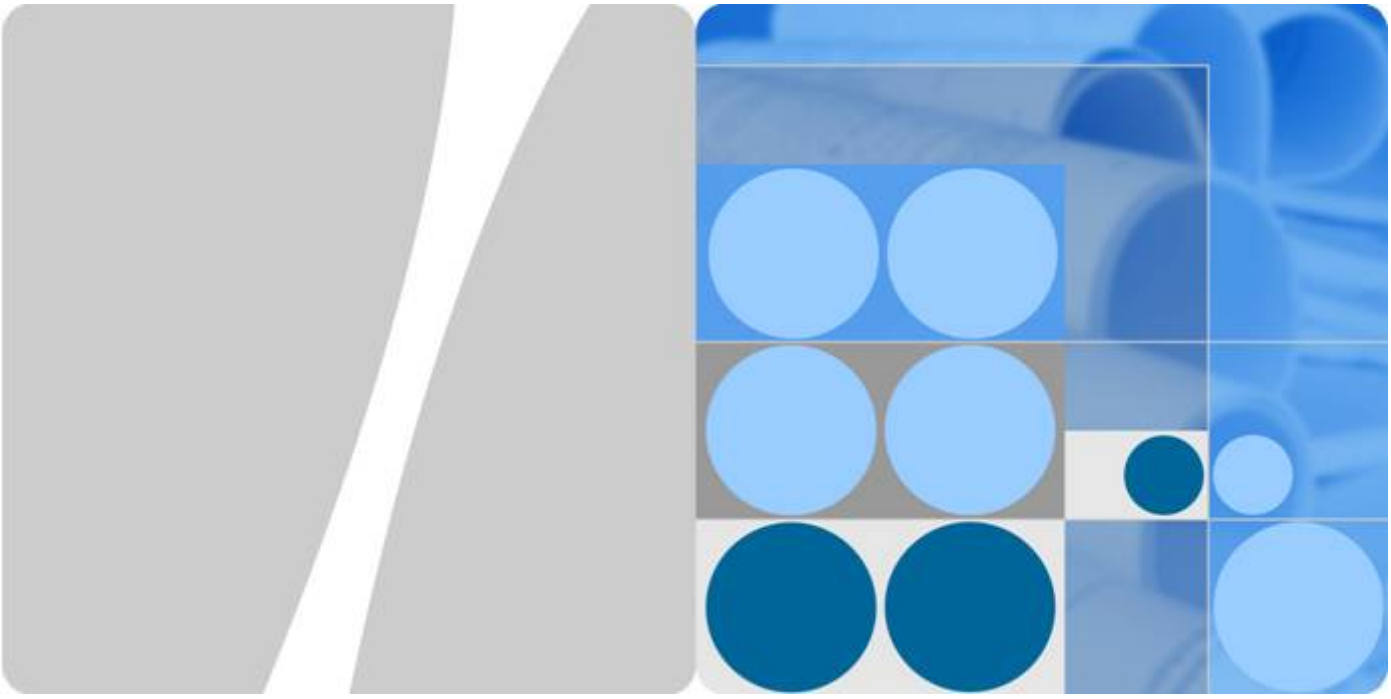

Bare Metal Server

User Guide (Paris Region)

Date **2019-07-30**

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1 Overview

1.1 What Is BMS?

Overview

A Bare Metal Server (BMS) features both the scalability of VMs and high performance of physical servers. It provides dedicated servers on the cloud, delivering the performance and security required by core databases, critical applications, high-performance computing (HPC), and Big Data.

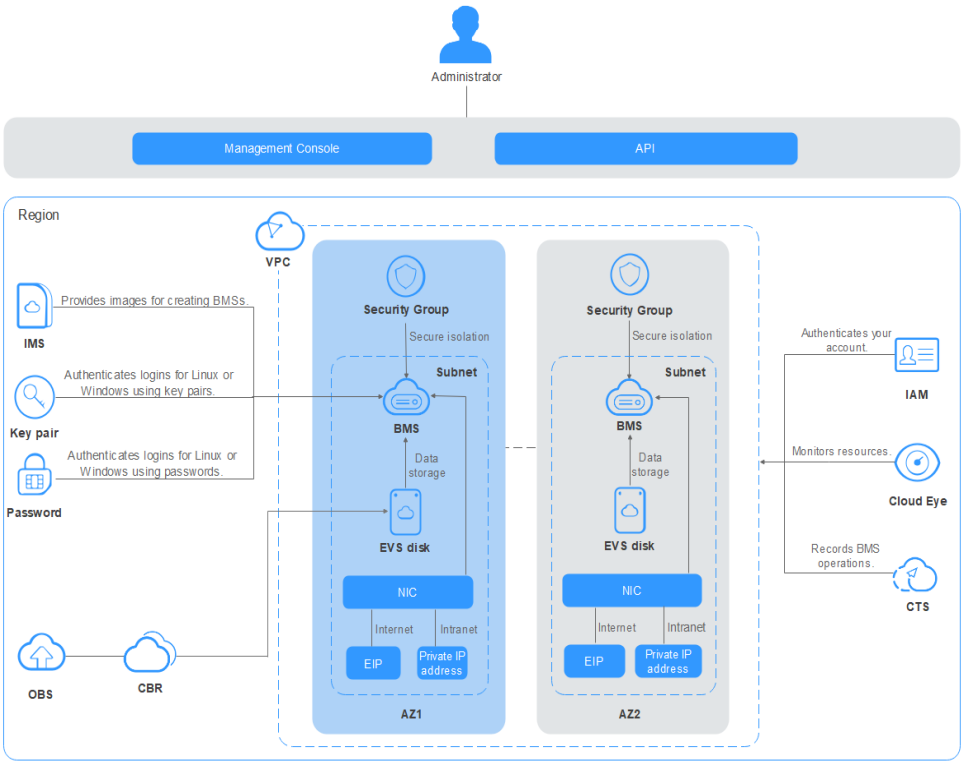
The BMS self-service feature allows you to apply for and use a BMS on demand. To apply for a BMS, you need to specify the server type, image, required network, and other configurations. You can obtain the BMS you require within 30 minutes.

System Architecture

BMS works with other cloud services to provide computing, storage, network, and image functions.

- BMSs are deployed in multiple availability zones (AZs) connected with each other through an internal network. If an AZ becomes faulty, other AZs in the same region will not be affected.
- With the Virtual Private Cloud (VPC) service, you can build a dedicated network, set subnets and security groups, and allow the VPC to communicate with the external network through an EIP (bandwidth support required).
- With the Image Management Service (IMS), you can install OSs on BMSs or create BMSs using private images for rapid service deployment.
- Elastic Volume Service (EVS) provides storage and Volume Backup Service (VBS) provides data backup and restoration.
- Cloud Eye is a key measure to monitor BMS performance, reliability, and availability. Using Cloud Eye, you can view BMS resource usage in real time.
- Cloud Backup and Recovery (CBR) backs up data for EVS disks and BMSs, and uses snapshot backups to restore the EVS disks and BMSs.

Figure 1-1 System architecture



Access Methods

The public cloud provides a web-based service management system (management console). You can access BMS through the management console or HTTPS APIs. The two access methods differ as follows:

- API

  If you want to integrate BMS into a third-party system for secondary development, use APIs to access the BMS service.

  NOTE

  This method will be available in later versions.

- Management console

  For all other purposes, use the management console.

1.2 BMS Advantages

High Security and Reliability

BMS allows you to use dedicated computing resources, add servers to VPCs and security groups for network isolation, and integrate related components for server security. BMS interconnects with Dedicated Storage Service (DSS) to ensure the data security and reliability required by enterprise services.

High Performance

BMS has no virtualization overhead, enabling dedicated computing resources for service running. BMS supports high-bandwidth, low-latency cloud storage and cloud network access, meeting the deployment density and performance requirements of critical services such as enterprise databases, big data, containers, HPC, and AI.

Quick Provisioning and Unified O&M

The required BMSs can be provisioned within minutes after you submit an order. You can manage your BMSs through their lifecycle from the management console or using open APIs with SDKs.

Quick Integration of Cloud Services and Solutions

Based on the unified VPC model, cloud services and database, big data, container, HPC, and AI solutions can be quickly integrated to run on BMSs, improving the cloud transformation efficiency.

1.3 Application Scenarios

High Security

Financial and security industries have high compliance requirements, and some customers have strict data security requirements. The BMS service ensures exclusive, dedicated resource usage, data isolation, as well as operation monitoring and tracking.

High-Performance Computing

Certain scenarios, such as supercomputing centers and DNA sequencing, need to process a large amount of data. Therefore, they have high computing performance, stability, and timeliness requirements, all of which BMSs can meet.

Core Databases

Some critical database services cannot be deployed on VMs and must be deployed on physical servers that feature dedicated resources, isolated networks, and assured performance. The BMS service provides high-performance servers dedicated for individual users, meeting isolation and performance requirements.

1.4 Instance

1.4.1 Instance Family

Overview

An instance is a purchased BMS. Different instance types provide varied computing capabilities, storage space, and network performance. You can select a type that meets your service requirements.

BMS Types

The cloud platform provides a variety of BMS flavors. You can choose BMS flavors that best suit your needs.

- General-purpose

  This BMS type uses Intel Xeon Skylake CPU and meets the requirements for dedicated resources, isolated networks, and basic performance in scenarios such as databases, core ERP systems, and financial systems.

  Table 1-1 General-purpose BMS specifications

Flavor Name/ID	CPU	Memory	Local Disk	Extended Configuration
physical.s4.3xlarge	2 x 22 Core Intel Xeon Skylake Gold 6161 (2.20 GHz/2.70 GHz)	DDR4 RAM (384 GB)	None	2 x 2-port 10GE

- Compute-optimized

  This BMS type uses SDI iNICs and supports OLTP databases with higher performance, higher memory ratio, and transactional workloads cache.

  Table 1-2 Compute-optimized BMS specifications

Flavor Name/ID	CPU	Memory	Local Disk	Extended Configuration
physical.o2.medium	2 x 8 Core Intel Xeon E5-2667 V4 (3.2 GHz)	DDR4 RAM (256 GB)	2 x 800GB SAS SSD RAID1 + NVMe SSD Card 1.6 TB	2 x 10GE
physical.o3.small	2 x 4 Core Intel Xeon Skylake Gold 5122 (3.6 GHz)	DDR4 RAM (192 GB)	None	2 x 2-port 10GE

1.4.2 Lifecycle

The lifecycle of a BMS contains all states from its creation to deletion.

Figure 1-2 BMS states

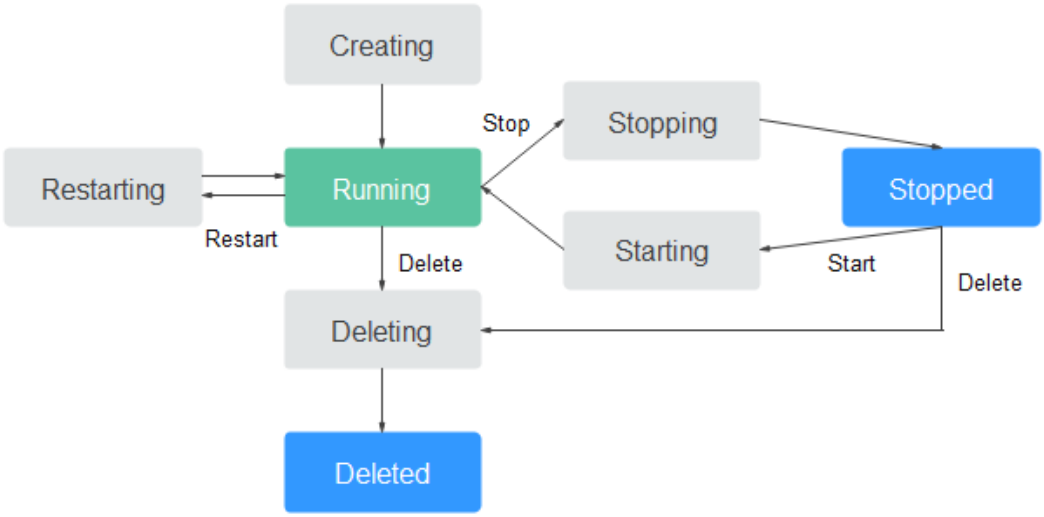


Table 1-3 Description of BMS states

State	Attribute	Description	API Status
Creating	Intermediate state	A BMS is in this state after you request for the BMS and before it enters the running state. If a BMS remains in this state for a long time, exceptions will occur. Contact the administrator to handle the exceptions.	BUILD/ BUILDING
Starting	Intermediate state	It is an intermediate state between **Stopped** and **Running**. If a BMS remains in this state for a long time, exceptions will occur. Contact the administrator to handle the exceptions.	SHUTOFF
Running	Stable state	A BMS is in this state when it is running properly. A BMS in this state can be used normally.	ACTIVE

State	Attribute	Description	API Status
Stopping	Intermediate state	It is an intermediate state between **Running** and **Stopped**. If a BMS remains in this state for a long time, exceptions will occur. Contact the administrator to handle the exceptions.	ACTIVE
Stopped	Stable state	A BMS is in this state after it is stopped successfully. A BMS in this state cannot be used.	SHUTOFF
Restarting	Intermediate state	A BMS is in this state when it is being restarted. If a BMS remains in this state for a long time, exceptions will occur. Contact the administrator to handle the exceptions.	REBOOT
Forcibly restarting	Intermediate state	A BMS is in this state when it is being forcibly restarted.	HARD_REBOOT
Deleting	Intermediate state	A BMS is in this state when it is being deleted. If a BMS remains in this state for a long time, exceptions will occur. Contact the administrator to handle the exceptions.	ACTIVE/ SHUTOFF/ REBOOT/ HARD_REBOOT/ERROR
Deleted	Intermediate state	A BMS is in this state after it is deleted successfully. A BMS in this state cannot be used and will be removed from the system in a short time.	DELETED
Faulty	Stable state	A BMS is in this state when an exception occurs on it. A BMS in this state cannot be used. Contact the administrator to rectify the fault.	ERROR
Rebuilding	Intermediate state	A BMS is in this state when it is being rebuilt.	SHUTOFF
Reinstalling OS	Intermediate state	A BMS is in this state when its OS is being reinstalled.	SHUTOFF

State	Attribute	Description	API Status
Reinstalling OS failed	Stable state	An exception occurred when the BMS OS was being reinstalled and the reinstallation failed. A BMS in this state cannot be used. Contact the administrator to rectify the fault.	SHUTOFF

1.5 Image

What Is an Image?

