port number* in the Internet Explorer address bar. If you do not specify the port number, port 21 is used by default. If a dialog box is displayed for you to enter the username and password, the configuration is correct. After entering the username and password, you can perform operations on the FTP folder with assigned permissions.

NOTE

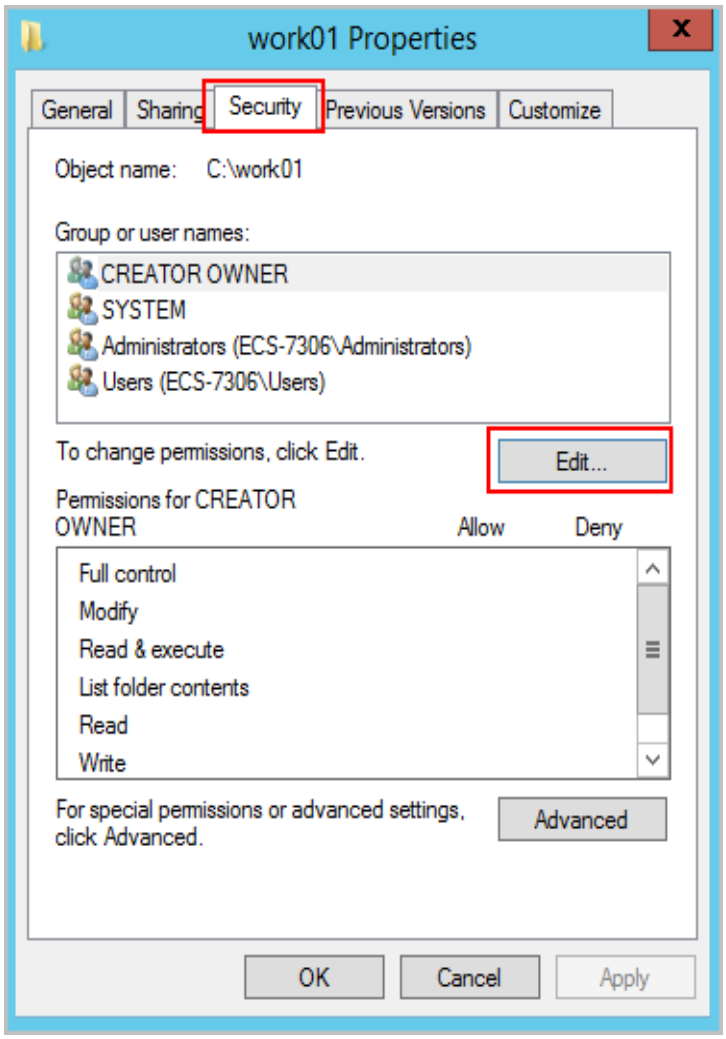
If **FTP Firewall Support** is not configured, configure the Internet Explorer browser. Otherwise, the FTP folder cannot be accessed. To configure the Internet Explorer browser, choose **Tools** > **Internet Options** > **Advanced**, select **Enable FTP folder view**, and deselect **Use Passive FTP**.



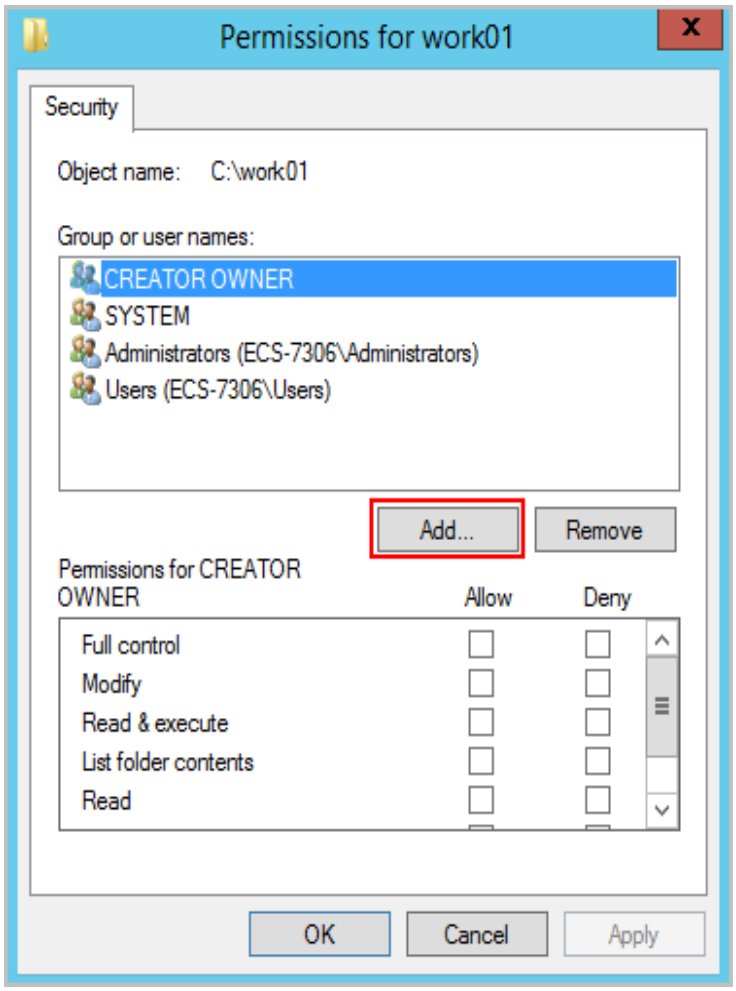
----End

FAQs

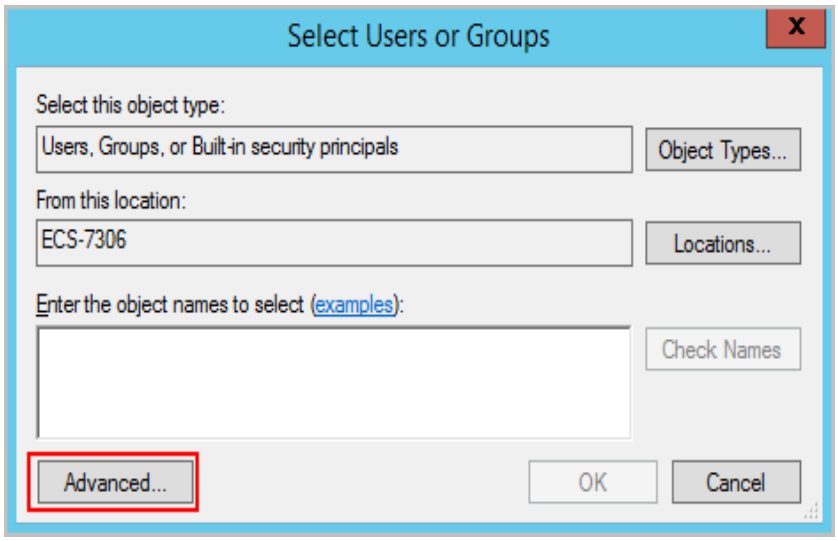
1. For more information about setting up an FTP site on a Windows ECS, see **Microsoft official documents**.
2. When configuring the properties of a folder, if **Everyone** is unavailable, perform the following operations to add it:
   a. On the **Security** tab, click **Edit**.



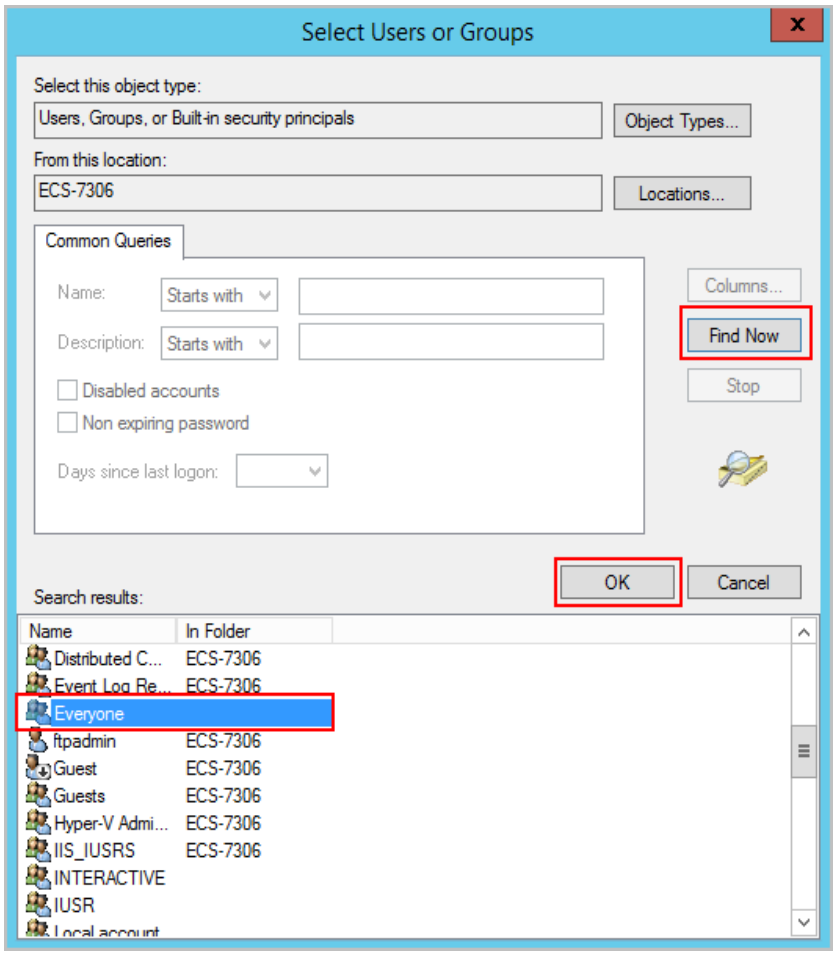
b. In the displayed dialog box, click **Add**.



c. In the displayed dialog box, click **Advanced**.



d. In the displayed dialog box, click **Find Now**, select **Everyone** in search results, and click **OK**.

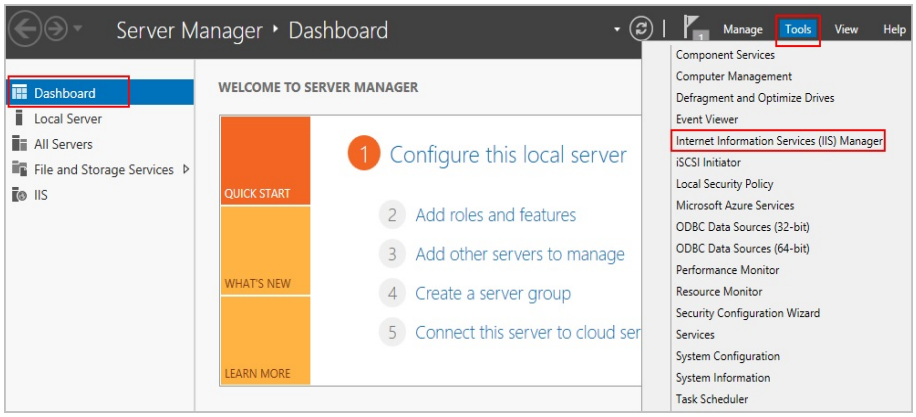


e. Click **OK** to return to the permissions page.

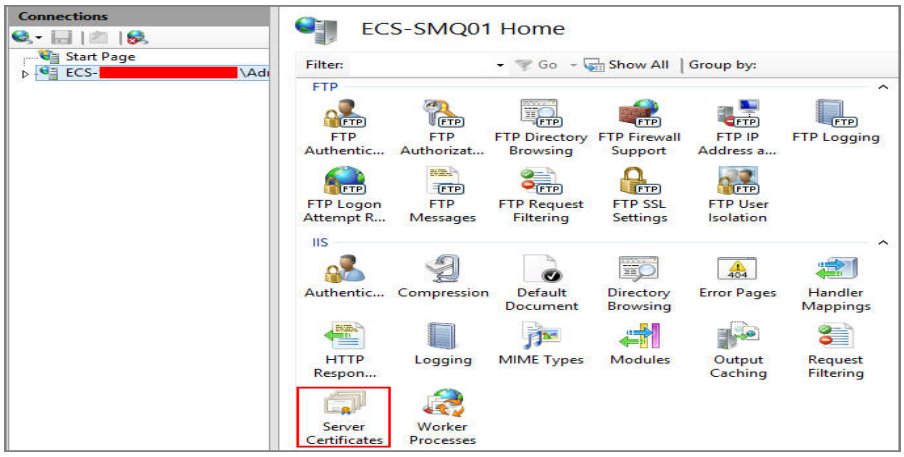
f. Click **OK**.

3. Create a server certificate.

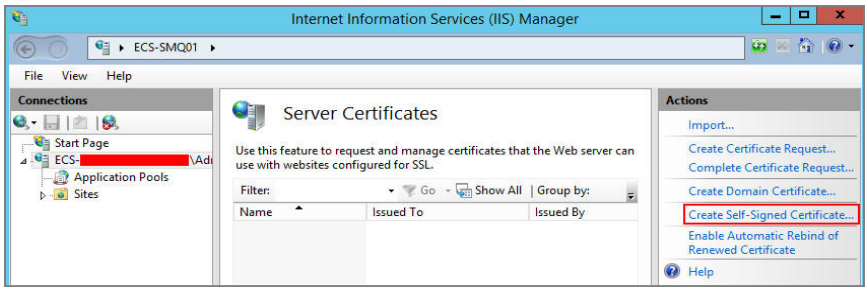
a. In **Server Manager**, choose **Dashboard** > **Tools** > **Internet Information Services (IIS) Manager**.



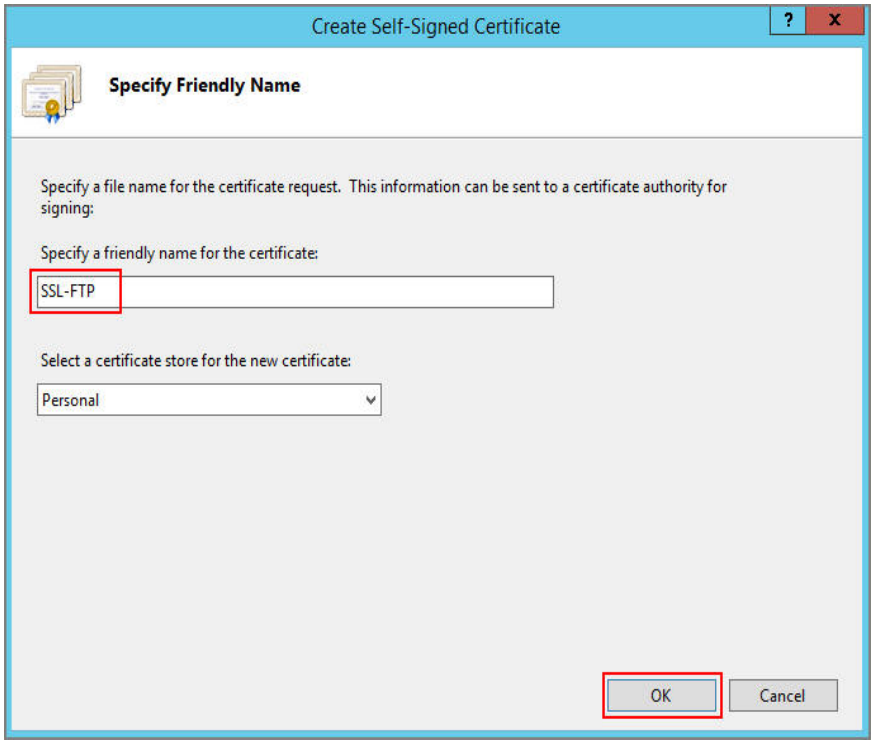
b. In the left list, click the server. Under **IIS** area, double-click **Server Certificates**. The **Server Certificates** page is displayed.



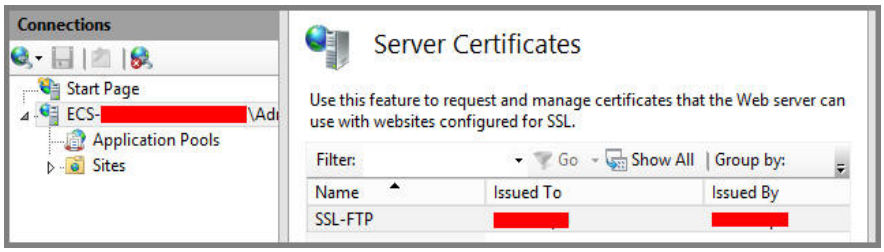
c. Click **Create Self-Signed Certificate**.



d. Specify a certificate name, select a certificate storage type, and click **OK**.



The created certificate is displayed on the **Server Certificates** page.



6.1.2 Setting Up an FTP Site (Windows 2019)

Overview

The best practices for ECS guide you through the setup of an FTP site on a Windows ECS. The Windows Server 2019 OS is used as an example in this section.

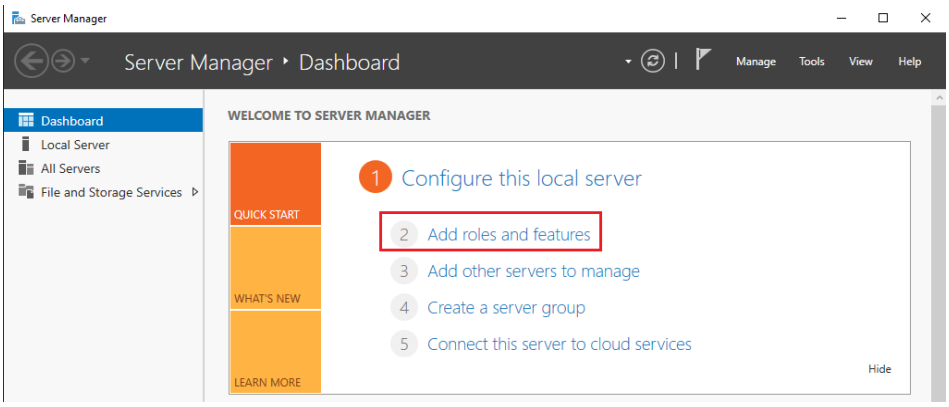
The process is as follows:

1. **Add IIS and FTP service roles.**
2. **Create a username and password.**
3. **Assign permissions to shared files.**
4. **Add and set the FTP site.**
5. **(Optional) Configure the FTP firewall.**
6. **Set the security group and firewall.**
7. **Verify the configuration on the client.**

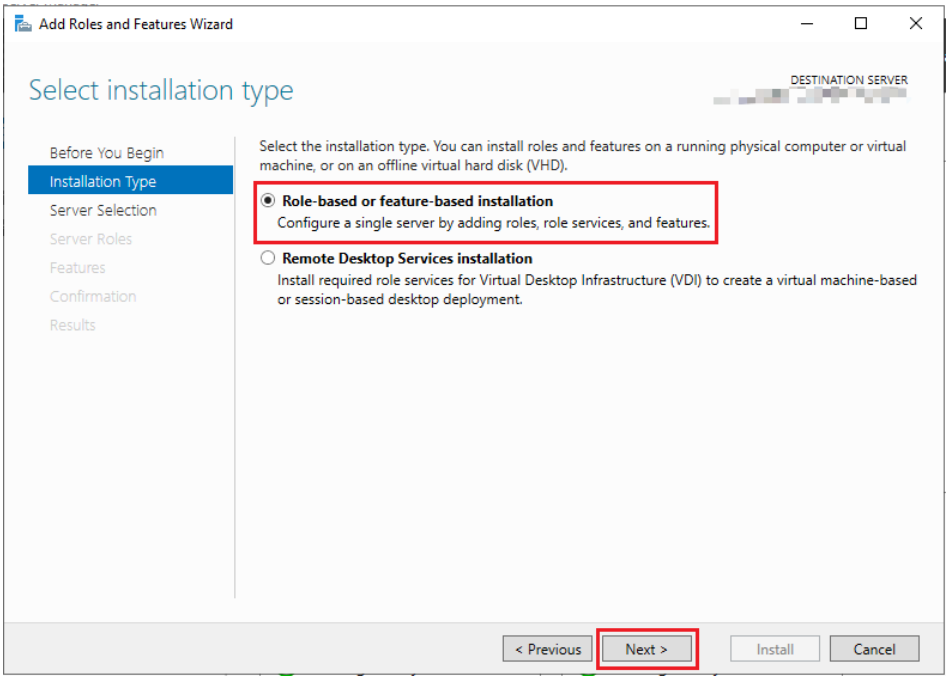
Procedure

Step 1 Add IIS and FTP service roles.

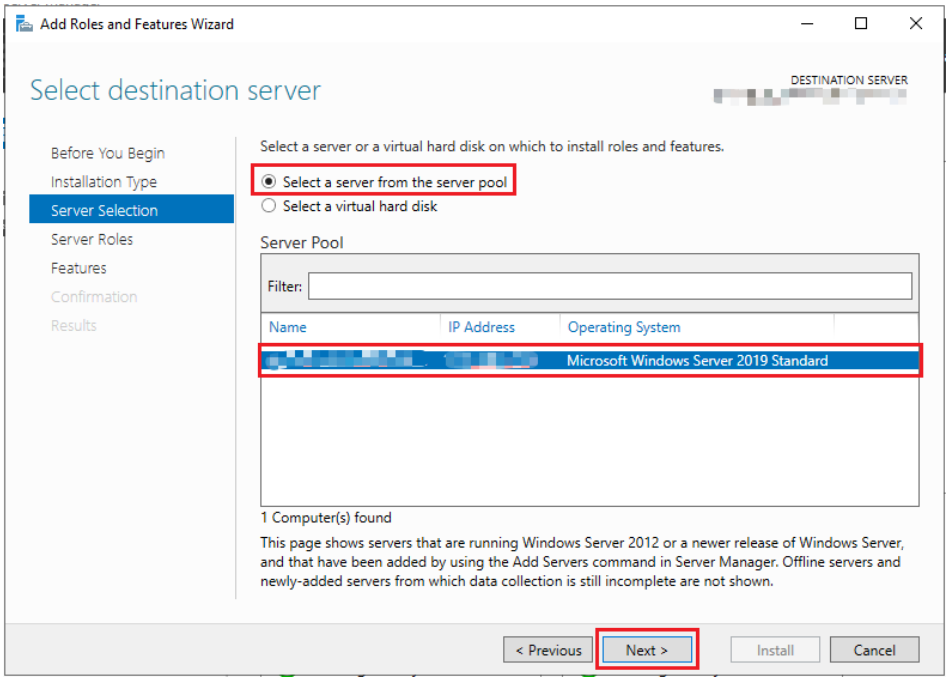
1. Log in to the ECS.
2. Choose **Start** > **Server Manager**.
3. Click **Add roles and features**.



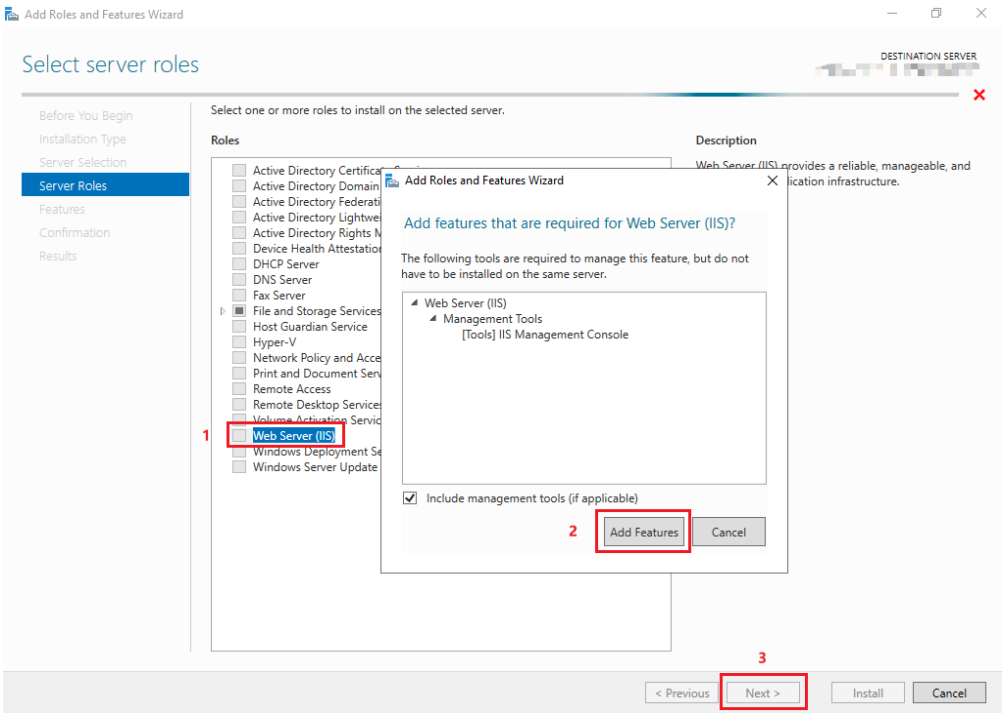
4. In the **Before you begin** dialog box, click **Next**.
5. Select **Role-based or feature-based installation** and click **Next**.



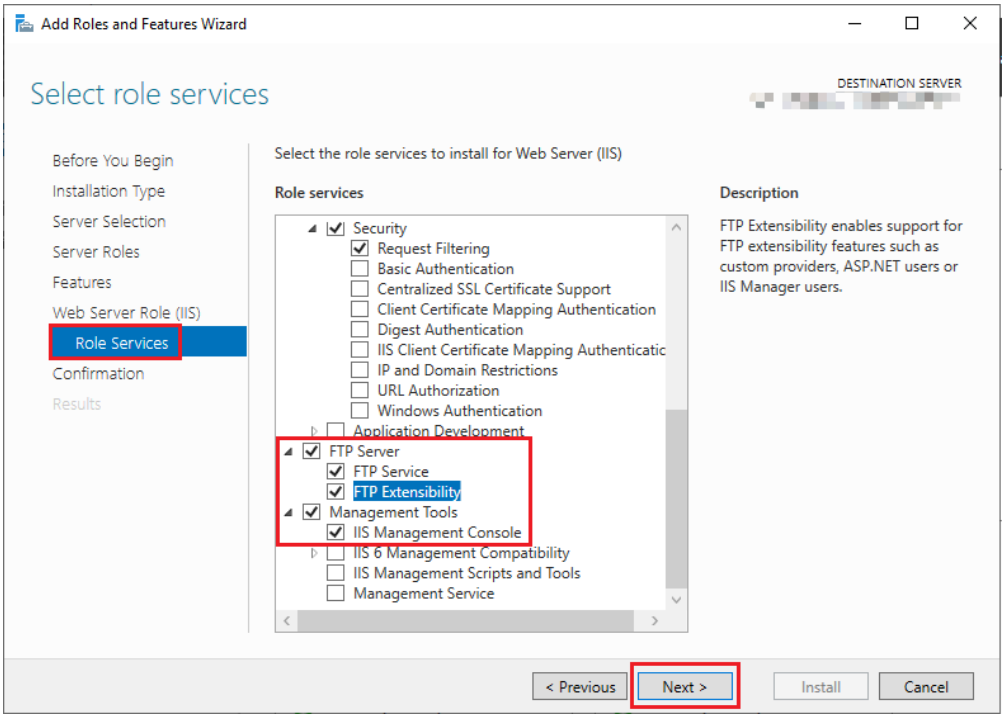
6. Select the ECS where FTP is to be deployed and click **Next**.



7. Select **Web Server (IIS)**. In the displayed dialog box, click **Add Features** and then **Next**.



8. Click **Next** until the **Role Services** page is displayed.
9. Select **FTP Server** and **IIS Management Console**. Then, click **Next**.

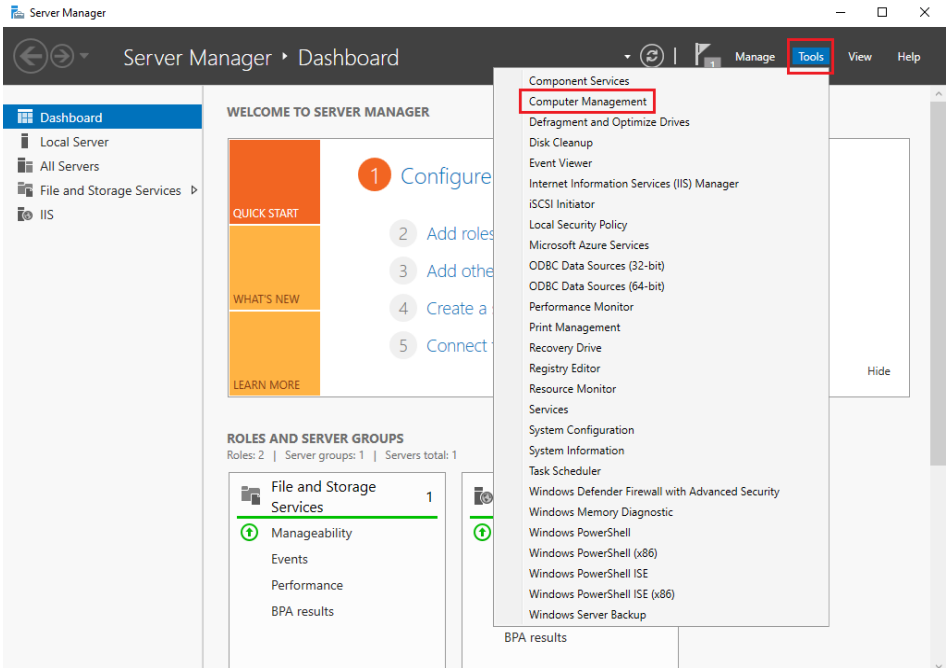


10. Click **Install** to assign the service roles.
11. After the installation is complete, click **Close**.

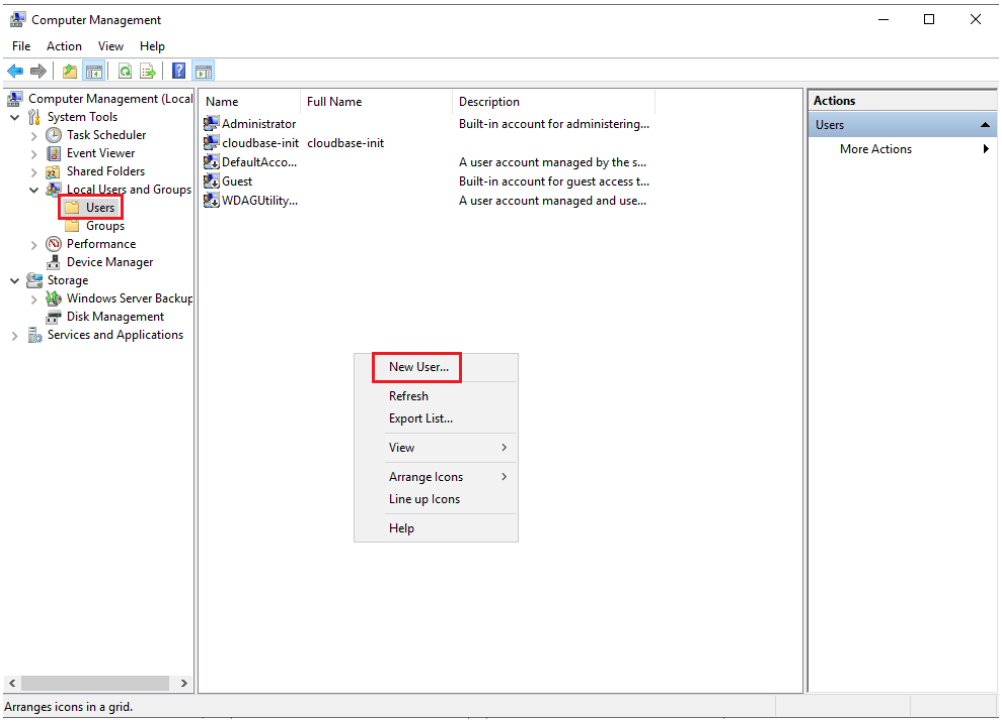
Step 2 Create a username and password.

The Windows username and password are used for FTP. If you allow anonymous users to access FTP, you do not need to create an FTP username and password.

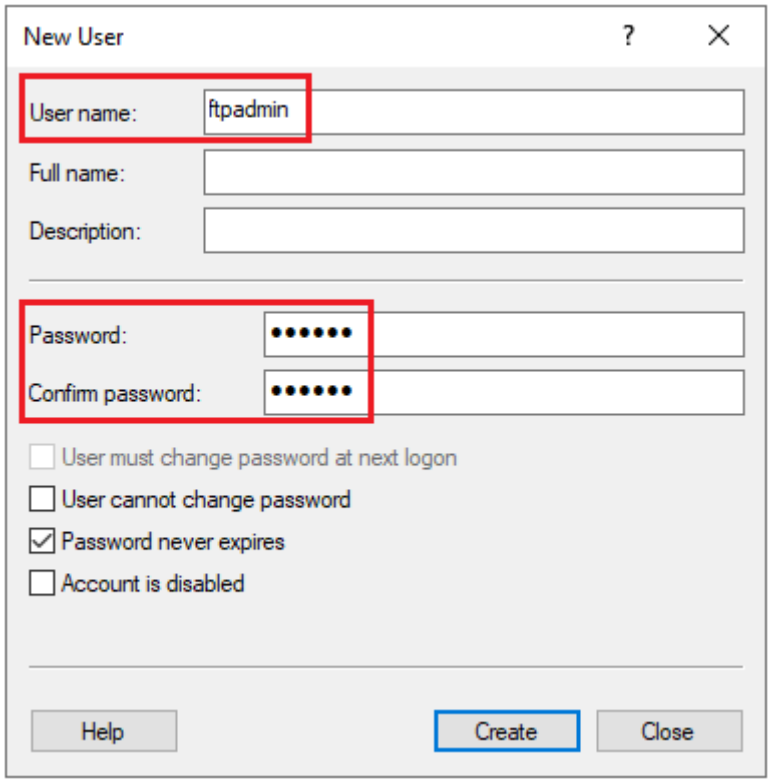
1. In **Server Manager**, choose **Dashboard** > **Tools** > **Computer Management**.



2. Choose **System Tools** > **Local Users and Groups** > **Users**, right-click the blank area on the right, and choose **New User** from the shortcut menu.



3. Set **User name** (**ftpadmin** is used as an example) and **Password**.



4. Click **Create**.

Step 3 Assign permissions to shared files.

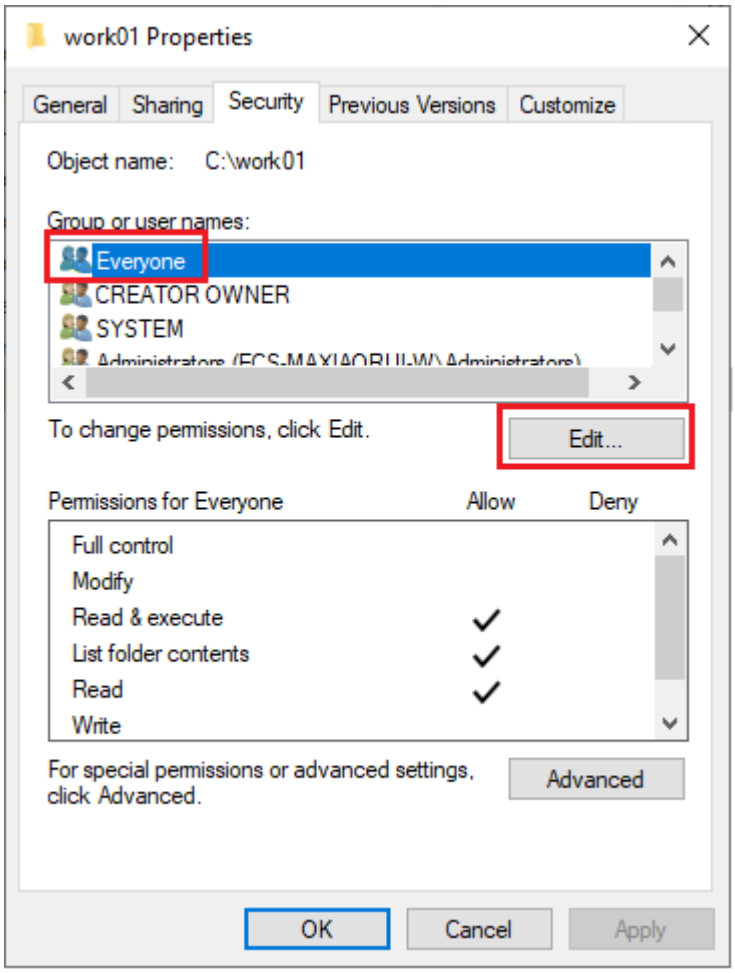
Set access and edit permissions for the files shared to users on the FTP site.

1. Create a folder for FTP on the ECS, right-click the folder, and choose **Properties** from the shortcut menu.

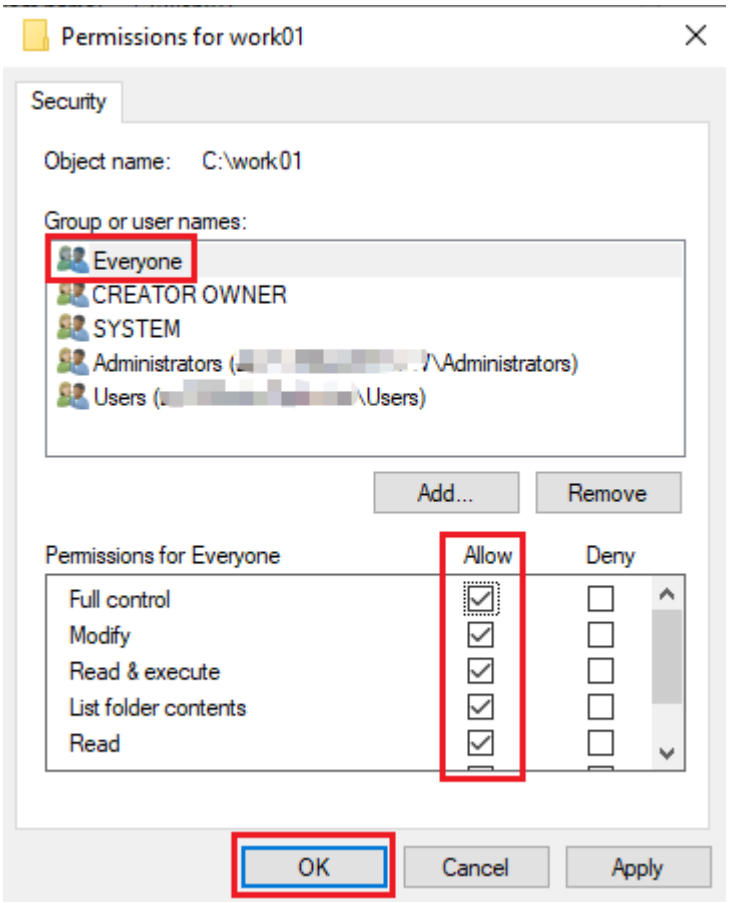
   The **work01** folder is used as an example and it contains the **test.txt** file to be shared.

2. On the **Security** tab, select **Everyone** and click **Edit**.

   If **Everyone** is unavailable, add it. For details, see **FAQs**.

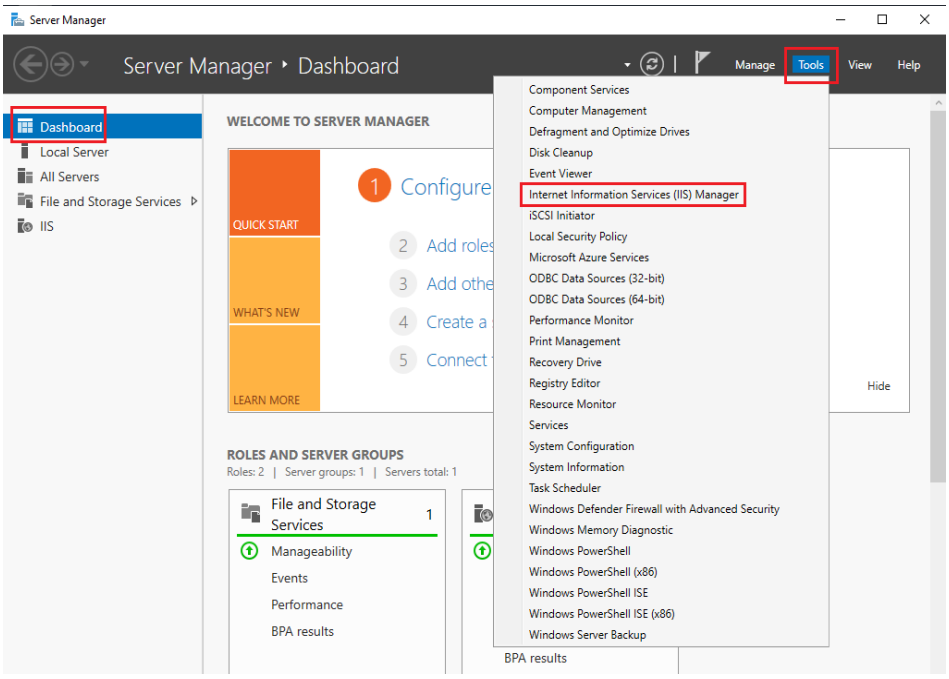


3. Select **Everyone**, assign permissions as needed, and click **OK**.
   In this example, all permissions are allowed.

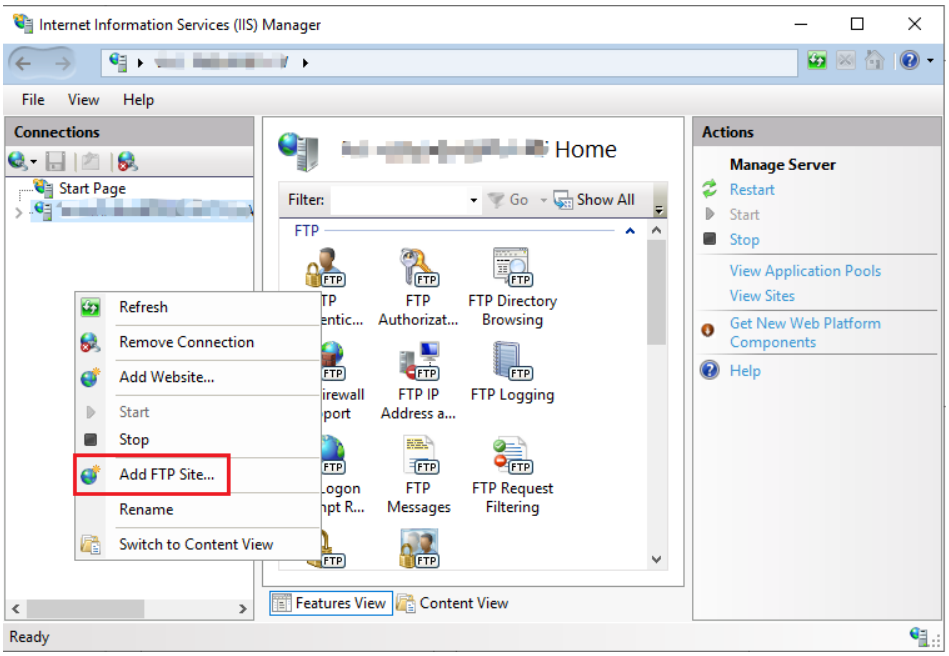


Step 4 Add and set the FTP site.

1. In **Server Manager**, choose **Dashboard** > **Tools** > **Internet Information Services (IIS) Manager**.

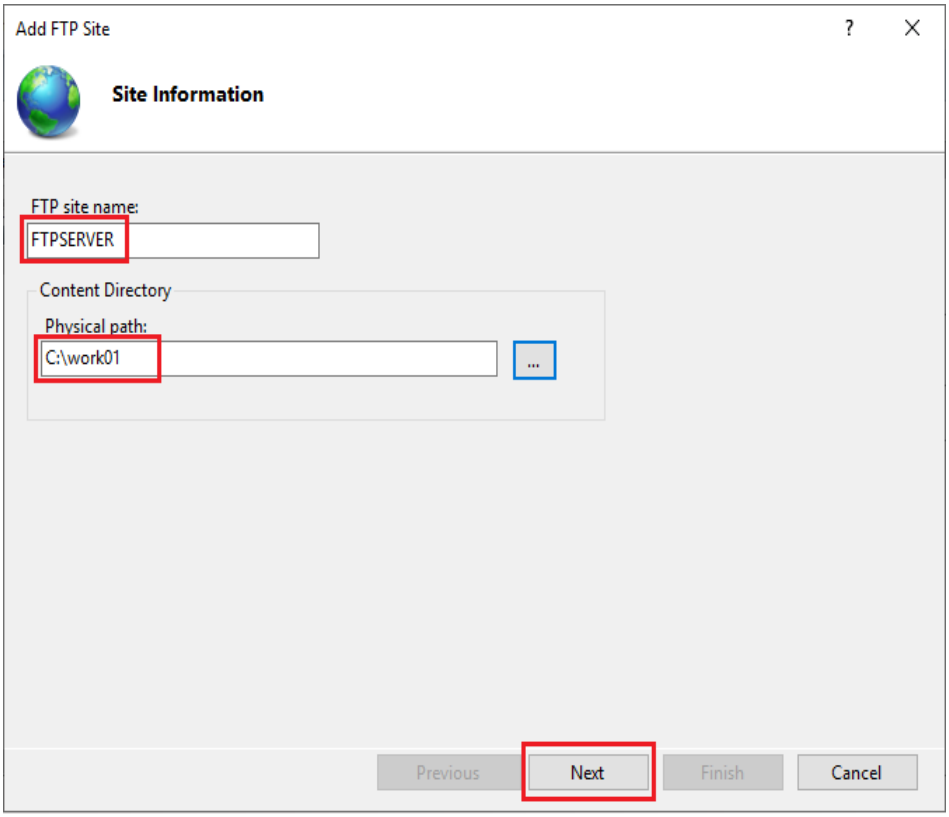


2. Right-click **Sites** and choose **Add FTP Site** from the shortcut menu.



3. In the displayed dialog box, set the FTP site name and the physical path in which the shared folder is stored. Then, click **Next**.

   Site name **FTPSERVER** is used as an example.

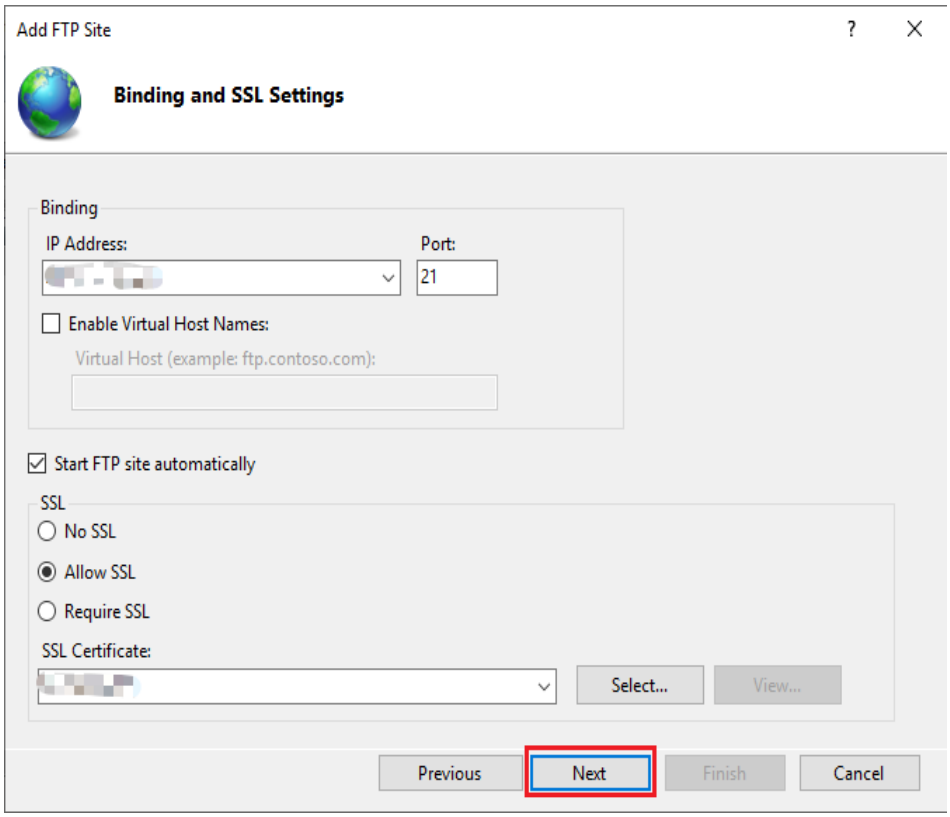


4. Enter the private IP address and port number of the ECS, set SSL, and click **Next**.
   - Port 21 is used by default. You can set it as required.
   - You can also set SSL as required.

- **No SSL**: SSL encryption is not required.
- **Allow SSL**: Non-SSL and SSL connections between the FTP server and the client are allowed.
- **Require SSL**: SSL encryption is required for the communication between the FTP server and the client.

NOTE

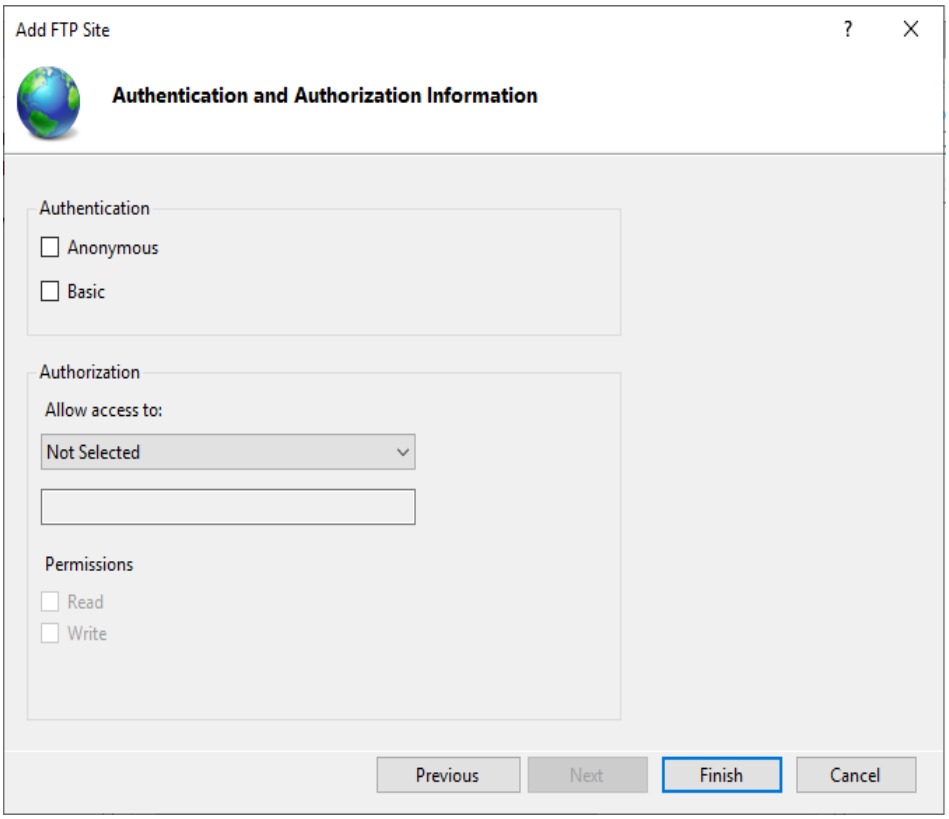
When **Allow SSL** and **Require SSL** are selected, you can select an existing SSL certificate or create one. For details, see 3.



5. Configure authentication and authorization and click **Finish**.
   - Authentication
     - **Anonymous**: allows any user with username **anonymous** or **ftp** to access.
     - **Basic**: allows only users with authorized usernames and passwords to access. However, the passwords transmitted over the network are not encrypted. You are advised to use this authentication method after confirming that the network connection between the client and the FTP server is secure.
   - Authorization
     - **Allow access to:**
       - **All users**: All users are allowed.
       - **Anonymous users**: Anonymous users are allowed.

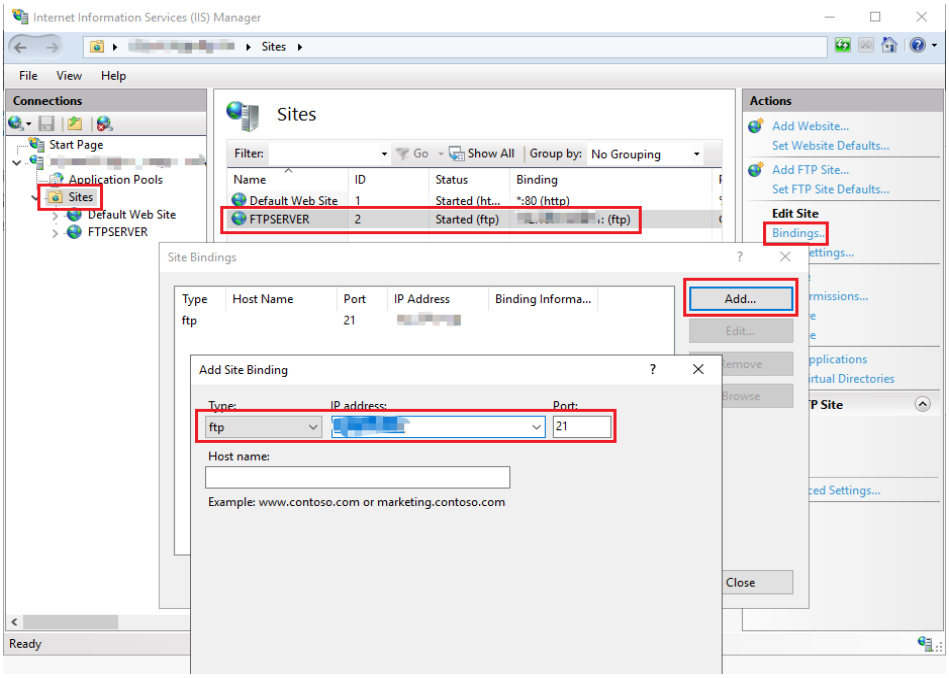
- **Specified roles or user groups**: Only specified roles or user group members are allowed. If you select this option, you are required to enter the specified roles or user groups in the text box.
- **Specified users**: Only specified users are allowed. If you select this option, you are required to enter the specified users in the text box.

- **Permissions**: specifies permissions for the authorized users.



6. Add the private IP address of the ECS to the FTP site.

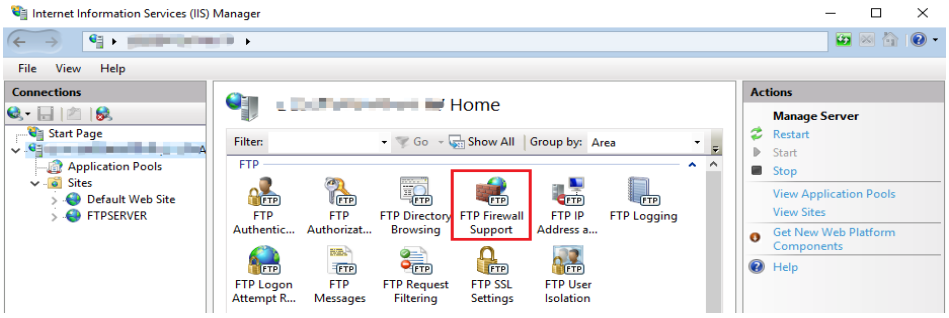
   Choose **Sites**, select the FTP site, and click **Bindings**. In the **Site Bindings** dialog box, click **Add**. Then, add the private IP address of the ECS in the displayed dialog box and click **OK**.



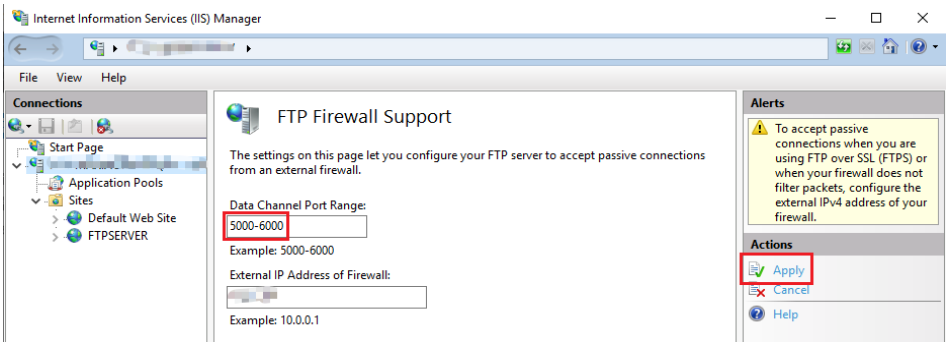
Step 5 (Optional) Configure the FTP firewall.

- To enable the passive mode on the FTP server, the FTP firewall must be configured.
- If Huawei Cloud servers use public IP addresses to access the FTP site that is set up on a Huawei Cloud ECS, the passive mode must be enabled on the FTP server.

1. Double-click **FTP Firewall Support**.



2. Set parameters and click **Apply**.
   - **Data Channel Port Range**: specifies the range of ports used for passive connections. The port range is 1025-65535. Configure this parameter based on site requirements.
   - **External IP Address of Firewall**: specifies the public IP address of the ECS.



3. Restart the ECS for the firewall configuration to take effect.

Step 6 Set the security group and firewall.

After setting up the FTP site, add a rule in the inbound direction of the security group to allow packets to pass through the FTP port. For details, see **Configuring Security Group Rules**. For details about which ports are allowed, see **Table 6-2**.

If **FTP Firewall Support** is configured, enable the ports used by the FTP site and the data channel ports used by the FTP firewall in the security group.

By default, the firewall allows packets to pass through TCP port 21 for FTP. If another port is used, add an inbound rule that allows packets to pass through the port on the firewall.

Table 6-2 Security group rules

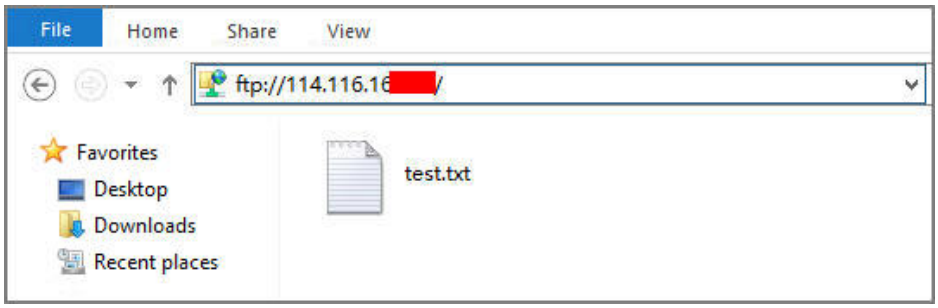
Priority	Action	Type	Protocol & Port	Source Address
1	Allow	IPv4	Protocols/TCP (Custom): 20-21	0.0.0.0/0
1	Allow	IPv4	Protocols/TCP (Custom): 1024-65535 (for example, 5000-6000)	0.0.0.0/0

Step 7 Verify the configuration on the client.

On the computer with the client installed, enter **ftp://***Public IP address of the FTP server.FTP port number* in the Internet Explorer address bar. If you do not specify the port number, port 21 is used by default. If a dialog box is displayed for you to enter the username and password, the configuration is correct. After entering the username and password, you can perform operations on the FTP folder with assigned permissions.

NOTE

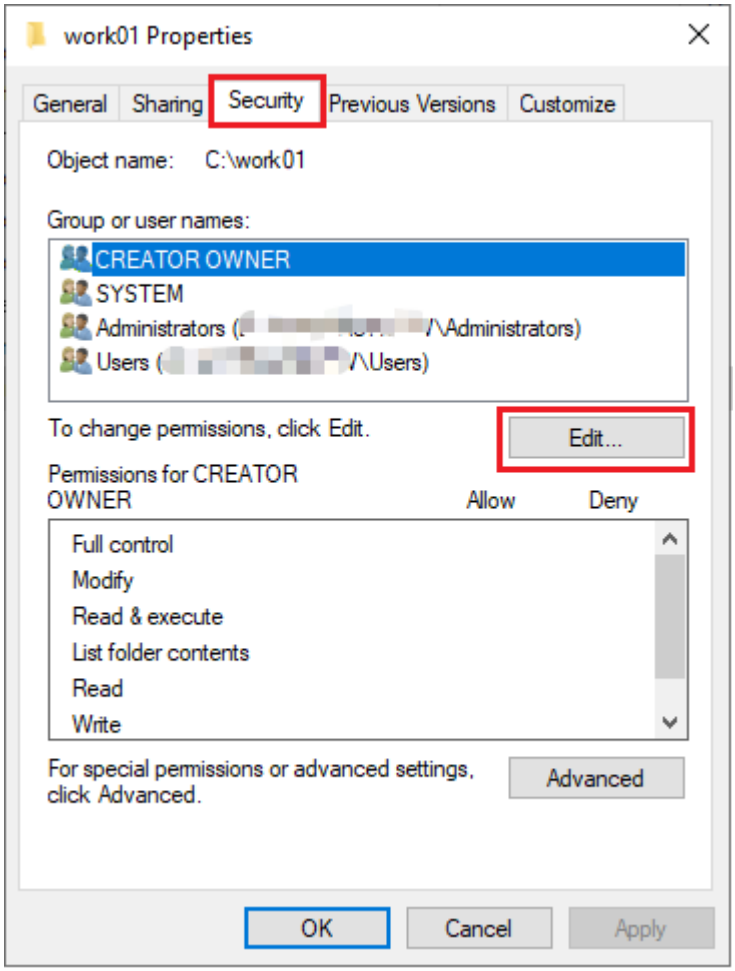
If **FTP Firewall Support** is not configured, configure the Internet Explorer browser. Otherwise, the FTP folder cannot be accessed. To configure the Internet Explorer browser, choose **Tools** > **Internet Options** > **Advanced**, select **Enable FTP folder view**, and deselect **Use Passive FTP**.



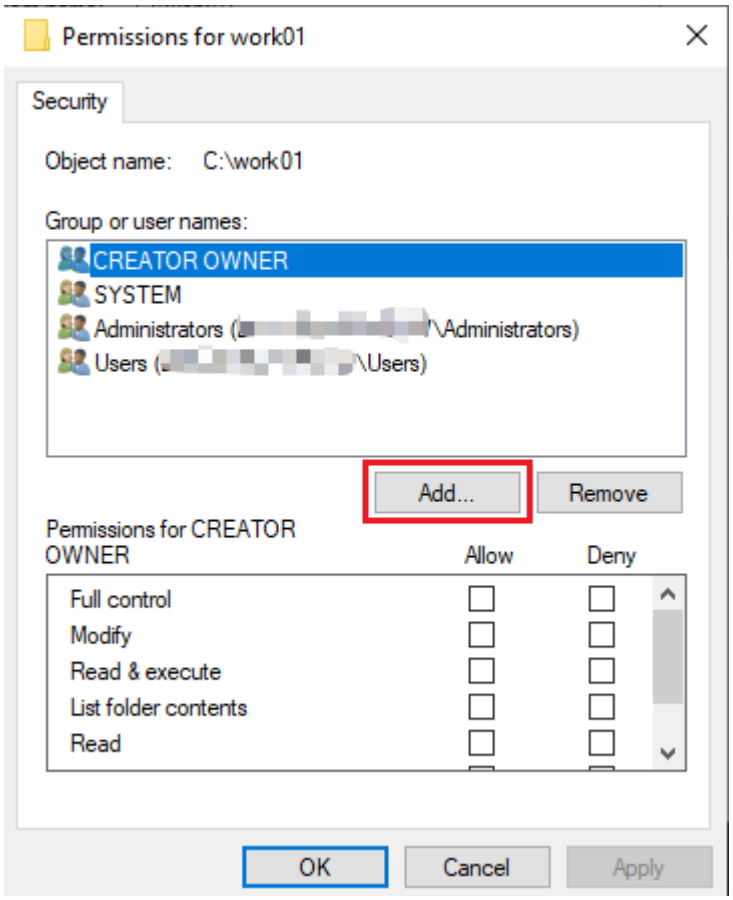
----End

FAQs

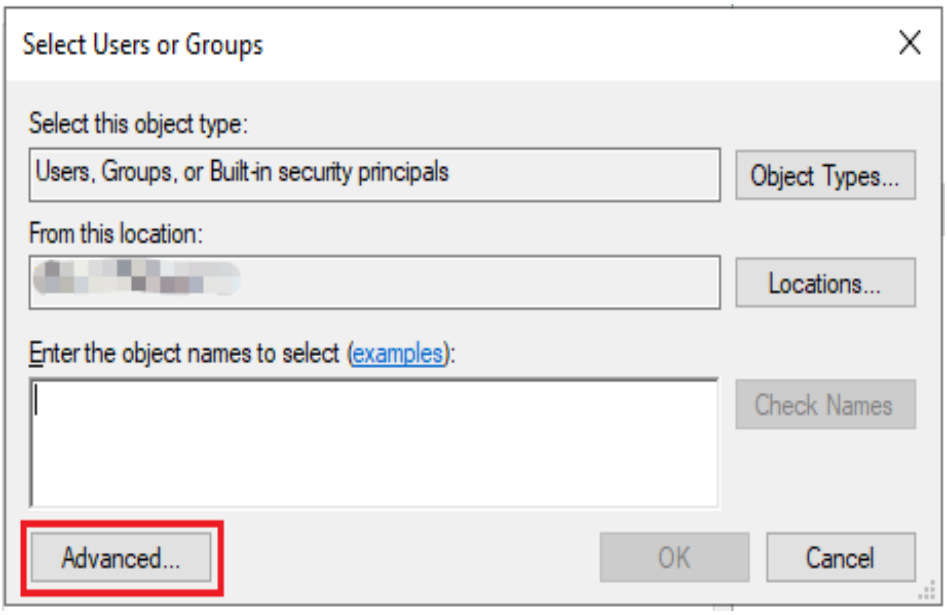
1. For more information about setting up an FTP site on a Windows ECS, see **Microsoft official documents**.
2. When configuring the properties of a folder, if **Everyone** is unavailable, perform the following operations to add it:
   a. On the **Security** tab, click **Edit**.



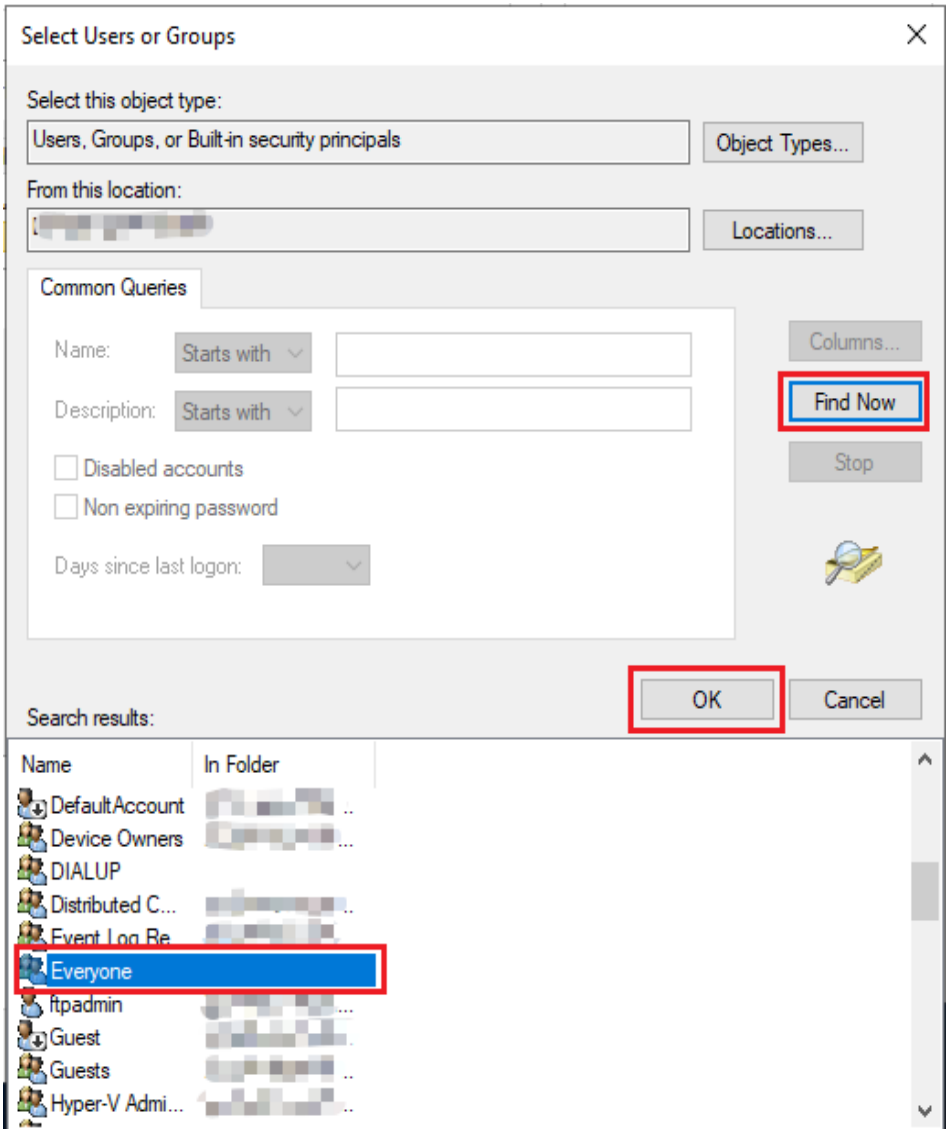
   b. In the displayed dialog box, click **Add**.



c. In the displayed dialog box, click **Advanced**.



d. In the displayed dialog box, click **Find Now**, select **Everyone** in search results, and click **OK**.

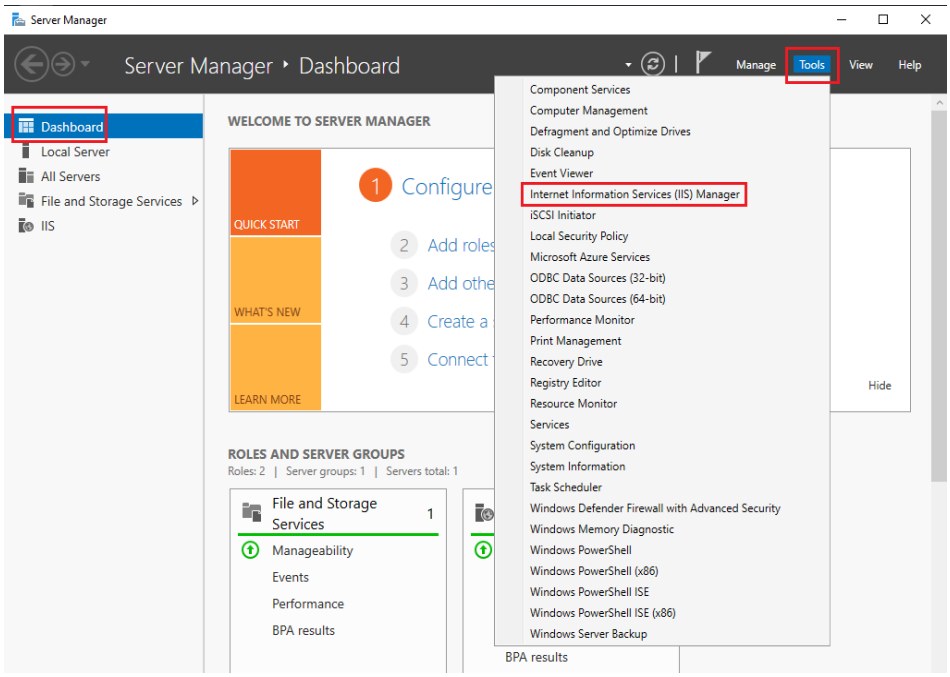


e. Click **OK** to return to the permissions page.

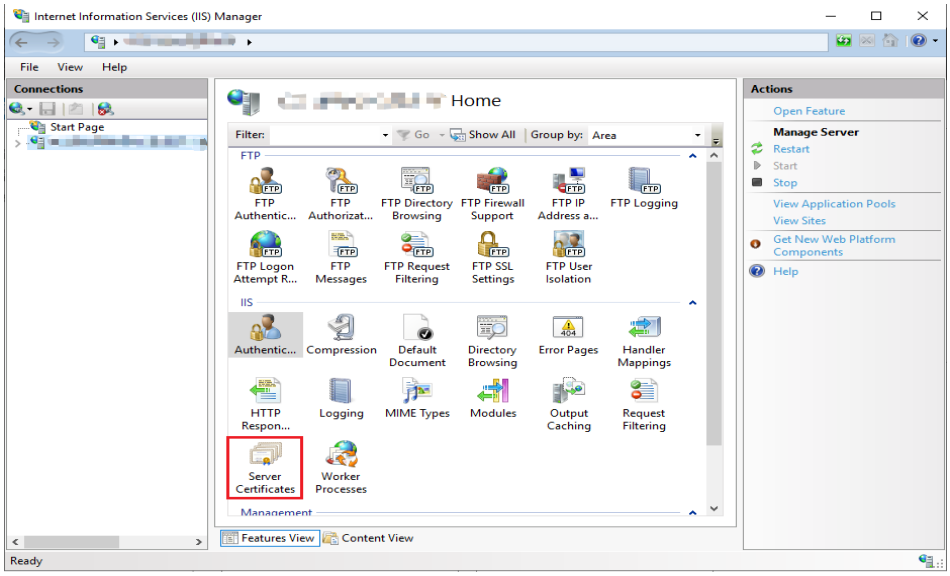
f. Click **OK**.

3. Create a server certificate.

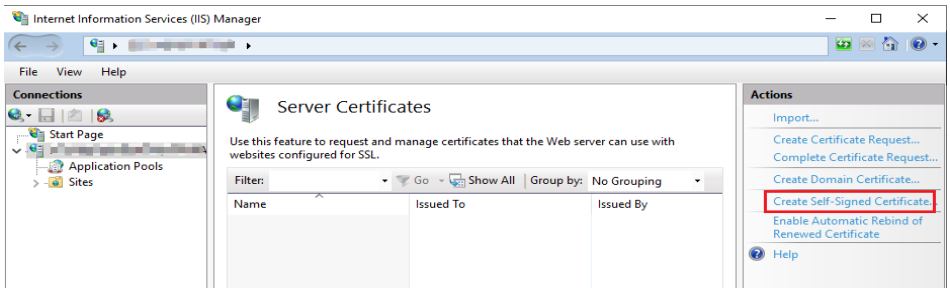
   a. In **Server Manager**, choose **Dashboard** > **Tools** > **Internet Information Services (IIS) Manager**.



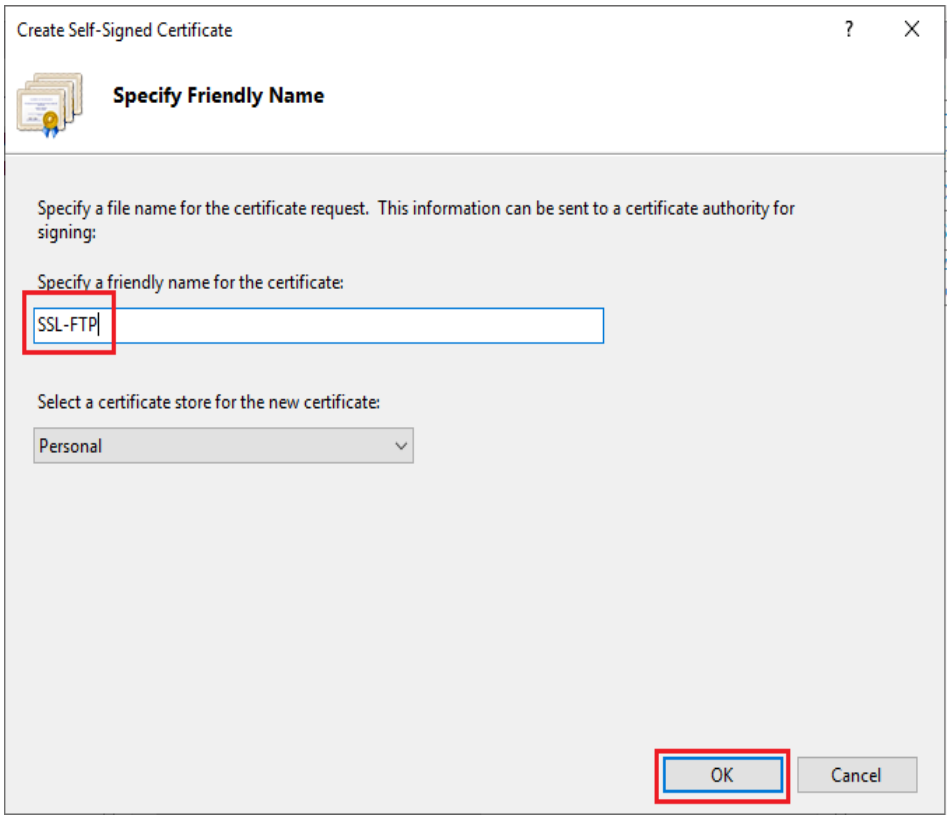
b. In the left list, click the server. Under **IIS** area, double-click **Server Certificates**. The **Server Certificates** page is displayed.