An image is a template of the BMS running environment. It contains an OS and runtime environment, and some pre-installed applications. An image file is equivalent to a copy file that contains all data in the system disk.

Image Types

Images can be classified into public images, private images, and shared images.

Table 1-4 Image types

Image Type	Description
Public image	A public image is provided by the cloud platform and is available to all users. It contains an OS and preinstalled public applications.
Private image	A private image is created by a user and is available only to the user who created it. It contains an OS, pre-installed public applications, and the user's private applications. Using a private image to create BMSs frees you from repeatedly configuring BMSs.
Shared image	A shared image is a private image other users share with you.

Public Image

Public images are provided by the system. These images are available to all users, compatible with BMS and most mainstream OSs, and are pre-installed with necessary plug-ins. Public images available to users vary depending on the BMS flavor.

Characteristics

- OS types: Linux and Windows OSs that are updated and maintained periodically

- Supported software: plug-ins that BMS storage, networks, and basic functions depend on

  CAUTION

  These plug-ins are necessary for BMSs to run properly. Do not delete or modify any of them. Otherwise, basic BMS functions will be affected.

  Table 1-5 Supported software

Software	Description
Cloud-Init	Cloud-Init is an open-source cloud initialization program, which initializes specific configurations, such as the host name, key, and user data, of a newly created BMS.
bms-network-config	This plug-in is used to automatically configure BMS networks during BMS provisioning and restore the BMS network when the network is interrupted due to faults.
SDI iNIC frontend driver plug-in	This plug-in is installed in the image so that EVS disks can be attached to BMSs. BMSs can be started from EVS disks, facilitating quick BMS provisioning.

- Compatibility: compatible with server hardware
- Security: highly stable and licensed
- Restrictions: no restrictions on usage

Private Image

A private image contains an OS, preinstalled public applications, and a user's private applications. You can use a private image to create BMSs without having to repeatedly configure BMSs.

Characteristics

- Compatibility: Private images can be used to deploy servers that are of the same model as the source BMS and may fail to deploy servers of other models.
- Supported functions: You can create and delete private images, as well as create BMSs and reinstall the BMS OS using private images.
- Restrictions: You can create a maximum of 50 private images.

Shared Image

A shared image is a private image other users share with you.

Application Scenarios

- Deploying software environments in a batch

Prepare a BMS with an OS, the partition arrangement you prefer, and software installed to create a private image. You can use the image to create batch clones of your custom BMS.

- Backing up a BMS

  Create an image from a BMS to back up the BMS. If the software of the BMS becomes faulty, you can use the image to restore the BMS.

1.6 EVS Disk

What Is Elastic Volume Service (EVS)?

EVS offers scalable block storage for BMSs. EVS disks feature high reliability, high performance, and rich specifications, and are ideal for distributed file systems, development and test environments, data warehouse applications, and high-performance computing (HPC) scenarios.

Unlike traditional servers that use local disks, BMSs use EVS disks that are not constrained by capacity. Shared EVS disks allow concurrent reads and writes by multiple BMSs, enabling you to deploy core applications in clusters.

EVS Disk Types

BMSs support the following types of EVS disks:

- Common I/O: This EVS disk type delivers a maximum of 1000 IOPS. It is ideal for application scenarios that require large capacity, medium read/write speed, and fewer transactions, such as enterprise office applications and small-scale testing.
- High I/O: This EVS disk type delivers a maximum of 5000 IOPS and a minimum of 6 ms read/write latency. It is designed to meet the needs of mainstream high-performance, high-reliability application scenarios, such as enterprise applications, large-scale development and testing, and web server logs.
- Ultra-high I/O: This EVS disk type delivers a maximum of 20,000 IOPS and a minimum of 1 ms read/write latency. It is excellent for ultra-high I/O, ultra-high bandwidth, and read/write-intensive application scenarios, such as distributed file systems in HPC or NoSQL/RDS in I/O-intensive scenarios.

EVS Disk Performance

The key indicators of EVS disk performance include read/write I/O latency, IOPS, and throughput.

- IOPS: number of read/write operations performed by an EVS disk per second
- Throughput: amount of data successfully transmitted by an EVS disk per second, that is, the amount of data read from and written into an EVS disk
- Read/write I/O latency: minimum interval between two consecutive read/write operations of an EVS disk

For more information about EVS disk performance, see *Elastic Volume Service User Guide*.

EVS Disk Device Types

BMS supports only Small Computer System Interface (SCSI) EVS disks.

On the management console, you can create EVS disks with **Device Type** set to **SCSI**. The EVS disks support transparent SCSI command transmission, allowing BMS OSs to directly access underlying storage media. The EVS disks support basic read/write SCSI commands and advanced SCSI commands.

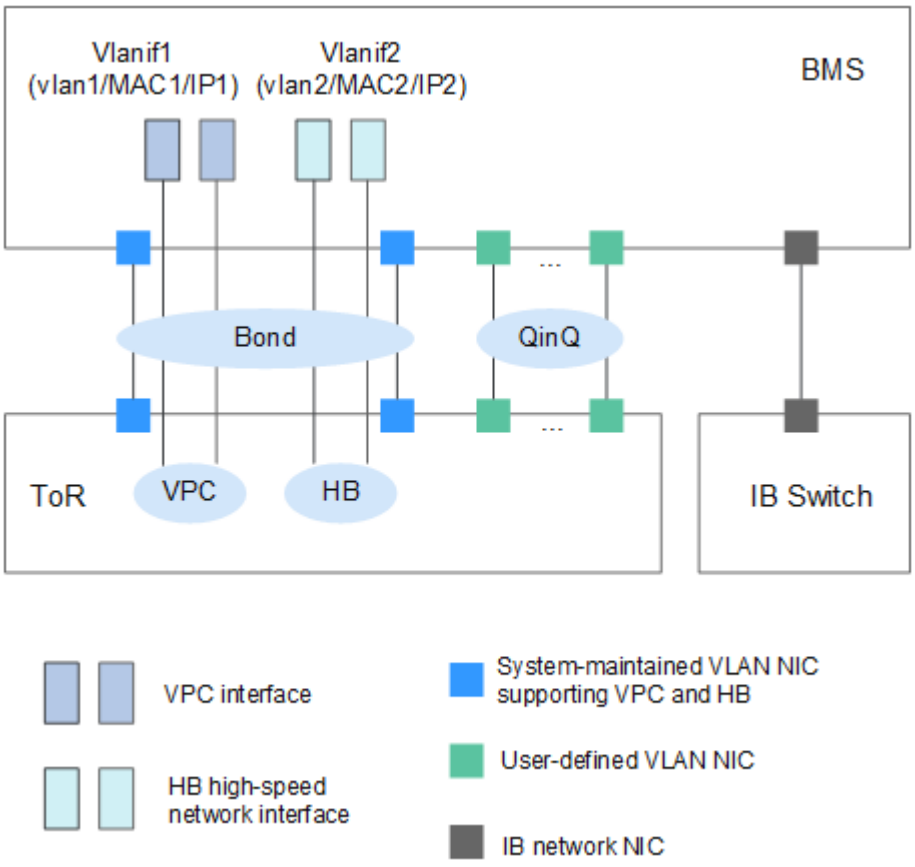
NOTE

BMS public image OSs are preinstalled with the driver required to use SCSI disks, so you do not need to install the driver. To know how to install the driver, see "Installing the SDI Card Driver" in *Bare Metal Server Private Image Creation Guide*.

1.7 Network

BMS provides four types of networks: VPC, high-speed network, user-defined VLAN, and IB network. They are isolated from each other. VPC and high-speed network interfaces are VLAN sub-interfaces created after system maintenance VLAN NICs are bonded. You can manage and configure NICs of user-defined VLANs and IB networks.

Figure 1-3 BMS networks



NOTE

- In the preceding figure, ToR indicates the cabling mode in the server cabinet. The access switch is placed on top of the rack and the server is placed beneath it. HB indicates a high-speed network. QinQ indicates an 802.1Q tunnel.
- VPC and high-speed network interfaces are generated by the system and you should not change them. They are configured in the same NIC bond.
- BMSs can communicate with ECSs through VPCs or IB networks (if any).
- Only VPC supports security groups, EIPs, and ELB.
- For a high-speed network and user-defined VLAN, BMSs in the same network communicate with each other only through layer-2 connections.

VPC

A VPC is a logically isolated, configurable, and manageable virtual network. It helps improve the security of cloud resources and simplifies network deployment. You can create security groups and VPNs, configure IP address ranges, and specify bandwidth sizes in your VPC. With a VPC, you can easily manage and configure internal networks and change network configurations. You can also customize access rules to control BMS access within a security group and across different security groups to enhance BMS security.

For more information, see *Virtual Private Cloud User Guide*.

High-Speed Network

A high-speed network is an internal network between BMSs. It provides high bandwidth for connecting BMSs in the same AZ. If you want to deploy services that require high throughput and low latency, you can create high-speed networks. Currently, the BMS service supports high-speed networks with a maximum bandwidth of 10 Gbit/s.

For more information, see **Overview**.

User-defined VLAN

You can use the 10GE Ethernet NICs that are not being by the system to configure a user-defined VLAN. The QinQ technology is used to isolate networks and provide additional physical planes and bandwidths. You can create VLANs to isolate network traffic. User-defined VLAN NICs are in pairs. You can configure NIC bonding to achieve high availability. User-defined VLANs in different AZs cannot communicate with each other.

NOTE

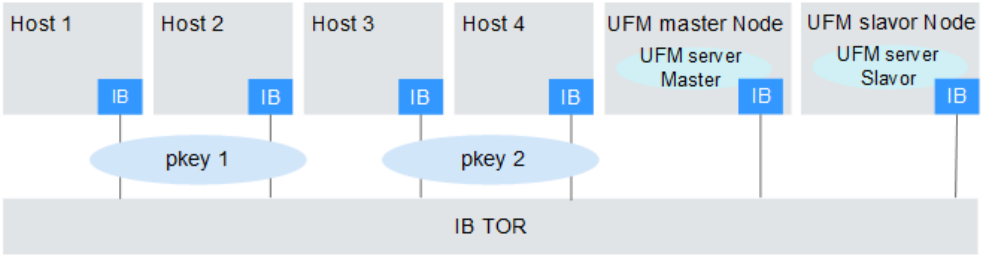
QinQ is a layer 2 tunnel protocol based on IEEE 802.1Q encapsulation. It adds a public VLAN tag to a frame with a private VLAN tag to allow the frame with double VLAN tags to be transmitted over the service provider's backbone network based on the public VLAN tag. This provides a layer 2 VPN tunnel for customers.

IB Network

An IB network features low latency and high bandwidth and is used in a number of High Performance Computing (HPC) projects. It uses the 100 Gbit/s Mellanox IB NIC, dedicated IB switch, and controller software UFM to ensure network

communication and management, and uses the Partition Key to isolate IB networks of different tenants (similar to VLANs in an Ethernet).

Figure 1-4 IB network isolation



NOTE

Unified Fabric Manager (UFM) is the IB switch controller of an IB network based on OpenSM software and provides northbound service ports. It is deployed in active/standby mode.

1.8 Security

1.8.1 License Type

Use License from the System

You can use OS licenses provided by the cloud platform. You need to pay for the licenses which are billed on a pay-as-you-go basis. The licenses are managed by the cloud platform.

Bring Your Own License (BYOL)

What Is BYOL?

Bring Your Own License (BYOL) allows you to use your own OS licenses. You do not need to pay for the licenses but need to manage them by yourself.

How Can I Use BYOL?

If you choose BYOL, you need to manage licenses by yourself. The cloud platform provides functions you need for maintaining license compliance during the lifecycle of your license.

Application Scenarios

You can choose BYOL when you create a BMS.

The system will not allow you to change the license type after you create the BMS or when you reinstall its OS.

1.8.2 Security Group

What Is a Security Group?

A security group is a virtual firewall that detects status and filters data packets. It is an important network isolation method used to set access control for ECSs, BMSs, load balancers, and database instances.

You can configure security group rules to allow instances in a security group to access the public or private network.

- A security group is a logical group. You can add BMSs that have the same security protection requirements within a region to the same security group.
- By default, BMSs in the same security group can communicate with each other through an internal network, whereas BMSs in different security groups cannot.
- You can modify a security group rule at any time, and the modification takes effect immediately.

Default Security Group

When you create a BMS in a region, the system will create a default security group if no security group exists in the region.

The default security group rule allows all outgoing data packets and blocks incoming data packets. BMSs in this security group can access each other already. You do not need to add additional rules.

Figure 1-5 Default security group

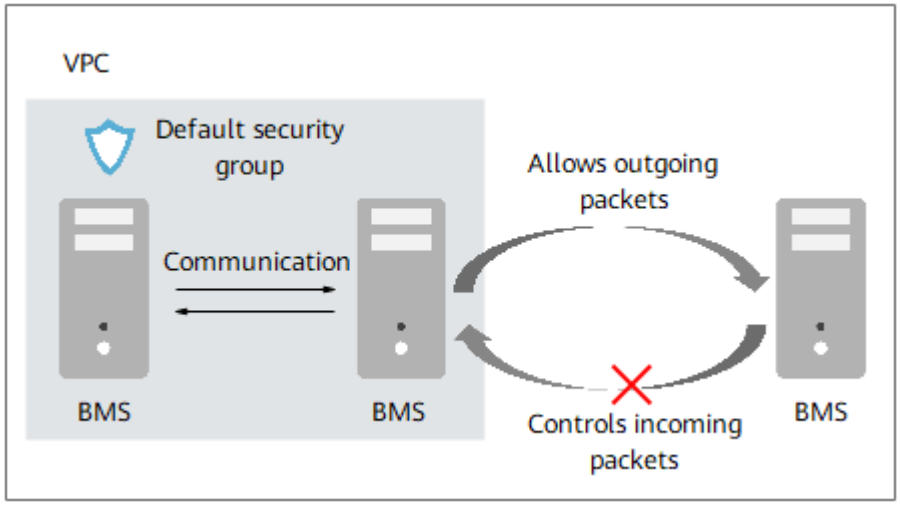


Table 1-6 lists the rules for a default security group.