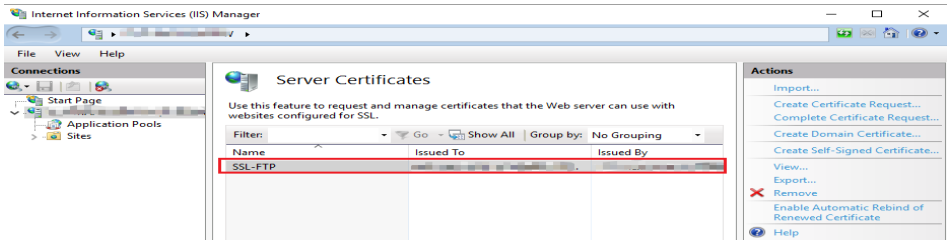
c. Click **Create Self-Signed Certificate**.



d. Specify a certificate name, select a certificate storage type, and click **OK**.



The created certificate is displayed on the **Server Certificates** page.



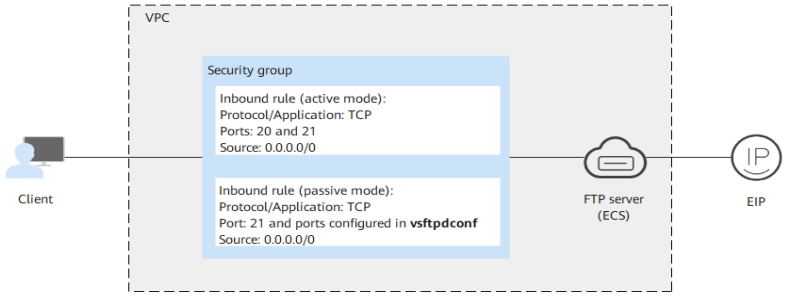
6.1.3 Setting Up an FTP Site (Linux)

Application Scenarios

The best practices for Huawei Cloud ECS guide you through the setup of an FTP site on a Linux ECS using very secure FTP daemon (vsftpd). vsftpd is an FTP server software that is widely used in Linux releases. The CentOS 7.2 64bit OS is used as an example in this section.

Architecture

Figure 6-1 Setting up an FTP site (Linux)



Advantages

- A website with a simple networking architecture can be quickly set up.
- The website is secure and easy to use.

Resource and Cost Planning

Table 6-3 Resources and costs

Resource	Description	Cost
VPC	VPC CIDR block: 192.168.0.0/16	Free
Subnet	• AZ: AZ1 • CIDR block: 192.168.0.0/24	Free

Resource	Description	Cost
Security group	Inbound rule (active mode): • **Priority**: Set it to **1**. • **Action**: Select **Allow**. • **Type**: Select **IPv4**. • **Protocol & Port**: Set it to **TCP: 20-21**. • **Source**: Set it to **0.0.0.0/0**. Inbound rule (passive mode): • **Priority**: Set it to **1**. • **Action**: Select **Allow**. • **Type**: Select **IPv4**. • **Protocol & Port**: Set it to **TCP: 21** and ports configured in **vsftpdconf** • **Source**: Set it to **0.0.0.0/0**.	Free
ECS	• Billing mode: Yearly/Monthly • AZ: AZ1 • Flavor: s6.large.2 • Image: CentOS 7.2 64bit • System disk: 40 GiB • EIP: Auto assign • EIP type: Dynamic BGP • Billed by: Traffic • Bandwidth: 5 Mbit/s	The following resources generate costs: • ECSs • EVS disks • EIPs For billing details, see **Billing Modes**.
vsftpd	A free, open-source FTP software.	Free

Process

The process of manually setting up an FTP website on a Linux ECS is as follows:

1. **Install vsftpd.**
2. **Configure vsftpd.**

3. **Configure a security group.**
4. **Verify the configuration on the client.**

Procedure

Step 1 Install vsftpd.

1. Log in to the ECS.
2. Run the following command to install vsftpd:

   yum install -y vsftpd

   If information similar to the following is displayed, vsftpd has been installed.

```
Dependencies Resolved

================================================================================================================================
 Package                    Arch                       Version                          Repository                   Size
================================================================================================================================
Installing:
 vsftpd                     x86_64                     3.0.2-22.el7                     base                        169 k

Transaction Summary
================================================================================================================================
Install  1 Package

Total download size: 169 k
Installed size: 348 k
Downloading packages:
vsftpd-3.0.2-22.el7.x86_64.rpm                                                                    | 169 kB  00:00:00
Running transaction check
Running transaction test
Transaction test succeeded
Running transaction
  Installing : vsftpd-3.0.2-22.el7.x86_64                                                                            1/1
  Verifying  : vsftpd-3.0.2-22.el7.x86_64                                                                            1/1

Installed:
  vsftpd.x86_64 0:3.0.2-22.el7
```

3. Run the following command to configure automatic FTP enabling upon ECS startup:

   systemctl enable vsftpd.service

4. Run the following command to start FTP:

   systemctl start vsftpd.service

5. Run the following command to obtain the port running FTP:

   netstat -antup | grep ftp

   Information similar to the following is displayed.

```
tcp6       0      0 :::21                   :::*                    LISTEN      11836/vsftpd
```

Step 2 Configure vsftpd.

After vsftpd is installed, anonymous FTP is enabled by default, allowing you to log in to the FTP server without requiring the login username and password. However, you are not allowed to modify or upload files. If you attempt to log in to the FTP server using the Linux OS account, your request will be rejected by vsftpd, but you are allowed to configure the username and password in vsftpd for logging in to the FTP server. To do so, perform the following operations:

1. Create a user.

   For example, to create user **ftpadmin**, run the following command:

   useradd ftpadmin

2. Run the following command to configure the password of user **ftpadmin**:

   passwd ftpadmin

3. Run the following command to create a file directory for the FTP server, **/var/ftp/work01** is used as an example:

mkdir /var/ftp/work01

4. Run the following command to change the owner of the created file directory to the local user for logging in to the FTP server:

   chown -R ftpadmin:ftpadmin /var/ftp/work01

5. Modify the **vsftpd.conf** configuration file.

   a. Run the following command to open the file:

      vi /etc/vsftpd/vsftpd.conf

   b. Press **i** to enter insert mode.

   c. Modify the **vsftpd.conf** file.

      Set FTP to active or passive mode based on site requirements. If other Huawei Cloud ECSs are required to use public IP addresses to access the FTP site that is set up on a Huawei Cloud ECS, set FTP to passive mode.

      - Parameters to be configured for the active FTP mode:

```
#No anonymous login to the FTP server is allowed. Local users are allowed to log in to
the FTP server with their local file directories specified.
anonymous_enable=NO            #No anonymous login to the FTP server is allowed.
local_enable=YES               #Local users are allowed to log in to the FTP server.
local_root=/var/ftp/work01     #Specifies the file directory used by a local FTP user.

#The following parameter allows login users to visit their own home directories:
chroot_local_user=YES                  #The directory access rule applies to all users.
chroot_list_enable=YES                 #The directory access rule does not apply to
exclusive users.
chroot_list_file=/etc/vsftpd/chroot_list   #Specifies exclusive users.
allow_writeable_chroot=YES
```

      - Apart from the parameters configured in active FTP mode, the following parameters are also required for passive FTP mode:

```
#The public IP address of the FTP server and the range of accessible ports must also be
configured.
listen=YES
listen_ipv6=NO
pasv_address=xx.xx.xx.xx     #Public IP address of the FTP server

pasv_min_port=3000           #Minimum port number in passive FTP mode
pasv_max_port=3100           #Maximum port number in passive FTP mode
```

   d. Press **Esc** to exit insert mode. Then, enter **:wq** to save the settings and exit.

   e. Create the **chroot_list** file in **/etc/vsftpd/**.

      touch chroot_list

      The **chroot_list** file contains exclusive users to whom the home directory access rules do not apply. To allow a user to access non-home directories, add the username to this file. If there is no exclusive user, the **chroot_list** file can be left blank, but the file must be available.

6. Run the following command to restart vsftpd for the configuration to take effect:

   systemctl restart vsftpd.service

Step 3 Configure a security group.

After setting up the FTP site, add a rule in the inbound direction of the security group to allow packets to pass through the FTP port. For details, see **Adding a Security Group Rule**.

Table 6-4 Security group rules

Priority	Action	Type	Protocol & Port	Source Address
1	Allow	IPv4	Protocols/TCP (Custom): 20-21	0.0.0.0/0
1	Allow	IPv4	Protocols/TCP (Custom): 1024-65535 (for example, 5000-6000)	0.0.0.0/0

Step 4 Verify the configuration on the client.

On the computer with the client installed, enter **ftp://***IP address of the FTP server.FTP port number* in the Internet Explorer address bar. If you do not specify the port number, port 21 is used by default. If a dialog box is displayed for you to enter the username and password, the configuration is correct. After entering the username and password, you can perform operations on the FTP folder with assigned permissions.

NOTE

- If active FTP mode is selected, use this method to configure the Internet Explorer browser. Otherwise, the FTP folder will be inaccessible. To configure the Internet Explorer browser, choose **Tools** > **Internet Options** > **Advanced**, select **Enable FTP folder view**, and deselect **Use Passive FTP**.
- If an error occurs when you use a browser to access the FTP server, clear the browser caches and try again.

----End

6.2 Building Microsoft SharePoint Server 2016

6.2.1 Purchasing and Logging In to an ECS

Purchase an ECS on Huawei Cloud with specified specifications and OS.

1. Log in to the management console.
2. Click in the upper left corner and select the desired region and project.
3. Under **Compute**, click **Elastic Cloud Server**.
4. Click **Buy ECS**.

   The **Buy ECS** page is displayed.
5. Configure ECS parameters.

   For details, see **Purchasing an ECS**.

Figure 6-2 Setting ECS specifications

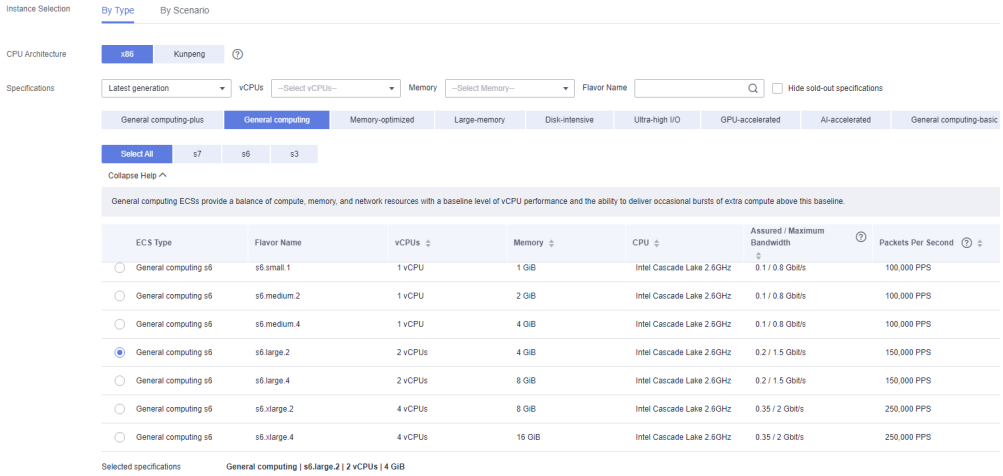


Figure 6-3 Setting the network

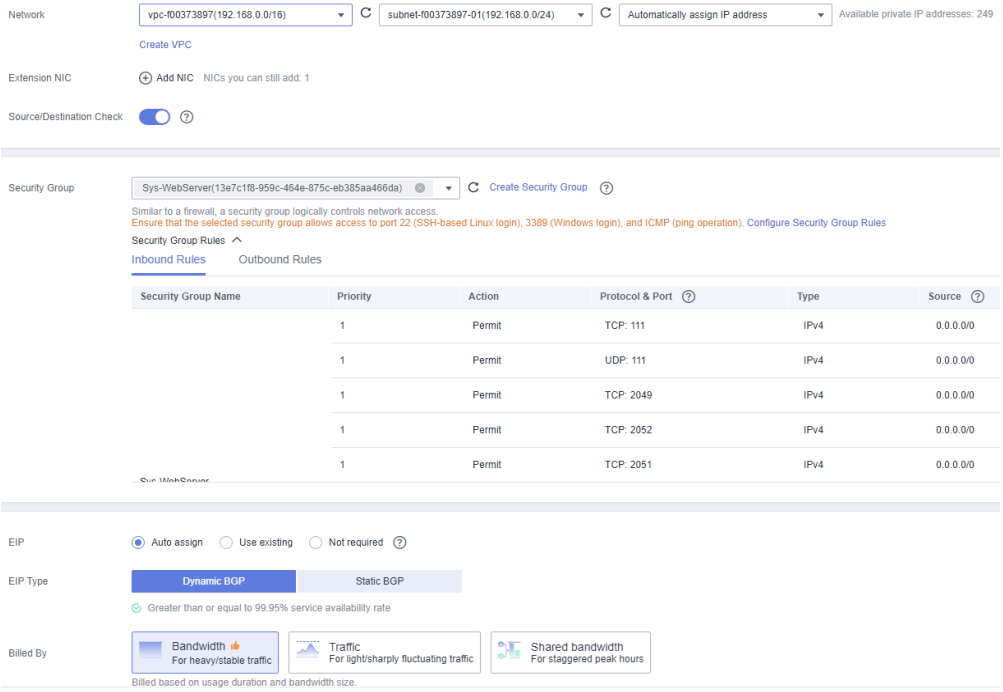
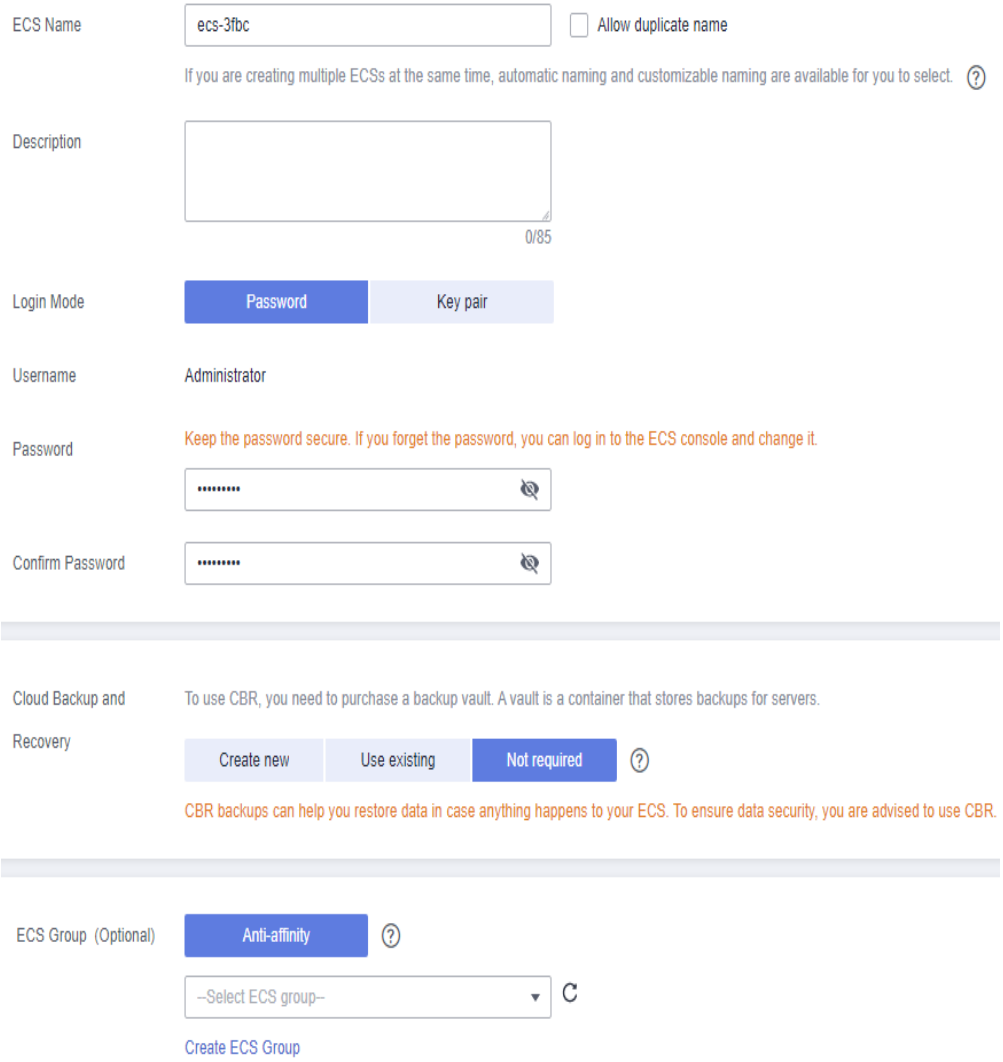


Figure 6-4 Setting the login mode and ECS name

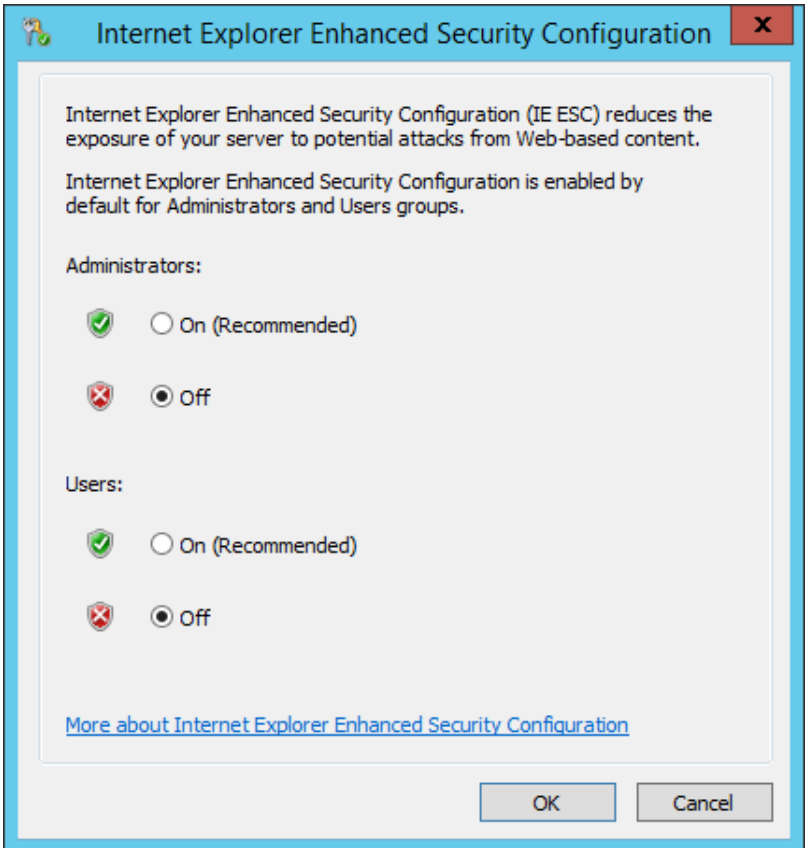


6. Confirm the ECS configuration, and read and agree to the agreement.
7. Click **Submit** and wait for the ECS creation to complete.
8. In the ECS list, locate the ECS you created and click **Remote Login** in the **Operation** column.
9. Enter the password of the ECS to log in.

6.2.2 Adding AD, DHCP, DNS, and IIS Services

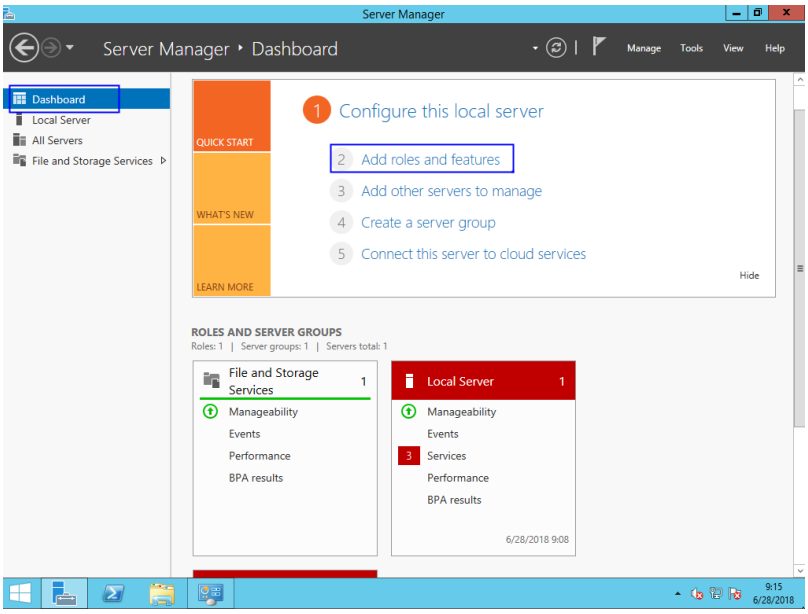
1. Choose **Server Manager** > **Local Server** and set **IE Enhanced Security Configuration** to **Off**.

Figure 6-5 Internet Explorer Enhanced Security Configuration



2. Choose **Server Manager** > **Dashboard**.
3. Click **Add roles and features** to add roles and functions for the server, including DNS, DHCP, IIS, and Net Framework 3.5.

Figure 6-6 Add roles and features



4. On the **Server Roles** page, select **Active Directory Domain Services**, **DHCP Server**, **DNS Server**, and **Web Server (IIS)**.

Figure 6-7 Server role 1

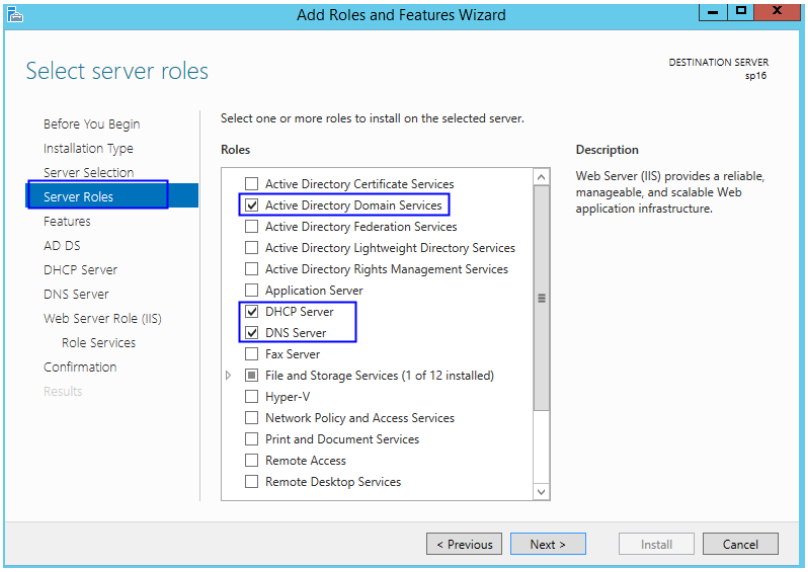
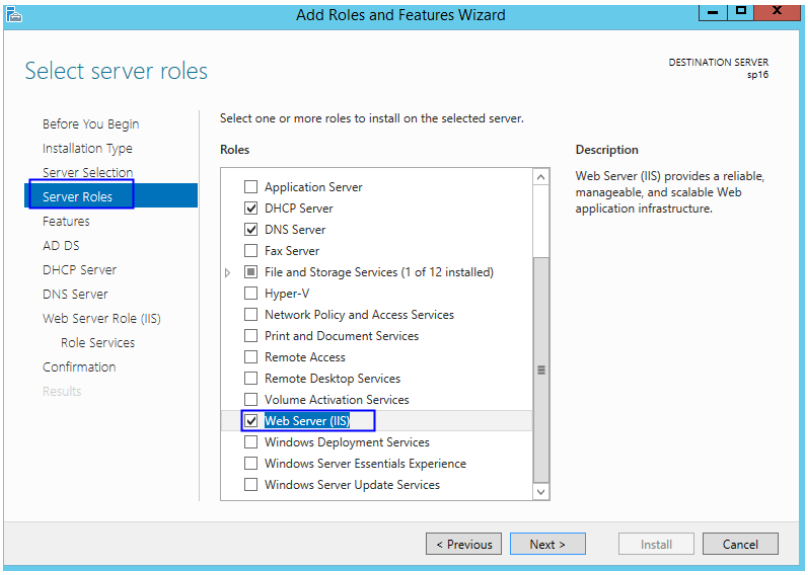
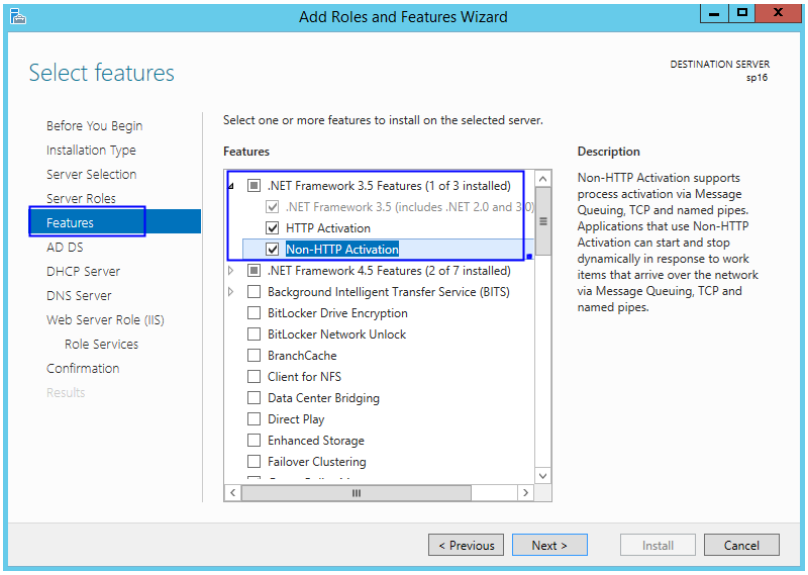


Figure 6-8 Server role 2



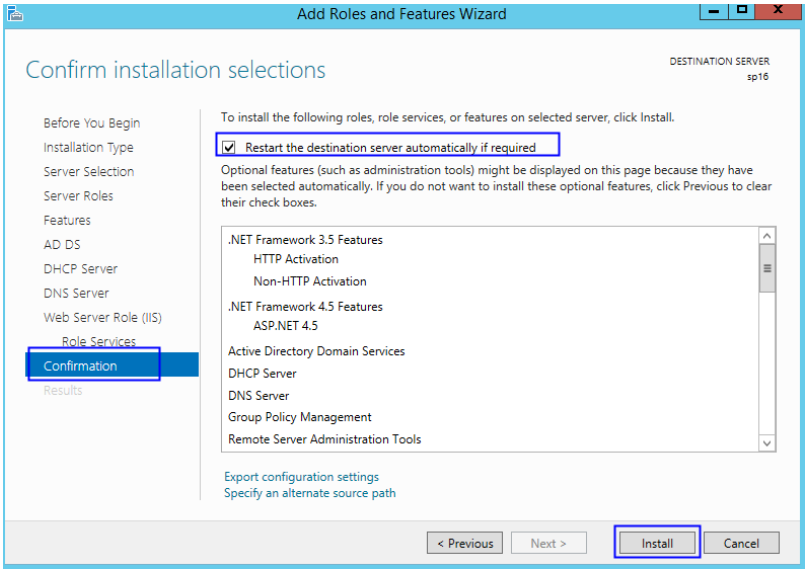
5. Click **Next**.
6. On the **Features** page, select **.NET Framework 3.5 Features**.

Figure 6-9 Features



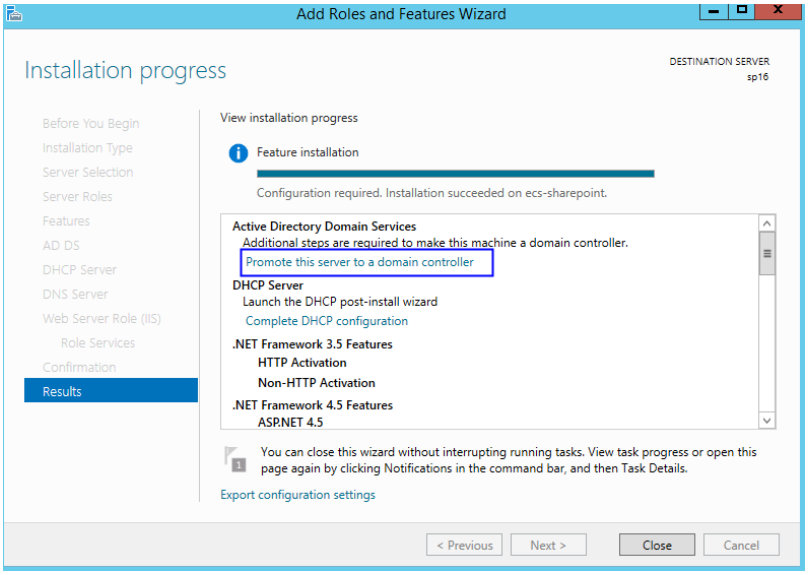
7. Click **Next** until the configuration is complete.
8. On the **Confirmation** page, select **Restart the destination server automatically if required**.

Figure 6-10 Confirm installation selections



9. Click **Install** to start installation.
10. After the installation is complete, click **Promote this server to a domain controller** to configure the AD service.

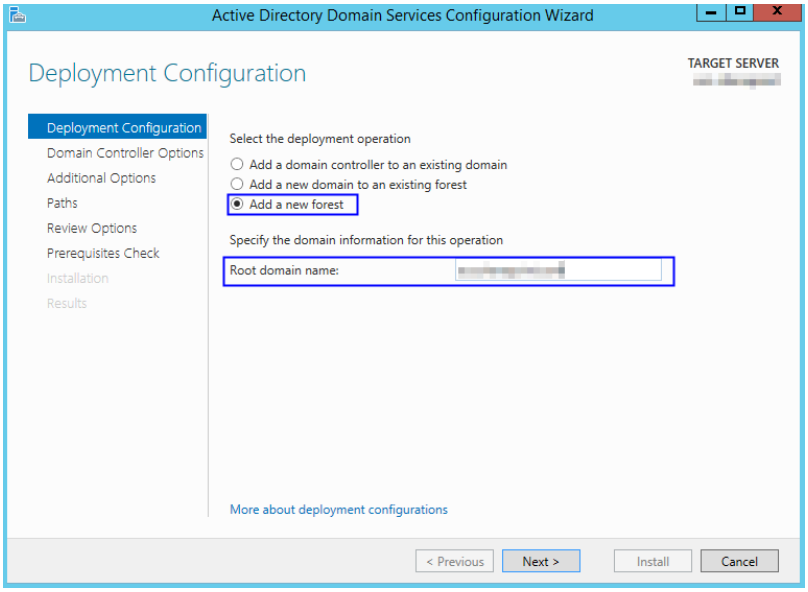
Figure 6-11 AD configuration



11. Choose **Add a new forest**.

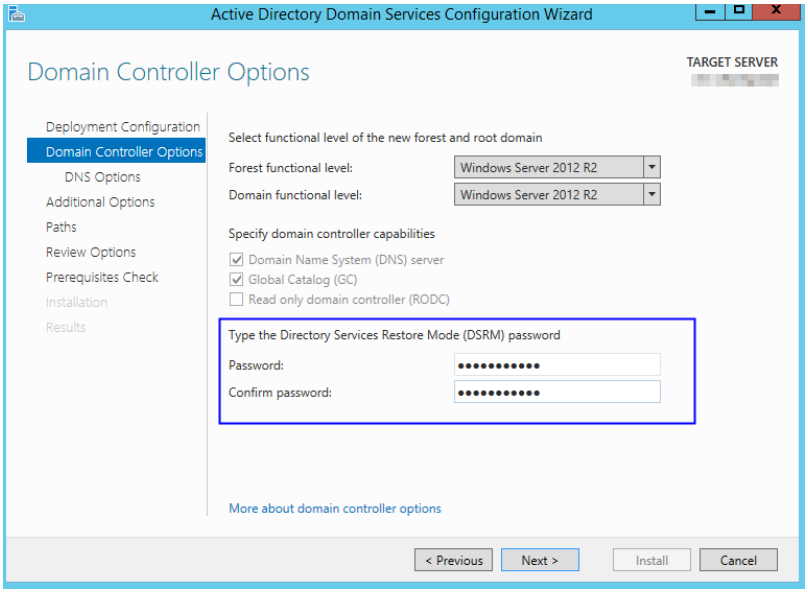
    Set **Root domain name** to **sp160.com.cn**.

Figure 6-12 Add a new forest



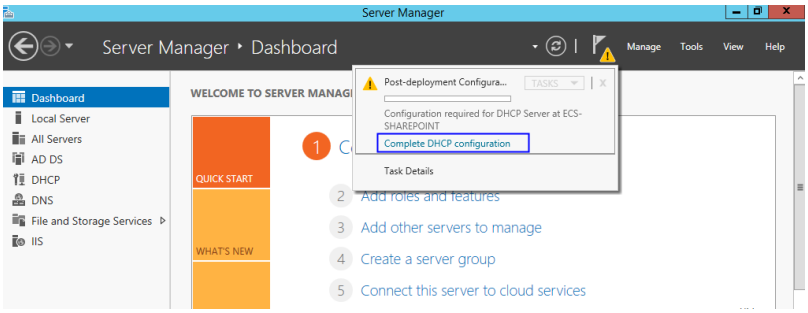
12. Click **Next**.
13. Set the password, which is used to back up and restore the domain controller.

Figure 6-13 Password setting



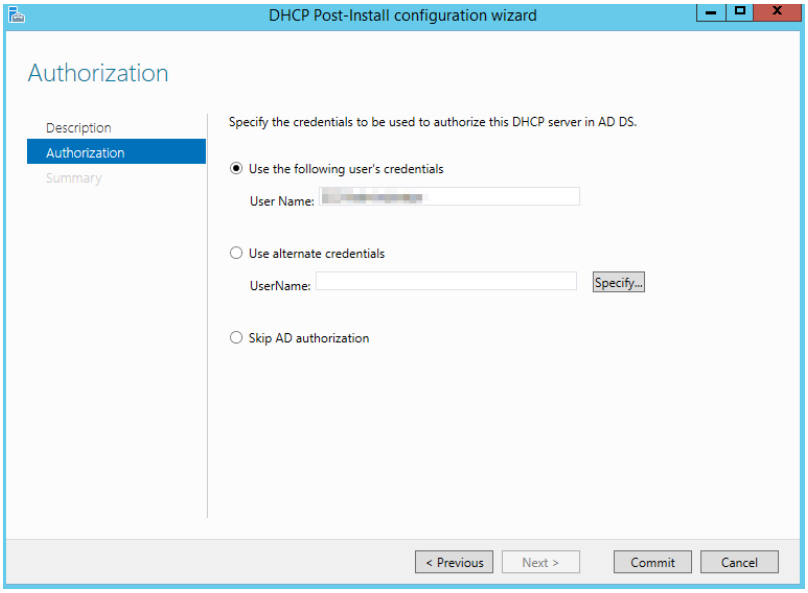
14. Click **Next** until the installation is complete.
15. Click **Complete DHCP configuration** to configure the DHCP function.

Figure 6-14 DHCP configuration 1



16. Retain the default settings and click **Next**.

Figure 6-15 DHCP configuration 2

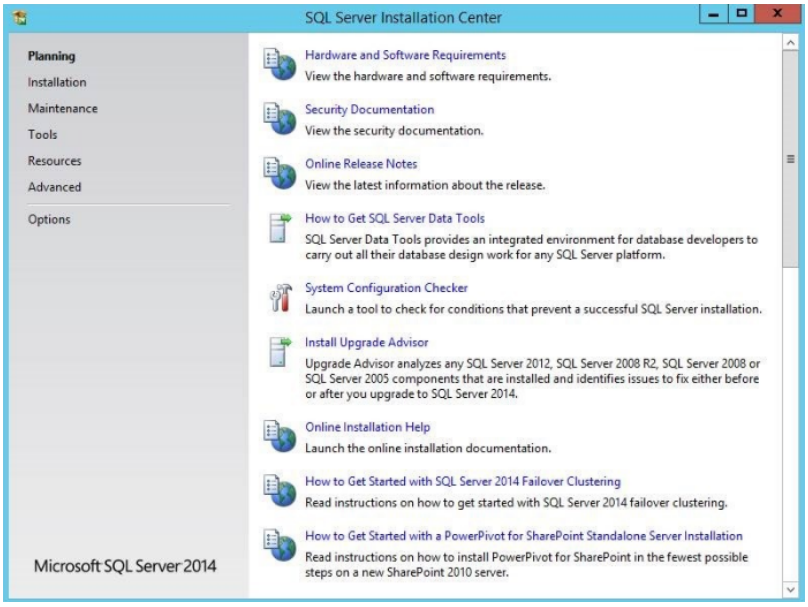


17. Click **Commit**.
18. After the configuration is complete, click **Close**.

6.2.3 Installing SQL Server

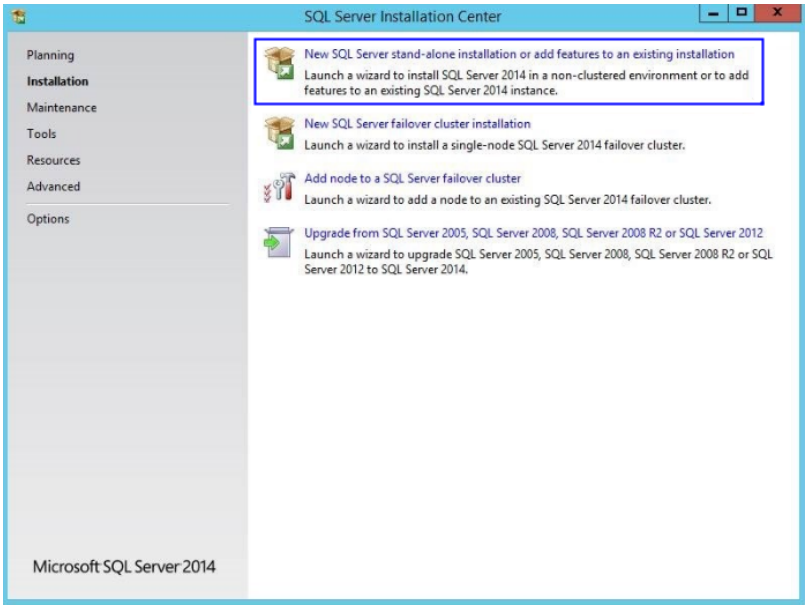
1. Double-click **Setup.exe** to open the SQL Server installation center.

Figure 6-16 SQL Server installation center



2. On the **Installation** page, click the first option.

Figure 6-17 SQL Server installation options

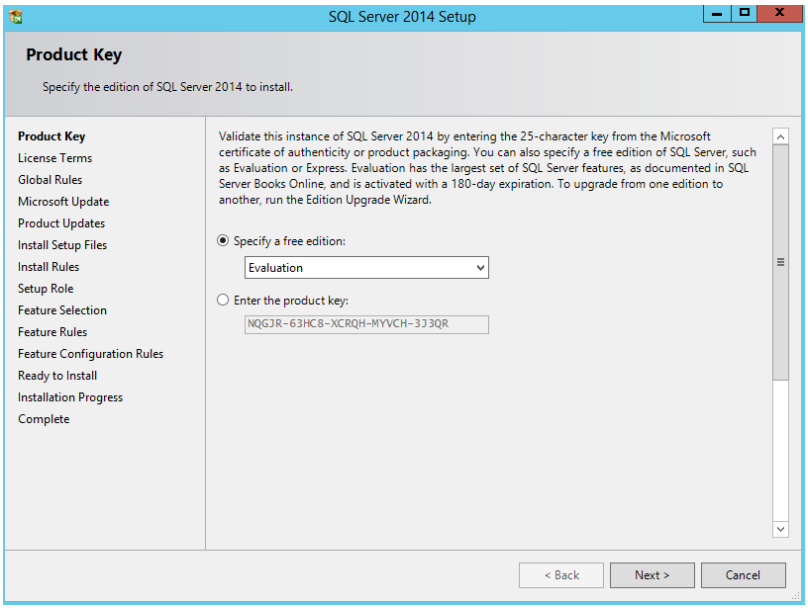


3. Select **Specify a free edition** to install SQL Server with a free image.

NOTE

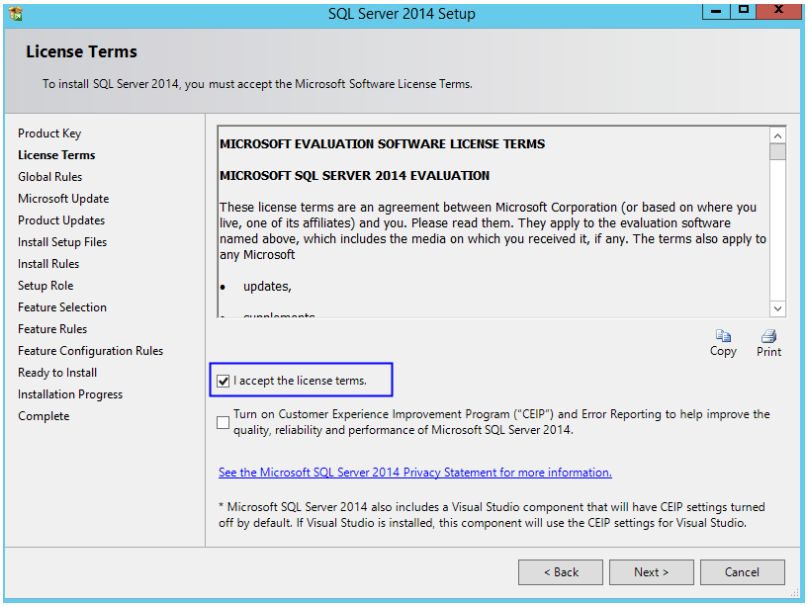
To set up an official SharePoint environment, you need to enter a key to install a full edition of SQL Server.

Figure 6-18 SQL Server free edition



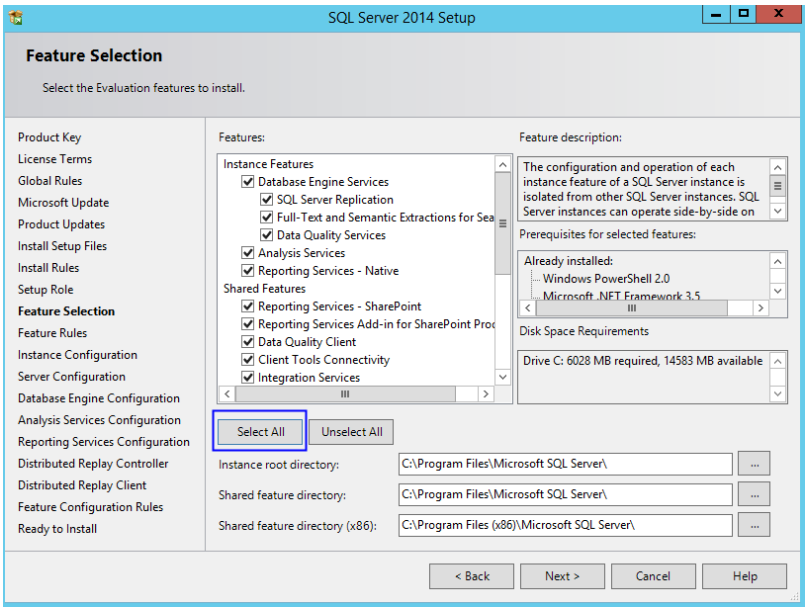
4. Select **I accept the license terms** and click **Next**.

Figure 6-19 SQL Server license option



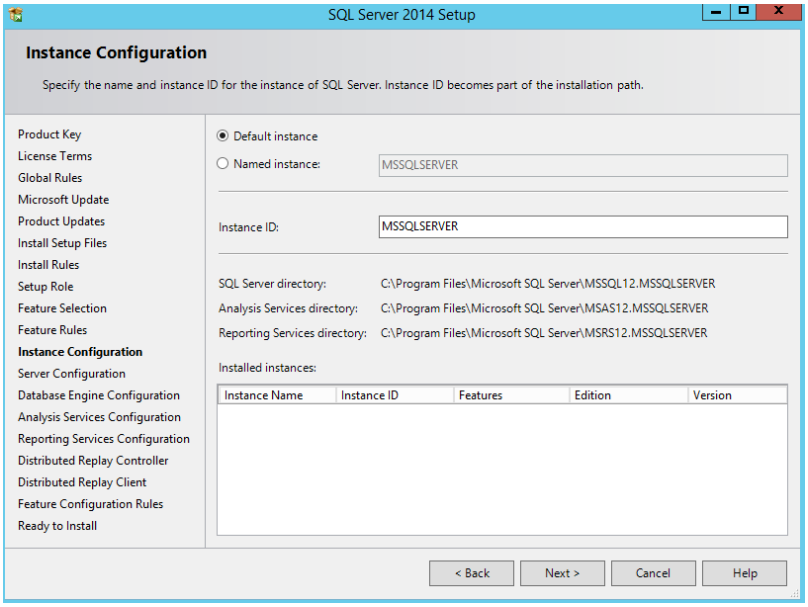
5. Click **Next** to install **Microsoft Updates**, **Install Rules**, and **Setup Role** using the default settings.
6. Click **Select All** to select all features and click **Next**.

Figure 6-20 SQL Server Feature Selection



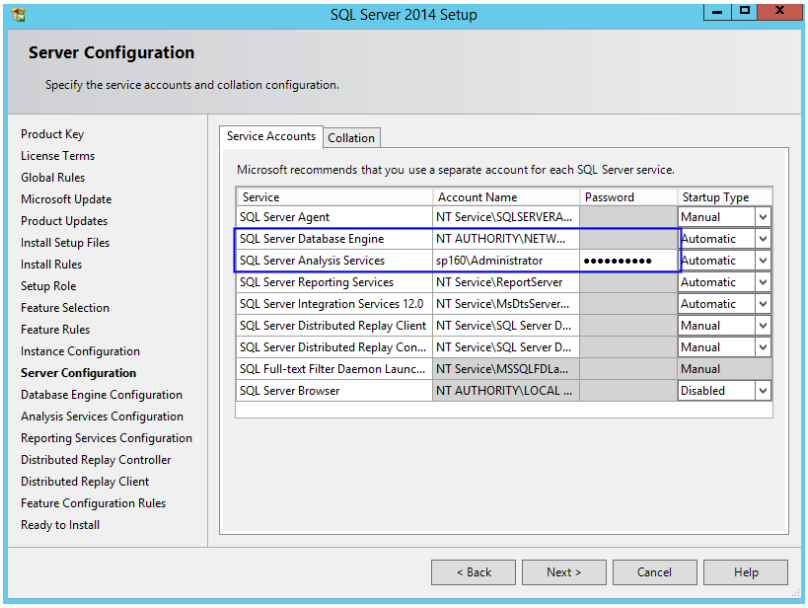
7. Select **Default instance**.

Figure 6-21 SQL Server instance



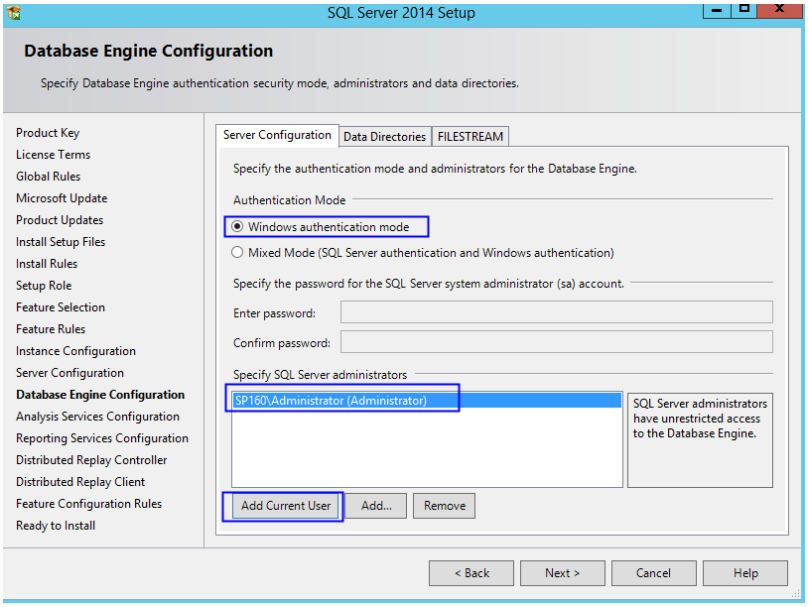
8. Set SQL Server configurations.
   - Change the account name of **SQL Server Database Engine** to **NT AUTHORITY\NETWORK SERVICE**.
   - Set the account and password of **SQL Server Analysis Services** to those configured in steps **11** to **13** in **Adding AD, DHCP, DNS, and IIS Services**.

Figure 6-22 SQL Server service accounts



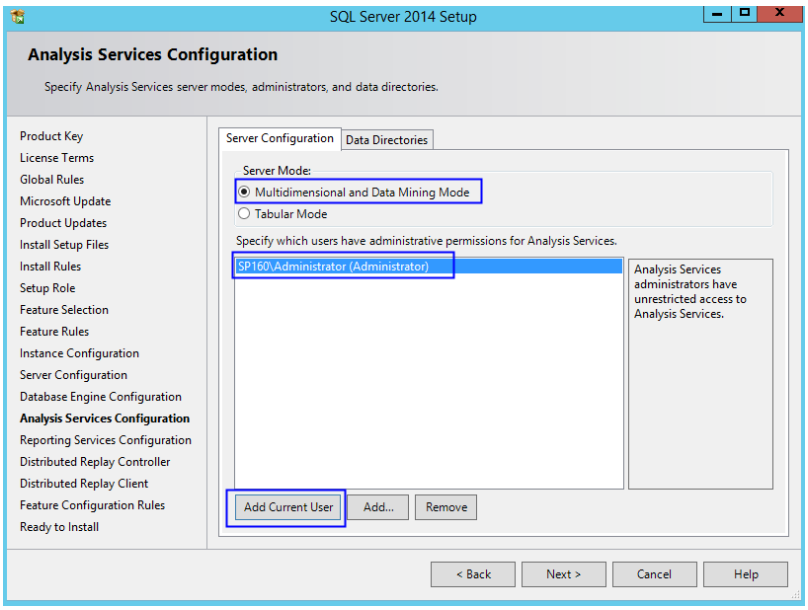
9. Click **Add Current User** to set the current account as the SQL Server administrator account, and click **Next**.

Figure 6-23 SQL Server administrator account 1



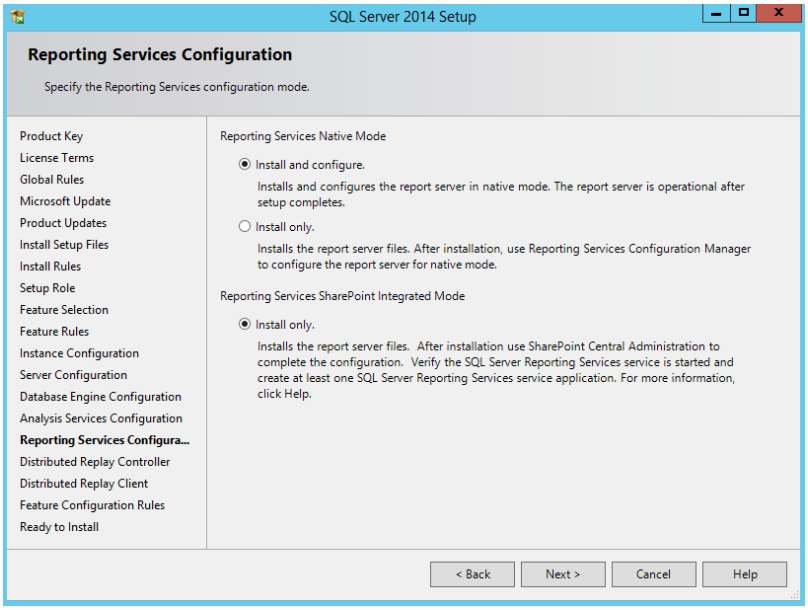
10. Click **Add Current User** to grant Analysis Services administrator permissions to the current account, and click **Next**.

Figure 6-24 SQL Server administrator account 2



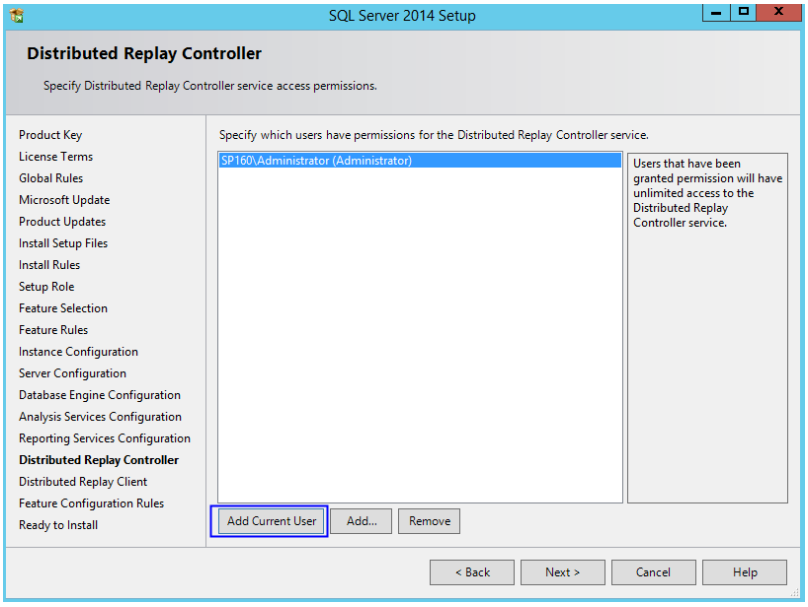
11. Retain the default setting in **Reporting Services Configuration** and click **Next**.

Figure 6-25 Reporting Services Configuration



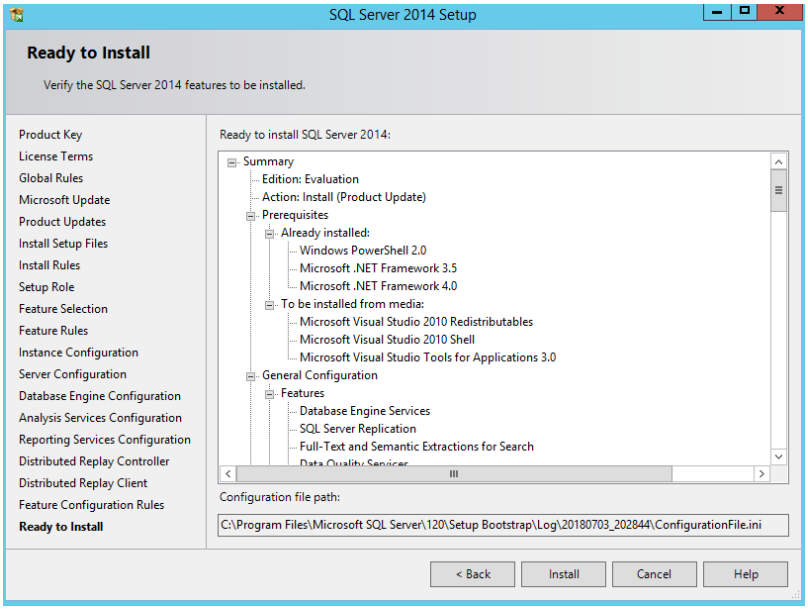
12. Click **Add Current User** to grant Distribution Replay Controller service permissions to the current account, and click **Next**.

Figure 6-26 Distribution Replay Controller service



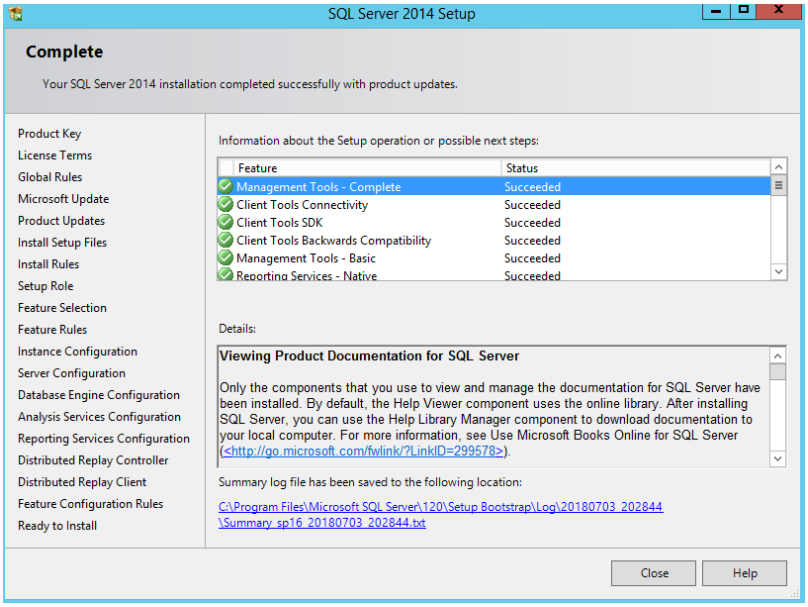
13. Confirm SQL Server configurations and click **Install**.

Figure 6-27 SQL Server installation



14. Click **Close**. The SQL Server installation is complete.

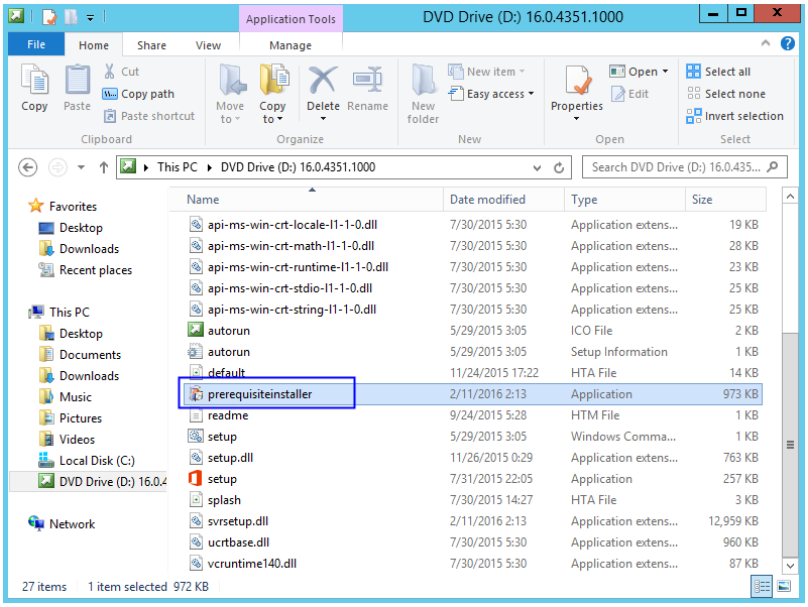
Figure 6-28 Finish SQL Server installation



6.2.4 Installing Microsoft SharePoint Server 2016

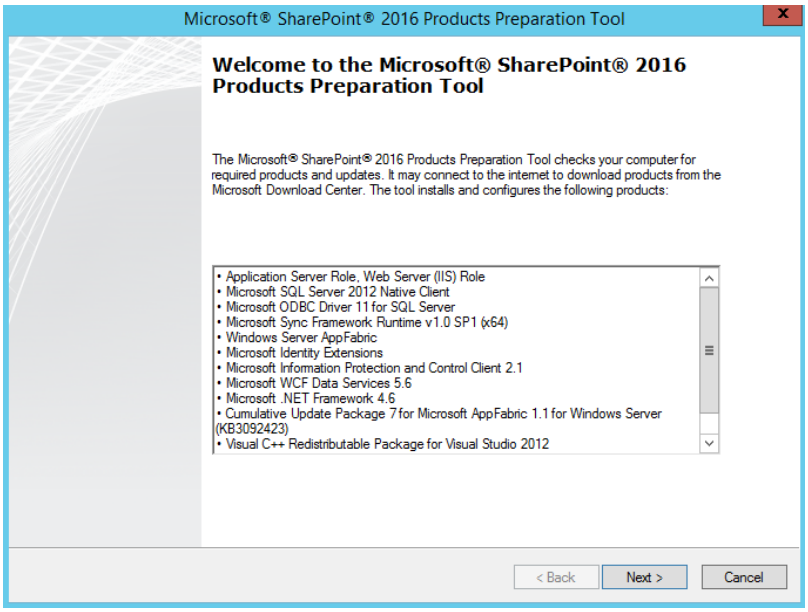
1. Open the image file and double-click the executable file of the preparation tool to install SharePoint 2016 preparation tool.

Figure 6-29 SharePoint preparation tool



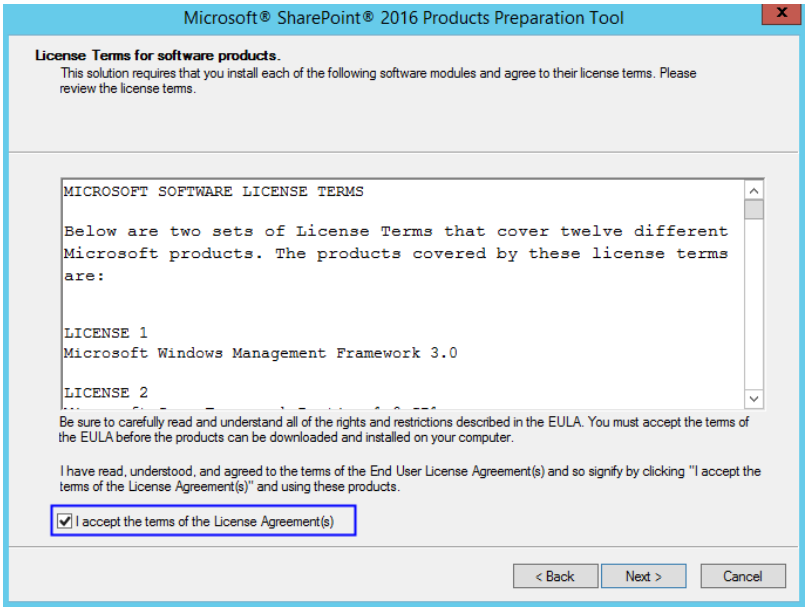
2. Open the installation wizard of the SharePoint preparation tool and click **Next**.

Figure 6-30 SharePoint preparation tool installation wizard



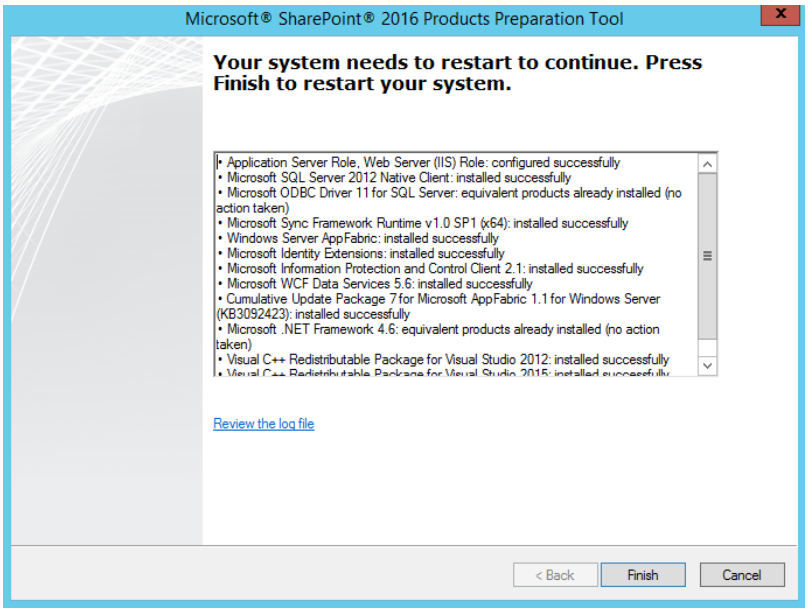
3. Select **I accept the terms of the License Agreement(s)** and click **Next**.

Figure 6-31 SharePoint preparation tool license



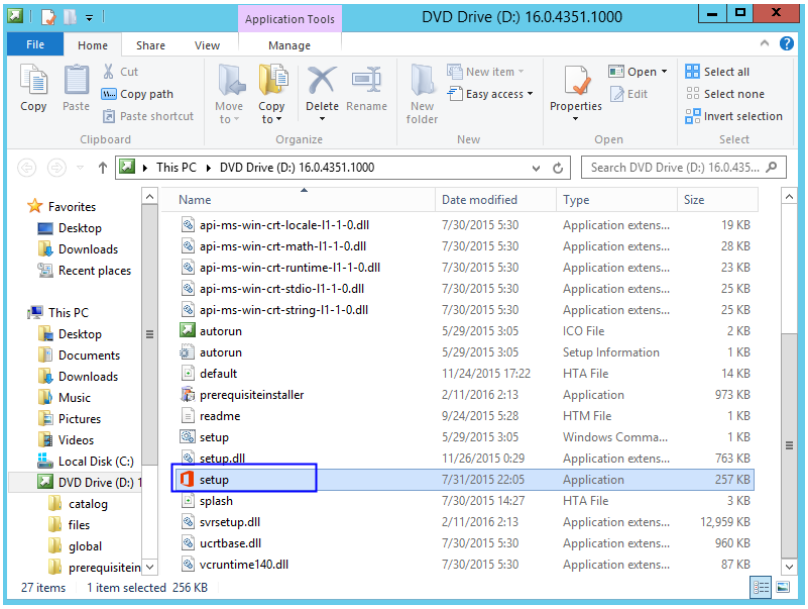
4. After the preparation tool is installed, click **Finish** to restart the system.

Figure 6-32 Successful preparation tool installation



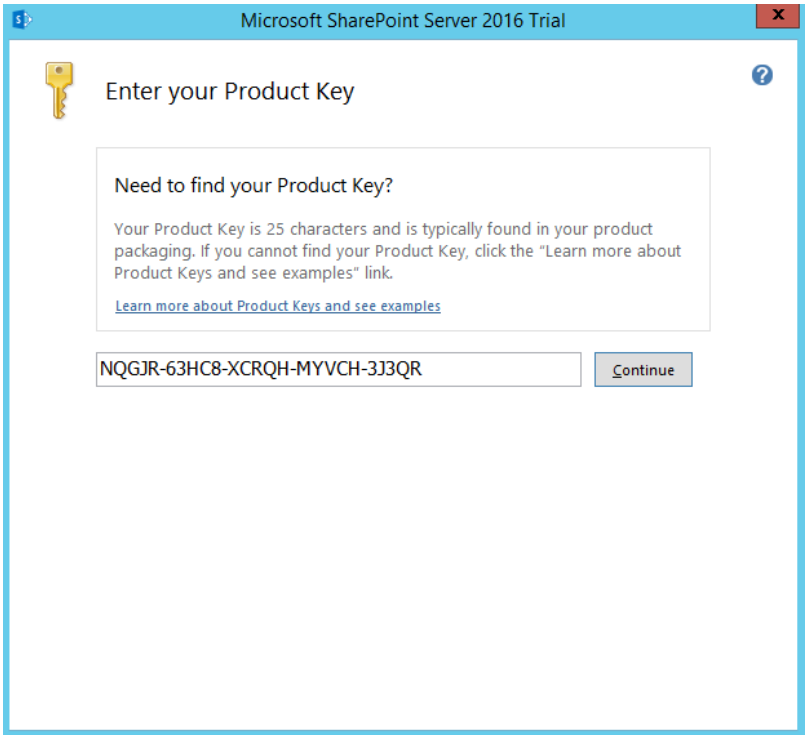
5. Double-click the installation file to install SharePoint.

Figure 6-33 Installing SharePoint



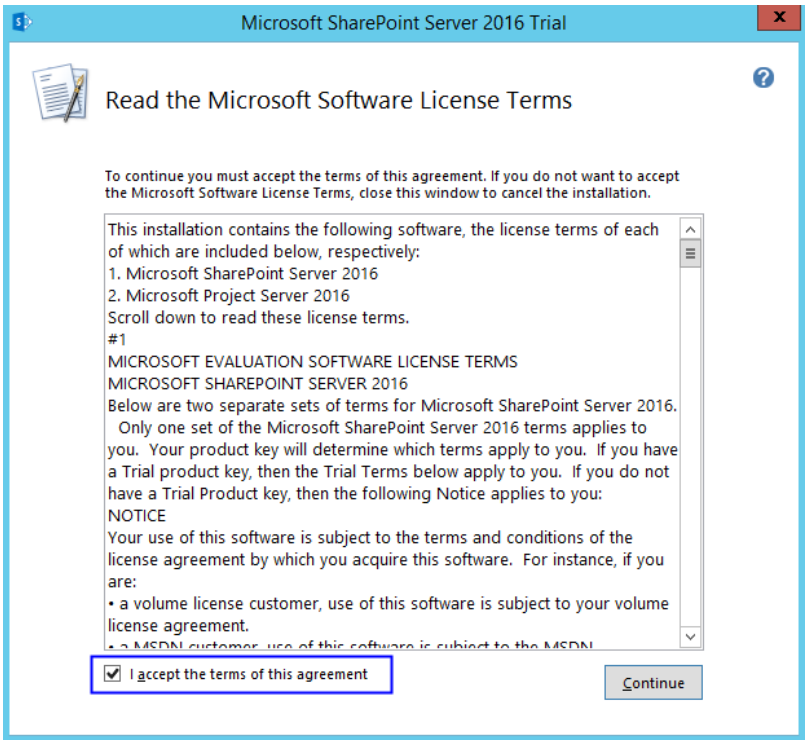
6. Enter the key of the SharePoint product. The key of the 180-day trial edition is **NQGJR-63HC8-XCRQH-MYVCH-3J3QR**.

Figure 6-34 SharePoint product key



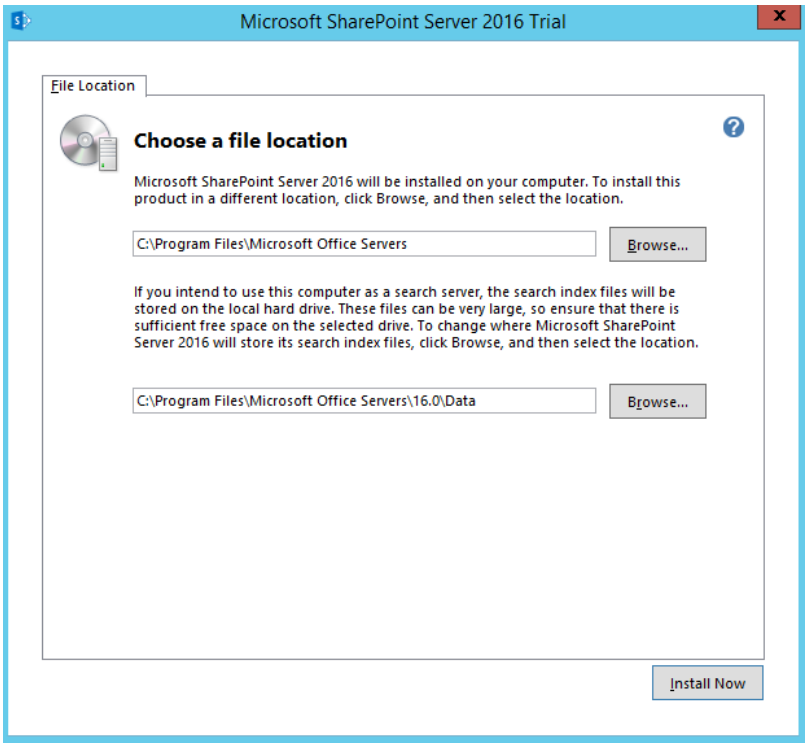
7. Accept the license and click **Continue**.

Figure 6-35 SharePoint license terms



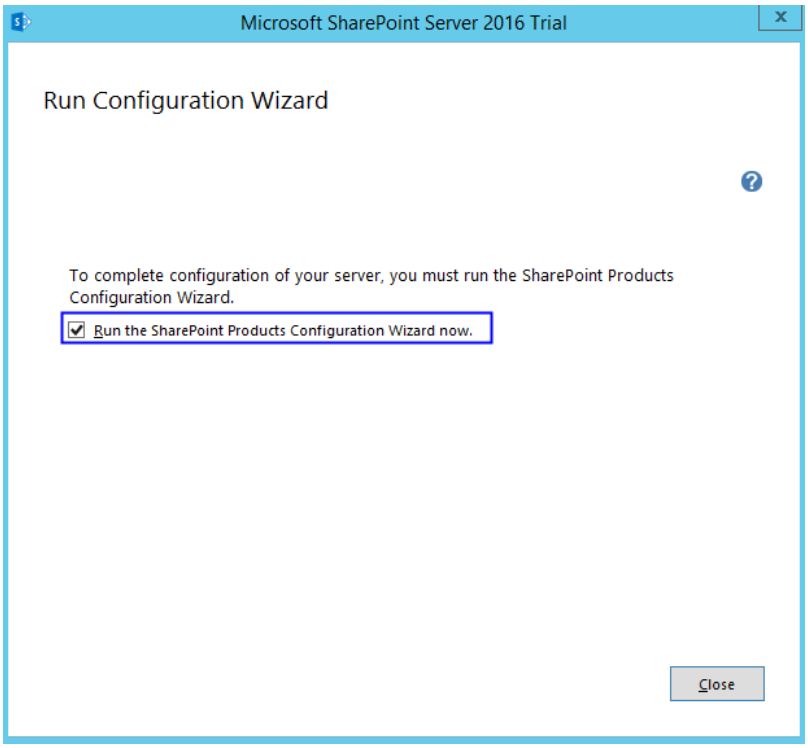
8. Retain the default installation paths.

Figure 6-36 SharePoint installation paths



9. Click **Install Now**.
10. After **SharePoint** is installed, select **Run the SharePoint Products Configuration Wizard now.** to run the SharePoint configuration wizard.