Table 1-6 Default security group rules

Direction	Protocol	Port Range	Source/ Destination	Description
Outbound	All	All	Destination: 0.0.0.0/0	Allows all outbound traffic.
Inbound	All	All	Source: current security group ID (for example, sg-*xxxxx*)	Allows inbound traffic from BMSs in the same security group.
Inbound	TCP	22	Source: 0.0.0.0/0	Allows all IP addresses to access Linux BMSs over SSH.
Inbound	TCP	3389	Source: 0.0.0.0/0	Allows all IP addresses to access Windows BMSs over RDP.

For more information, see *Virtual Private Cloud User Guide*.

1.8.3 Cloud-Init

What Is Cloud-Init?

Cloud-Init is an open-source cloud initialization program, which initializes specific configurations, such as the host name, key, and user data, of a newly created BMS.

All public images support Cloud-Init.

Impact on IMS

To ensure that BMSs you create using private images support customized configurations, you must install Cloud-Init or Cloudbase-Init when you create private images.

- For Windows OSs, download and install Cloudbase-Init.
- For Linux OSs, download and install Cloud-Init.

After Cloud-Init or Cloudbase-Init is installed in an image, Cloud-Init or Cloudbase-Init automatically initializes the BMS when you create it. For details about how to install Cloud-Init and Cloudbase-Init, see *Bare Metal Server Private Image Creation Guide*.

Impact on BMS

- When you create a BMS, if the image you select supports Cloud-Init, you can use user data injection to inject customized configuration, such as the BMS login password, into the BMS. For details, see **Injecting User Data into BMSs**.
- If Cloud-Init is installed, you can view BMS metadata and configure and manage running BMSs. For more information, see **Metadata**.

Notes

- If Cloud-Init has been installed, enable DHCP in the VPC to which the BMS belongs.
- If Cloud-Init has been installed, ensure that security group rules in the outbound direction meet the following requirements so that you can access the metadata service:
  - Protocol: TCP
  - Port Range: 80
  - Remote End: 169.254.0.0/16

  NOTE

  If you use the default security group rule in the outbound direction, the preceding requirements are met, and the metadata service can be accessed. The default outbound security group rule is as follows:
  - Protocol: ANY
  - Port Range: ANY
  - Remote End: 0.0.0.0/16

1.8.4 Key Pair and Password

What Is a Key Pair?

A key pair, or SSH key pair, is an authentication method used when you remotely log in to Linux instances. A key pair is generated using an encryption algorithm. It contains a public key, and a private key reserved for you. The public key is used to encrypt data (for example, a password), and the private key is used to decrypt the data.

The cloud platform stores the public key, and you need to store the private key. Do not share your private key with anyone. Keep your private key secure.

Advantages

The key pair is more secure and convenient than the username/password method.

Table 1-7 Comparison between the key pair and username/password

Item	Key Pair	Username and Password
Security	• More secure than the password and free from brute-force attacks • The private key cannot be derived from the public key.	Poor security
Convenience	Simultaneous login to a large number of Linux instances, simplifying management	Login to only one Linux instance at one time; batch maintenance cannot be performed.

Constraints

- Only Linux instances support the key pair method.
- Only RSA key pairs are supported. A key pair can contain 1024, 2048, or 4096 characters.
- A Linux instance can have only one key pair. If a private key is bound to your BMS and you bind a new private key to the BMS, the new private key will replace the original one.

Generation Method

- Create a key pair on the management console.

  NOTE

  When generating a key pair for the first time, download and properly save the private key.

- Use PuTTYgen to create a key pair and import the key pair into the cloud platform.

Related Operations

Using an SSH Key Pair

1.9 Region and AZ

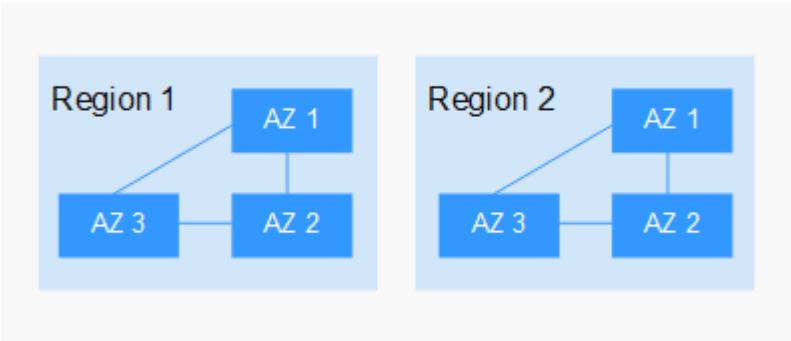
Concept

A region and availability zone (AZ) identify the location of a data center. You can create resources in a specific region and AZ.

- A region is a physical data center, which is completely isolated to improve fault tolerance and stability. The region that is selected during resource creation cannot be changed after the resource is created.
- An AZ is a physical location where resources use independent power supplies and networks. A region contains one or more AZs that are physically isolated but interconnected through internal networks. Because AZs are isolated from each other, any fault that occurs in one AZ will not affect others.

Figure 1-6 shows the relationship between regions and AZs.

Figure 1-6 Regions and AZs



Selecting a Region

Select a region closest to your target users for lower network latency and quick access.

Selecting an AZ

When deploying resources, consider your applications' requirements on disaster recovery (DR) and network latency.

- For high DR capability, deploy resources in different AZs within the same region.
- For lower network latency, deploy resources in the same AZ.

Regions and Endpoints

Before you use an API to call resources, specify its region and endpoint. For more details, see **Regions and Endpoints**.

1.10 Related Services

Relationships Between BMS and Other Services

- Image Management Service (IMS)

  You can quickly create BMSs using images. You can also create private images using BMSs.

- Virtual Private Cloud (VPC)

  You can configure a logically isolated network for your BMSs and configure security groups, VPN, IP address segments, and bandwidth. With a VPC, you can easily manage and configure internal networks and change network configurations. You can also customize access rules to control BMS access within a security group and across different security groups to enhance BMS security.

- Dedicated Cloud (DeC)

  If you want to physically isolate your BMSs, you need to enable the DeC service.

- Elastic Volume Service (EVS)

  You can attach EVS disks to a BMS and expand their capacity at any time.

- Dedicated Storage Service (DSS)

  DSS provides you with dedicated, physical storage resources. DSS features data redundancy and cache acceleration technologies and provides highly reliable, durable, low-latency, and stable storage resources. It delivers enterprise-class performance in a wide range of scenarios, such as HPC, OLAP, and a mix of loads.

- Cloud Eye

  After you obtain a BMS and install and configure Agent on the BMS, you can view the monitoring data of the BMS in Cloud Eye.

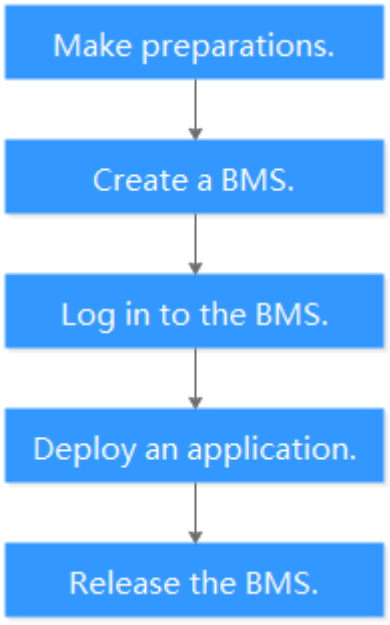
2 Getting Started

2.1 Quick Start

This section uses a web application server as an example to describe how you can create and use BMSs. This section helps you choose an appropriate BMS, log in to it, and deploy Nginx on it.

The following figure shows how to use BMSs.

Figure 2-1 Process of using BMSs



2.2 Making Preparations

Create a Key Pair

The cloud platform uses public key cryptography to protect the login information of your BMS. You need to specify the key pair name and provide the private key when logging in to the BMS using SSH.

If you do not have a key pair, create one on the management console.

NOTE

If you want to create BMSs in multiple regions, you need to create a key pair in each region. For more information about regions, see **Region and AZ**.

1. Log in to the management console.
2. Under **Computing**, click **Bare Metal Server**.

   The BMS console is displayed.
3. In the navigation tree, choose **Key Pair**.
4. On the right side of the page, click **Create Key Pair**.
5. Enter the key name and click **OK**.

   An automatically populated key name consists of **KeyPair-** and a 4-digit random number. Change it to an easy-to-remember one, for example, **KeyPair-***xxxx*_**bms**.
6. Download the private key file. The file name is the specified key pair name with a suffix of .pem. Store the private key file securely. In the displayed dialog box, click **OK**.

CAUTION

You can save the private key file only once. When you create a BMS, provide the key pair name. Each time you log in to the BMS using SSH, you need to provide the private key.

2.3 Step 1: Create a BMS

Scenarios

This section helps you quickly create a BMS that will be used as a web server. For details about all the parameters used for creating a BMS, see **Creating a Common BMS**.

Procedure

1. Log in to the Cloud Server Console.
2. In the navigation pane, choose **Bare Metal Server**.

3. In the upper right corner, click **Apply for BMS**.
4. Configure parameters.
   - Specify **Region** and **AZ**.

     NOTE

     After the BMS is created, you cannot change its region or AZ.
   - Set **Flavor**.

     Available **flavors** vary depending on the region and AZ you select. Web servers are mainly used for web page access and do not require strong computing capabilities. In addition, only a small amount of storage is required for recording logs. Therefore, select **physical.h2.large**.
   - Set **Image**.

     Select **Public image** and then **CentOS 7.4 64bit for BareMetal**.
   - Set **License Type**.

     Select **Use system license**. You will be billed for the license. If you have an OS license, select **Bring your own license (BYOL)**.
   - Specify **Disk**.

     An EVS disk can be attached to a BMS. However, whether an EVS disk can be attached is determined by the flavor and image you select.
   - Set **VPC** and **NIC**.

     Retain the default values. When you use cloud services for the first time, the system automatically creates a VPC **default-vpc** and a subnet **default-subnet** for you. You can also create VPCs and subnets.

     NOTE

     The system creates a security group for you by default. The default security group rule allows all outgoing data packets and blocks incoming data packets. In this way, the default security group rule ensures the security of basic BMS communications.
   - Set **EIP**.

     BMSs without an EIP cannot be accessed from the Internet and are only used for deploying services in a private network or used in a cluster. Select **Automatically Assign** and set **Bandwidth**.
   - Set **Login Mode**.

     Select the key pair created in **Making Preparations** from the drop-down list and select **I acknowledge that I have obtained private key file xxx.pem and that without this file I will not be able to log in to my BMS**.
   - Configure **Advanced Settings**.

     Select **Do not configure**.
   - Set **BMS Name**.

     The BMS name is in the format bms-*four random digits*. To distinguish BMSs, you can add the function of a BMS to its name, for example, **bms-7676-nginx**.
   - Set **Quantity**.

     Set the value to **1**.

5. Click **Apply Now**. Confirm the specifications and click **Submit**.

Result

The BMS creation process requires about 5 to 30 minutes to complete. Refresh the BMS list. After the BMS status changes from **Creating** to **Running**, the BMS is created successfully.

Follow-up Operations

A BMS that functions as a web server must allow ICMP traffic on ports 80 and 443. These rules are not configured for the default security group. You need to add the rules after you create the BMS. For details, see *Virtual Private Cloud User Guide*.

Protocol	Direction	Port Range	Source
TCP	Inbound	80	0.0.0.0/0
TCP	Inbound	443	0.0.0.0/0
ICMP	Inbound	All	0.0.0.0/0

2.4 Step 2: Log In to the BMS

Scenarios

After you create a BMS, you can log in to it using multiple methods. This section describes the procedure to log in to a BMS using an SSH key pair. For more login modes, see **Linux BMS Login Methods** or **Windows BMS Login Methods**.

Procedure

The following steps describe how to log in to a BMS using an SSH key pair through PuTTY.

1. Log in to the Cloud Server Console.
2. In the navigation pane, choose **Bare Metal Server**.
3. In the upper left corner, click  and select a region.
4. In the BMS list, locate **bms-7676-nginx**. Record the EIP of the BMS and perform the following steps:
   a. Check whether the private key file has been converted to **.ppk** format.
      - If yes, go to step **4.g**.
      - If no, go to step **4.b**.
   b. Visit the following website and download PuTTY and PuTTYgen:
      https://www.chiark.greenend.org.uk/~sgtatham/putty/latest.html

NOTE

PuTTYgen is a private key generator, which is used to create a key pair that consists of a public key and a private key for PuTTY.

c. Run PuTTYgen.

d. In the **Actions** area, click **Load** and import the private key file that you stored when creating the BMS.