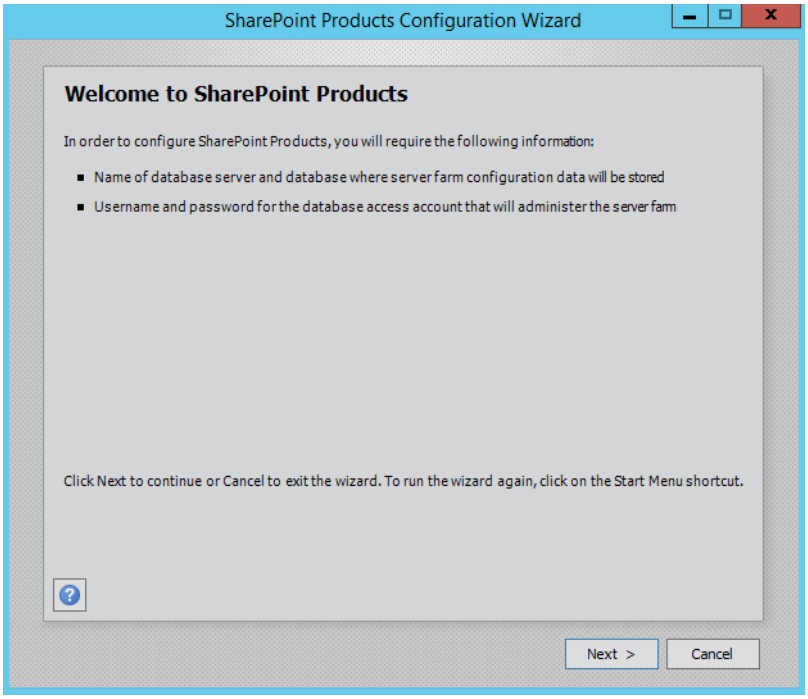
Figure 6-37 Successful SharePoint installation



6.2.5 Configuring Microsoft SharePoint Server 2016

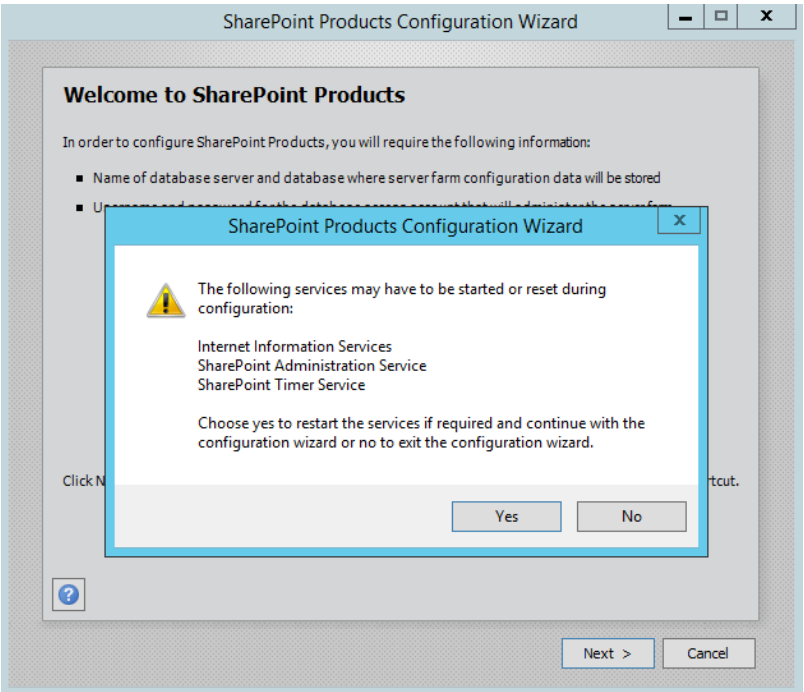
1. In the SharePoint products configuration wizard, click **Next**.

Figure 6-38 SharePoint Products Configuration Wizard



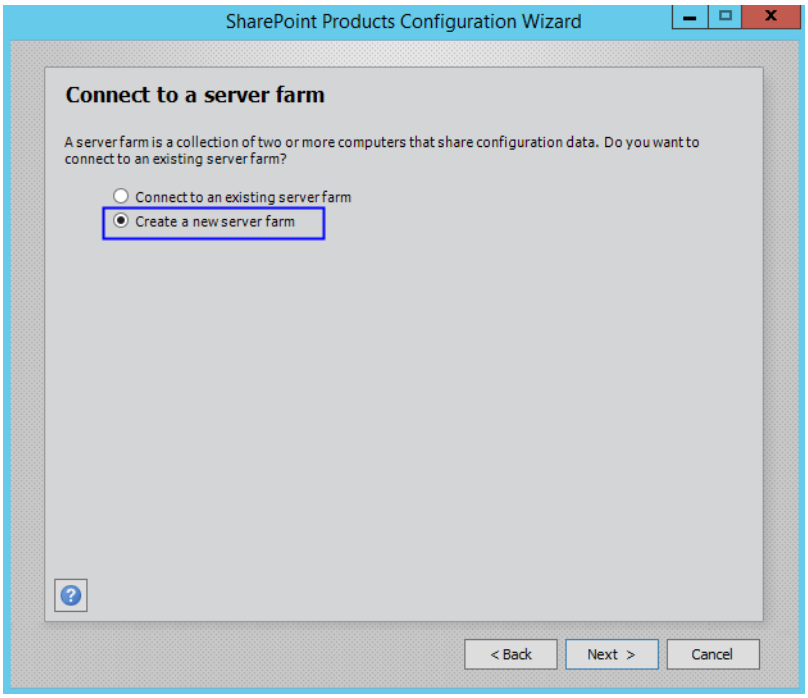
2. Click **Yes** to allow service restart during the configuration.

Figure 6-39 Service restart prompt



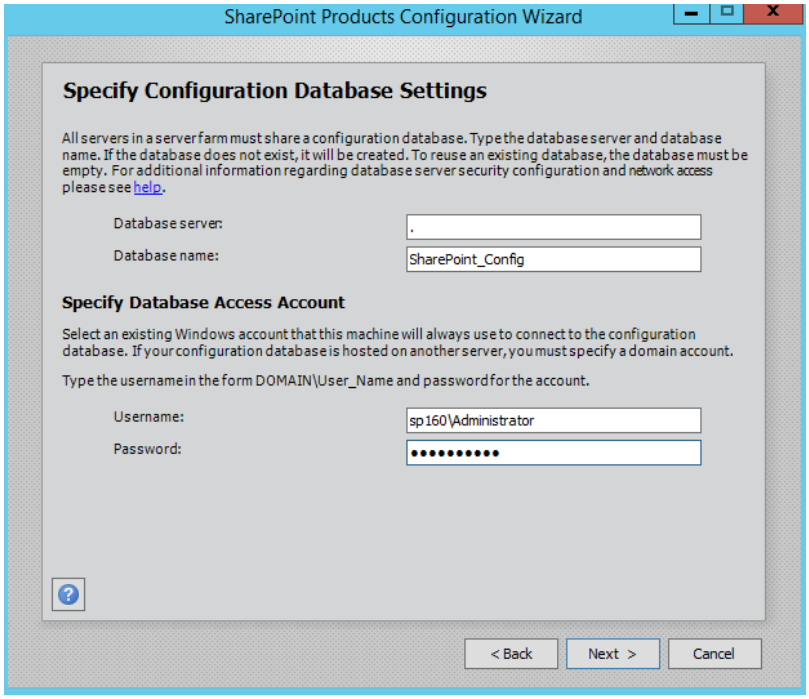
3. Select **Create a new server farm**.

Figure 6-40 Creating a new server farm



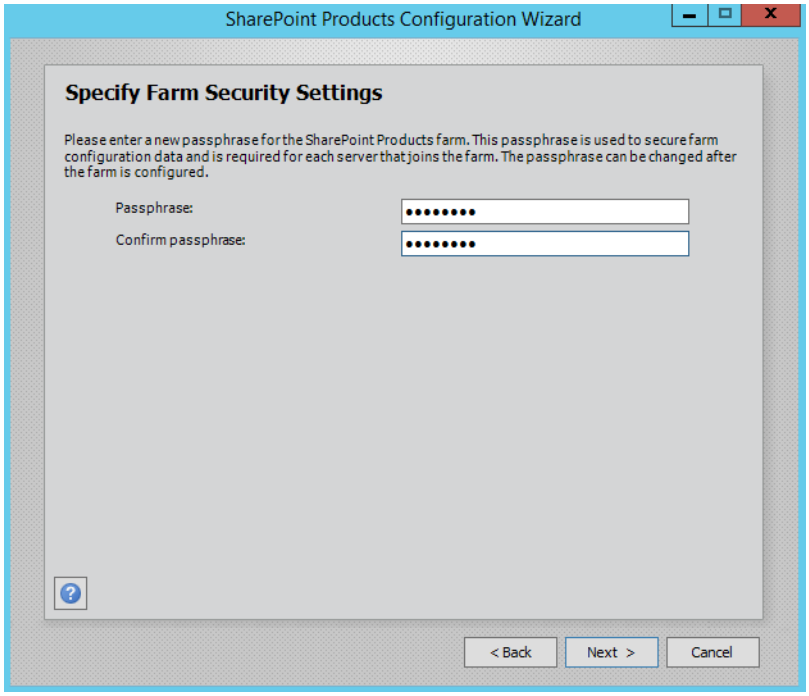
4. Specify configuration database settings. The SharePoint database is on the local host, so you need to enter the local database and account. Then, click **Next**.

Figure 6-41 Configuring the SharePoint database



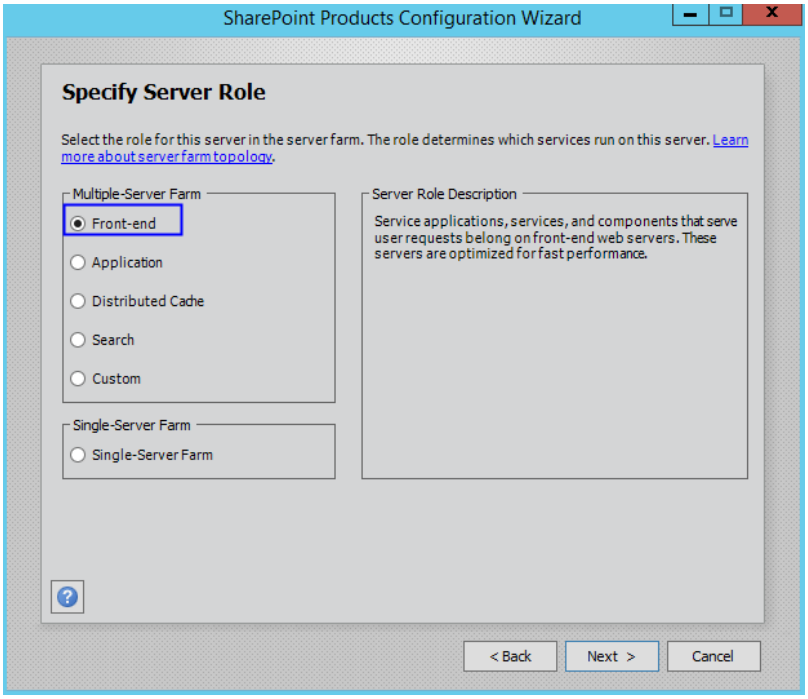
5. Enter the password of the server farm and click **Next**.

Figure 6-42 Setting the password for the SharePoint server farm



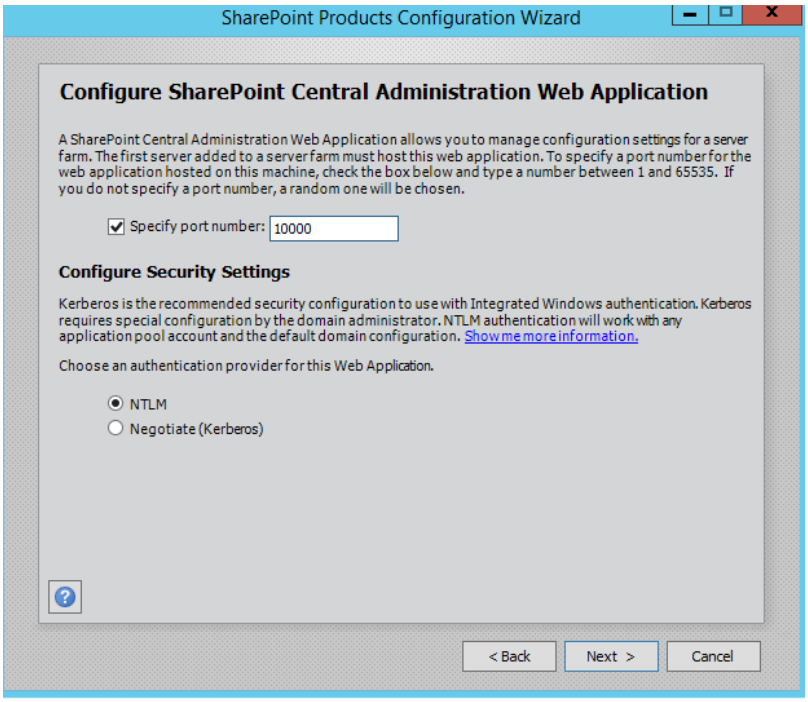
6. Select **Front-end** to specify the server role and click **Next**.

Figure 6-43 Setting the SharePoint server role



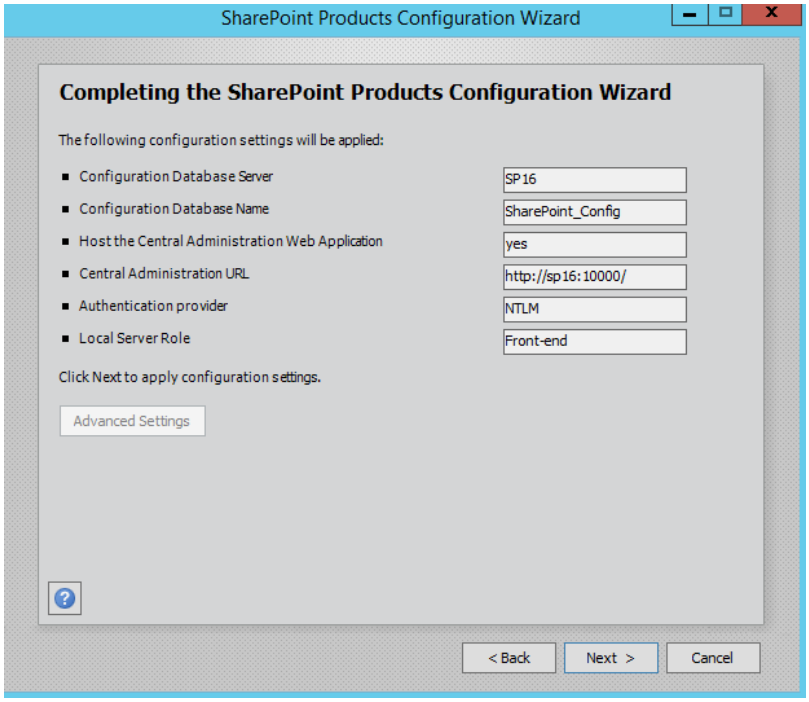
7. Set the port number of SharePoint Central Administration Web Application to **10000**.

Figure 6-44 Port number of SharePoint Central Administration Web Application



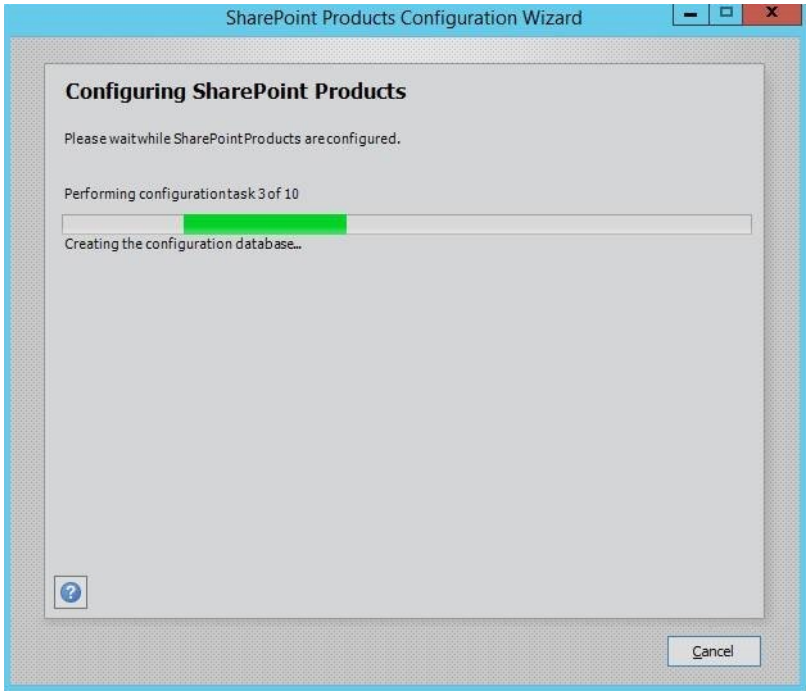
8. Check and confirm the SharePoint configurations.

Figure 6-45 SharePoint configurations



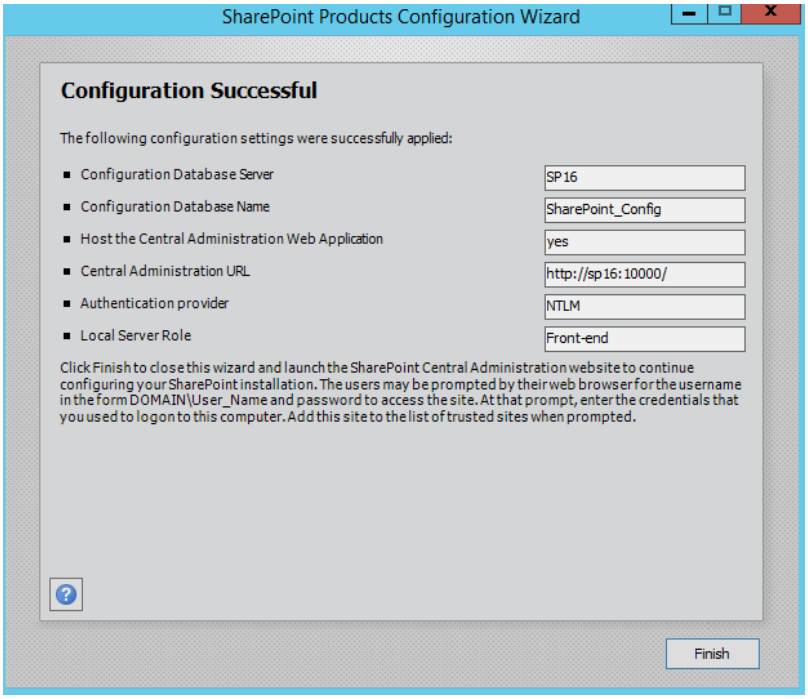
9. Click **Next** to start configuring SharePoint.

Figure 6-46 Configuration progress



10. After SharePoint is configured successfully, click **Finish**.

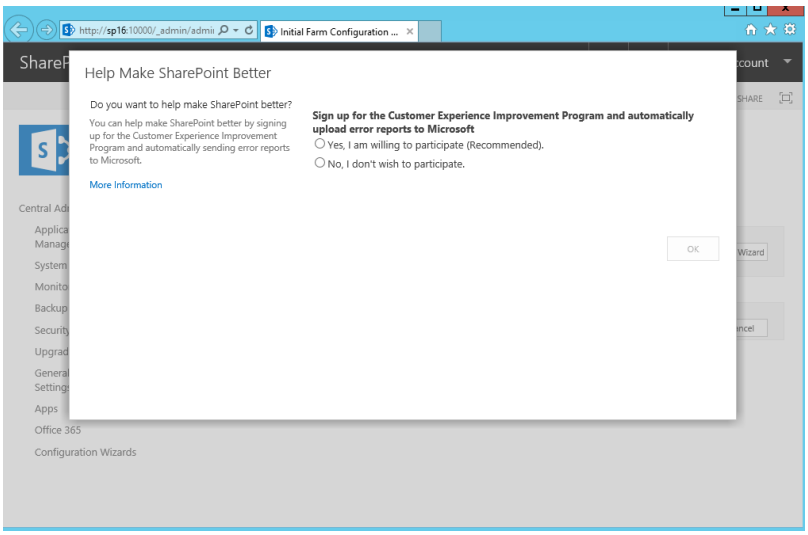
Figure 6-47 Successful SharePoint configuration



6.2.6 Verifying Microsoft SharePoint Server 2016

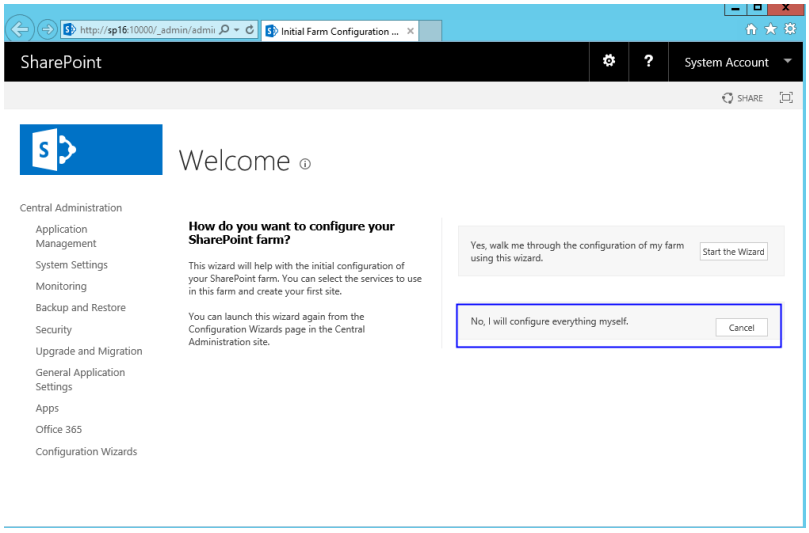
1. Open the SharePoint central administration.

Figure 6-48 SharePoint central administration



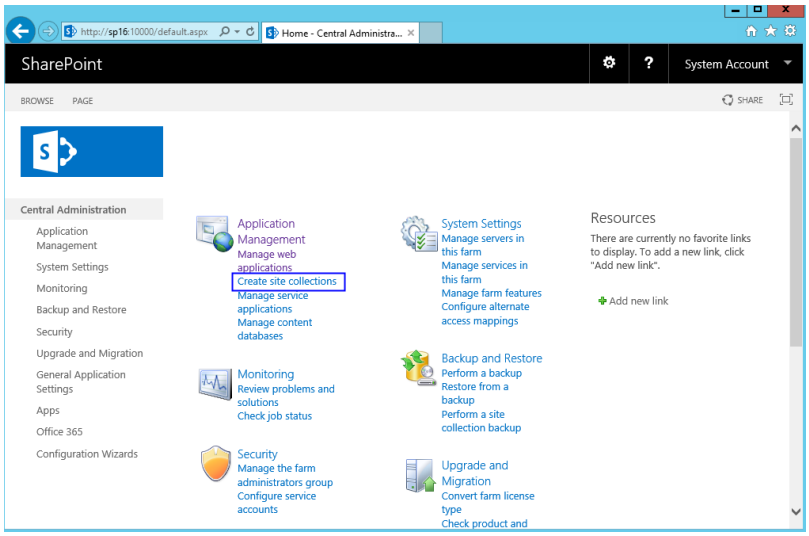
2. Select the method to configure the SharePoint farm. Click **Cancel**.
   To configure the SharePoint farm through the wizard, click **Start the Wizard**.

Figure 6-49 SharePoint farm configuration



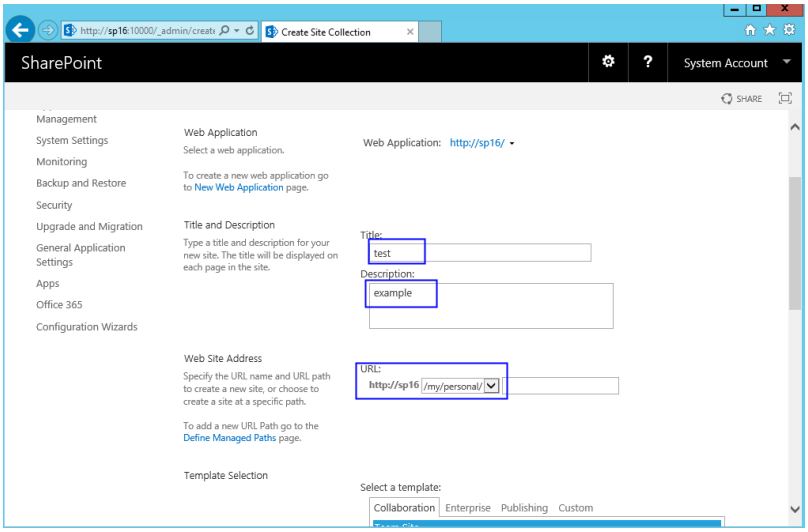
3. In the SharePoint central administration, click **Create site collections** to create a SharePoint site.

Figure 6-50 Creating a SharePoint site



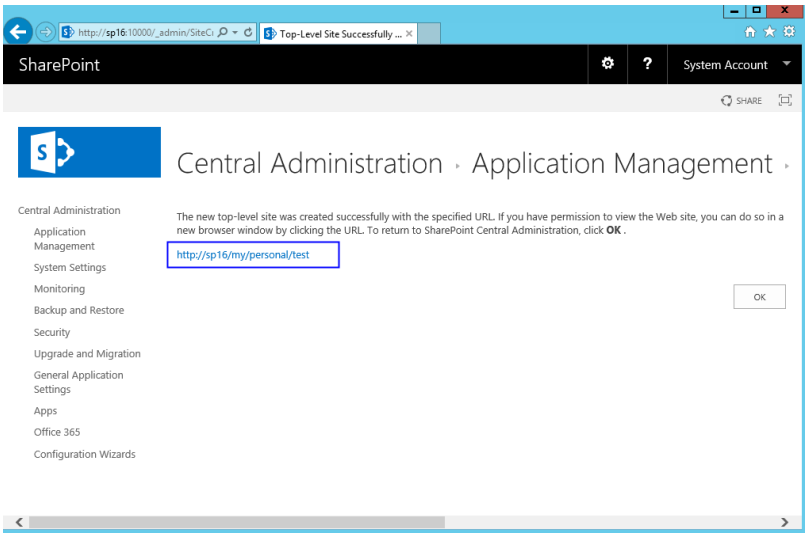
4. Set SharePoint site parameters.

Figure 6-51 Setting SharePoint site parameters



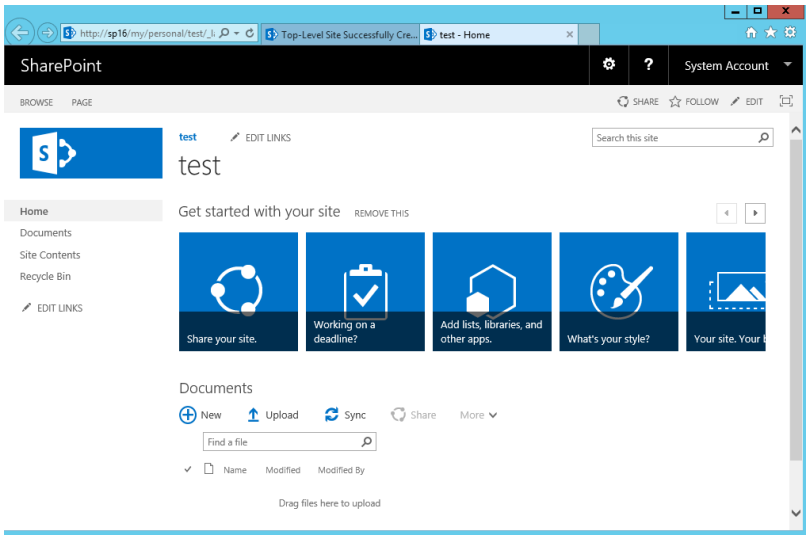
5. The SharePoint top-level site is created successfully. Click the link to open the page.

Figure 6-52 SharePoint top-level site created successfully



6. Open the SharePoint site, where you can design your web pages.

Figure 6-53 SharePoint verification



6.3 Deploying Docker

6.3.1 Manually Deploying Docker (CentOS 7.5)

Overview

The best practices for Huawei Cloud ECS guide you through the manual deployment of Docker on a Linux ECS. Additionally, common Docker operations and the process of creating a Docker image are provided.

Table 6-5 Docker terminologies

Term	Description
Docker	Docker is a platform for developers and system administrators to develop, deploy, and run applications using containers.
Docker image	Docker image is a special file system, which provides the programs, libraries, resources, and configuration files required for running containers. A Docker image also contains configuration parameters, for example, for anonymous disks, environment variables, and users. A Docker image does not contain any dynamic data, and its content remains unchanged after being built.
Container	Images become containers at runtime, that is, containers are created from images. A container can be created, started, stopped, deleted, and suspended.

For more information about Docker, image, and container, see **Docker Documentation**.

Docker requires 64bit OSs with a kernel version being 3.10 or later. This section uses CentOS 7.5 64bit (40 GiB) as an example.

Prerequisites

- The target ECS has an EIP bound. For instructions about how to bind an EIP to an ECS, see **Assigning an EIP**.
- The rule listed in the following table has been added to the security group which the target ECS belongs to. For details, see **Adding a Security Group Rule**.

Table 6-6 Security group rule

Direction	Priority	Action	Type	Protocol & Port	Source Address
Inbound	1	Allow	IPv4	TCP: 80	0.0.0.0/0

Deploying Docker

1. Log in to the ECS.
2. Add a yum repository.

   yum install epel-release -y

   yum clean all
3. Install yum-utils.

   yum install -y yum-utils device-mapper-persistent-data lvm2
4. Configure the yum repository for Docker.

   yum-config-manager --add-repo https://download.docker.com/linux/centos/docker-ce.repo
5. Install and run Docker.

   yum -y install docker-ce

   systemctl enable docker

   systemctl start docker
6. Check the installation.

   docker --version

   If the information similar to the following is displayed, Docker has been installed:

```
Docker version 26.1.4, build 5650f9b
```

Basic Operations on Docker

1. Managing Docker processes
   - Start Docker.

     systemctl start docker
   - Stop Docker.

     systemctl stop docker

– Restart Docker.

systemctl restart docker

2. Managing Docker images

a. Pull docker images, taking official Apache and CentOS images as an example.

docker pull *httpd*

docker pull *centos*

b. View existing images.

docker images

```
[root@ecs-b67a-docker ~]# docker images
REPOSITORY          TAG                 IMAGE ID            CREATED             SIZE
docker.io/httpd     latest              55a118e2a010        2 weeks ago         132 MB
docker.io/centos    latest              75835a67d134        5 weeks ago         200 MB
[root@ecs-b67a-docker ~]#
```

c. Forcibly delete an image.

docker rmi *centos*

3. Managing containers

a. Create a container and run it.

docker run -it -d -p *80:80* **--name** *datahttpd* **-v** */data/:/var/www/httpd/* **httpd**

The parameters are as follows:

- **-i**: runs the container in interactive mode, which is usually used with **-t**.
- **-t**: reallocates a pseudo input terminal to the container. This parameter is usually used with **-i**.
- **-d**: runs the container at the backend and returns the container ID.
- **-p**: port mapping, in the format of "Host port:Container port".
- **--name**: specifies a name for the container.
- **-v**: mounts an absolute directory on the host to the image, in the format of "Directory on the host:Mount path in the image".

NOTE

In the preceding parameters, the host is the target ECS.

For example, use image **httpd** to start a container in interactive mode, map port 80 on the container to port 80 on the host, and map **/data** on the host to **/var/www/httpd** on the container, and have the container ID returned. Then, run the following command:

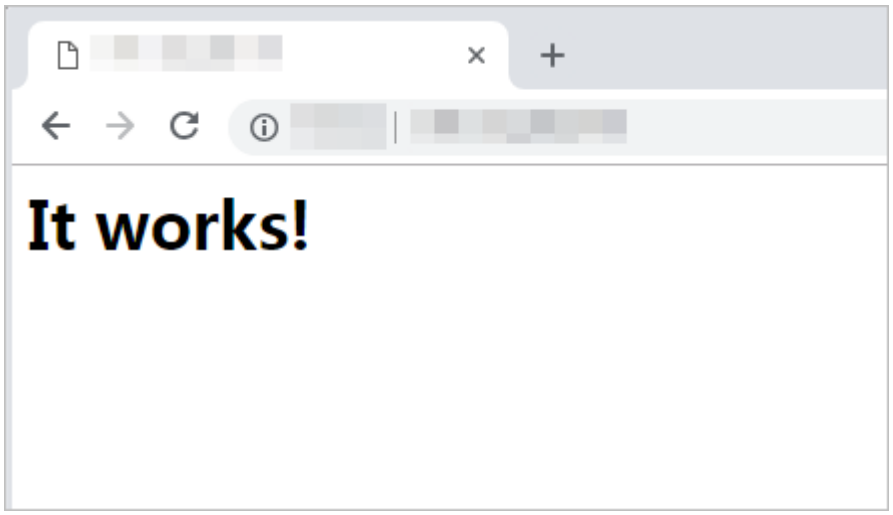
```
[root@ecs-b67a-docker ~]# docker run -it -d -p 80:80  --name datahttpd -v /data/:/var/www/httpd/ httpd
6a514dea52a9465c1f6863c0f17ff41debda231ccff8bf66e3c0dbcc5f33cb20
[root@ecs-b67a-docker ~]#
```

b. Check whether the container has been started.

docker ps -a

```
[root@ecs-b67a-docker ~]# docker ps -a
CONTAINER ID        IMAGE               COMMAND             CREATED             STATUS              PORTS               NAMES
6a514dea52a9        httpd               "httpd-foreground"  4 minutes ago       Up 4 minutes        0.0.0.0:80->80/tcp  datahttpd
[root@ecs-b67a-docker ~]#
```

c. In the address bar of the browser, enter the EIP bound to the ECS and check the running status of the container. If the following information is displayed, the container is running properly.



Creating an Image

Use **Dockerfile** to customize a simple Nginx image.

1. Create a file named **Dockerfile**.

   mkdir mynginx

   cd mynginx

   touch Dockerfile

2. Edit the file.

   vim Dockerfile

   Add the following data to **Dockerfile**:

   ```
   FROM nginx
   RUN echo '<h1>Hello, Docker!</h1>' > /usr/share/nginx/html/index.html
   ```

   Simple **Dockerfile** commands are as follows (for more information, log in at **https://docs.docker.com**):

   – **FROM** statement (mandatory): must be the first instruction in **Dockerfile**, indicating that the Nginx image is used as a basic image.

   – **RUN** statement: indicates that the echo command is executed with the message "Hello, Docker!" displayed on the screen.

3. Build the image.

   docker build -t nginx:v3 .

   – **-t nginx:v3**: specifies the image name and version.

   – **.**: specifies the context path. After the image-built command is executed, all data in the path will be packed to the Docker engine to build the image.

4. Check the created Nginx image, the version of which is v3.

   docker images

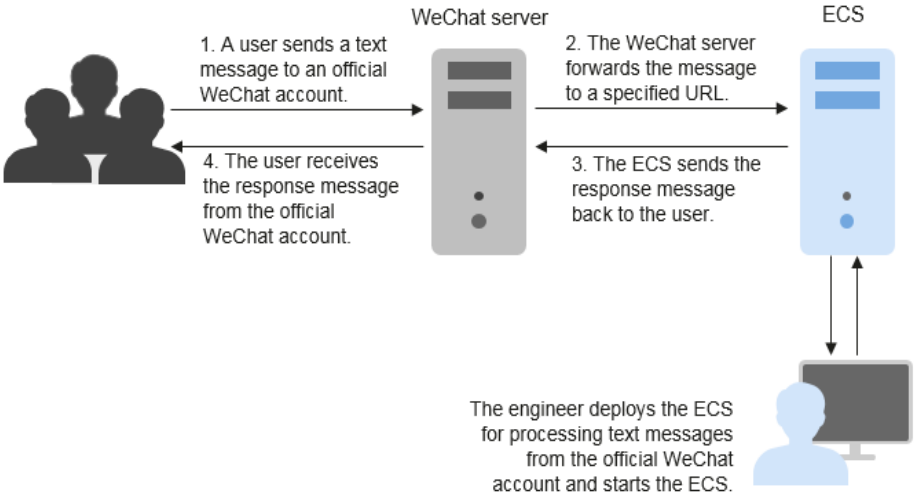
   ```
   REPOSITORY    TAG    IMAGE ID       CREATED          SIZE
   nginx         v3     09422e465d96   10 seconds ago   109 MB
   ```

6.4 Deploying an ECS for Handling Text Messages from an Official WeChat Account

Overview

The best practices for Huawei Cloud ECS guide you through the deployment of an ECS as an official WeChat account server so that the ECS receives text messages from the WeChat server and sends processing results to end users. On this ECS, Python is used to compile the logic code for processing WeChat messages. **Figure 6-54** shows the service flow.

Figure 6-54 Flowchart for processing text messages



Before performing the operations described in this section, you are required to have basic knowledge on the CentOS (Linux), Python language, Web.py framework, and HTTP/XML protocol.

Preparations

- Apply for an official WeChat account.

  URL: **https://mp.weixin.qq.com/**

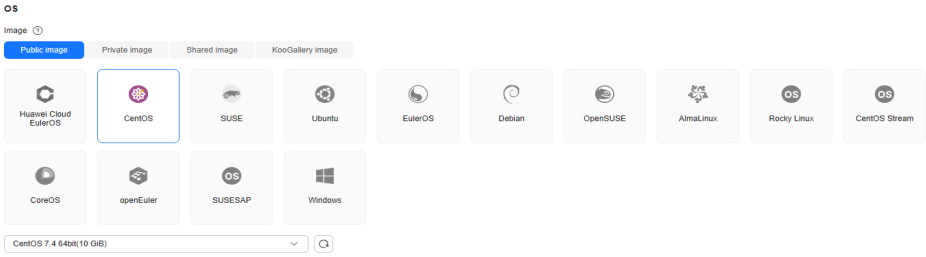
  This section uses the Service Infographics WeChat account as an example.

- Purchase an ECS.

  If you do not have an account, **register a HUAWEI ID and enable Huawei Cloud services**.

  This section uses an ECS running CentOS 7.4 as an example.

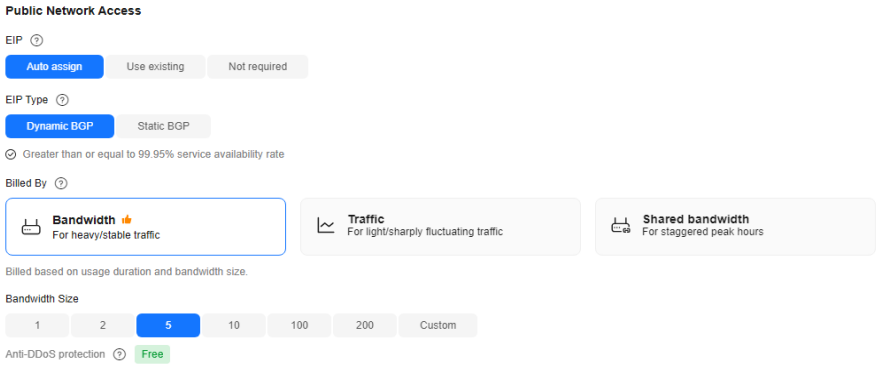
Figure 6-55 Public images



- Purchase an EIP.

  Purchase an EIP with your ECS. The EIP will be configured in the official WeChat account.

Figure 6-56 EIP



Installing Basic Software

This section uses Python and Web.py to develop the official WeChat account. You are required to install or upgrade Python, pip, Web.py framework, and WinSCP software.