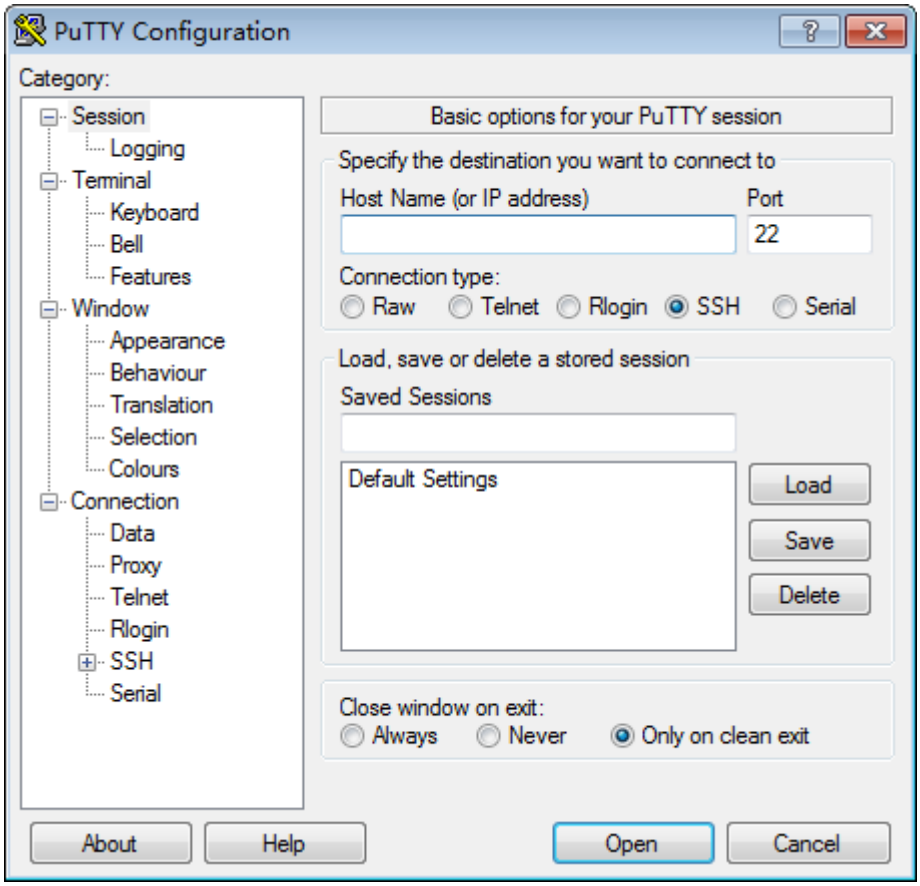
Ensure that the private key file is in the format of **All files (*.*)**.

e. Click **Save private key**.

f. Save the converted private key, for example, **kp-123.ppk**, to your local PC.

g. Double-click **PUTTY.EXE**. The **PuTTY Configuration** page is displayed.

Figure 2-2 PuTTY Configuration



h. Choose **Connection** > **Data**. Enter the image username in **Auto-login username**.

NOTE

Contact the administrator to obtain the image username.

i. Choose **Connection** > **SSH** > **Auth**. In the last configuration item **Private key file for authentication**, click **Browse** and select the .ppk private key in step **4.f**.

j. Choose **Session** and enter the EIP of the BMS in the box under **Host Name (or IP address)**.

k. Click **Open**.

Log in to a BMS.

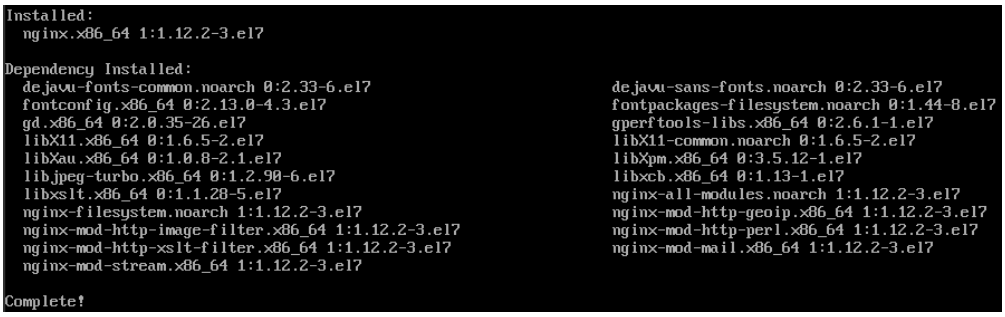
2.5 Step 3: Deploy an Application

This section describes how to deploy an application on a BMS.

Install and Start Nginx

1. Run the **yum install nginx** command to install Nginx and enter **y** as prompted.

   If the information shown in the following figure is displayed, Nginx is installed successfully.

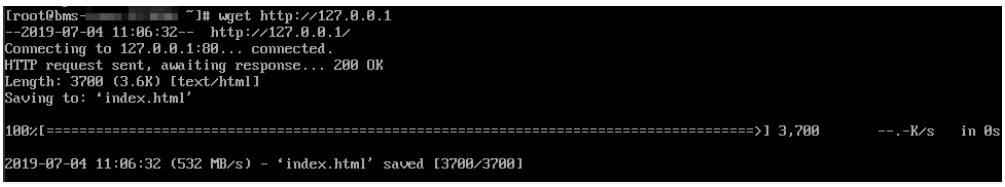
   

2. Enter **systemctl start nginx.service** to start Nginx.

   NOTE

   This command applies to CentOS 7.4 64-bit, which is used as an example.

3. Enter **wget http://127.0.0.1** to test Nginx.

Access the Default Web Page

Open a browser and enter http://*BMS EIP* in the address box. If the Nginx welcome page is displayed, Nginx is installed successfully.

2.6 Step 4: Release the BMS

Scenarios

If you no longer require the BMS, you can release it to avoid occupying resources.

Procedure

1. Log in to the Cloud Server Console.

2. In the navigation pane, choose **Bare Metal Server**.
3. In the upper left corner, click  and select a region.
4. In the BMS list, locate **bms-7676-nginx**. Click **More** in the **Operation** column and select **Delete** from the drop-down list.
5. In the displayed dialog box, confirm the information and click **OK**.

   If the BMS has associated resources, such as EVS disks and EIP, you can choose whether to delete these resources.

Result

The deleted BMS will no longer be displayed in the BMS list.

3 Instance

3.1 Creating a BMS

3.1.1 Creating a Common BMS

Scenarios

This section describes how to create a BMS to deploy your services.

Prerequisites

- You have completed **Preparations**.
- To inject user data, you have prepared **user data scripts**.
- You have enabled Dedicated Cloud (DeC).

Procedure

1. Log in to the management console.
2. Under **Computing**, click **Bare Metal Server**.

   The BMS console is displayed.
3. Click **Apply for BMS**.
4. Confirm **Region**.

   If the region is incorrect, click  in the upper left corner of the page to correct it.
5. Select an AZ.

   An AZ is a physical region where resources use independent power supply and networks. AZs are physically isolated but interconnected through an internal network.

   - It is recommended that you create BMSs in different AZs to ensure high availability of applications running on the BMSs.
   - To lower the network delay, create BMSs in the same AZ.

6. Select a flavor.

   Flavor contains the CPU, memory, local disks, and extended configuration of the BMS. After you select a flavor, the name and use scenarios of the flavor are displayed under the flavor list.

   Extended Configuration provides the NIC information of the selected flavor. For example, 2 x 2*10GE indicates that the BMS has two 10GE NICs, each with two ports. One NIC is used for the BMS to connect to a VPC and the other is used for the BMS to communicate with other BMSs in a high-speed network.

   NOTE

   - Configuration in the flavor, such as the CPU, memory, and local disks, cannot be changed.
   - The bandwidth of different BMS flavors varies. Choose a flavor that meets your requirements.
   - Some flavors support quick BMS provisioning. If you select a flavor of this type, parameter **System Disk** is displayed under **Disk**. The OS will be installed on the EVS disk attached to the BMS.

7. Set **Image**.
   - Public Image

     A public image is a standard OS image provided by the system and is available to all users. It contains an OS and pre-installed public applications, such as the SDI iNIC driver, bms-network-config (a network configuration program), and Cloud-Init (an initialization tool). If you need other applications or software, configure them on the new BMSs.
   - Private Image

     A private image is created from an external image file or a BMS and is available only to the user who created it. It contains an OS, preinstalled public applications, and the user's private applications.
   - Shared Image

     A shared image is a private image shared by another public cloud user with you.

8. Set **License Type**.

   Set a license type for using an OS or software on the cloud platform. This parameter is available only if the public image you selected is charged.
   - Use license from the system

     Allows you to use the license provided by the cloud platform. Obtaining the authorization of such a license is charged.
   - Bring your own licenses (BYOL)

     Allows you to use your existing OS license. In such a case, you do not need to apply for a license again.

9. Set **Disk**.

   Disks are classified as EVS disks and DSS disks based on whether the disks use dedicated storage resources. DSS disks provide dedicated storage resources.
   - If you have applied for a storage pool on the DSS console and have obtained the pool, click the **DSS** tab and create disks in the storage pool.
   - If you have not obtained a dedicated storage pool, click the **EVS** tab and create EVS disks that use public storage resources.

NOTE

- When you use DSS resources to create a disk, the disk type must be the same as that of the requested storage pool. For example, both are of the high I/O type.

A BMS has one system disk and one or more data disks. You can add multiple data disks for a BMS and customize the system disk size.

- System disk

  If you select a flavor that supports quick provisioning, parameter **System Disk** is available. You can set the system disk type and size as needed.

- Data disk

  You can add multiple data disks for a BMS and enable sharing for each data disk.

  - Currently, BMSs only support SCSI disks.
  - **Share**: indicates that the EVS disk can be shared. A shared disk can be attached to multiple BMSs simultaneously.

10. Set network parameters, including **VPC**, **NIC**, and **Security Group**.

    When you use VPC for the first time, the system automatically creates a VPC for you, including the security group and NIC. The default subnet segment is 192.168.1.0/24 and the subnet gateway is 192.168.1.1. Dynamic Host Configuration Protocol (DHCP) is enabled for the subnet.

Table 3-1 Network parameters

Parameter	Description
VPC	You can select an existing VPC or create one.
NIC	Includes primary and extension NICs. You can add an extension NIC for a BMS and specify IP addresses for the primary and extension NICs. **CAUTION** • The primary NIC cannot be deleted because it is used to provide the default route. • If you choose to assign an IP address automatically, do not change the private IP address of the BMS after the BMS is provisioned. Otherwise, the IP address may conflict with that of another BMS. • If a fixed IP address is assigned to a NIC, you cannot create BMSs in a batch.
High-Speed NIC	A high-speed NIC provides high-speed network ports for communication between BMSs. It provides high bandwidth. Each high-speed NIC of a BMS must be in a different high-speed network.

Parameter	Description
Security Group	Security groups are used to control access to BMSs. You can define different access control rules for a security group, and these rules take effect for all BMSs added to this security group. When creating a BMS, you can select only one security group. After a BMS is created, you can associate it with multiple security groups. For details, see **Changing a Security Group**. **NOTE** Before initializing a BMS, ensure that security group rules in the outbound direction meet the following requirements: • Protocol: TCP • Port Range: 80 • Remote End: 169.254.0.0/16 If you use the default outbound security group rule, the preceding requirements are met, and the BMS can be initialized. The default outbound security group rule is as follows: • Protocol: Any • Port Range: Any • Remote End: 0.0.0.0/16
EIP	An EIP is a static public IP address bound to a BMS in a VPC. Using the EIP, the BMS can access the Internet. You can select one of the following three options for **EIP** as needed: • **Not required**: The BMS cannot communicate with the Internet and can be used only on a private network for deploying services or used to deploy a cluster. • **Automatically assign**: The system automatically assigns an EIP with a dedicated bandwidth to the BMS. The bandwidth is configurable. • **Use existing**: An existing EIP is assigned to the BMS. **NOTE** If you select **Use existing**, you can create only one BMS at a time.
Bandwidth	This parameter is available when you select **Automatically assign** for **EIP**. Specifies the bandwidth size in Mbit/s.

11. Set the BMS login mode.

    Key pair: A key pair is used for BMS login authentication. You can select an existing key pair, or click **View Key Pair** and create one.

    NOTE

    If you use an existing key pair, ensure that you have saved the key file locally. Otherwise, logging in to the BMS will fail.

12. (Optional) Configure **Advanced Settings**.

    To use functions listed in **Advanced Settings**, click **Configure now**. Otherwise, click **Do not configure**.

    - **User Data Injection** enables the BMS to automatically inject user data when the BMS starts for the first time. After this function is enabled, the BMS automatically injects user data upon its first startup.

      This parameter is available only when **Key pair** is selected for **Login Mode**. For detailed operations, see **Injecting User Data into BMSs**.

    - **Agency**

      An agency provides BMSs with temporary security credentials for accessing other cloud services. The agency is created by the tenant administrator on the IAM console.

      If you have created an agency in IAM, you can select the agency from the drop-down list. Currently, agencies are mainly used for server monitoring.

13. Set **BMS Name**.

    The name can be customized but can contain only letters, digits, underscores (_), hyphens (-), and periods (.).

    If you create multiple BMSs at a time, suffixes will be added to the BMSs in sequence, such as **bms-0001**, **bms-0002**, ... If you create multiple BMSs again, the values in the new BMS names increase from the existing maximum value. For example, the existing BMS with the maximum number in name is **bms-0010**. If you enter **bms**, the names of the new BMSs will be **bms-0011**, **bms-0012**, ... When the value reaches 9999, it will start from 0001 again.

14. Set your desired number of BMSs, which is a maximum of all available BMSs.

    After the configuration, click **Price Calculator** to view the BMS configuration fee.

    NOTE

    If you manually set an IP address when configuring **NIC** or **High-Speed NIC** or select **Use existing** when configuring **EIP**, you can create only one BMS at a time.

15. Click **Apply Now**.

16. On the displayed page, confirm the specifications and click **Submit**.

    The BMS status changes to **Running** after about 30 minutes. If you select a flavor that supports quick provisioning, you can obtain a BMS within about five minutes.

    NOTE

    You can view the BMS creation status. For details, see **Viewing BMS Creation Statuses**.

Follow-up Operations

- After the BMS is created, you can view its details, such as name/ID, disks, and private IP address. For details, see **Viewing BMS Details**.
- After logging in to the BMS, you can install software or deploy services as needed. The login mode varies depending on the BMS OS. For details, see **Linux BMS Login Methods** or **Windows BMS Login Methods**.

- If you have created data disks when creating the BMS, you must format partitions of the data disks. For details, see **Introduction to Data Disk Initialization Scenarios and Partition Styles**.
- Change the validity period of the password to prevent any inconvenience caused by password expiration. For detailed operations, see **How Do I Set the Password Validity Period?**
- Currently, Windows Server 2012 BMSs have the same security identifier (SID), which is used to identify users, groups, and computer accounts. In cluster deployment scenarios, change the SIDs of BMSs by following the instructions in **How Do I Change the SID of a Windows Server 2012 BMS?** to ensure that each BMS has a unique SID.