Upgrade the default Python version.

The Python version delivered with CentOS 7.4 is too old to use. You are advised to upgrade it to Python 3.

1. Run the following command to view the Python version:

   python --version

   Figure 6-57 Viewing the Python version

   ```
   [root@ecs-      ~]# python --version
   Python 2.7.5
   [root@ecs-      ~]#
   ```

2. Download the Python installation package, for example, **Python 3.6.0**.

   wget https://www.python.org/ftp/python/3.6.0/Python-3.6.0a1.tar.xz

Figure 6-58 Downloading the Python installation package

```
[root@ecs-      ~]# wget https://www.python.org/ftp/python/3.6.0/Python-3.6.0a1.tar.xz
--2020-12-28 09:25:56--  https://www.python.org/ftp/python/3.6.0/Python-3.6.0a1.tar.xz
Resolving www.python.org (www.python.org)...                    2a04:4e42:1a::223
Connecting to www.python.org (www.python.org)|                  |:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 15328032 (15M) [application/octet-stream]
Saving to: 'Python-3.6.0a1.tar.xz'

100%[=========================================================================================

2020-12-28 09:25:57 (12.7 MB/s) - 'Python-3.6.0a1.tar.xz' saved [15328032/15328032]

[root@ecs-      ~]#
```

3. Run the following command to decompress the installation package:

   tar xvf Python-3.6.0a1.tar.xz

4. Run the following commands to configure Python:

   cd Python-3.6.0a1

   ./configure

   – If information similar to the following is displayed, the command has been successfully executed.

     Figure 6-59 Successful execution

```
configure: creating ./config.status
config.status: creating Makefile.pre
config.status: creating Modules/Setup.config
config.status: creating Misc/python.pc
config.status: creating Misc/python-config.sh
config.status: creating Modules/ld_so_aix
config.status: creating pyconfig.h
creating Modules/Setup
creating Modules/Setup.local
creating Makefile
```

   – If the message "configure: error: no acceptable C compiler found in $PATH" is displayed, no proper compiler has been installed.

     Solution:

     Run the following command to install or upgrade GCC and its dependent packages:

     sudo yum install gcc-c++

     Enter **y** and press **Enter** as prompted. If information shown in **Figure 6-60** is displayed, the dependency packages have been installed.

     Figure 6-60 Successful installation

```
Installed:
  gcc-c++.x86_64 0:4.8.5-44.el7


Dependency Installed:
  libstdc++-devel.x86_64 0:4.8.5-44.el7


Dependency Updated:
  cpp.x86_64 0:4.8.5-44.el7          gcc.x86_64 0:4.8.5-44.el7
```

Run the **./configure** command again.

5. Run the following command to install Python:

   make && make install

   If the system displays a pip error after the command execution, the openssl-devel package is unavailable. Ignore the error.

   Figure 6-61 Successful execution

```
rm -f /usr/local/bin/pyvenv
(cd /usr/local/bin; ln -s pyvenv-3.6 pyvenv)
if test "x" != "x" ; then \
        rm -f /usr/local/bin/python3-32; \
        (cd /usr/local/bin; ln -s python3.6-32 python3-32) \
fi
rm -f /usr/local/share/man/man1/python3.1
(cd /usr/local/share/man/man1; ln -s python3.6.1 python3.1)
if test "xupgrade" != "xno"  ; then \
        case upgrade in \
                upgrade) ensurepip="--upgrade" ;; \
                install|*) ensurepip="" ;; \
        esac; \
         ./python -E -m ensurepip \
                $ensurepip --root=/ ; \
fi
Ignoring ensurepip failure: pip 8.1.1 requires SSL/TLS
```

6. Run the following command to view the Python 3 version:

   python3 --version

   Figure 6-62 Viewing the Python 3 version

```
[root@ecs-      Python-3.6.0a1]# python3 --version
Python 3.6.0a1
```

7. Run the following command to verify the Python 3 installation:

   python3

   If information shown in the following figure is displayed, Python 3 has been installed.

   Figure 6-63 Successful installation

```
[root@ecs-      Python-3.6.0a1]# python3
Python 3.6.0a1 (default, Dec 18 2020, 15:45:57)
[GCC 4.8.5 20150623 (Red Hat 4.8.5-44)] on linux
Type "help", "copyright", "credits" or "license" for more information.
>>>
```

NOTE

Before performing subsequent operations, exit the Python CLI by running any of the following commands and press **Enter**:

- Ctrl+Z
- exit()
- quit()

Upgrade the default pip version.

pip is a common Python package management tool, which allows you to search for, download, install, and uninstall Python packages. pip3 is delivered with Python 3, but the version is too old to use. Upgrade pip to the latest version. During Python 3 installation, the error message "Ignoring ensurepip failure: pip 8.1.1 requires SSL/TLS" indicates a pip installation failure, so pip must be reinstalled.

1. Run the following command to install the openssl-devel package:

   yum install openssl-devel -y

   Figure 6-64 Installing the openssl-devel package

```
Installed:
  openssl-devel.x86_64 1:1.0.2k-21.el7_9

Dependency Installed:
  keyutils-libs-devel.x86_64 0:1.5.8-3.el7     krb5-devel.x86_64 0:1.15.1-50.el7
  libselinux-devel.x86_64 0:2.5-15.el7         libsepol-devel.x86_64 0:2.5-10.el7
  zlib-devel.x86_64 0:1.2.7-18.el7

Dependency Updated:
  openssl.x86_64 1:1.0.2k-21.el7_9

Complete!
```

2. Run the following command to install pip:

   make && make install

   If information shown in the following figure is displayed, pip has been installed.

   Figure 6-65 Successful installation

```
Collecting setuptools
Collecting pip
Installing collected packages: setuptools, pip
Successfully installed pip-8.1.1 setuptools-20.10.1
```

3. Run the following command to upgrade pip3:

   pip3 install --upgrade pip

   If information shown in the following figure is displayed, pip has been upgraded to the latest version.

   Figure 6-66 Successful upgrade

```
[root@ecs-      Python-3.6.0a1]# pip3 install --upgrade pip
Collecting pip
  Downloading https://files.pythonhosted.org/packages/54/eb/4a36
    100% |████████████████████████████████| 1.5MB 32kB/s
Installing collected packages: pip
  Found existing installation: pip 8.1.1
    Uninstalling pip-8.1.1:
      Successfully uninstalled pip-8.1.1
Successfully installed pip-20.3.3
```

Install the Web.py framework.

To obtain the official Web.py installation tutorial, log in at **http://webpy.org/**. Run the following command to install Web.py:

pip3 install web.py==0.40.dev0

Figure 6-67 Installing Web.py

```
[root@ecs-c438 Python-3.6.0a1]# pip3 install web.py==0.40.dev0
Collecting web.py==0.40.dev0
  Downloading web.py-0.40.dev0.tar.gz (116 kB)
     |████████████████████████████████| 116 kB 76 kB/s
Using legacy 'setup.py install' for web.py, since package 'wheel'
Installing collected packages: web.py
    Running setup.py install for web.py ... done
Successfully installed web.py-0.40.dev0
```

Install WinSCP.

Code is generally edited on a local Windows OS and uploaded to the CentOS ECS. WinSCP is an SSH-based open source SFTP client for Windows and supports SCP. Its main function is file transfer between a local and a remote computer. Additionally, WinSCP offers scripting and basic file manager functionality.

Download WinSCP from **https://winscp.net/eng/index.php**.

Uploading Code

1. Create the **main.py** file and copy the following data:

```
# -*- coding: utf-8 -*-
# filename: main.py
import web
from handle import Handle

urls = (
    '/wx', 'Handle',
)

if __name__ == '__main__':
    app = web.application(urls, globals())
    app.run()
```

2. Create the **handle.py** file and copy the following data:

```
# -*- coding: utf-8 -*-
# filename: handle.py

import hashlib
import web
import receive
import time
import os

class Handle(object):

    def __init__(self):
        self.app_root = os.path.dirname(__file__)
        self.templates_root = os.path.join(self.app_root, 'templates')
        self.render = web.template.render(self.templates_root)

    def GET(self):
        try:
            data = web.input()
            if len(data) == 0:
                return "hello, this is handle view"
            signature = data.signature
            timestamp = data.timestamp
            nonce = data.nonce
            echostr = data.echostr
            token = "Use the taken value obtained in the basic configuration of the official WeChat
```

```
account."

            list = [token, timestamp, nonce]
            list.sort()
            s = list[0] + list[1] + list[2]
            hashcode = hashlib.sha1(s.encode('utf-8')).hexdigest()
            print( "handle/GET func: hashcode, signature: ", hashcode, signature)
            if hashcode == signature:
                return echostr
            else:
                return echostr
        except (Exception) as Argument:
            return Argument

    def POST(self):
        try:
            webData = web.data()
            print("Handle Post webdata is:\n", webData)
            #Print message body logs.
            recMsg = receive.parse_xml(webData)

            if isinstance(recMsg, receive.Msg) and recMsg.MsgType == 'text':
                toUser = recMsg.FromUserName
                fromUser = recMsg.ToUserName
                content = "Welcome to Service Infographics." + str(recMsg.Content)
                print('Reply message info:\n')
                print('toUser =', toUser)
                print('fromUser = ', fromUser)
                print('content = ', content)
                return self.render.reply_text(toUser, fromUser, int(time.time()), content)
            else:
                print("Message types not supported:",recMsg.MsgType)
                return "success"
        except (Exception) as Argment:
            return Argment
```

3. Create the **receive.py** file and copy the following data:

```
# -*- coding: utf-8 -*-
# filename: receive.py
import xml.etree.ElementTree as ET

def parse_xml(web_data):
    if len(web_data) == 0:
        return None
    xmlData = ET.fromstring(web_data)
    msg_type = xmlData.find('MsgType').text
    if msg_type == 'text':
        return TextMsg(xmlData)
    elif msg_type == 'image':
        return ImageMsg(xmlData)
    elif msg_type == 'location':
        return LocationMsg(xmlData)
    elif msg_type == 'event':
        return EventMsg(xmlData)

class Event(object):
    def __init__(self, xmlData):
        self.ToUserName = xmlData.find('ToUserName').text
        self.FromUserName = xmlData.find('FromUserName').text
        self.CreateTime = xmlData.find('CreateTime').text
        self.MsgType = xmlData.find('MsgType').text
        self.Eventkey = xmlData.find('EventKey').text

class Msg(object):
    def __init__(self, xmlData):
        self.ToUserName = xmlData.find('ToUserName').text
        self.FromUserName = xmlData.find('FromUserName').text
        self.CreateTime = xmlData.find('CreateTime').text
        self.MsgType = xmlData.find('MsgType').text
        self.MsgId = xmlData.find('MsgId').text
```

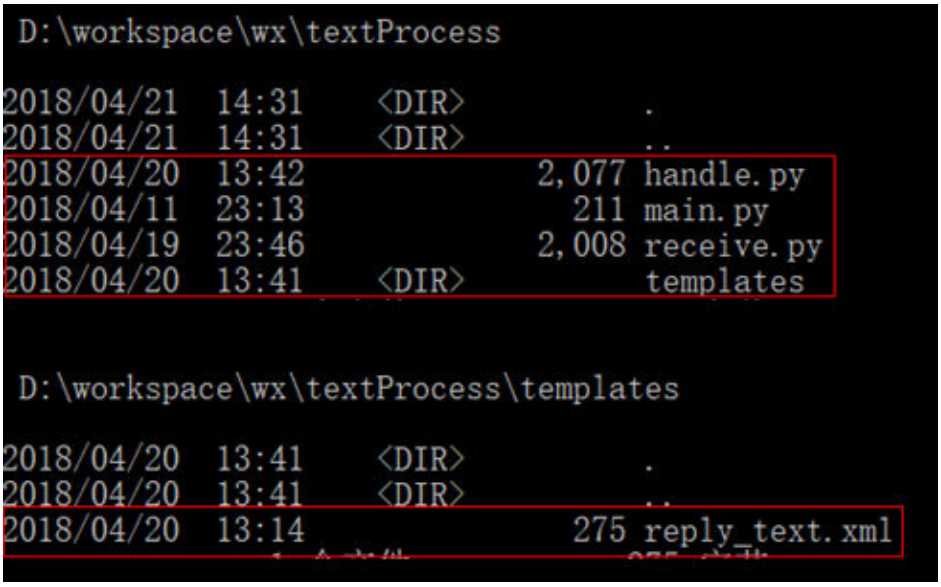
```
class TextMsg(Msg):
    def __init__(self, xmlData):
        Msg.__init__(self, xmlData)
        self.Content = xmlData.find('Content').text

class ImageMsg(Msg):
    def __init__(self, xmlData):
        Msg.__init__(self, xmlData)
        self.PicUrl = xmlData.find('PicUrl').text
        self.MediaId = xmlData.find('MediaId').text

class LocationMsg(Msg):
    def __init__(self, xmlData):
        Msg.__init__(self, xmlData)
        self.Location_X = xmlData.find('Location_X').text
        self.Location_Y = xmlData.find('Location_Y').text

class EventMsg(Msg):
    def __init__(self, xmlData):
        Event.__init__(self, xmlData)
        self.Event = xmlData.find('Event').text
```

4. Create the **templates** folder and the **reply_text.xml** file in the folder. Then, copy the following data:

```
$def with (toUser,fromUser,createTime,content)
<xml>
<ToUserName><![CDATA[$toUser]]></ToUserName>
<FromUserName><![CDATA[$fromUser]]></FromUserName>
<CreateTime>$createTime</CreateTime>
<MsgType><![CDATA[text]]></MsgType>
<Content><![CDATA[$content]]></Content>
</xml>
```

5. Obtain the local file.

Figure 6-68 Local file



6. Use WinSCP to upload the preceding files and folder to the specified directory on the ECS.

Figure 6-69 Uploading files

```
[root@ecs-test1-0001 wx]# ls -lR
.:
total 16
-rw-r--r-- 1 root root 2077 Apr 20 13:42 handle.py
-rw-r--r-- 1 root root  211 Apr 11 23:13 main.py
-rw-r--r-- 1 root root 2008 Apr 19 23:46 receive.py
drwxr-xr-x 2 root root 4096 May  7 22:40 templates

./templates:
total 4
-rw-r--r-- 1 root root 275 Apr 20 13:14 reply_text.xml
```

Starting the Service

Run the following command to start the service:

python3 main.py 80

If the command output shown in **Figure 6-70** is displayed, the service has been started.

Figure 6-70 Successful service startup

```
[root@ecs-test1-0001 wx]# python3 main.py 80
http://0.0.0.0:80/
```

Enabling the Developer Mode

1. Log in to official WeChat platform, choose **Develop** > **Basic Configuration**, and click **Modify Configuration**.
2. Specify the following basic configurations and click **Submit**.
   - **URL**: https://*EIP bound to the ECS*/wx. Port 80 is not required.
   - **Token**: the same as the token value in the **handle.py** file.
   - **EncodingAESKey**: generated randomly.
   - **Message encryption and decryption**: plaintext in this example.
3. Authenticate the token and click **Enable**.

   NOTE

   If authenticating the token failed, check whether the token configuration is the same as that in the code for processing GET messages in the **handle.py** file.

Verifying Service Deployment

Send a text message to the official WeChat account. If the response is properly received, the service has been successfully deployed.

6.5 Manually Deploying GitLab (CentOS 7.2)

Overview

The best practices for Huawei Cloud ECS guide you through the manual deployment of GitLab on a Linux ECS. GitLab is an open-source version

management system that uses Git as the code management tool. The CentOS 7.2 64bit OS is used as an example in this section.

Prerequisites

- The memory of the target ECS is greater than or equal to 4 GB.
- The rule listed in the following table has been added to the security group which the target ECS belongs to. For details, see **Adding a Security Group Rule**.

Table 6-7 Security group rule

Direction	Priority	Action	Type	Protocol & Port	Source Address
Inbound	1	Allow	IPv4	TCP: 80	0.0.0.0/0

Procedure

Step 1 Install the dependency package.

1. Log in to the ECS.
2. Run the following command to install the dependency packages:

   sudo yum install -y curl policycoreutils-python openssh-server
3. Run the following commands to configure automatic SSH enabling upon ECS startup and start SSH:

   sudo systemctl enable sshd

   sudo systemctl start sshd

Step 2 Install Postfix to send emails.

1. Run the following command to install Postfix:

   sudo yum install postfix
2. Run the following commands to configure automatic Postfix enabling upon ECS startup and start Postfix:

   sudo systemctl enable postfix

   sudo systemctl start postfix

Step 3 Add the GitLab repository and install the software package.

1. Run the following command to add the GitLab repository:

   curl https://packages.gitlab.com/install/repositories/gitlab/gitlab-ee/script.rpm.sh | sudo bash
2. Run the following command to install GitLab:

   sudo EXTERNAL_URL="http://*gitlab.example.com***" yum install -y gitlab-ee**

   Set **EXTERNAL_URL** to the IP address of the GitLab server, which can be the public IP address of the server or the domain name.

NOTE

- After the command is executed, you can view the software download speed and the estimated download completion time in the command output.

If information similar to the following is displayed, GitLab has been installed:

```
Running handlers:
Running handlers complete
Chef Client finished, 452/672 resources updated in 01 minutes 38 seconds
gitlab Reconfigured!

      *.                  *.
     ***                 ***
    *****               *****
    .******            *******
    ********           ********
        ***********
   ,,,,,,,,,*********,,,,,,,,,
  ,,,,,,,,,,         ,,,,,,,,,,
  .,,,,,,,,,,*******,,,,,,,,,,
            *****
      ,,,,,,,,,     ,,,,,,,,,.
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  / / __/ / __/ /   / __ `/ __ \
 / /_/ / / /_/ /___/ /_/ / /_/ /
 \____/_/\__/_____/\__,_/_.___/

Thank you for installing GitLab!
```
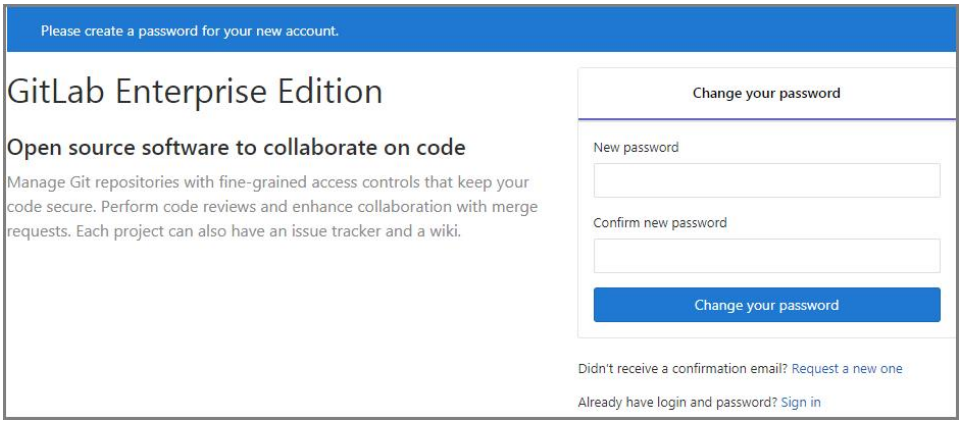

Step 4 Test the GitLab deployment.

1. Enter **http://***Server IP address* in the address bar. If the following page is displayed, GitLab has been set up.



2. Change the password upon your first login. Then, enter the new password to log in.

----End

6.6 Manually Deploying RabbitMQ (CentOS 7.4)

Overview

The best practices for Huawei Cloud ECS guide you through the manual deployment of RabbitMQ on a Linux ECS. RabbitMQ is a message middleware that uses the Erlang programming language for the Advanced Message Queuing Protocol (AMQP). It originates from the financial system and is used to store and forward messages in the distributed system. Featuring high reliability, scalability, availability, and rich functions, RabbitMQ is widely used.

Prerequisites

The rule listed in the following table has been added to the security group which the target ECS belongs to. For details, see **Adding a Security Group Rule**.

Table 6-8 Security group rule

Direction	Priority	Action	Type	Protocol & Port	Source Address
Inbound	1	Allow	IPv4	TCP: 5672	0.0.0.0/0
Inbound	1	Allow	IPv4	TCP: 15672	0.0.0.0/0

Procedure

Step 1 Install the dependency package and perl.

1. Log in to the target ECS.
2. Run the following command to install the dependency packages:

   yum -y install make gcc gcc-c++ m4 ncurses-devel openssl-devel unixODBC-devel
3. Run the following command to install perl:

   yum install perl

Step 2 Install Erlang.

For details, see **Erlang Packages Download**.

1. Run the following commands to add **Erlang Solutions repository** to your system:

   wget https://packages.erlang-solutions.com/erlang-solutions-2.0-1.noarch.rpm

   rpm -Uvh erlang-solutions-2.0-1.noarch.rpm

   Alternatively, add the **repository entry** manually.

   rpm --import https://packages.erlang-solutions.com/rpm/erlang_solutions.asc

2. In the **/etc/yum.repos.d/** directory, create a file named **rabbitmq-erlang.repo**, and add the following to the file:

   cd /etc/yum.repos.d/

   vi rabbitmq-erlang.repo

```
[erlang-solutions]
name=CentOS $releasever - $basearch - Erlang Solutions
baseurl=https://packages.erlang-solutions.com/rpm/centos/$releasever/$basearch
gpgcheck=1
gpgkey=https://packages.erlang-solutions.com/rpm/erlang_solutions.asc
enabled=1
```

   Press **Esc** to exit insert mode. Then, enter **:wq** to save the settings and exit.

3. Run the following command to install Erlang:

   sudo yum install erlang

   Run the following command to install esl-erlang:

   sudo yum install esl-erlang

4. Run the following command to check the installation result:

   erl -version

   If information similar to the following is displayed, Erlang has been installed:

```
[root@ecs-rabbitmq ~]# erl -version
Erlang (SMP,ASYNC_THREADS,HIPE) (BEAM) emulator version 11.1.7
```

Step 3 Install RabbitMQ.

1. Run the following command to go to the home directory:

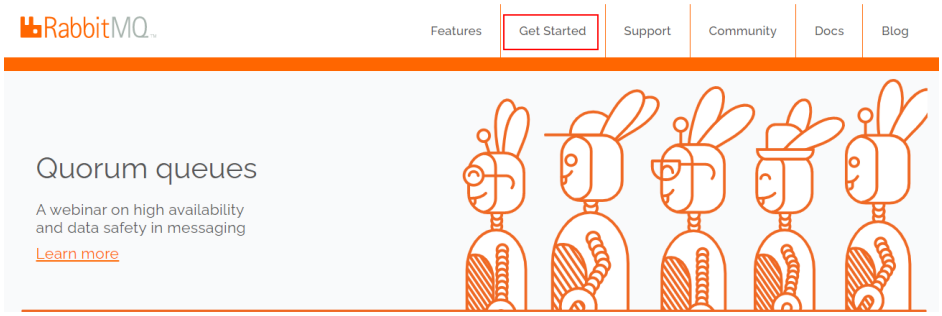
   cd

2. Perform the following steps to download the RabbitMQ installation package:

   a. Open **RabbitMQ**.

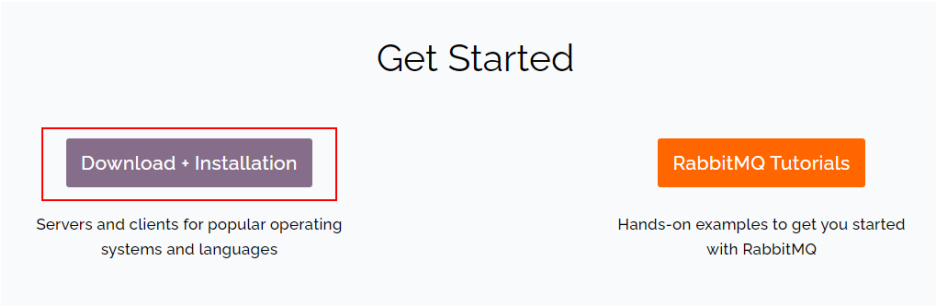
   b. Click **Get Started**.

   Figure 6-71 Get Started



   c. Click **Download+Installation**.

   Figure 6-72 Download+Installation



d. Select a download address based on the ECS OS. Here, the CentOS 7.x is used as an example.

Figure 6-73 Selecting a download address

Downloads **on GitHub**

- Windows installer
- Debian, Ubuntu
- RHEL/CentOS 8.x | RHEL/CentOS 7.x | RHEL/CentOS 6.x | OpenSUSE | SLES 11.x | Erlang RPM
- Generic UNIX binary
- Windows binary

e. Run the following command to download the RabbitMQ installation package.

For example, the download address in **Step 3.2.d** is as follows:

https://github.com/rabbitmq/rabbitmq-server/releases/download/v3.8.12/rabbitmq-server-3.8.12-1.el7.noarch.rpm

Run the following command:

wget https://github.com/rabbitmq/rabbitmq-server/releases/download/v3.8.12/rabbitmq-server-3.8.12-1.el7.noarch.rpm

If the message **Unable to establish SSL connection.** is displayed during the download,

you can add **--no-check-certificate** to the end of the wget command and repeat it for several times for download.

For example:

wget https://github.com/rabbitmq/rabbitmq-server/releases/download/v3.8.12/rabbitmq-server-3.8.12-1.el7.noarch.rpm --no-check-certificate

f. Run the following command to install the RabbitMQ installation package:

yum install rabbitmq-server-3.8.12-1.el7.noarch.rpm

3. Start the RabbitMQ after it is installed.

service rabbitmq-server start

4. Check the RabbitMQ status.

service rabbitmq-server status

Step 4 Run the following command to enable the RabbitMQ management web page:

rabbitmq-plugins enable rabbitmq_management

Information similar to the following is displayed:

```
[root@ecs-rabbitmq ~]# rabbitmq-plugins enable rabbitmq_management
Enabling plugins on node rabbit@ecs-rabbitmq:
rabbitmq_management
The following plugins have been configured:
  rabbitmq_management
  rabbitmq_management_agent
  rabbitmq_web_dispatch
Applying plugin configuration to rabbit@ecs-2b36...
The following plugins have been enabled:
  rabbitmq_management
  rabbitmq_management_agent
```



```
rabbitmq_web_dispatch

started 3 plugins.
```

Step 5 Run the following command to create a user:

rabbitmqctl add_user *Username password*

For example, run the following command:

rabbitmqctl add_user root 123456

Step 6 Run the following command to set the user as the administrator:

rabbitmqctl set_user_tags *Username* **administrator**

For example, run the following command:

rabbitmqctl set_user_tags root administrator

Step 7 Run the following command to assign all permissions to the user:

rabbitmqctl set_permissions -p / *Username* **'.*' '.*' '.*'**

For example, run the following command:

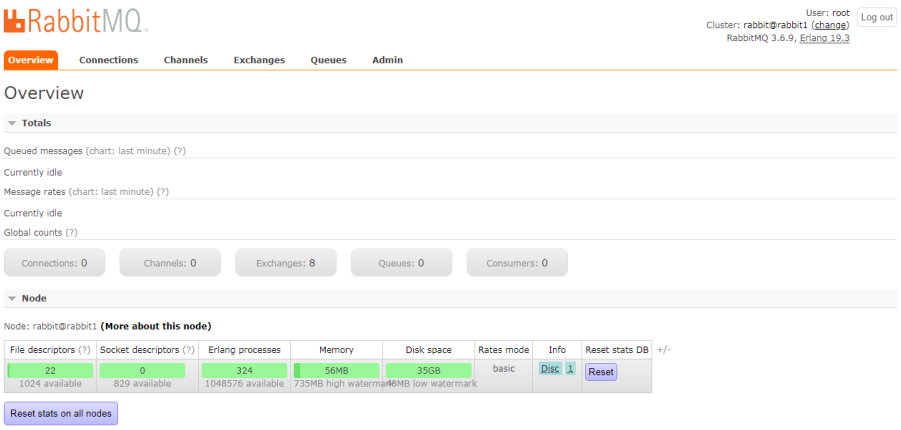
rabbitmqctl set_permissions -p / root '.*' '.*' '.*'

Step 8 Run the following command to start RabbitMQ on the backend:

rabbitmq-server -detached

Step 9 Enter **http://***EIP***:15672** in the address bar to access RabbitMQ. If the following page is displayed, RabbitMQ has been installed.

Step 10 Enter the username and password of the account created in **Step 5** to go to the RabbitMQ management page.



----End

6.7 Setting Up Master-Slave Replication on PostgreSQL

What Is PostgreSQL?

PostgreSQL is an open source object-relational DBMS (ORDBMS) with an emphasis on extensibility and standards compliance. It applies to business-oriented online transaction processing (OLTP) scenarios and supports NoSQL (JSON, XML, or hstore) and geographic information system (GIS) data types. It has won a good reputation in reliability and data integrity, and applies widely to Internet websites, location-based applications, and complex data object processing.

This section helps you use Huawei Cloud ECSs to set up PostgreSQL.

Preparations

- Create two ECSs.
- Configure a security group rule for the ECSs to allow port 5432.

NOTE

The CentOS 7.6 64bit is used as an example.

The PostgreSQL 11.2 version is used as an example.

Configuring the Master Node

1. Run the following commands to install **PostgreSQL** on the master node:

   # yum update -y

   # yum install https://download.postgresql.org/pub/repos/yum/reporpms/EL-7-x86_64/pgdg-redhat-repo-latest.noarch.rpm

   # yum install postgresql11-server

   # yum install postgresql11

   # /usr/pgsql-11/bin/postgresql-11-setup initdb

   # systemctl enable postgresql-11

   # systemctl start postgresql-11

2. Run the following command to switch to the default user **postgres**:

   # su - postgres

3. Run the following command to enter the database:

   # psql

4. Run the following command to create an account and assign permissions to it:

   create role *Username* **login replication encrypted password** '*Password*'

   NOTE

   The password in the preceding command must be enclosed in single quotation marks.

   Assume the username is **dbar** and the password is *xxxxx*. Run the following command:

   create role dbar login replication encrypted password *'xxxxx'*;

5. Run the following command to open configuration file **/var/lib/pgsql/11/data/pg_hba.conf**:

   # vim /var/lib/pgsql/11/data/pg_hba.conf

   Add the following content to the file:

```
host all all 192.168.1.0/24 md5 #Allows for MD5 password authentication connection in the VPC network segment.
host replication dbar IP address of the slave database/24 md5 #Allows for data replication from the master database to the slave database.
```

6. Run the following command to open file **/var/lib/pgsql/11/data/postgresql.conf**:

   # vim postgresql.conf

   Add the following content to the file:

```
wal_level = hot_standby
max_wal_senders= 6
wal_sender_timeout = 60s
max_connections = 512 #The max_connections value of the slave database must be greater than that of the master database.
archive_command= 'cp %p /var/lib/pgsql/11/data/archivelog/%f'
wal_keep_segments=10240
archive_mode = on
listen_addresses= xxx.xx.xx.xx
```

7. Run the following command to restart PostgreSQL:

   # systemctl restart postgresql-11

Configuring the Slave Node

1. Run the following commands to install PostgreSQL on the slave node:

   # yum update -y

   # yum install https://download.postgresql.org/pub/repos/yum/reporpms/EL-7-x86_64/pgdg-redhat-repo-latest.noarch.rpm

   # yum install postgresql11-server

   # yum install postgresql11

2. Run the following commands to copy the configuration file from the master node:

   # pg_basebackup -h *IP address of the master node* **-U *dbar* -D /var/lib/pgsql/11/data -X stream -P**

 # cp /usr/pgsql-11/share/recovery.conf.sample /var/lib/pgsql/11/data/recovery.conf

```
[root@ecs-22f5-0002 ~]# pg_basebackup -D /var/lib/pgsql/11/data -h [redacted] -p 5432 -U test -X s
tream -P
Password:
24508/24508 kB (100%), 1/1 tablespace
[root@ecs-22f5-0002 ~]#
```

3. Run the following command to modify the **recovery.conf** file:

   # vim recovery.conf

   ```
   standby_mode = on  # This node is used as the slave database.
   primary_conninfo = 'host=IP address of the master node  port=5432 user=dbar password=xxxxx (Do
   not enclose the password in single quotation marks.)
   trigger_file = '/var/lib/pgsql/11/data/trigger.kenyon'    #Trigger file for master/slave switchover
   recovery_target_timeline = 'latest'
   restore_command = 'cp /var/lib/pgsql/11/data/archivelog/%f %p'
   archive_cleanup_command = 'pg_archivecleanup /var/lib/pgsql/11/data/archivelog %r' #Clear
   outdated archives.
   ```

4. Run the following command to modify the **postgresql.conf** file:

   # chown -R postgres.postgres /var/lib/pgsql/11/data

5. Add the following content to the **/var/lib/pgsql/11/data/postgresql.conf** file.

   listen_addresses= *xxx.xx.xx.xx*

   max_connections = 600

6. Run the following commands to start PostgreSQL and enable it to start automatically upon ECS startup:

   #systemctl enable postgresql-11

   #systemctl start postgresql-11

Verifying Master-Slave Replication

1. Run the following command to check whether process **sender** runs on the master node:

   # ps aux |grep sender

   ```
   [root@ecs-22f5-0001 ~]# ps aux |grep sender
   postgres 14406  0.0  0.3 397240  3620 ?        Ss   20:19   0:00 postgres: walsender test [redacted] (53052) streaming 0/3000140
   ```

2. Run the following command to check whether process **receiver** runs on the slave node:

   # ps aux | grep receiver

   ```
   [root@ecs-22f5-0002 ~]# ps aux |grep receiver
   postgres  4390  0.0  0.3 403500  3632 ?        Ss   20:19   0:00 postgres: walreceiver   streaming 0/3000140
   ```

3. Run the following commands to check whether the status of the slave database can be viewed from the master database:

   # su - postgres

   -bash-4.2# psql

   replication=# select * from pg_stat_replication;

   ```
   postgres=#  select * from pg_stat_replication;
     pid  | usesysid | usename | application_name | client_addr  | client_hostname | client_port |         backend_start         | backend_xmin |   state   | se
   nt_lsn  | write_lsn | flush_lsn | replay_lsn | write_lag | flush_lag | replay_lag | sync_priority | sync_state
   -------+----------+---------+------------------+-------------+-----------------+-------------+-------------------------------+--------------+-----------+---
   -------+-----------+-----------+------------+-----------+-----------+------------+---------------+------------
    14406 |    16384 | test    | walreceiver      | [redacted] |                 |       53052 | 2019-03-26 20:19:18.693053+08 |              | streaming | 0/
   3000140 | 0/3000140 | 0/3000140 | 0/3000140  |           |           |            |             0 | async
   (1 row)
   ```

4. Create a database from the master database and check whether the newly created database is synchronized to the slave database.

a. Run the following commands to create a database from the master database:

postgres=# create database testdb;

postgres=# \l

b. Run the following command to check whether the newly created database is synchronized to the slave database.

postgres=# \l

6.8 Manually Installing a BT Panel (CentOS 7.2)

Application Scenarios

The best practices for Huawei Cloud ECS guide you through the manual installation of a BT panel on Linux ECSs. BT panel is an easy-to-use, powerful, and free-of-charge server management software that supports Linux and Windows. It allows you to configure LAMP, LNMP, websites, databases, FTP, and SSL with few clicks and easily manage ECSs through a web client. This section uses CentOS 7.2 64bit as an example to describe how to install BT panel 6.9.

Advantages

- A management project can be quickly created.
- You can view your server resource usage.
- The software installation and source code deployment is easy.

Constraints

- ECS OS and specifications:
  - A minimum of 512 MB memory is required, but 768 MB or above is recommended. A BT panel occupies about 60 MB of the total.
  - A minimum of 100 MB disk space is required. A BT panel occupies about 20 MB of the total.
  - BT panel Linux 6.0 was developed based on CentOS 7, so CentOS 7.*x* is recommended.
  - The OS has no Apache, Nginx, PHP, or MySQL installed.
- The rule listed in **Table 6-9** has been added to the security group which the target ECS belongs to. For details, see **Adding a Security Group Rule**.

  NOTE

  The BT panel usually uses port 8888, but it may vary according to the installation environment, so the port used by the panel installed in **Step 1.2** or the port set in the system is recommended.

Table 6-9 Security group rule

Direction	Priority	Action	Type	Protocol & Port	Source Address
Inbound	1	Allow	IPv4	TCP: 8888	0.0.0.0/0

Process of Installing a BP Panel

To manually install a BT panel on the Linux ECS, perform the following steps:

1. **Install the BT panel.**
2. **Log in to the BT panel.**

Procedure

Step 1 Install the BT panel.

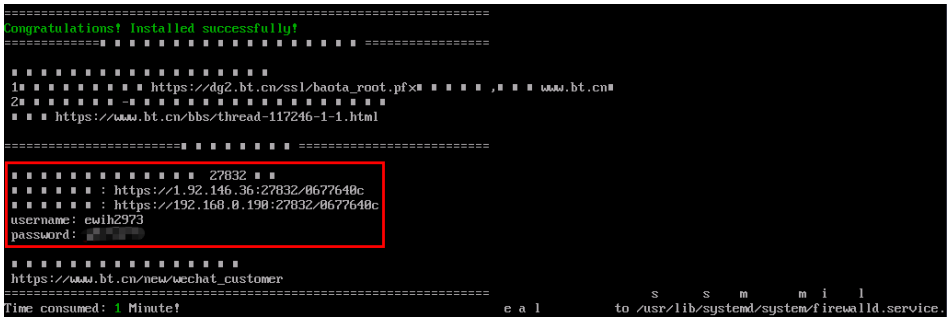
1. Log in to the target ECS.
2. Run the following command to download and install the BT panel:

   yum install -y wget && wget -O install.sh http://download.bt.cn/install/install_6.0.sh && sh install.sh

   When information similar to the following is displayed, enter **y**:

   ```
   ...
   Do you want to install Bt-Panel to the /www directory now?(y/n): y
   ...
   ```

   After the installation is complete, information similar to the following is displayed:

   NOTE

   Record the address information in the red box as well as the **username** and **password** in the command output.

Step 2 Log in to the BT panel.

1. In the address bar of the browser, enter the recorded address, for example, **https://1.92.*xxx.xx*:27832/0677640c**. In this example, port 27832 is used, and you need to add it to the security group, or the message "The webpage cannot be found" is displayed.
2. Enter the username and password you recorded.
3. Select **I have read and agreed to *Service Agreement*** and click **Enter Panel**.

4. Bind the BT panel account.
5. Install desired suites and deploy websites using the BT panel based on service requirements.

----End

6.9 Installing and Deploying Jenkins on an ECS

Preparations

- Before installing Jenkins, purchase an ECS (recommended configuration: 4 GB + memory and 40 GB+ disk size) running CentOS 7.6. Bind an EIP to the ECS.
- After the ECS is purchased, add the inbound rule listed in the following table to the security group which the ECS belongs to. For details, see **Adding a Security Group Rule**.

Direction	Priority	Action	Type	Protocol & Port	Source Address
Inbound	1	Allow	IPv4	TCP: 8080	0.0.0.0/0

Procedure

Step 1 Install JDK.

NOTE

To ensure compatibility with Jenkins, install OpenJDK 11 (**view supported Java versions**).

1. Remotely log in to the purchased ECS.
2. Run the following command to view the current JDK version:

   java -version

   If JDK exists and its version is earlier than 11, uninstall the JDK.

   rpm -qa | grep java | xargs rpm -e --nodeps
3. Install JDK 11.

   yum install -y java-11-openjdk
4. Restart the ECS.
5. Check whether the installation is successful.

   java -version

```
[root@ecs-jenkins ~]# java -version
openjdk version "11.0.16" 2022-07-19 LTS
OpenJDK Runtime Environment (Red_Hat-11.0.16.0.8-1.el7_9) (build 11.0.16+8-LTS)
OpenJDK 64-Bit Server VM (Red_Hat-11.0.16.0.8-1.el7_9) (build 11.0.16+8-LTS, mixed mode, sharing)
```

Step 2 Install Jenkins.

1. Run the following commands one at a time:

   sudo wget -O /etc/yum.repos.d/jenkins.repo https://pkg.jenkins.io/redhat-stable/jenkins.repo

   sudo rpm --import https://pkg.jenkins.io/redhat-stable/jenkins.io.key

yum install -y jenkins --nogpgcheck

2. Edit the **Jenkins** file.

   vim /etc/sysconfig/Jenkins

```
#Port
JENKINS_PORT="8080"
#Modify the user
$JENKINS_USER="root"
#Modify directory permissions
chown -R root:root /var/lib/jenkins
chown -R root:root /var/cache/jenkins
chown -R root:root /var/log/Jenkins
```

3. Start Jenkins and check its status.

   systemctl start jenkins

   systemctl status jenkins

```
[root@ecs-jenkins ~]# systemctl start jenkins
[root@ecs-jenkins ~]# systemctl status jenkins
● jenkins.service - Jenkins Continuous Integration Server
   Loaded: loaded (/usr/lib/systemd/system/jenkins.service; disabled; vendor preset: disabled)
   Active: active (running) since Thu 2022-12-22 10:30:57 CST; 1min 34s ago
 Main PID: 8236 (java)
   CGroup: /system.slice/jenkins.service
           └─8236 /usr/bin/java -Djava.awt.headless=true -jar /usr/share/java/jenkins.war --webroot=%C/jenkins/war
```

Step 3 Unlock Jenkins.

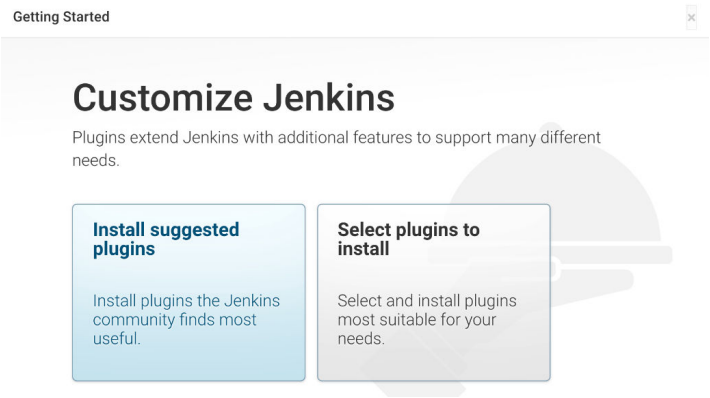
1. In the address bar of your local browser, enter **http:*EIP bound to the ECS hosting Jenkins*:8080**. The unlocking page is displayed.

2. Log in to the ECS.
3. Obtain the activation password.

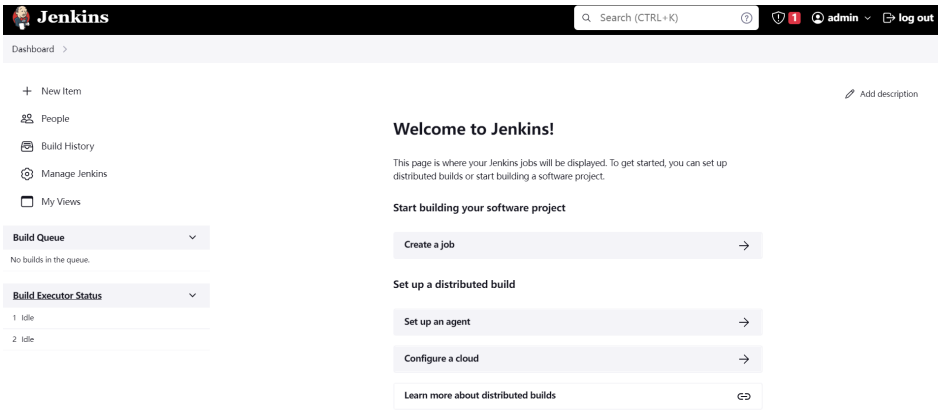
   cat /var/lib/jenkins/secrets/initialAdminPassword

```
[root@ecs-jenkins ~]# cat /var/lib/jenkins/secrets/initialAdminPassword
f4360f0b[redacted]62f7f
```

4. On the **Unlock Jenkins** page, paste this password into the **Administrator password** field and click **Continue**.
5. Install suggested plugins. After the installation is complete, use the admin account to go to the next step.



6. Save the settings and complete the installation. The Jenkins page is displayed.

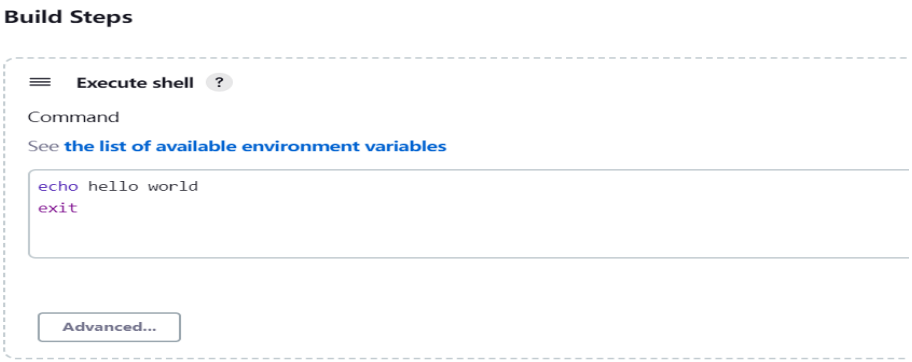


----End

Verification

Single Job

1. Choose **New item**, select **Freestyle Project**, click **OK.**
2. In **Build Steps**, select **Execute shell**, enter **echo hello world; exit**, and click **OK**.



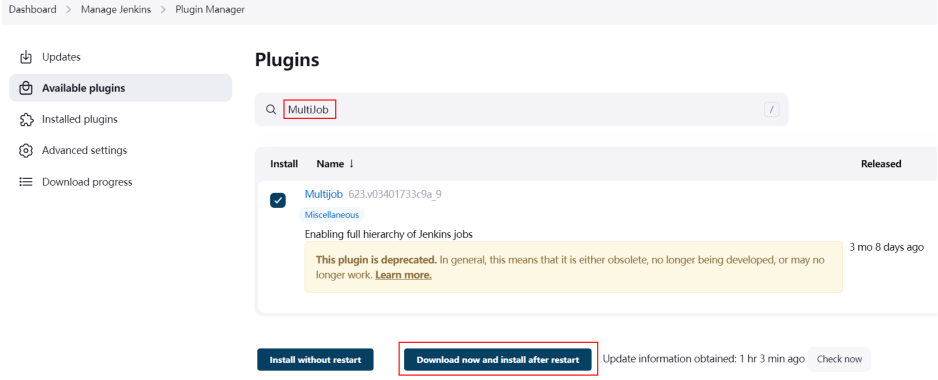
3. Click **Build Now**.
4. Wait until the execution of build task in the lower left corner is complete. Click Console Output, you can see the job is finished and **hello world** is displayed.

Multiple Jobs

1. On the plug-in management page, search for the MultiJob plug-in and install it.

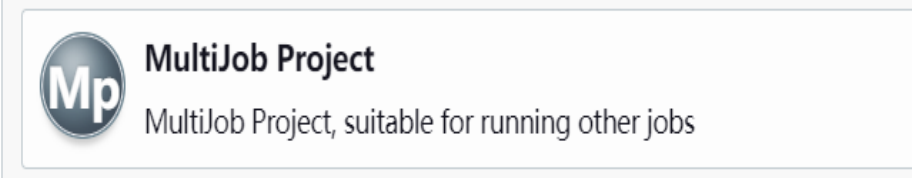
   NOTE

   - After the plug-in is installed, you need to restart Jenkins for the plug-in to take effect. Select **Download now and install after restart**.



   - After Jenkins is restarted, check whether the MultiJob plug-in takes effect on the installed plug-ins page.

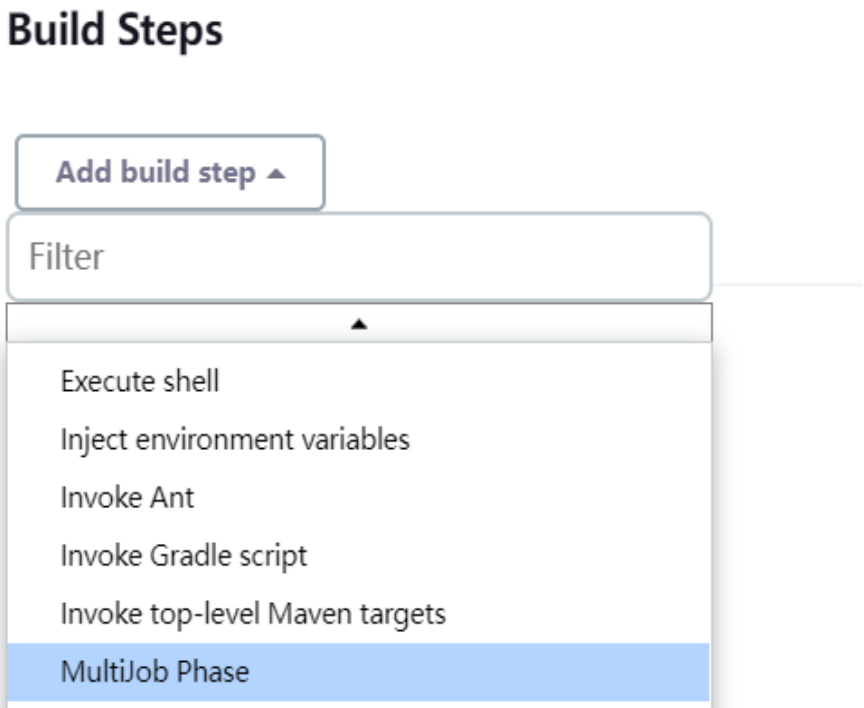
2. Click **New item**, select **MultiJob Project**, and click **OK**.



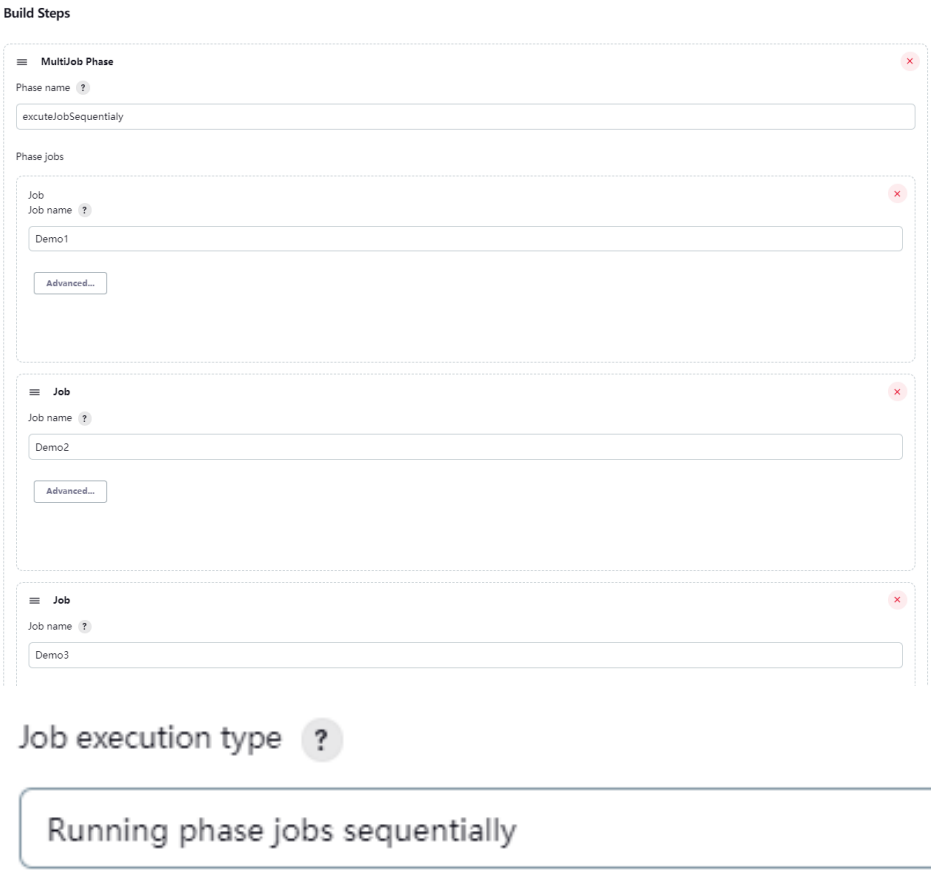
NOTE

Before creating a MultiJob project, you need to create three jobs.

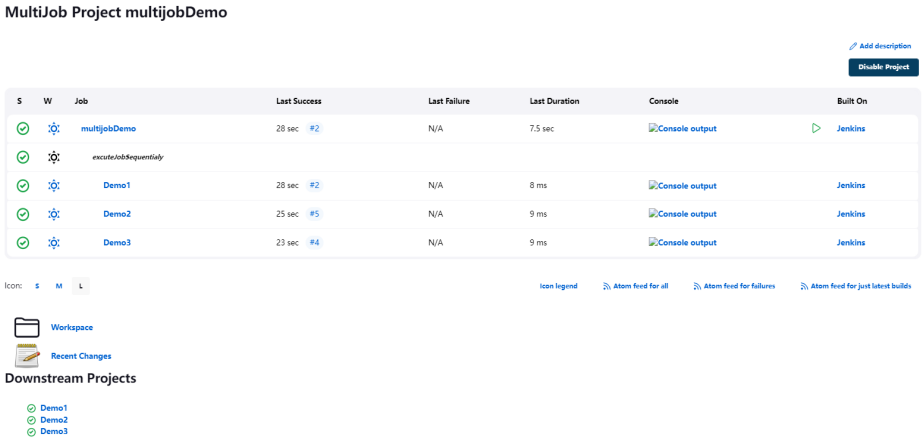
3. In **Build Steps**, select **MultiJob Phase**.



4. Add three jobs as follows:



5. Save the settings. The jobs are added.
6. Click **Build Now**. The three jobs are successfully built in sequence.



6.10 Using auditd to Record File Changes (Linux)

The auditd is a user-space component of the Linux audit system. It records operation logs, including file read/write and invoking records, in the OS, which can be used for audit if a fault occurs. This section uses CentOS 7.4 64bit as an example to describe how to install and configure auditd.

auditd-related Tool Commands and Configuration Files

Tool commands:

- **auditctl**: controls the audit daemon in real time, such as adding rules.
- **aureport**: checks and generates audit reports.
- **ausearch**: searches for audit events.
- **auditspd**: forwards event notifications to other applications instead of writing them to audit logs.
- **autrace**: traces processes.

Configuration files:

- **/etc/audit/auditd.conf**: specifies configuration file of auditd.
- **/etc/audit/rules.d/audit.rules**: contains audit rules.
- **/etc/audit/audit.rules**: records audit rules.

Procedure

Installing auditd

1. Run the following command to install auditd:

   yum install -y auditd*

   NOTE

   After auditd is installed for the first time, there are no audit rules by default. You can run the **sudo auditctl -l** command to query the audit rules.

2. Run the following command to check the runtime status of auditd:

   service auditd status

   Figure 6-74 Runtime status

```
[root@ecs ~]# service auditd status
Redirecting to /bin/systemctl status auditd.service
● auditd.service - Security Auditing Service
   Loaded: loaded (/usr/lib/systemd/system/auditd.service; enabled; vendor preset: enabled)
   Active: active (running) since Mon 2023-08-28 10:46:20 CST; 45min ago
     Docs: man:auditd(8)
           https://github.com/linux-audit/audit-documentation
 Main PID: 400 (auditd)
   CGroup: /system.slice/auditd.service
           └─400 /sbin/auditd

Aug 28 10:46:20 localhost.localdomain augenrules[404]: lost 0
Aug 28 10:46:20 localhost.localdomain augenrules[404]: backlog 0
Aug 28 10:46:20 localhost.localdomain augenrules[404]: enabled 1
Aug 28 10:46:20 localhost.localdomain augenrules[404]: failure 1
Aug 28 10:46:20 localhost.localdomain augenrules[404]: pid 400
Aug 28 10:46:20 localhost.localdomain augenrules[404]: rate_limit 0
Aug 28 10:46:20 localhost.localdomain augenrules[404]: backlog_limit 8192
Aug 28 10:46:20 localhost.localdomain augenrules[404]: lost 0
Aug 28 10:46:20 localhost.localdomain augenrules[404]: backlog 0
Aug 28 10:46:20 localhost.localdomain systemd[1]: Started Security Auditing Service.
```

Configuring audit rules

1. Run the following command to configure the monitoring file and change the directory:

   auditctl -w /etc/passwd -p rwxa

   where:

- **-w**: specifies the file path to be monitored. The preceding command specifies the monitored file path **/etc/passwd**.
- **-p**: specifies the access permission of the file or directory that triggers the audit.
- **rwxa**: specifies trigger conditions. **r** indicates the read permission, **w** the write permission, **x** the execution permission, and **a** the attribute.

2. Run the following commands to audit all accesses to **/production**:

   mkdir production

   auditctl -w /production/

3. Run the following command to check configured rules:

   auditctl -l

```
-w /etc/passwd -p rwxa
-w /production -p rwxa
```

4. After rules are added, run the following command to check the audit log:

   ausearch -f /etc/passwd

   Figure 6-75 Checking the audit log

```
time->Mon Aug 28 14:57:10 2023
type=PROCTITLE msg=audit(1693205830.281:154): proctitle=7375646F006175736561726368002D66002F6574632F706173737764
type=PATH msg=audit(1693205830.281:154): item=0 name="/etc/passwd" inode=1314178 dev=fd:01 mode=0100644 ouid=0 ogid=0 rdev=00:00
 objtype=NORMAL cap_fp=0000000000000000 cap_fi=0000000000000000 cap_fe=0 cap_fver=0
type=CWD msg=audit(1693205830.281:154):  cwd="/root"
type=SYSCALL msg=audit(1693205830.281:154): arch=c000003e syscall=2 success=yes exit=4 a0=7f9205d96552 a1=80000 a2=1b6 a3=24 ite
ms=1 ppid=7919 pid=18923 auid=0 uid=0 gid=0 euid=0 suid=0 fsuid=0 egid=0 sgid=0 fsgid=0 tty=tty1 ses=1 comm="sudo" exe="/usr/bin
/sudo" key=(null)
```

   Figure 6-75 shows that the file is not modified. The parameters are described as follows:

   - **time**: audit time
   - **name**: audit object
   - **cwd**: current path
   - **syscall**: related system calls
   - **auid**: ID of the audited user
   - **uid** and **gid**: user ID and user group ID for accessing a file
   - **comm**: command for a user to access a file
   - **exe**: file path where the preceding command can be executed

5. Run the following command to add a user **test** to the monitoring file:

   useradd test

6. Run the following command to check the audit log again:

   ausearch -f /etc/passwd

   Figure 6-76 Checking the audit log again

```
time->Mon Aug 28 15:35:52 2023
type=PROCTITLE msg=audit(1693208152.845:203): proctitle=7375646F006175736561726368002D66002F6574632F706173737764
type=PATH msg=audit(1693208152.845:203): item=0 name="/etc/passwd" inode=1315998 dev=fd:01 mode=0100644 ouid=0 ogid=0 rdev=00:00
 objtype=NORMAL cap_fp=0000000000000000 cap_fi=0000000000000000 cap_fe=0 cap_fver=0
type=CWD msg=audit(1693208152.845:203):  cwd="/root"
type=SYSCALL msg=audit(1693208152.845:203): arch=c000003e syscall=2 success=yes exit=4 a0=7fdc42775552 a1=80000 a2=1b6 a3=24 ite
ms=1 ppid=7919 pid=19034 auid=0 uid=0 gid=0 euid=0 suid=0 fsuid=0 egid=0 sgid=0 fsgid=0 tty=tty1 ses=1 comm="sudo" exe="/usr/bin
/sudo" key=(null)
```

   Figure 6-76 shows that **/etc/passwd** is modified by user **root** (uid=0, gid=0) in the **/root** directory at a specified time. The **/etc/passwd** file is accessed from **/usr/bin/sudo**.

7. Run the following command to check whether the audit log contains any content:

   ausearch -f /production

```
[root@ecs ~]# ausearch -f /production
<no matches>
```

8. Run the following commands to change the directory permissions as user **root** and check the audit log again:

   chmod -R 777 /test/

   ausearch -f /test/

9. Run the following command to view the audit report:

   aureport

   Figure 6-77 Viewing the audit report

```
[root@ecs ~]# aureport

Summary Report
======================
Range of time in logs: 01/01/1970 08:00:00.000 - 08/28/2023 18:11:02.564
Selected time for report: 01/01/1970 08:00:00 - 08/28/2023 18:11:02.564
Number of changes in configuration: 4
Number of changes to accounts, groups, or roles: 1
Number of logins: 4
Number of failed logins: 0
Number of authentications: 1
Number of failed authentications: 0
Number of users: 2
Number of terminals: 4
Number of host names: 3
Number of executables: 7
Number of commands: 3
Number of files: 0
Number of AVC's: 0
Number of MAC events: 0
Number of failed syscalls: 0
Number of anomaly events: 0
Number of responses to anomaly events: 0
Number of crypto events: 12
Number of integrity events: 0
Number of virt events: 0
Number of keys: 0
Number of process IDs: 15
Number of events: 140
```

10. Run the following command to view the authorization failure details:

    aureport -au

    Figure 6-78 Viewing authorization failure details

```
[root@ecs- ~]# aureport -au

Authentication Report
============================================
# date time acct host term exe success event
============================================
1. 08/28/2023 17:33:52 root ecs tty1 /usr/bin/login yes 60
```

11. Run the following command to view all events related to account modifications:

    aureport -m

Figure 6-79 Viewing account modification events

```
[root@ecs- ~]# aureport -m

Account Modifications Report
===============================================
# date time auid addr term exe acct success event
===============================================
1. 08/28/2023 17:26:24 -1 ? ? /usr/sbin/chpasswd ? yes 50
```

12. (Optional) Run the following commands to clear the defined rules:

    auditctl -D

    auditctl -l

Figure 6-80 Clearing defined rules

```
[root@ecs- ~]# auditctl -D
No rules
[root@ecs- ~]# auditctl -l
No rules
```

6.11 Restoring Accidentally Deleted Data Using Extundelete (Linux)

Application Scenarios

You can use Extundelete to restore accidentally deleted files. Extundelete is a utility that can restore deleted files from an ext3 or ext4 partition.

NOTICE

Whether deleted files can be restored are determined by the following factors:

- Whether data in the files is overwritten after being deleted
- Whether metadata is stored in journal

If the accidentally deleted files were stored in the system disk and data was continuously written into the files after deletion, the files cannot be restored using Extundelete.

To improve data security, you are advised to periodically back up data. For details, see **Creating a Snapshot**, **Creating a Private Image**, and **Creating a Cloud Disk Backup**.

The following uses an ECS running CentOS 7.5 as an example to describe how to use the open-source tool Extundelete to quickly restore accidentally deleted data.

Prerequisites

Before restoring data, complete the following preparations:

- Back up data by referring to **Creating a Snapshot** and **Creating a Private Image** to ensure that data can be restored to its original state if an error occurs during data restoration.
- Stop writing data to the file system. If you want to restore a data disk, unmount it first.

Procedure

Step 1 Install Extundelete.

1. Log in to the ECS.
2. Run the following commands in sequence to install Extundelete dependencies and libraries:

   yum install libcom_err e2fsprogs-devel

   yum install gcc gcc-c++
3. Type **y** when the following information is displayed:

```
Installed size: 25 M
Is this OK [y/d/N]: y
```

4. Run the following command to **download** the Extundelete source code:

   wget https://github.com/curu/extundelete/archive/refs/tags/v1.0.tar.gz
5. Run the following command to decompress **v1.0.tar.gz**:

   tar xf v1.0.tar.gz
6. Run the following commands in sequence to compile and install Extundelete:

   cd extundelete-1.0

   ./configure

   make
7. Run the following command to go to the **src** directory and view the compiled Extundelete file:

   cd ./src

Step 2 Run the following command to restore data:

./extundelete --restore-all /dev/*partition*

The data is restored in **RECOVERED_FILES** in the same directory.

----End

6.12 Setting Up a ThinkPHP Framework

Overview

ThinkPHP, a free, open-source, fast, and simple object-oriented lightweight PHP development framework, is released under the Apache2 open source protocol and is designed for developing agile web applications and simple enterprise applications. The section guides you through the setup of ThinkPHP using an ECS running CentOS 7.2 on Huawei Cloud.

Prerequisites

- You have purchased an ECS and bound an EIP to it.
- The rule listed in the following table has been added to the security group which the target ECS belongs to. For details, see **Adding a Security Group Rule**.

Table 6-10 Security group rules

Direction	Priority	Action	Type	Protocol & Port	Source Address
Inbound	1	Allow	IPv4	TCP: 22	0.0.0.0/0
Inbound	1	Allow	IPv4	TCP: 443	0.0.0.0/0
Inbound	1	Allow	IPv4	TCP: 8000	0.0.0.0/0

Procedure

1. Install PHP.
   a. Run the following commands to install the EPEL and REMI repositories:

      sudo yum install -y epel-release

      sudo yum install -y https://rpms.remirepo.net/enterprise/remi-release-7.rpm

   b. Run the following commands to enable the PHP 8.0 repository:

      sudo yum -y install yum-utils

      sudo yum-config-manager --enable remi-php80

   c. Run the following commands to install PHP:

      sudo yum install -y php php-cli php-fpm php-mysqlnd php-zip php-devel php-gd php-mcrypt php-mbstring php-curl php-xml php-pear php-bcmath php-json

   d. Run the following command to check the version of the installed PHP:

      php -v

      Information similar to the following is displayed:

      ```
      PHP 8.0.30 (cli) (built: Jun  4 2024 15:19:49) ( NTS gcc x86_64 )
      Copyright (c) The PHP Group
      Zend Engine v4.0.30, Copyright (c) Zend Technologies
      ```

2. Install Composer.

   Composer is a package manager for the PHP programming language that provides a standard format for managing dependencies of PHP software and required libraries.

   a. Run the following command to install the dependencies required by Composer:

      sudo yum install -y unzip git

b. Run the following commands to install Composer:

curl -sS https://getcomposer.org/installer | php

sudo mv composer.phar /usr/local/bin/composer

c. Run the following command to check the version of the installed Composer:

composer --version

Information similar to the following is displayed:

```
Composer version 2.7.7 2024-06-10 22:11:12
PHP version 8.0.30 (/usr/bin/php)
```

3. Install ThinkPHP.

a. Use Composer to create a new ThinkPHP application.

Run the following command to create **my-thinkphp-app** in the current directory and download the core files and dependencies of ThinkPHP:

composer create-project topthink/think my-thinkphp-app

b. Run the following commands to switch to the created directory and start the ThinkPHP built-in server for development:

cd my-thinkphp-app

php think run

If information similar to the following is displayed, ThinkPHP has been started:

```
[root@[redacted] my-thinkphp-app]# php think run
ThinkPHP Development server is started On <http://0.0.0.0:8000/>
You can exit with `CTRL-C`
Document root is: /root/my-thinkphp-app/public
[Thu Jul  4 16:07:47 2024] PHP 8.0.30 Development Server (http://0.0.0.0:8000) started
```

c. After the installation is complete, enter **http://***ECS EIP***:8000** in the address bar of the browser. If the following page is displayed, ThinkPHP has been installed.

7 Securing an ECS

7.1 Enhancing Security for SSH Logins to Linux ECSs

Linux ECSs are generally logged in using SSH. How can I ensure login security for password-authenticated Linux ECSs? This section uses CentOS 7.6 as an example to describe how to enhance security for SSH logins.

Table 7-1 ECS configurations

Parameter	Example Value
Name	ecs-f5a2
OS	CentOS 7.6 64bit
EIP	119.3.*xxx.x*
Login mode	Password

Changing the Default Login Port

1. Remotely log in to the ECS using its password through SSH. For details, see **Login Using an SSH Password**.
2. Run the following command to change the default port for SSH logins, for example, to **5000**:

   vim /etc/ssh/sshd_config

   Press **i** to enter insert mode. In line 17, delete the comment character (#) and change the port number to **5000**.

   Figure 7-1 Before the change

   ```
   #
   #Port 22
   #AddressFamily any
   #ListenAddress 0.0.0.0
   #ListenAddress ::
   ```


Figure 7-2 After the change

```
Port 5000
#AddressFamily any
#ListenAddress 0.0.0.0
#ListenAddress ::
```

3. Press **Esc** and enter **:wq** to save the changes and exit.

Adding a Firewall Rule to Open a Specified Port

CentOS 7 series use the **fireware** firewall rather than **iptables** by default. Perform the operations described in this section only if Iptables has been installed on your ECS to open port 5000 for SSH logins.

1. Run the following command to check whether Iptables has been installed:

   service iptables status

   – If information similar to the following is displayed, Iptables has not been installed. In such a case, skip this section and proceed with **Adding a Security Group Rule**.

   ```
   [root@ecs-[redacted] ~]# service iptables status
   Redirecting to /bin/systemctl status iptables.service
   Unit iptables.service could not be found.
   [root@ecs-[redacted] ~]#
   ```

   – If information similar to the following is displayed, Iptables has been installed, and it is in **active** state. Then, go to step **2**.

   ```
   [root@ecs-[redacted] ~]# service iptables status
   Redirecting to /bin/systemctl status iptables.service
   ● iptables.service - IPv4 firewall with iptables
      Loaded: loaded (/usr/lib/systemd/system/iptables.service; disabled; vendor preset: disabled)
      Active: active (exited) since Tue 2019-04-16 10:42:53 CST; 3s ago
     Process: 23744 ExecStart=/usr/libexec/iptables/iptables.init start (code=exited, status=0/SUCCESS)
    Main PID: 23744 (code=exited, status=0/SUCCESS)

   Apr 16 10:42:53 ecs-[redacted] systemd[1]: Starting IPv4 firewall with iptables...
   Apr 16 10:42:53 ecs-[redacted] iptables.init[23744]: iptables: Applying firewall rules: [  OK  ]
   Apr 16 10:42:53 ecs-[redacted] systemd[1]: Started IPv4 firewall with iptables.
   ```

2. Run the following command to add an Iptables rule to open port 5000:

   iptables -A INPUT -p tcp -m state --state NEW -m tcp --dport 5000 -j ACCEPT

3. Run the following command to check whether port 5000 is contained in the existing Iptables rules:

   iptables -L -n

   ```
   Chain INPUT (policy ACCEPT)
   target     prot opt source       destination
   ACCEPT     tcp  --  0.0.0.0/0    0.0.0.0/0    state NEW tcp dpt:5000
   ACCEPT     tcp  --  0.0.0.0/0    0.0.0.0/0    state NEW tcp dpt:5000
   ```

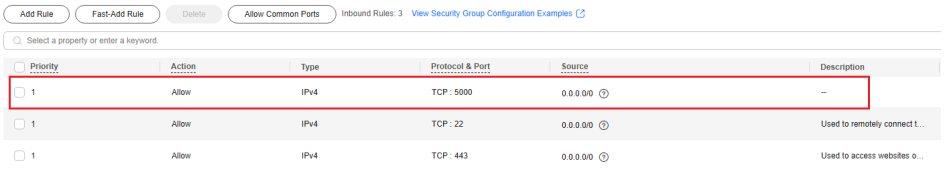
Adding a Security Group Rule

By default, port 22 is enabled in the inbound direction of a security group. After changing the SSH login port on your ECS to port 5000, add a rule for port 5000 to the security group.

1. Log in to the management console.
2. Under **Compute**, click **Elastic Cloud Server**. The ECS console is displayed.

3. Click the ECS name **ecs-f5a2** to go to the page providing details about the ECS.
4. Click the **Security Groups** tab and then to show details about the security group rules. Click **Modify Security Group Rule** in the upper right corner of the table for the security group rules.
5. Add an inbound rule, as shown in **Figure 7-3**.

Figure 7-3 Security group rules



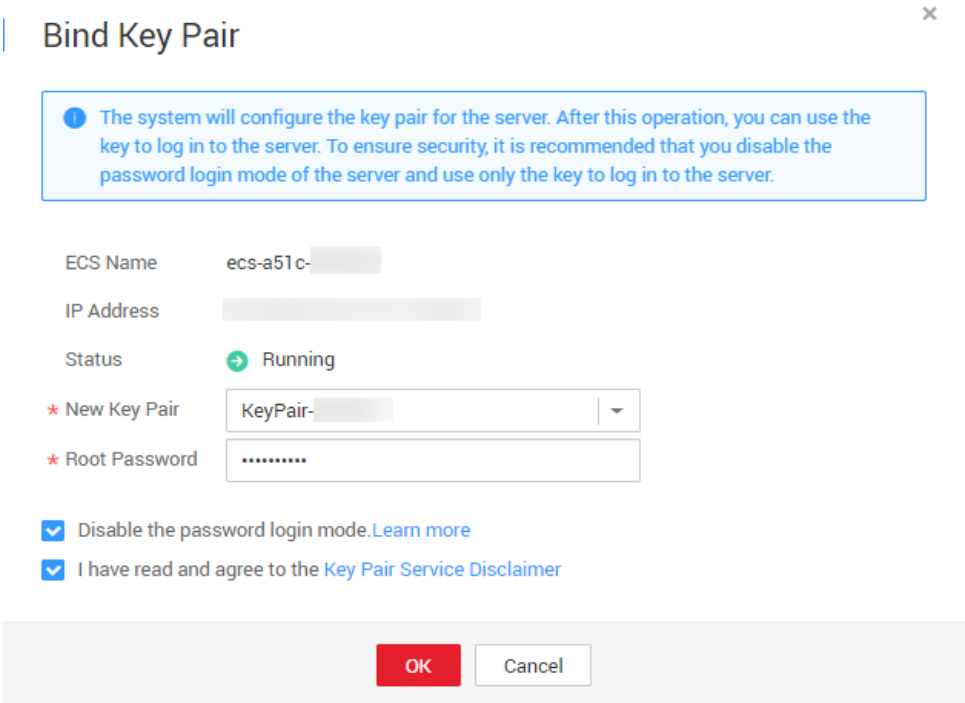
Changing Password Authentication to Key-Pair Authentication

Create a key pair on the management console, bind the key pair to your ECS to change the ECS login mode.

1. Log in to the management console.
2. Under **Computing**, click **Elastic Cloud Server** to switch to the ECS console.
3. Create a key pair by following the instructions provided in **Creating a Key Pair**, and keep the private key file secure.
4. Choose **Service List** > **Security & Compliance** > **Data Encryption Workshop**. In the left navigation pane, click **Key Pair Service**.
5. Click the **ECS List** tab, locate the row containing **ecs-f5a2**, and click **Bind** in the **Operation** column. Set parameters according to **Figure 7-5**, and click **OK**.

   To disable password authentication, select **Disable the password login mode** on the **Bind Key Pair** page, or edit the **sshd_config** configuration file.

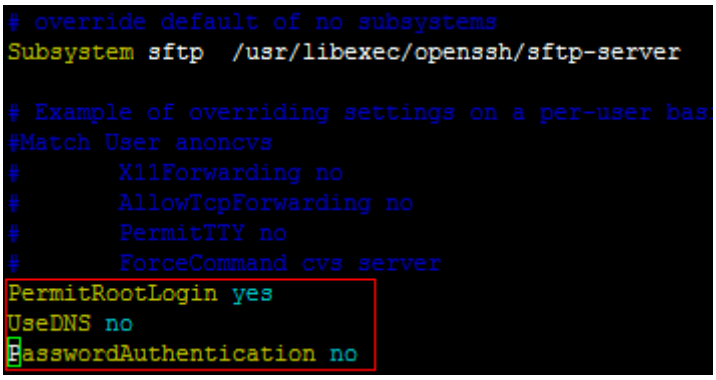
Figure 7-4 Bind Key Pair



6. Log in to the ECS, and edit the **sshd_config** file to disable password authentication.

   vim /etc/ssh/sshd_config

   Press **i** to enter insert mode, and configure the data in last several lines according to the following figure.



   Parameter description:

   – **PermitRootLogin**: specifies whether to allow the **root** user to log in to the ECS. Set this parameter to **yes**.
   – **UseDNS**: specifies whether DNS resolution is allowed. Set this parameter to **no**.
   – **PasswordAuthentication**: specifies whether a login is authenticated using a password. Set this parameter to **no**.