3.1.2 Creating a BMS Supporting Quick Provisioning

Scenarios

When provisioning a common BMS, you need to download its OS from the cloud and install it. The download costs a long time. BMSs using EVS disks as system disks can be provisioned quickly.

BMSs supporting quick provisioning have the following advantages over other BMSs:

- BMSs booted from EVS disks can be provisioned within about 5 minutes.
- BMSs support CSBS backups, ensuring data security.
- BMS rebuilding upon faults is supported, enabling quick service recovery.
- An Image of a BMS can be exported to apply configurations of the BMS to other BMSs without the need of configuring the BMSs again.

On the page for creating a BMS, select a flavor that supports quick BMS provisioning, set the system disk type and capacity, and configure other required parameters to obtain a BMS.

Procedure

You can create a BMS supporting quick provisioning by following the instructions in **Creating a Common BMS**.

When creating the BMS, pay attention to the following parameters:

- **Flavor**: Select **physical.h2.large** or **physical.hs2.large**. For more information about flavors, see **Instance Family**.
- **Image**: Select a public image that supports quick provisioning.
- **Disk**: Set the system disk type and size.

3.1.3 Creating a BMS from a Private Image

Scenarios

If you want to create a BMS that has the same OS and applications as an existing BMS, you can create a private image using the existing BMS and then create a BMS using the private image. This frees you from repeatedly configuring BMSs and improves efficiency.

Background

You can create a private image using either of the following methods:

- **Creating a Private Image from a BMS**
- **Creating a Private Image from an External Image File**

Procedure

Create a BMS by following the instructions in **Creating a Common BMS**.

Note for setting the parameters:

- **Region**: Select the region where the private image is located.
- **Image**: Select **Private image** or **Shared image** and select the required image from the drop-down list.
- **Disk**: If the selected flavor supports quick provisioning, you are advised to increase **System Disk** by 2 GB or more.

3.2 Viewing BMS Information

3.2.1 Viewing BMS Creation Statuses

Scenarios

After clicking **Submit** to request a BMS, you can query the task status in the **Task Status** area. A task involves several sub-tasks, such as creating a BMS resource, binding an EIP, and attaching an EVS disk.

The task status may be either **Creating** or **Failed**:

- **Processing**: The system is processing the task.
- **Failed**: The system has failed to process the task. The system rolls back the failed task and displays an error code, for example, **(BMS.3033) Failed to create system disk**.

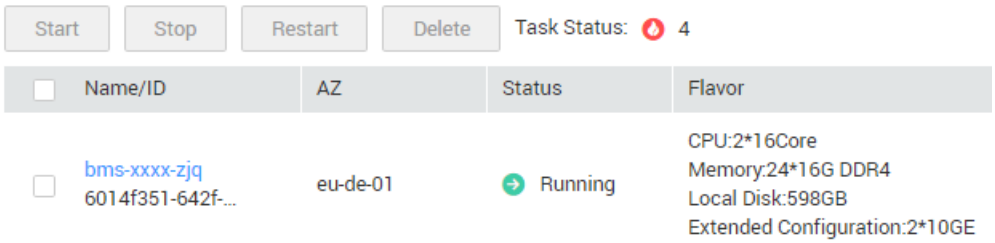
This section describes how to query BMS application processing status and the information displayed in the **Task Status** area.

Procedure

1. Log in to the management console.
2. Under **Computing**, click **Bare Metal Server**.

   The BMS console is displayed.
3. **Task Status** is displayed on the right of common operations, such as **Start**, **Stop**, **Restart**, and **Delete**. After you create a BMS, the **Task Status** area will show the task processing status.

Figure 3-1 BMS application status



4. Click the number displayed in the **Task Status** area to view details about the BMS application processing status. The tasks in **Processing** and **Failed** statuses are displayed.

   NOTE

   If **Failed** is displayed for a task in the **Task Status** area, but the BMS list contains the BMS, handle this issue by following the instructions in **Why Is Failed Displayed for a BMS Application Task But the BMS List Shows the Obtained BMS?**

3.2.2 Viewing BMS Details

Scenarios

After you obtain a BMS, you can view and manage your BMS on the management console. This section describes how to query detailed information about a BMS, such as the BMS name/ID, disks, NICs, and EIP.

Procedure

1. Log in to the management console.
2. Under **Computing**, click **Bare Metal Server**.

   On the BMS list page, you can view your BMS and its flavor, image, and private IP address.
3. In the upper right corner of the BMS list, query BMSs by specifying the status, name, BMS ID, flavor, and private IP address.
4. Click the name of the queried BMS.

   The page showing details of the BMS is displayed.
5. View the BMS details, such as name, status, flavor, and VPC. You can also click the **Disks**, **NICs**, **Security Groups**, **EIPs**, and **Monitoring** tabs to attach EVS disks to or detach EVS disks from the BMS, change the security group, bind an EIP to or unbind an EIP from the BMS, and create agencies.

   NOTE

   The BMS monitoring data and charts are not displayed on the BMS details page. You need to view them on the Cloud Eye console. The prerequisite is that Agent has been installed on your BMS. For details, see *Cloud Eye User Guide*.

3.3 Logging In to a Linux BMS

3.3.1 Linux BMS Login Methods

Choose an appropriate method to log in to a Linux BMS based on the BMS network configuration and your on-premise OS.

Table 3-2 Linux BMS login methods

Access to the Internet	On-premise OS	Login Method
Yes/No	Windows or Linux	**Remotely Logging In to a BMS**
Yes	Windows	Use a remote login tool, such as PuTTY. • For how to log in to a BMS using an SSH key pair, see **Logging In to a BMS Using an SSH Key Pair**. • For how to log in to a BMS using an SSH password, see **Logging In to a BMS Using an SSH Password**.
Yes	Linux	Run commands. • For how to log in to a BMS using an SSH key pair, see **Logging In to a BMS Using an SSH Key Pair**. • For how to log in to a BMS using an SSH password, see **Logging In to a BMS Using an SSH Password**.

3.3.2 Remotely Logging In to a BMS

Scenarios

If common remote connection software (such as PuTTY) is unavailable, you can use the remote login function on the management console to log in to a BMS.

Constraints

- Only Linux BMSs support remote login.
- Only the user who creates a BMS or users with the Tenant Administrator or Server Administrator role can log in to the BMS remotely.
- The remote login page does not support Chinese input or desktop GUI-based operations.
- When you log in to a BMS remotely, shortcut keys such as Ctrl and Alt are not well supported. For example, if you enter **Alt +** *ASCII code*, multiple special characters are displayed.
- Before exiting the management console, log out of the OS.

Prerequisites

- The BMS must be in **Running** state.
- If you selected the key pair login mode when creating the BMS, log in to the BMS by following the instructions in **SSH Key Pair** and set a password for the BMS. The detailed operations are as follows:

  Log in to the BMS using the key pair, switch to user **root**, and run the **passwd** command to set a password for user **root**.

  Figure 3-2 Setting a password for user **root**

  ```
  [root@serverc28ef36e-08ef-4d94-8921-155fa4d4332b ~]# passwd
  Changing password for user root.
  New password:
  Retype new password:
  passwd: all authentication tokens updated successfully.
  [root@serverc28ef36e-08ef-4d94-8921-155fa4d4332b ~]#
  ```

Procedure

1. Log in to the management console.
2. Under **Computing**, click **Bare Metal Server**.

   The BMS console is displayed.
3. Locate the row that contains the target BMS and click **Remote Login** in the **Operation** column.

   After about one minute, the login page is displayed. Press **Enter** and enter username **root** and password to log in.

   NOTE

   - If you do not log in within 10 minutes after obtaining the remote login link, it will become invalid.
   - If you do not perform any operation on the remote login page within 10 minutes, you need to obtain the link again.
   - If the login page does not respond after you press **Enter**, a possible cause is that remote login is not configured for the BMS image. You can resolve the issue by following the instructions in **What Do I Do If the Login Page Does Not Respond?**
   - If the BMS console is displayed improperly (such as broken lines and garbled characters) after you remotely log in to it, see **What Do I Do If the BMS Console Is Displayed Improperly After I Remotely Log In to a BMS?**
   - If numbers are not properly displayed after you enter them using the numeric keypad for remote login, see **What Do I Do If the Numeric Keypad Does Not Work During Remote Login?**

3.3.3 Logging In to a BMS Using an SSH Key Pair

Scenarios

This section describes how to log in to a Linux BMS using an SSH key pair from a Windows or Linux PC.

Prerequisites

- The BMS must be in **Running** state.
- You have obtained the private key file used during BMS creation.
- You have bound an EIP to the BMS. For details, see **Binding an EIP to a BMS**.
- You have configured the inbound rules of the security group. For details, see **Adding Security Group Rules**.
- The network connection between the login tool (such as PuTTY) and the target BMS is normal. For example, the default port 22 is not blocked by the firewall.

Logging In to the Linux BMS from a Windows PC

You can use the following methods to log in to a Linux BMS from a local PC running Windows:

Method 1: Use PuTTY to log in to the BMS.

Before logging in to the BMS using PuTTY, ensure that the private key file has been converted to .ppk format.

1. Check whether the private key file has been converted to **.ppk** format.
   - If yes, go to step 7.
   - If no, go to step 2.
2. Visit the following website and download PuTTY and PuTTYgen:

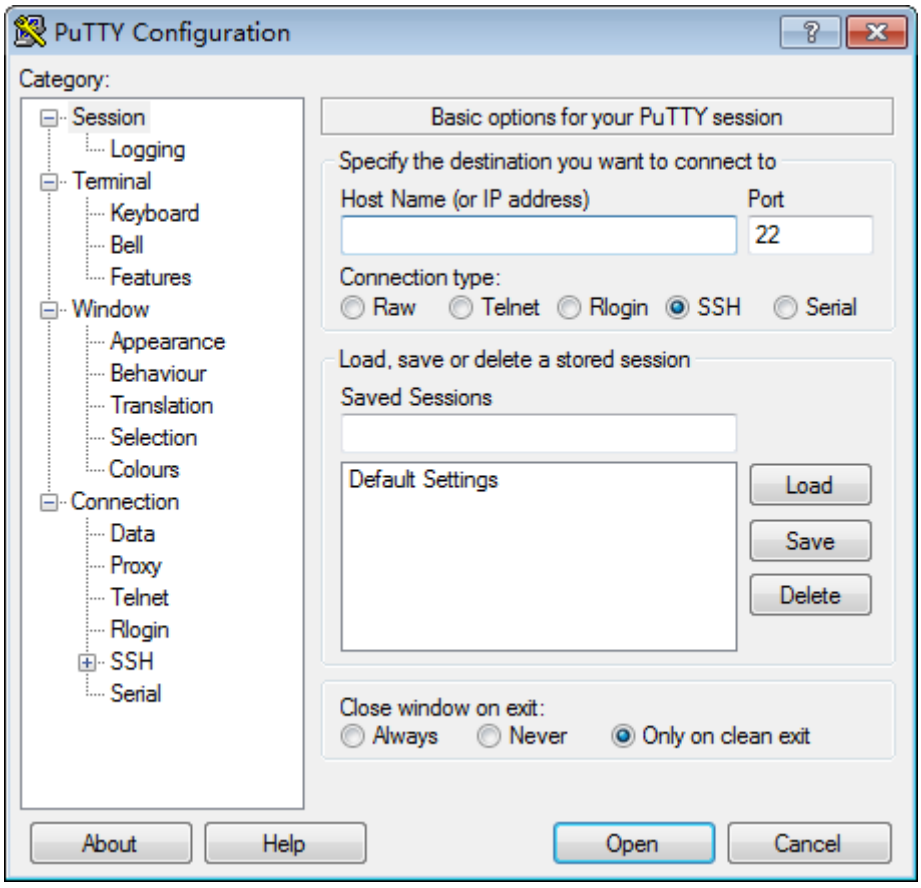
   https://www.chiark.greenend.org.uk/~sgtatham/putty/latest.html

   NOTE

   PuTTYgen is a private key generator, which is used to create a key pair that consists of a public key and a private key for PuTTY.
3. Run PuTTYgen.
4. In the **Actions** area, click **Load** and import the private key file that you stored when creating the BMS.

   Ensure that the private key file is in the format of **All files (*.*)**.
5. Click **Save private key**.
6. Save the converted private key, for example, **kp-123.ppk**, to your local PC.
7. Double-click **PUTTY.EXE**. The **PuTTY Configuration** page is displayed.

Figure 3-3 PuTTY Configuration



8. Choose **Connection** > **Data**. Enter the image username in **Auto-login username**.

   NOTE

   Contact the administrator to obtain the image username.

9. Choose **Connection** > **SSH** > **Auth**. In the last configuration item **Private key file for authentication**, click **Browse** and select the .ppk private key in step **6**.
10. Choose **Session** and enter the EIP of the BMS in the box under **Host Name (or IP address)**.
11. Click **Open**.

    Log in to a BMS.

Method 2: Use Xshell to log in to the BMS.

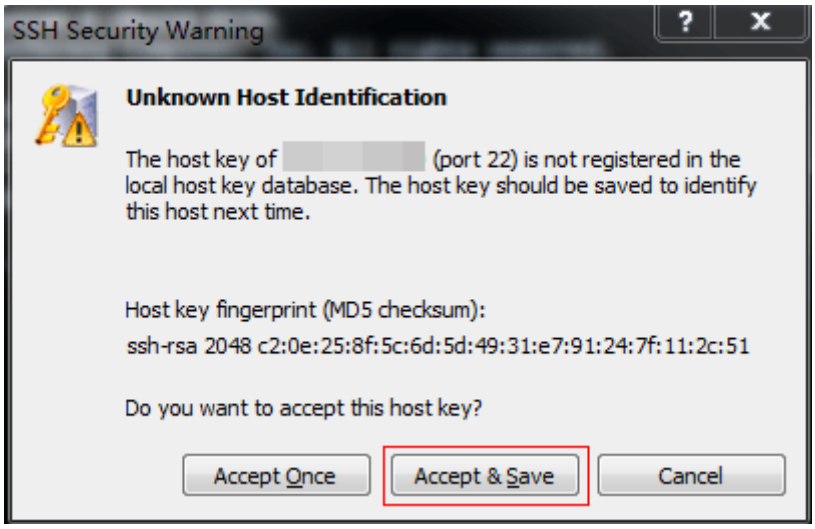
1. Start the Xshell tool.
2. Run the following command to remotely log in to the BMS through SSH:

   ssh *Username*@*EIP*

   Example:

   ssh root@192.168.0.1
3. (Optional) If the system displays the **SSH Security Warning** dialog box, click **Accept & Save**.