   NOTE

   During key pair binding in step **5**, you have selected "Disable the password login mode". The **PasswordAuthentication** value should be **no**. You only need to verify it.

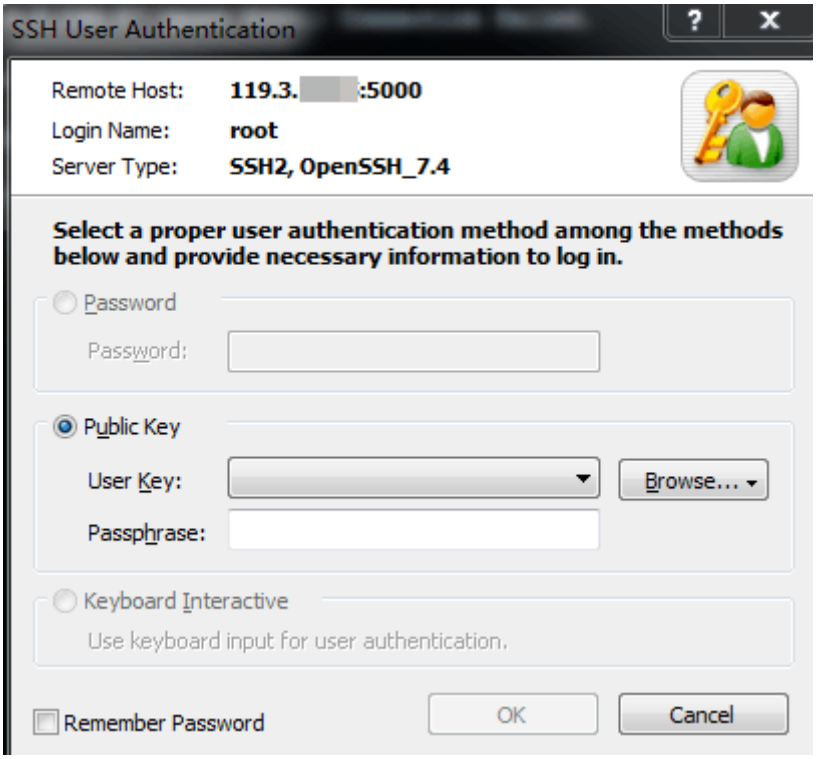
Press **Esc** and enter **:wq** to save the changes and exit.

7. Run the following command to restart sshd:

   systemctl restart sshd

8. Attempt to log in to the ECS using Xshell or an SSH client. If password input is unavailable, as shown in **Figure 7-5**, the configuration is successful.

Figure 7-5 Logging in to the ECS using Xshell



Editing hosts.allow and hosts.deny

The **/etc/hosts.allow** and **/etc/hosts.deny** files control remote access. You can configure these files to allow or deny the access from certain IP addresses or IP address ranges to a process running on the Linux ECS.

For example, if SSH is available only to the administrator, you can only allow access from the IP address ranges used by the administrator.

The ECS may be logged in anywhere. You are advised to allow accesses from all IP addresses in **/etc/hosts.allow**.

vim /etc/hosts.allow

Add **sshd:ALL** in the last line.

```
#           either use the tcp_wrappers library or that have been
#           started through a tcp_wrappers-enabled xinetd.
#
#           See 'man 5 hosts_options' and 'man 5 hosts_access'
#           for information on rule syntax.
#           See 'man tcpd' for information on tcp_wrappers
sshd:ALL
```


Identify ECS security risks using certain methods, for example, checking the SSH status, to detect risky IP addresses, and add them to **/etc/hosts.deny** to deny the access from these IP addresses.

8 Migrating an ECS

8.1 Migrating Servers to the Cloud

Background

As the public cloud is agile, flexible, reliable, easy to use, and cost-effective, more and more enterprises choose to migrate their IT applications and loads to the public cloud. An easy and quick migration method is of great significance for the enterprises. Huawei Cloud allows you to quickly and easily migrate workloads from x86 physical servers or VMs on private clouds or other public cloud platforms to Huawei Cloud ECSs.

Two migration methods are available for you.

- Server Migration Service (Recommended)
- Image import

This section describes how to use the preceding methods to migrate applications and data from your existing servers to Huawei Cloud.

Server Migration Service (Recommended)

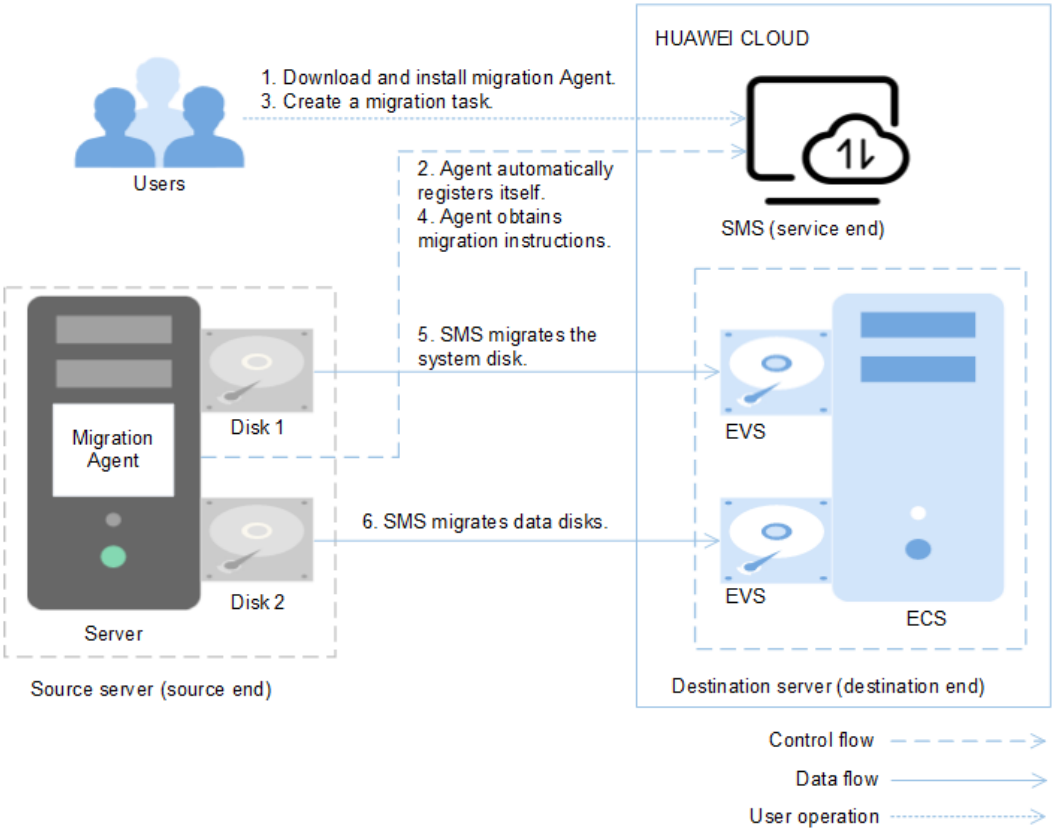
Service Overview

Server Migration Service (SMS) provides P2V and V2V migration services to help you migrate applications and data from on-premises x86 physical servers or VMs on private or public clouds to Huawei Cloud Elastic Cloud Servers (ECSs).

SMS supports a wide range of OS types. For details, see **Supported OSs**.

Before using SMS, you need to know **constraints on source servers**.

Figure 8-1 SMS working principle



SMS automatically performs the migration, and you only need to perform steps **1** and **3**.

1. Install the migration Agent on the source server. For details, see **How Do I Download and Install the Agent on Source Servers?**
2. The migration Agent installed on the source server registers its connection status with SMS and reports the information about the source server to SMS. Then, SMS completes the migration feasibility check.
3. After the migration feasibility check is passed, you can create a migration task. For details, see **Creating a Migration Task**.
4. The migration Agent obtains and executes the migration instruction sent by SMS.
5. SMS starts to migrate system disk of the source server.
6. SMS starts to migrate data disks of the source server.

NOTE

- **Source end**: indicates the source server in a migration task.
- **Destination end**: indicates the destination server in a migration task.
- **Service end**: indicates the SMS service.

Service entry

SMS procedure: **Creating a Migration Task**.

SMS introduction: **Server Migration Service**.

Image Import

1. Create an image. For example, you can use QEMU to create an image. See **details**.
2. Create a private image. See **details**.
3. For details about how to create an ECS using a private image, see **Purchasing an ECS**.

9 Accessing OBS from an ECS over the Intranet

9.1 Overview

Scenario Introduction

An enterprise runs basic services on Elastic Cloud Servers (ECSs), but storage capacity of hard disks becomes insufficient for storing a large number of images and videos. After learning that HUAWEI CLOUD provides OBS, an elastic cloud storage service for massive amounts of data, the enterprise determined to use OBS as the data storage resource pool to reduce the burden on local servers.

From ECSs, you can access OBS over the internet or HUAWEI CLOUD intranet. However, for access over the internet, the network response speed is subject to the network conditions, and you need to pay for data access over the internet. To maximize performance and reduce costs, enterprise administrators want to access OBS over the intranet.

NOTE

When accessing OBS over the intranet, ensure that the OBS resources to be accessed are in the region where the ECS resides. If the OBS resources reside in a different region, access is supported only over the Internet.

Solution

Configure intranet DNS on the established ECS. The intranet DNS resolves the OBS domain name so that the ECS can access OBS through the intranet. **Figure 9-1** shows the access process.

Figure 9-1 Accessing OBS through the intranet

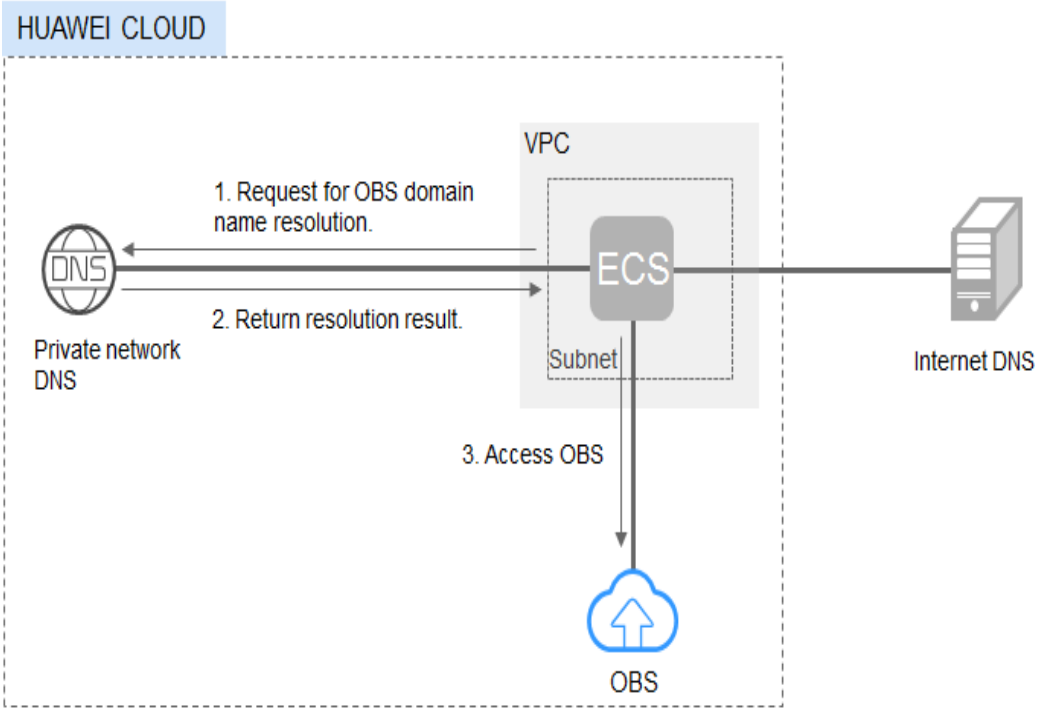


Table 9-1 describes the services in the figure.

Table 9-1 Service description

Service	Description
Virtual Private Cloud (VPC)	VPC enables users to create an isolated virtual network environment defined and managed by themselves, improving security of resources in the cloud and simplifying network deployment. A subnet is a network that provides IP address management and DNS services for the ECS in a VPC. IP addresses of an ECS must be in the same subnet of the ECS.
Domain Name Service (DNS)	Intranet DNS is provided for resolving intranet domain names and OBS domain names. This simplifies the domain name resolution process and saves costs.

- For Windows ECSs, you are advised to use OBS Browser+ to access OBS over intranet. For details, see:

  Accessing OBS over Intranet by Using OBS Browser+ on a Windows ECS

- For Linux ECSs, you are advised to use obsutil to access OBS over intranet. For details, see:

  Accessing OBS over Intranet by Using obsutil on a Linux ECS

When accessing OBS through the intranet from your ECSs, you can read, back up, and archive data without affecting the internet bandwidth.

9.2 Accessing OBS over Intranet by Using OBS Browser+ on a Windows ECS

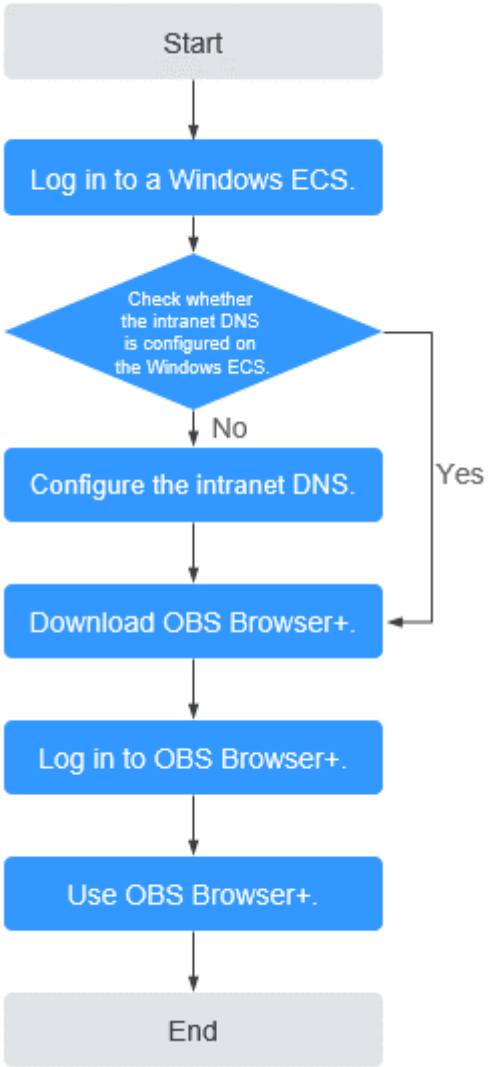
OBS Browser+ is a graphical interface tool applicable to object-based storage services. You can configure the intranet DNS server address to access OBS over intranet on a Huawei Cloud Windows ECS. The process and procedure are described as follows.

CAUTION

You need to download OBS Browser+ over the Internet. Alternatively, you can download OBS Browser+ from a cloud server that can access the Internet and then transfer the downloaded OBS Browser+ to the current cloud server for installation.

Process

Figure 9-2 The process of accessing OBS over intranet by using OBS Browser+ on a Windows ECS



Procedure

Step 1 Log In to the Windows ECS.

1. Log in to the **Huawei Cloud official website** and click **Console**.
2. On the home page of the console, choose **Compute** > **Elastic Cloud Server**.
3. Select an ECS and log in to it.

   A Windows ECS can be logged in using either VNC or MSTSC. For details, see **Logging In to an ECS**.

Step 2 Check whether the intranet DNS is configured on the Windows ECS.

On the Windows ECS, you can view the current DNS configuration by using the graphical user interface (GUI) or command line interface (CLI). This section uses the CLI as an example to describe how to view the DNS configuration.

1. After logging in to the ECS, open the CLI.
2. Run the **ipconfig /all** command to check whether DNS server is at the intranet DNS address of the region where the current ECS resides.

   NOTE

   Huawei Cloud provides different private DNS server addresses for different regions. For details, see **What Are the Private DNS Server Addresses Provided by Huawei Cloud?**

   – If no, go to **Step 3**.
   – If yes, go to **Step 5**.

Step 3 Configure the Intranet DNS.

Change the DNS server address of the ECS to the intranet DNS provided by Huawei Cloud. You can change the DNS address of the VPC subnet or modify the local DNS configuration to achieve this.

- **Methods 1: Changing the DNS server address of the VPC subnet**

  Locate the VPC where the ECS resides and change the DNS server address of the VPC subnet to the intranet DNS address. In this manner, ECSs in the VPC can use the intranet DNS for resolution and thereby you can access OBS on Huawei Cloud intranet. For details, see **Modifying a Subnet**.

  NOTE

  The intranet DNS server address must be selected based on the region where the ECS resides. For details, see **What Are the Private DNS Server Addresses Provided by Huawei Cloud?**

- **Method 2: Modifying the local DNS configuration**

  The intranet DNS configured in this method becomes invalid once the ECS is restarted. You need to reconfigure the intranet DNS after each restart of the ECS. This section uses configuration through CLI as an example to describe how to modify the DNS configuration locally.

1. Open the CLI.
2. Run the following command to configure the IP address of the primary DNS server:

   netsh interface ip set dns name="*Local connection*" **source=static addr=***Intranet DNS server address* **register**=**primary**

   NOTE

   – **Local connection**: NIC name. You need to modify the name according to the actual NIC.
   – **Intranet DNS server address**: Select the intranet DNS server address based on the region where the ECS resides. For details, see **What Are the Private DNS Server Addresses Provided by Huawei Cloud?**

3. (Optional) Run the following command to configure the IP address of the backup DNS server:

   netsh interface ip add dns name="*Local connection*" **addr**= *Alternative DNS server address* **index**=2

NOTE

- *Local connection*: a NIC name. Use the actual NIC name when configuring the local DNS.
- **Alternative DNS server address**: The DNS server is used when the primary DNS server is faulty, unavailable, or cannot resolve the requested domain name. You can set this parameter to the IP address of the Huawei Cloud intranet DNS server. (You need to select the intranet DNS server address based on the region where the ECS resides. For details, see **What Are the Private DNS Server Addresses Provided by Huawei Cloud?**) You can also set this parameter to the IP address of a public DNS server.

Step 4 Check whether OBS is accessed over the intranet.

For details, see **How Do I Determine Whether OBS Is Being Accessed from an Intranet Connection?**

The global domain name of an OBS bucket is in the *Bucket name*.**obs.my-kualalumpur-1.alphaedge.tmone.com.my** format.

Step 5 Download OBS Browser+.

For details, see **Downloading OBS Browser+**.

Step 6 Log in to OBS Browser+.

OBS Browser+ accesses OBS over a public network by default. When you log in to OBS Browser+ and add an account, set **Service** and **Server Address** as follows:

- **Server Address**: Enter the OBS domain name in the region where your ECS resides and the port number. The HTTPS port number is **443** and the HTTP port number is **80**. The HTTPS server is used by default. If you want to use the HTTP server, click  in the upper right corner of OBS Browser+ and click **System Configuration**. In the **System Configuration** dialog box that is displayed, deselect **Enable HTTPS**.

  Example: obs.eu-west-101.myhuaweicloud.eu:443

  NOTE

Step 7 Start to use OBS Browser+.

After logging in to OBS Browser+, you can access OBS over the intranet from the Windows ECS to perform basic data access operations and other advanced settings.

For details, see **OBS Browser+ Tool Guide**.

----End

9.3 Accessing OBS over Intranet by Using obsutil on a Linux ECS

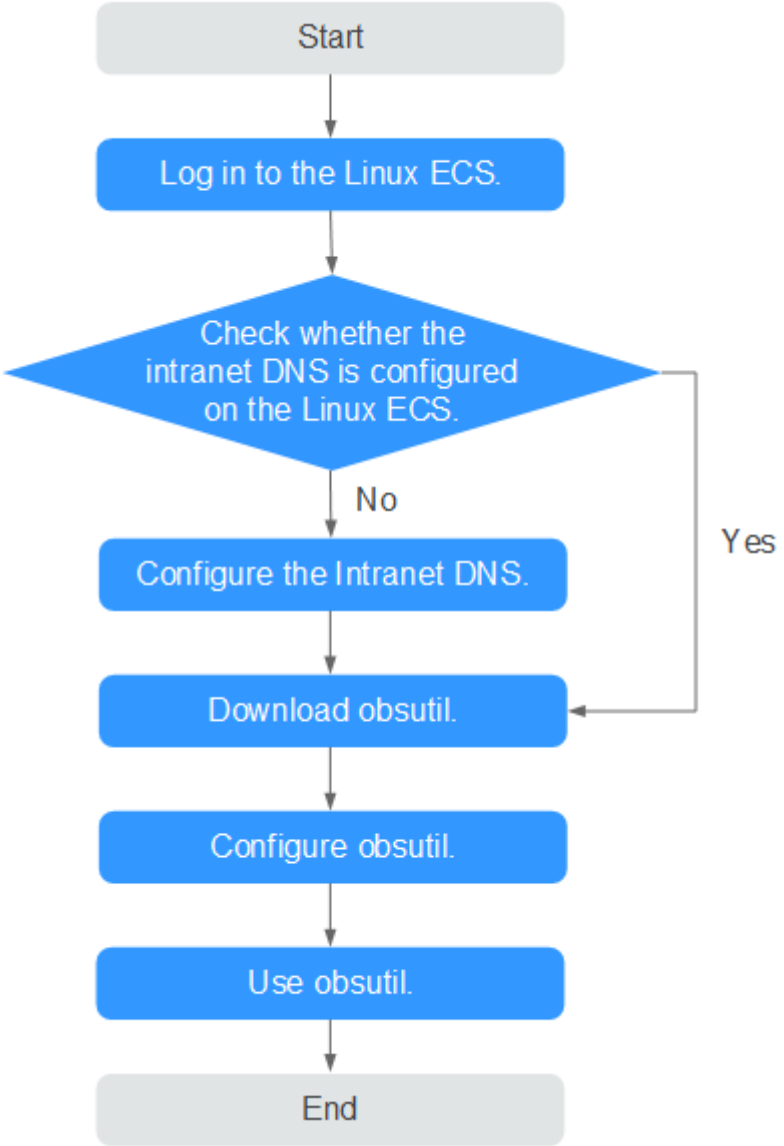
obsutil is a command line tool that can run Windows, macOS, and Linux operating systems. This section describes how to configure an intranet DNS server for a Huawei Cloud Linux ECS to access OBS over the intranet.

NOTE

You need to download obsutil over the Internet. Alternatively, you can download obsutil from a cloud server that can access the Internet and then transfer the downloaded obsutil to the current cloud server for installation.

Process

Figure 9-3 The process of accessing OBS over intranet by using obsutil on a Linux ECS



Procedure

Step 1 Log In to the Linux ECS.

1. Log in to the **Huawei Cloud official website** and click **Console**.
2. On the home page of the console, choose **Compute** > **Elastic Cloud Server**.

3. Select an ECS and log in to it.

   The login mode is set during the Linux ECS creation.

   For details about how to log in to the ECS, see **Logging In to an ECS**.

Step 2 Check whether the intranet DNS is configured on the Linux ECS.

1. Log in to the Linux ECS and open the CLI.
2. Run the **cat /etc/resolv.conf** command to check whether the IP address after **nameserver** in the first line is the intranet DNS address of the region where the current ECS resides.

   NOTE

   Huawei Cloud provides different private DNS server addresses for different regions. For details, see **What Are the Private DNS Server Addresses Provided by Huawei Cloud?**

   – If no, go to **Step 3**.
   – If yes, go to **Step 5**.

Step 3 Configure the Intranet DNS.

Change the DNS server address of the ECS to the intranet DNS provided by Huawei CloudDNS. To do this, you can change the DNS address of the VPC subnet or change the local DNS configuration.

- **Methods 1: Changing the DNS server address of the VPC subnet**

  Locate the VPC where the ECS resides and change the DNS server address of the VPC subnet to the intranet DNS address. In this manner, ECSs in the VPC can use the intranet DNS for resolution and thereby you can access OBS on Huawei Cloud intranet. For details, see **Modifying a Subnet**.

  NOTE

  The intranet DNS server address must be selected based on the region where the ECS resides. For details, see **What Are the Private DNS Server Addresses Provided by Huawei Cloud?**

- **Method 2: Modifying the local DNS configuration**

  The following uses an ECS running CentOS 6.*x* 64bit as an example to describe how to modify the local DNS configuration.

  a. Open the CLI.
  b. Run the following command to open the **/etc/resolv.conf** file:
     ```
     vi /etc/resolv.conf
     ```
  c. Press **i** to enter insert mode. In the **/etc/resolv.conf** file, add the intranet DNS server address before the existing DNS server address in the following format:
     nameserver *Intranet DNS server address*

NOTE

- The intranet DNS server address must be selected based on the region where the ECS resides. For details, see **What Are the Private DNS Server Addresses Provided by Huawei Cloud?**
- The IP address of the new DNS server must be placed before all existing DNS IP addresses.
- DNS servers are selected in the sequence of **nameserver**. A new DNS server is selected only when the previous DNS server is faulty, unavailable, or cannot resolve the requested domain name. If you want to switch to the public network access mode, you need to change the first line of the DNS address to a public DNS server address or add a public DNS server address before the existing DNS server address.

d. Press **Esc** and enter **:wq!** to save the settings and close the file.

NOTE

The modified DNS server address takes effect immediately after you save the modification to the **/etc/resolv.conf** file.

Step 4 Check whether OBS is accessed over the intranet.

For details, see **How Do I Determine Whether OBS Is Being Accessed from an Intranet Connection?**

Step 5 Download obsutil.

For details about the latest version of obsutil and download link, see **Downloading obsutil**.

Step 6 Configure obsutil.

Before using obsutil, you need to configure the interconnection between obsutil and OBS. Parameters include OBS endpoints and access keys (AK and SK).

For details, see **Initializing Configurations** in the tool guide of obsutil.

NOTE

The OBS endpoint needs to be entered according to the region where the ECS resides.

Step 7 Use obsutil.

After obsutil is successfully configured, you can access OBS over Huawei Cloud intranet on the Linux ECS to perform basic data access operations and other advanced settings.

For details, see the following topics:

- **Uploading an Object**
- **Downloading an Object**

For details, see **OBS Tools Guide (obsutil)**.

----End

10 Using VNC Viewer to Access a Linux ECS

Linux ECSs are generally accessed through SSH, allowing you to securely log in to your ECSs using key pairs. However, SSH connections use a character-based user interface, which does not support complex operations that are supported on the GUI. This section uses the Ubuntu 20.04 OS as an example to describe how to install VNC Server on a Linux ECS and how to use VNC Viewer to access the ECS.

Preparations

- An ECS running Ubuntu 20.04 has been created, and an EIP has been bound to it for internet access.

  For details, see **Purchasing an ECS** and **Assigning an EIP**.
- The VNC Viewer client has been installed on a local PC.

  NOTE

  Log in at **https://www.realvnc.com/en/connect/download/viewer/** to download VNC Viewer.

Installing VNC Server

Ubuntu 20.04 has no GUI or VNC Server installed by default. In this example, Xfce, a compact lightweight desktop is used. Xfce is more compact and user-friendly than Gnome and KDE. It applies to remote ECS access.

1. Remotely log in to the ECS.

   The username is **root**, and the password is the one you set during ECS creation.
2. Run the following command to update the software package list:

   sudo apt update
3. Install Xfce.

   sudo apt install xfce4 xfce4-goodies
4. Install the TightVNC server.

   sudo apt install tightvncserver

5. Run the **vncserver** command to configure the TightVNC server.

   After the first running of the **vncserver** command, the system automatically creates a default startup script. Then, configure parameters as prompted.

```
root@ecs-9240-[redacted]:~# vncserver

You will require a password to access your desktops.

Password:
Verify:
Would you like to enter a view-only password (y/n)? n
xauth:  file /root/.Xauthority does not exist

New 'X' desktop is ecs-9240-[redacted]:1

Creating default startup script /root/.vnc/xstartup
Starting applications specified in /root/.vnc/xstartup
Log file is /root/.vnc/ecs-9240-[redacted]:1.log

root@ecs-9240-[redacted]:~#
```

   - **Password**: consists of 6 to 8 characters. When the number of characters reaches the upper limit (8), no more characters can be entered. Securely keep the password, which will be used by VNC Viewer to access an ECS.
   - **Verify**: Enter the password again.
   - **Would you like to enter a view-only password**: If you select **y**, you are not allowed to use the mouse or keyboard to control your ECS. Press **n**.

Configuring VNC Server

1. Stop the first virtual desktop.

   vncserver -kill :1

```
root@ecs-9240-[redacted]:~# vncserver -kill :1
Killing Xtightvnc process ID 2738
root@ecs-9240-[redacted]:~#
```

2. Modify the **xstartup** file.

   vim ~/.vnc/xstartup

   Press **i** to enter insert mode and add the following to the file:

```
#!/bin/sh
xrdb $HOME/.Xresources
startxfce4 &
```

   In the preceding terminal display:

   - The first command **xrdb $HOME/.Xresources** is used to have the VNC GUI framework read the .Xresources file of VNC Server. You can modify GUI settings in the .Xresources file, such as the color display, cursor theme, and font rendering.
   - The second command **startxfce4 &** have VNC Server start Xfce.

```
#!/bin/sh

xrdb $HOME/.Xresources
xsetroot -solid grey
#x-terminal-emulator -geometry 80x24+10+10 -ls -title "$VNCDESKTOP Desktop" &
#x-window-manager &
# Fix to make GNOME work
export XKL_XMODMAP_DISABLE=1
/etc/X11/Xsession
startxfce4 &
~
```

3. Assign executable permissions to the file to ensure proper VNC running.

   sudo chmod +x ~/.vnc/xstartup

4. Restart VNC Server.

   vncserver

   After the second running of the **vncserver** command, the system automatically creates a log file.

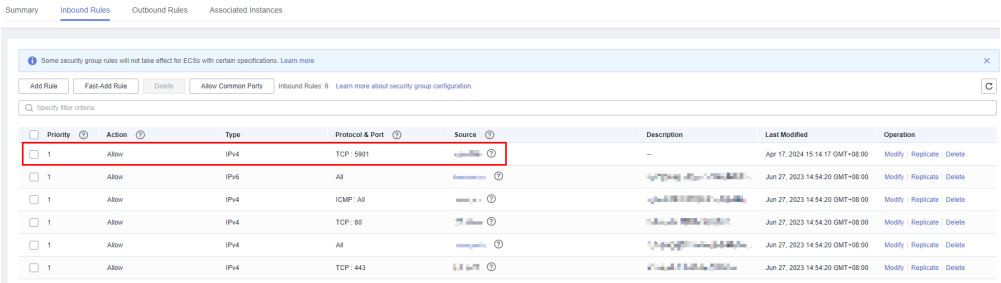
```
root@ecs-9240-[redacted]:~# vncserver

New 'X' desktop is ecs-9240-[redacted]:1

Starting applications specified in /root/.vnc/xstartup
Log file is /root/.vnc/ecs-9240-[redacted]:1.log

root@ecs-9240-[redacted]:~#
```

   The information similar to "Log file is /root/.vnc/xxx:1.log" is displayed. **1** indicates that the current user is allocated with the first VNC desktop.

Configuring the ECS on the Management Console

1. Log in to the management console.
2. Click the name of your ECS to switch to the page providing details about the ECS.
3. On the **Security Groups** tab page, click **Modify Security Group Rule** to permit port 5901.

Figure 10-1 Modifying security group rules

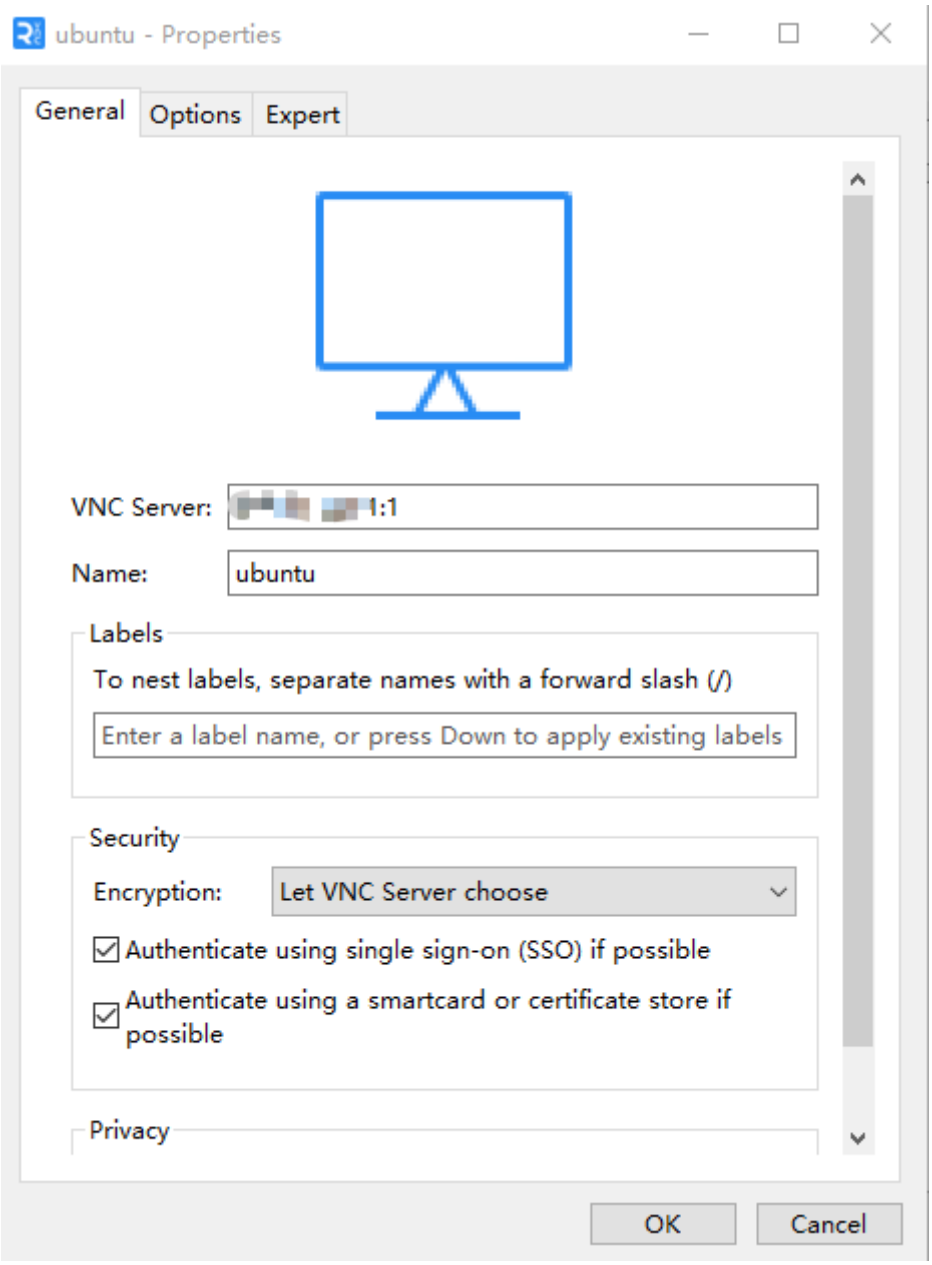


Using VNC Viewer to Access an ECS

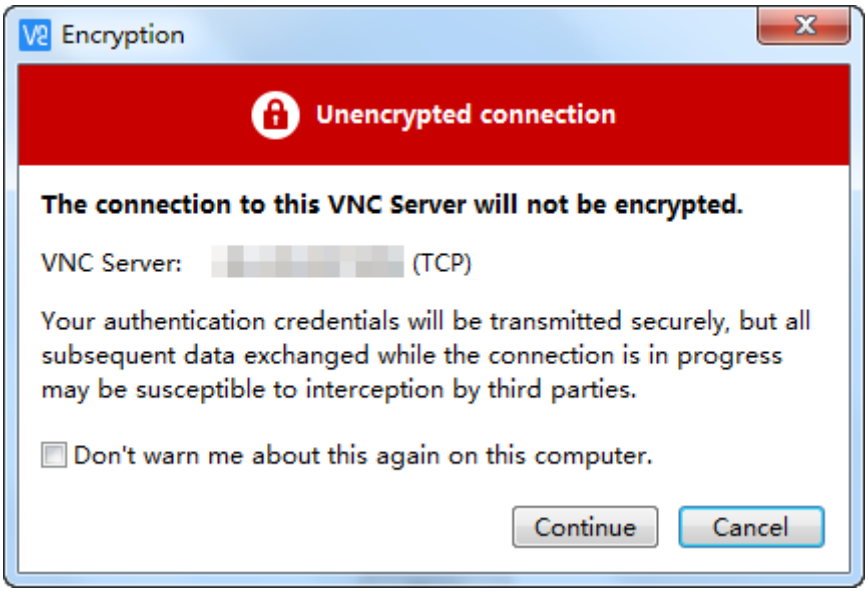
1. Start the VNC Viewer client on the local computer, enter **EIP:1**, set the name, and click **OK**.

NOTE

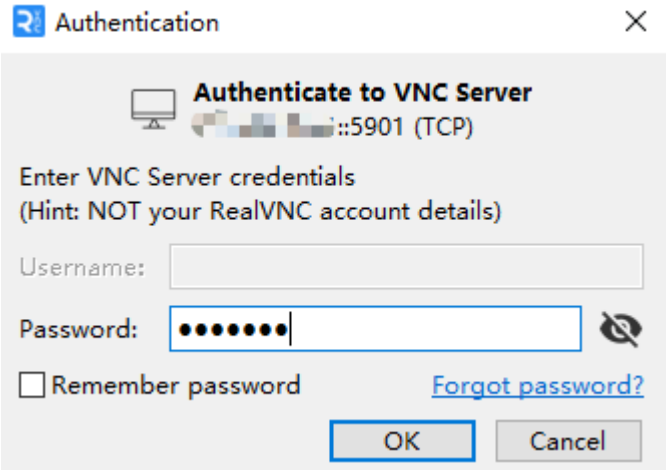
The port number is determined by the log file name displayed in the command output of step 4. If the log file name is **xxx:1.log**, enter **1**.



2. In the displayed dialog box, click **Continue**.



3. Enter the password set in step **5** and click **OK**.



4. Verify the GUI of the Ubuntu 20.04 OS.