Figure 3-4 SSH Security Warning



4. Select **Public Key** and click **Browse** beside the user key text box.
5. In the user key dialog box, click **Import**.
6. Select the locally stored key file and click **Open**.
7. Click **OK** to log in to the BMS.

Logging In to the Linux BMS from a Linux PC

Perform the following operations to log in to a Linux BMS from a local PC running Linux: The following procedure uses private key file **KeyPair-ee55.pem** as an example to describe how to log in to the BMS.

1. On the Linux CLI, run the following command to change operation permissions:

   chmod 400 /*path*/*KeyPair-ee55*

   NOTE

   In the preceding command, ***path*** refers to the path under which the key file is stored.

2. Run the following command to log in to the BMS:

   ssh -i /*path*/*KeyPair-ee55 xxx*@*EIP of the BMS*

   NOTE

   - In the preceding command, *path* refers to the path under which the key file is stored.
   - *xxx* indicates the username of the BMS image. Contact the administrator to obtain the username.

3.3.4 Logging In to a BMS Using an SSH Password

Scenarios

This section describes how to log in to a Linux BMS using an SSH password from a Windows or Linux PC.

Prerequisites

- The BMS must be in **Running** state.
- You have bound an EIP to the BMS. For details, see **Binding an EIP to a BMS**.
- You have configured the inbound rules of the security group. For details, see **Adding Security Group Rules**.
- The network connection between the login tool (such as PuTTY) and the target BMS is normal. For example, the default port 22 is not blocked by the firewall.
- By default, login to a Linux BMS using an SSH password is disabled. If you want to use this function, log in to the BMS (see **Logging In to a BMS Using an SSH Key Pair**) and enable the function. For details, see **How Do I Set SSH Configuration Items?**

Log In to a BMS from a Windows PC

You can use the following methods to log in to a Linux BMS from a local PC running Windows (for example, use PuTTY):

NOTE

Download PuTTY from **https://www.chiark.greenend.org.uk/~sgtatham/putty/latest.html**.

1. Run PuTTY.
2. In the navigation pane on the left, choose **Session**, enter the EIP of the BMS in the text box under **Host Name (or IP address)**, and select **SSH** for **Connection type**.
3. Choose **Windows** > **Translation** and select **UTF-8** from the **Received data assumed to be in which character set:** drop-down list box.
4. Click **Open**.
5. Enter username **root** and the password you set to log in to the BMS.

Log In to a BMS from a Linux PC

To log in to a Linux BMS from a Linux PC, run the following command:

ssh *EIP of the BMS*

3.4 Logging In to a Windows BMS

3.4.1 Windows BMS Login Methods

Currently, you can only log in to a Windows BMS remotely by running MSTSC on your local PC. An EIP must be bound to the BMS.

3.4.2 Logging In to a BMS Remotely Using MSTSC

Scenarios

This section describes how to log in to a Windows BMS using MSTSC (a remote login tool) from your local PC.

Prerequisites

- The BMS must be in **Running** state.
- You have obtained the password for logging in to the Windows BMS. For details, see **Obtaining the Password of a Windows BMS**.
- You have bound an EIP to the BMS. For details, see **Binding an EIP to a BMS**.
- You have configured the inbound rules of the security group. For details, see **Adding Security Group Rules**.
- The network connection between the login tool and the target BMS is normal. For example, the default port 3389 is not blocked by the firewall.

Procedure

The following procedure describes how to log in to a Windows BMS using **mstsc.exe**.

1. On the local PC, click **Start**.
2. In the **Search programs and files** box, enter **mstsc.exe** and press **Enter**.
3. Enter the EIP and username of the Windows BMS, click **Connect**, enter the password as prompted, and click **OK** to log in to the BMS.

3.5 Managing BMSs

3.5.1 Changing the Name of a BMS

Scenarios

To make it easy for you to identify and manage each BMS, the cloud platform allows you to set BMS names and change the names at any time. The new name of a BMS takes effect after the BMS is restarted.

Constraints

The names of Windows BMSs cannot be changed.

Procedure

1. Log in to the management console.
2. Under **Computing**, click **Bare Metal Server**.

   The BMS console is displayed.
3. Click the name of the BMS whose name is to be changed.

4. Click next to **Name**, enter a new name that meets requirements, and click to save the change.

   The BMS name can contain only letters, digits, hyphens (-), underscores (_), and periods (.).

5. Log in to the BMS OS and run the following command to enable automatic hostname synchronization:

   vi /opt/huawei/network_config/bms-network-config.conf

   Set the value of **auto_synchronize_hostname** to **True**.

   ```
   auto_synchronize_hostname = True
   ```

   Press **Esc** and enter **:wq** to save and exit the file.

   NOTE

   If the value of **auto_synchronize_hostname** is **False**, after the BMS is restarted, the hostname will be automatically changed to that set during BMS creation.

6. Log in to the management console again. Locate the row that contains the BMS, click **More** in the **Operation** column, and select **Restart**.

   After about 10 minutes, verify that the BMS is restarted and its hostname is automatically updated.

3.5.2 Stopping a BMS

Scenarios

You can stop BMSs in **Running** state.

NOTE

If you choose to forcibly stop a BMS, services running on the BMS will be stopped. Before performing this operation, ensure that you have saved files on the BMS.

Procedure

1. Log in to the management console.
2. Under **Computing**, click **Bare Metal Server**.

   The BMS console is displayed.

3. Locate the row that contains the target BMS, click **More** in the **Operation** column, and select **Stop** from the drop-down list. To stop multiple BMSs, select them and click **Stop** at the top of the BMS list.
4. In the displayed dialog box, click **Yes**.

After a BMS is stopped, its status becomes **Stopped**.

You can perform the following operations only when the BMS is stopped:

- **Detaching the System Disk**
- **Creating an Image**
- **Rebuilding a BMS**

3.5.3 Restarting a BMS

Scenarios

You can restart BMSs on the console. Only BMSs in running state can be restarted.

NOTE

Restarting a BMS will interrupt your services. Exercise caution when performing this operation.

Procedure

1. Log in to the management console.
2. Under **Computing**, click **Bare Metal Server**.
   The BMS console is displayed.
3. Locate the row that contains the target BMS, click **More** in the **Operation** column, and select **Restart** from the drop-down list. To restart multiple BMSs, select them and click **Restart** at the top of the BMS list.
4. In the displayed dialog box, click **Yes**.

3.5.4 Reinstalling the OS

Scenarios

If the OS of a BMS fails to start, suffer from viruses, or requires optimization, reinstall the OS.

The original image is used to reinstall the BMS OS. BMSs provisioned on local disks and quickly provisioned BMSs both support OS reinstallation.

After the OS is reinstalled:

- The system disk type of the quickly provisioned BMS does not change.
- The IP address and MAC address of the BMS do not change.

Precautions

Reinstalling the OS is a mission-critical operation. Before performing this operation, read the following precautions carefully:

- To reinstall the OS, you must stop the BMS, which will interrupt your services.
- Reinstalling the OS clears the data in all partitions of the system disk. Back up data before performing this operation.
- Do not power off or restart the BMS during the OS reinstallation. Otherwise, the reinstallation may fail.
- After the OS is reinstalled, custom configurations, such as DNS and hostname of the original OS will be reset. You must reconfigure the OS.

Constraints

- The reinstalled OS must be the same as the original OS.

- During the OS reinstallation, the system disk capacity of a BMS provisioned using a local disk is not displayed.
- If the EVS disk where the BMS OS is installed is deleted during the OS reinstallation, the reinstallation will fail.
- During the OS reinstallation, you cannot inject user data.
- The OS of a BMS in maintenance state cannot be reinstalled.

Prerequisites

- The BMS must be in **Stopped** or **Reinstalling OS failed** state.
- If the boot device of the BMS is the EVS disk, the EVS disk quota must be greater than 0.
- If it is a quick-provisioning BMS, ensure that the BMS has a system disk.
- If the BMS is created using a private image, ensure that the image is still available.
- The OS reinstallation depends on the bms-network-config and Cloud-Init plug-ins in the BMS image.
  - If the BMS is created using a public image, ensure that the image has the bms-network-config and Cloud-Init plug-ins.
  - If the BMS is created using a private image, check whether bms-network-config and Cloud-Init are installed by following the instructions in *Bare Metal Server Private Image Creation Guide*.

Procedure

1. Log in to the management console.
2. Under **Computing**, click **Bare Metal Server**.

   The BMS console is displayed.
3. Locate the row containing the target BMS, click **More** in the **Operation** column, and select **Reinstall OS** from the drop-down list.

   The **Reinstall OS** dialog box is displayed.
4. Set **Login Mode**.
   - **Key pair**: You can select an existing key pair or click **Create Key Pair** and create a private key used to log in to the BMS.
   - **Password**: You can set the initial password for logging in to the BMS OS. The new password must meet the password complexity requirements listed in **Table 3-5**.
5. Click **OK**.
6. On the **BMS OS Reinstallation** page, confirm the OS configuration and click **Submit**.

   After the application is submitted, the BMS status changes to **Reinstalling OS**. The reinstallation is complete when the BMS status changes to **Running**. After the OS is reinstalled, the BMS will start automatically.

   NOTE

   Do not perform any operation on the temporary BMS during the reinstallation process.

Follow-up Operations

If the QinQ network has been configured for the BMS before the OS reinstallation, configure the network by following the instructions in sections **Configuring a User-defined VLAN (SUSE Linux Enterprise Server 12)** to **Configuring a User-defined VLAN (Windows Server)** after the OS is reinstalled.

3.5.5 Rebuilding a BMS

Scenarios

If the BMS cannot work properly due to hardware or SDI card damage, you can rebuild the BMS. This section describes how to rebuild a BMS.

NOTE

The BMS is not automatically rebuilt. You need to contact the administrator to have your BMS rebuilt.

Notes

- Currently, only BMSs that are quickly provisioned can be rebuilt.
- After a BMS is rebuilt, it will start automatically.
- If the BMS uses an IB NIC, record the IP address of the IB NIC rebuilding the BMS.
- If the BMS uses a QinQ network, record the IP address of the QinQ network before rebuilding the BMS.

Constraints

- A BMS can only be rebuilt in the same POD.
- A BMS to be rebuilt must use an EVS disk as its system disk.
- Data on local disks cannot be migrated after a BMS is rebuilt.

Prerequisites

- The BMS to be rebuilt must be stopped.
- The BMS to be rebuilt must have a system disk.

Procedure

1. If your BMS uses a QinQ network, delete configurations of the original QinQ network before rebuilding the BMS. For example, if eth3 and eth5 form port group bond1 for the QinQ network, delete the following configuration files:

   rm /etc/udev/rules.d/80-persistent-net.rules

   rm /etc/sysconfig/network-scripts/ifcfg-eth3

   rm /etc/sysconfig/network-scripts/ifcfg-eth5

   rm /etc/sysconfig/network-scripts/ifcfg-bond1

2. Contact the administrator and apply for rebuilding the BMS.
   - If your BMS uses the QinQ network, reconfigure the QinQ network based on the original QinQ network configuration and by following the

instructions in **Configuring a User-defined VLAN (SUSE Linux Enterprise Server 12)** to **Configuring a User-defined VLAN (Windows Server)** after the BMS is rebuilt.

- If your BMS uses the IB network and the IB NIC IP address assignment mode is DHCP, the IP address of the BMS will change after it is rebuilt. Therefore, if your service heavily depends on the IP address, you need to reconfigure the IP address of the IB network using the static configuration method. The operations describe how to set the IP address of the IB NIC to the original IP address.

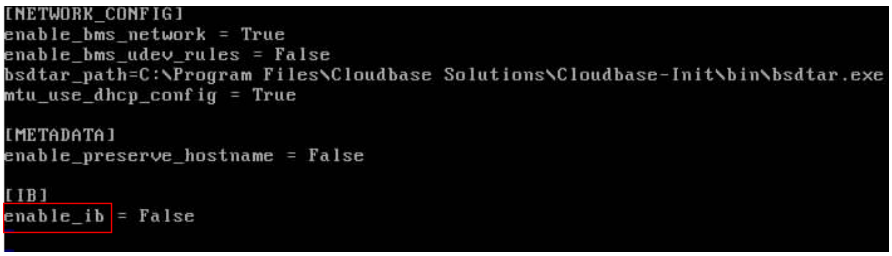
  i. Log in to the BMS OS.

  ii. Create the **/etc/sysconfig/network-scripts/ifcfg-ib0** configuration file. The following uses CentOS as an example. Set **IPADDR** to the IP address of the BMS before it is rebuilt.

  ```
  #/etc/sysconfig/network-scripts/ifcfg-ib0
  DEVICE=ib0
  ONBOOT=yes
  BOOTPROTO=none
  IPADDR=172.31.0.254
  NETWORK=172.31.0.0
  BROADCAST=172.31.0.255
  NETMASK=255.255.255.0
  ```

  iii. Change the value of **enable_ib** in the **/opt/huawei/network_config/bms-network-config.conf** file to **False**.

  Figure 3-5 Changing the parameter value

  iv. Save the configuration and exit. Then restart the NIC.

  ifdown ib0

  ifup ib0

  v. Run the following command to check whether the configured IP address takes effect:

  ifconfig ib0

3.5.6 Releasing a BMS

Scenarios

You can delete BMSs you no longer need.

After a BMS is deleted, it is still displayed in the BMS list for a short period of time, after which it will be deleted from the BMS list. Tags and disks of the BMS will be disassociated from the BMS, and data on the disks will be deleted.

Procedure

1. Log in to the management console.
2. Under **Computing**, click **Bare Metal Server**.

   The BMS console is displayed.
3. Locate the row that contains the target BMS, click **More** in the **Operation** column, and select **Delete** from the drop-down list. To delete multiple BMSs, select them and click **Delete** at the top of the BMS list.
4. In the displayed dialog box, click **Yes**.

   If the BMS has associated resources, such as EVS disks and EIP, you can choose whether to delete these resources.

3.6 Using User Data and Metadata

3.6.1 Injecting User Data into BMSs

Application Scenarios

Use the user data injection function to inject user data into BMSs to:

- Use scripts to simplify BMS configuration.
- Use scripts to initialize the BMS OS configuration.
- Upload your scripts to BMSs during BMS creation.
- Use scripts to perform other operations.

Constraints

- For Linux:
  - The image that is used to create BMSs must have Cloud-Init installed.
  - The user data to be injected must be less than or equal to 32 KB.
  - User data uploaded as text can contain only ASCII characters. User data uploaded as a file can contain any characters, and the file size must be less than or equal to 32 KB.
  - The image that is used to create ECSs must be a public image, a private image created based on a public image, or a private image with Cloud-Init installed.
  - The format of the customized scripts must comply with user data script specifications.
  - DHCP must be enabled for the VPC, and port 80 must be enabled for the security group in the outbound direction.
- For Windows:
  - The image that is used to create BMSs must have Cloudbase-Init installed.
  - The user data to be injected must be less than or equal to 32 KB.
  - User data uploaded as text can contain only ASCII characters. User data uploaded as a file can contain any characters, and the file size must be less than or equal to 32 KB.

- The image that is used to create ECSs must be a public image, a private image created based on a public image, or a private image with Cloudbase-Init installed.
- DHCP must be enabled for the VPC, and port 80 must be enabled for the security group in the outbound direction.

Use Methods

1. Create a user data script, the format of which complies with user data script specifications. For details, see section **Helpful Links**.
2. When creating a BMS, set **Advanced Settings** to **Configure now**, and paste the content of the user data script to the **User Data Injection** text box or upload the user data file.
3. The created BMS automatically runs Cloud-Init or Cloudbase-Init to read the user data script upon startup.

User Data Scripts of Linux BMSs

Customized user data scripts of Linux BMSs are based on the open-source Cloud-Init architecture. This architecture uses BMS metadata as the data source for automatically configuring the BMSs. The customized script types are compatible with open-source Cloud-Init. For details about Cloud-Init, see **http://cloudinit.readthedocs.io/en/latest/topics/format.html**.

- Script execution time: A customized user data script is executed after the time when the status of the target BMS changes to **Running** and before the time when **/etc/init** is executed.

  NOTE

  By default, the scripts are executed as user **root**.

- Script type: Both user-data scripts and Cloud-Config data scripts are supported.

Table 3-3 Linux BMS script types

-	User-Data Script	Cloud-Config Data
Description	Scripts, such as Shell and Python scripts, are used for custom configurations.	Methods pre-defined in Cloud-Init, such as the Yum source and SSH key, are used for configuring certain BMS applications.
Format	A script must be started with **#!**, for example, **#!/bin/bash** and **#!/usr/bin/env python**. When a script is started for the first time, it will be executed at the rc.local-like level, indicating a low priority in the boot sequence.	The first line must be **#cloud-config**, and no space is allowed in front of it.

-	User-Data Script	Cloud-Config Data
Constraint	Before Base64 encoding, the size of the script, including the first line, cannot exceed 32 KB.	Before Base64 encoding, the size of the script, including the first line, cannot exceed 32 KB.
Frequency	The script is executed only once when the BMS is started for the first time.	The execution frequency varies according to the applications configured on the BMS.

- How can I view the customized user data injected into a Linux BMS?
  a. Log in to the BMS.
  b. Run the following command to view the customized user data as user **root**:

     curl http://169.254.169.254/openstack/latest/user_data
- Script usage examples

  This section describes how to inject scripts in different formats into Linux BMSs and view script execution results.

  Example 1: Inject a User-Data script.

  When creating a BMS, set **User Data Injection** to **Text** and enter the customized user data script.

```
#!/bin/bash
echo "Hello, the time is now $(date -R)" | tee /root/output.txt
```

  After the BMS is created, start it and run the **cat *[file]*** command to check the script execution result.

```
[root@XXXXXXXX ~]# cat /root/output.txt
Hello, the time is now Mon, 16 Jul 2016 16:03:18+0800
```

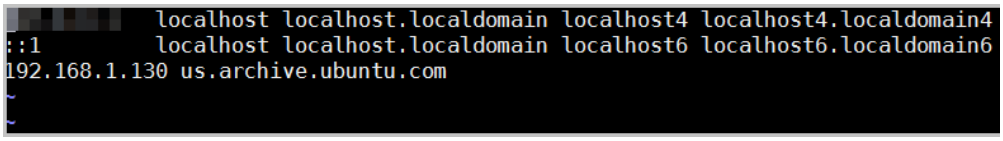
  Example 2: Inject a Cloud-Config Data script.

  When creating a BMS, set **User Data Injection** to **Text** and enter the customized user data script.

```
#cloud-config
bootcmd:
- echo 192.168.1.130 us.archive.ubuntu.com >> /etc/hosts
```

  After the BMS is created, start it and run the **cat /etc/hosts** command to check the script execution result.

  Figure 3-6 Viewing the running result



User Data Scripts of Windows BMSs

Customized user data scripts of Windows BMSs are based on the open-source Cloudbase-Init architecture. This architecture uses BMS metadata as the data source for initializing and automatically configuring the BMSs. The customized script types are compatible with open-source Cloudbase-Init. For details about

Cloudbase-Init, see **https://cloudbase-init.readthedocs.io/en/latest/userdata.html**.

- Script type: Both batch-processing program scripts and PowerShell scripts are supported.

  Table 3-4 Windows BMS script types

-	Batch-Processing Program Script	PowerShell Script
Format	The script must be started with **rem cmd**, which is the first line of the script. No space is allowed at the beginning of the first line.	The script must be started with **#ps1**, which is the first line of the script. No space is allowed at the beginning of the first line.
Constraint	Before Base64 encoding, the size of the script, including the first line, cannot exceed 32 KB.	Before Base64 encoding, the size of the script, including the first line, cannot exceed 32 KB.

- How can I view the customized user data injected into a Windows BMS?

  a. Log in to the BMS.

  b. Access the following URL in the address box of the browser and view the injected user data:

  http://169.254.169.254/openstack/latest/user_data

- Script usage examples

  This section describes how to inject scripts in different formats into Windows BMSs and view script execution results.

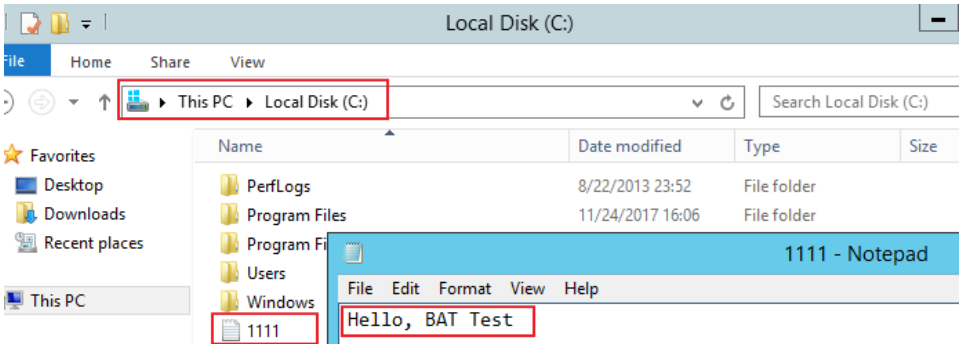
  Example 1: Inject a batch-processing program script.

  When creating a BMS, set **User Data Injection** to **Text** and enter the customized user data script.

```
rem cmd
echo "Hello, BAT Test" > C:\1111.txt
```

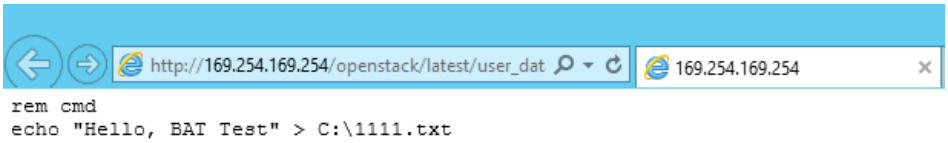
  After the BMS is created, start it and check the script execution result. In this example, a text file named **1111** is added to disk C:\.

  Figure 3-7 Creating text file **1111**



To view the user data injected into the Windows BMS, log in at http://169.254.169.254/openstack/latest/user_data.

Figure 3-8 Viewing user data 1111



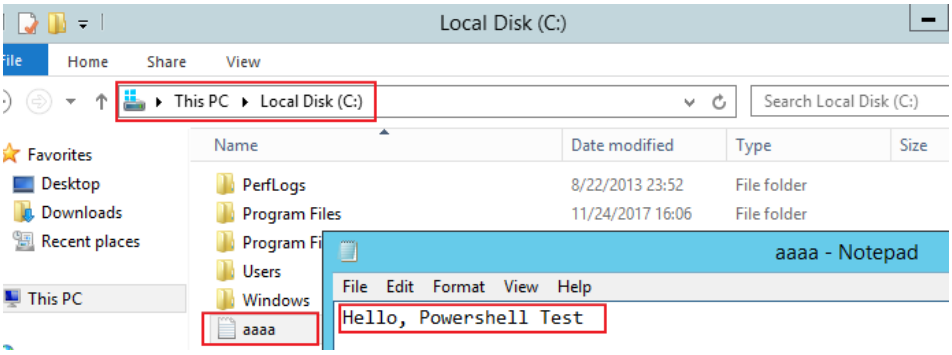
Example 2: Inject a PowerShell script.

When creating a BMS, set **User Data Injection** to **Text** and enter the customized user data script.

```
#ps1
echo "Hello, Powershell Test" > C:\aaaa.txt
```

After the BMS is created, start it and check the script execution result. In this example, a text file named **aaaa** is added to disk C:\.

Figure 3-9 Creating text file **aaaa**



To view the user data injected into the Windows BMS, log in at http://169.254.169.254/openstack/latest/user_data.

Figure 3-10 Viewing user data aaaa

Case 1

This case illustrates how to use the user data injection function to simplify BMS configuration.

In this example, vim is configured to enable syntax highlighting, display line numbers, and set the tab stop to **4**. Configuration file **.vimrc** is created and injected into the **/root/.vimrc** directory during BMS creation. After the BMS is created, vim is automatically configured based on your requirements. This helps to improve BMS configuration efficiency, especially in batch ECS creation scenarios.

The content of the script file to be injected is as follows:

```
#cloud-config
write_files:
  - path: /root/.vimrc
    content: |
      syntax on
      set tabstop=4
      set number
```

Case 2

This case illustrates how to use the user data injection function to reset the password for logging in to a Linux BMS.

In this example, the password of user **root** is reset to "******".

NOTE

The new password must meet the password complexity requirements listed in **Table 3-5**.

Table 3-5 Password requirements

Parameter	Requirements	Example Value
Password	• Consists of 8 characters to 26 characters. • Must contain at least three of the following character types: – Uppercase letters – Lowercase letters – Digits – Special characters !@$%^-_=+[]{}:,./? • Cannot contain the username or the username spelled backwards. • Cannot contain more than two characters in the same sequence as they appear in the username. (This requirement applies only to Windows BMSs.)	Test12$@

The content of the script file to be injected is as follows. (Retain the indentation in the following script.)

```
#cloud-config
chpasswd:
  list: |
    root:******
  expire: False
```

After the BMS is created, you can use the reset password to log in to it. To ensure system security, change the password of user **root** after logging in to the BMS for the first time.

Case 3

This case illustrates how to use the user data injection function to create a user on a Windows BMS and configure the password for the user.

In this example, the user's username is **abc**, its password is ******, and the user is added to the **administrators** user group.

NOTE

The new password must meet the password complexity requirements listed in **Table 3-6**.

Table 3-6 Password requirements

Parameter	Requirements	Example Value
Password	• Consists of 8 characters to 26 characters. • Must contain at least three of the following character types: – Uppercase letters – Lowercase letters – Digits – Special characters !@$%^-_=+[]{}:,./? • Cannot contain the username or the username spelled backwards. • Cannot contain more than two characters in the same sequence as they appear in the username. (This requirement applies only to Windows BMSs.)	Test12$@

The content of the script file to be injected is as follows:

```
rem cmd
net user abc ****** /add
net localgroup administrators abc /add
```

After the BMS is created, you can use the created username and password to log in to it.

Case 4

This case illustrates how to use the user data injection function to update system software packages for a Linux BMS and enable the HTTPd service. After the user data is injected, you can use the HTTPd service.

The content of the script file to be injected is as follows:

```
#!/bin/bash
yum update -y
service httpd start
chkconfig httpd on
```

Case 5

This case illustrates how to use the user data injection function to assign user **root** permission for remotely logging in to a Linux BMS. After injecting the file, you can log in to the BMS as user **root** in SSH key authentication mode.

The content of the script file to be injected is as follows:

```
#cloud-config
disable_root: false
runcmd:
- sed -i 's/^PermitRootLogin.*$/PermitRootLogin without-password/' /etc/ssh/sshd_config
- sed -i '/^KexAlgorithms.*$/d' /etc/ssh/sshd_config
- service sshd restart
```

Helpful Links

For more information about user data injection cases, visit the official Cloud-init/ Cloudbase-init website:

- **https://cloudinit.readthedocs.io/en/latest/**
- **https://cloudbase-init.readthedocs.io/en/latest/**

3.6.2 Metadata

Introduction

The BMS metadata includes BMS basic information on the cloud platform, such as the BMS ID, hostname, and network information. The BMS metadata can be obtained using compatible OpenStack and EC2 APIs listed in **Table 3-7**.

Table 3-7 BMS metadata types

Metadata Type	Metadata Item	Description
OpenStack type	/meta_data.json	This interface is used to query BMS metadata. For the key fields in the BMS metadata, see **Table 3-8**.
	/password	This interface is used to query the BMS password. If a key pair is selected during the creation of a Windows BMS, Cloudbase-Init is used to save the ciphertext password when the BMS is initialized.

Metadata Type	Metadata Item	Description
	/user_data	This interface is used to query BMS user data. This metadata allows you to specify scripts and configuration files for initializing BMSs. For details, see **Injecting User Data into BMSs**. For password-authenticated Linux BMSs, save the password injection script.
	/network_data.json	This interface is used to query network information of BMSs.
	/securitykey	This interface is used to obtain temporary AKs and SKs. Before obtaining a temporary AK and SK on a BMS, ensure that the **op_svc_ecs** account has been authorized on IAM and that the desired BMS resources have been authorized for management.
EC2 type	/meta-data/hostname	This interface is used to query the host name of a BMS. To remove the suffix **.novalocal** from a BMS, see: **Is the BMS Host Name with Suffix novalocal Normal?**
	/meta-data/instance-type	This interface is used to query the flavor name of a BMS.
	/meta-data/local-ipv4	This interface is used to query the fixed IP address of a BMS. If there are multiple NICs, only the IP address of the primary NIC is displayed.
	/meta-data/placement/availability-zone	This interface is used to query AZ information about a BMS.
	/meta-data/public-ipv4	This interface is used to query the EIP of a BMS. If there are multiple NICs, only the EIP of the primary NIC is displayed.
	/meta-data/public-keys/0/openssh-key	This interface is used to query the public key of a BMS.
	/user-data	This interface is used to query BMS user data.

Metadata Type	Metadata Item	Description
	/meta-data/security-groups	This interface is used to query the name of the security group of the BMS.

Table 3-8 Metadata key fields

Parameter	Type	Description
uuid	String	Specifies the BMS ID.
availability_zone	String	Specifies the AZ where the BMS is located.
meta	Dict	Specifies the metadata information, including the image name, image ID, and VPC ID.
hostname	String	Specifies the hostname of the BMS. To remove the suffix **.novalocal** from a BMS, see: **Is the BMS Host Name with Suffix novalocal Normal?**
vpc_id	String	Specifies the ID of the VPC where the BMS is located.

The following describes the URI and methods of using the supported BMS metadata.

Prerequisites

- You have logged in to the BMS.
- Security group rules in the outbound direction meet the following requirements:
  - Protocol: TCP
  - Port Range: 80
  - Remote End: 169.254.0.0/16

  NOTE

  If you use the default security group rules in the outbound direction, the preceding requirements are met, and the metadata can be accessed. The default outbound security group rule is as follows:

  - Protocol: Any
  - Port Range: Any
  - Remote End: 0.0.0.0/16

Metadata (OpenStack Metadata API)

This interface is used to query BMS metadata.

- URI

  /169.254.169.254/openstack/latest/meta_data.json
- Method

  Supports GET requests.
- Example

  The following describes how to use the cURL tool to query the BMS metadata:

  curl http://169.254.169.254/openstack/latest/meta_data.json


```
{
    "random_seed": "rEocCViRS+dNwlYdGIxJHUp+00poeUsAdBFkbPbYQTmpNwpoEb43k9z+96TyrekNKS
+iLYDdRNy4kKGoNPEVBCc05Hg1TcDblAPfJwgJS1okqEtlcofUhKmL3K0fto
+5KXEDU3GNuGwyZXjdVb9HQWU+E1jztAJjjqsahnU+g/tawABTVySLBKlAT8fMGax1mTGgArucn/
WzDcy19DGioKPE7F8ILtSQ4Ww3VClK5VYB/h0x+4r7IVHrPmYX/
bi1Yhm3Dc4rRYNaTjdOV5gUOsbO3oAeQkmKwQ/
NO0N8qw5Ya4l8ZUW4tMav4mOsRySOOB35v0bvaJc6p
+50DTbWNeX5A2MLiEhTP3vsPrmvk4LRF7CLz2J2TGIM14OoVBw7LARwmv9cz532zHki/c8tlhRzLmOTXh/
wL36zFW10DeuReUGmxth7IGNmRMQKV6+miI78jm/KMPpgAdK3vwYF/
GcelOFJD2HghMUUCeMbwYnvijLTejuBpwhJMNiHA/NvlEsxJDxqBCoss/Jfe+yCmUFyxovJ
+L8oNkTzkmtCNzw3Ra0hiKchGhqK3BIeToV/kVx5DdF081xrEA
+qyoM6CVyfJtEoz1zlRRyoo9bJ65Eg6JJd8dj1UCVsDqRY1pIjgzE/
Mzsw6AaaCVhaMJL7u7YMVdyKzA6z65Xtvujz0Vo=",
    "uuid": "ca9e8b7c-f2be-4b6d-a639-f10b4d994d04",
    "availability_zone": "lt-test-1c",
    "hostname": "bms-ddd4-l00349281.novalocal",
    "launch_index": 0,
    "meta": {
        "metering.image_id": "3a64bd37-955e-40cd-ab9e-129db56bc05d",
        "metering.imagetype": "gold",
        "metering.resourcespeccode": "physical.s3.small",
        "metering.cloudServiceType": "service.type.ec2",
        "image_name": "CentOS 7.6 64bit",
        "os_bit": "64",
        "vpc_id": "3b6c201f-aeb3-4bce-b841-64756e66cb49",
        "metering.resourcetype": "1",
        "cascaded.instance_extrainfo": "pcibridge:2",
        "os_type": "Linux",
        "charging_mode": "0"
    },
    "project_id": "6e8b0c94265645f39c5abbe63c4113c6",
    "name": "ecs-ddd4-l00349281"
}
```


User Data (OpenStack Metadata API)

This interface is used to query BMS user data. The value is configured when you create a BMS. It cannot be changed after the configuration.

- URI

  /169.254.169.254/openstack/latest/user_data
- Method

  Supports GET requests.
- Example

  curl http://169.254.169.254/openstack/latest/user_data

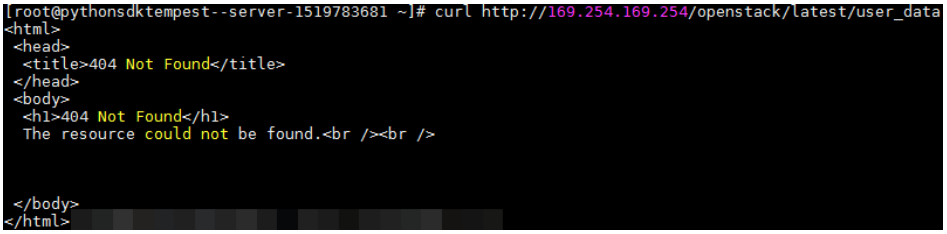

```
ICAgICAgDQoiQSBjbG91ZCBkb2VzIG5vdCBrbm93IHdoeSBpdCBtb3ZlcyBpbiBqdXN0IHN1Y2ggYSBkaXJlY
3Rpb24gYW5kIGF0IHN1Y2ggYSBzcGVlZC4uLkl0IGZlZWxzIGFuIGltcHVsc2lvbi4uLnRoaXMgaXMgdGhlIH
```

```
BsYWNlIHRvIGdvIG5vdy4gQnV0IHRoZSBza3kga25vd3MgdGhlIHJlYXNvbnMgYW5kIHRoZSBwYXR0ZXJucyBiZWhpbmQgYWxsIGNsb3VkcywgYW5kIHlvdSB3aWxsIGtub3csIHRvbywgd2hlbiB5b3UgbGlmdCB5b3Vyc2VsZiBoaWdoIGVub3VnaCB0byBzZWUgYmV5b25kIGhvcml6b25zLiINCg0KLVJpY2hhcmQgQmFjaA==
```

NOTE

If user data is not injected during BMS creation, the query result is 404.

Figure 3-11 404 Not Found



Network Data (OpenStack Metadata API)

This interface is used to query network information of a BMS.

- URI

  /openstack/latest/network_data.json
- Method

  Supports GET requests.
- Example

  curl http://169.254.169.254/openstack/latest/network_data.json

```
{
   "services": [{
      "type": "dns",
      "address": "100.125.1.250"
   },
   {
      "type": "dns",
      "address": "100.125.21.250"
   }],
   "networks": [{
      "network_id": "67dc10ce-441f-4592-9a80-cc709f6436e7",
      "type": "ipv4_dhcp",
      "link": "tap68a9272d-71",
      "id": "network0"
   }],
   "links": [{
      "type": "cascading",
      "vif_id": "68a9272d-7152-4ae7-a138-3ef53af669e7",
      "ethernet_mac_address": "fa:16:3e:f7:c1:47",
      "id": "tap68a9272d-71",
      "mtu": null
   }]
}
```

Security Key (OpenStack Metadata API)

This interface is used to obtain temporary AKs and SKs.

NOTE

- To obtain a temporary AK and SK on a BMS, ensure that the **op_svc_ecs** account has been authorized on IAM and that the desired BMS resources have been authorized for management.
- Temporary AKs and SKs expire an hour later.
- When using temporary AKs and SKs, add **'X-Security-Token':securitytoken** in the message header. **securitytoken** is the value returned when a call is made to the API.

- URI

  /openstack/latest/securitykey
- Method

  Supports GET requests.
- Example

  curl http://169.254.169.254/openstack/latest/securitykey

User Data (EC2 Compatible API)

This interface is used to query BMS user data. The value is configured when you create a BMS. It cannot be changed after the configuration.

- URI

  /169.254.169.254/latest/user-data
- Method

  Supports GET requests.
- Example

  curl http://169.254.169.254/latest/user-data

  ```
  ICAgICAgDQoiQSBjbG91ZCBkb2VzIG5vdCBrbm93IHdoeSBpdCBtb3ZlcyBpbiBqdXN0IHN1Y2ggYSBkaXJlY
  3Rpb24gYW5kIGF0IHN1Y2ggYSBzcGVlZC4uLkl0IGZlZWxzIGFuIGltcHVsc2lvbi4uLnRoaXMgaXMgdGhlIH
  BsYWNlIHRvIGdvIG5vdy4gQnV0IHRoZSBza3kga25vd3MgdGhlIHJlYXNvbnMgYW5kIHRoZSBwYXR0ZXJu
  cyBiZWhpbmQgYWxsIGNsb3VkcywgYW5kIHlvdSB3aWxsIGtub3csIHRvbywgd2hlbiB5b3UgbGlmdCB5b3
  Vyc2VsZiBoaWdoIGVub3VnaCB0byBzZWUgYmV5b25kIGhvcml6b25zLiINCg0KLVJpY2hhcmQgQmFjaA==
  ```

Hostname (EC2 Compatible API)

This interface is used to query the name of the host accommodating a BMS. The **.novalocal** suffix will be added later.

- URI

  /169.254.169.254/latest/meta-data/hostname
- Method

  Supports GET requests.
- Example

  curl http://169.254.169.254/latest/meta-data/hostname

  ```
  bms-test.novalocal
  ```

Instance Type (EC2 Compatible API)

This interface is used to query the flavor name of a BMS.

- URI

  /169.254.169.254/latest/meta-data/instance-type
- Method

  Supports GET requests.
- Example

  curl http://169.254.169.254/latest/meta-data/instance-type

  ```
  physical.o2.medium
  ```

Local IPv4 (EC2 Compatible API)

This interface is used to query the fixed IP address of a BMS. If there are multiple NICs, only the IP address of the primary NIC is displayed.

- URI

  /169.254.169.254/latest/meta-data/local-ipv4
- Method

  Supports GET requests.
- Example

  curl http://169.254.169.254/latest/meta-data/local-ipv4

  ```
  192.1.1.2
  ```

Availability Zone (EC2 Compatible API)

This interface is used to query AZ information about a BMS.

- URI

  /169.254.169.254/latest/meta-data/placement/availability-zone
- Method

  Supports GET requests.
- Example

  curl http://169.254.169.254/latest/meta-data/placement/availability-zone

  ```
  az1.dc1
  ```

Public IPv4 (EC2 Compatible API)

This interface is used to query the EIP of a BMS. If there are multiple NICs, only the EIP of the primary NIC is displayed.

- URI

  /169.254.169.254/latest/meta-data/public-ipv4
- Method

  Supports GET requests.
- Example

  curl http://169.254.169.254/latest/meta-data/public-ipv4

  ```
  46.1.1.2
  ```

Public Keys (EC2 Compatible API)

This interface is used to query the public key of a BMS.

- URI

  /169.254.169.254/latest/meta-data/public-keys/0/openssh-key
- Method

  Supports GET requests.
- Example

  curl http://169.254.169.254/latest/meta-data/public-keys/0/openssh-key

```
ssh-rsa AAAAB3NzaC1yc2EAAAADAQABAAABAQDI5Fw5k8Fgzajn1zJwLoV3+wMP+6CyvsSiIc/
hioggSnYu/AD0Yqm8vVO0kWlun1rFbdO+QUZKyVr/OPUjQSw4SRh4qsTKf/+eFoWTjplFvd1WCBZzS/
WRenxIwR00KkczHSJro763+wYcwKieb4eKRxaQoQvoFgVjLBULXAjH4eKoKTVNtMXAvPP9aMy2SLgsJNt
Mb9ArfziAiblQynq7UIfLnN3VclzPeiWrqtzjyOp6CPUXnL0lVPTvbLe8sUteBsJZwlL6K4i
+Y0lf3ryqnmQgC21yW4Dzu+kwk8FVT2MgWkCwiZd8gQ/+uJzrJFyMfUOBIklOBfuUENIJUhAB
Generated-by-Nova
```

4 Image

4.1 Private Image Overview

A private image is an image available only to the user who created it. It contains an OS, preinstalled public applications, and a user's private applications. You can create a private image in the following ways:

- **Creating a Private Image from a BMS**

  NOTE

  Currently, only a BMS that supports quick provisioning (the OS is installed on an EVS disk) can be used to create a private image.

- **Creating a Private Image from an External Image File**

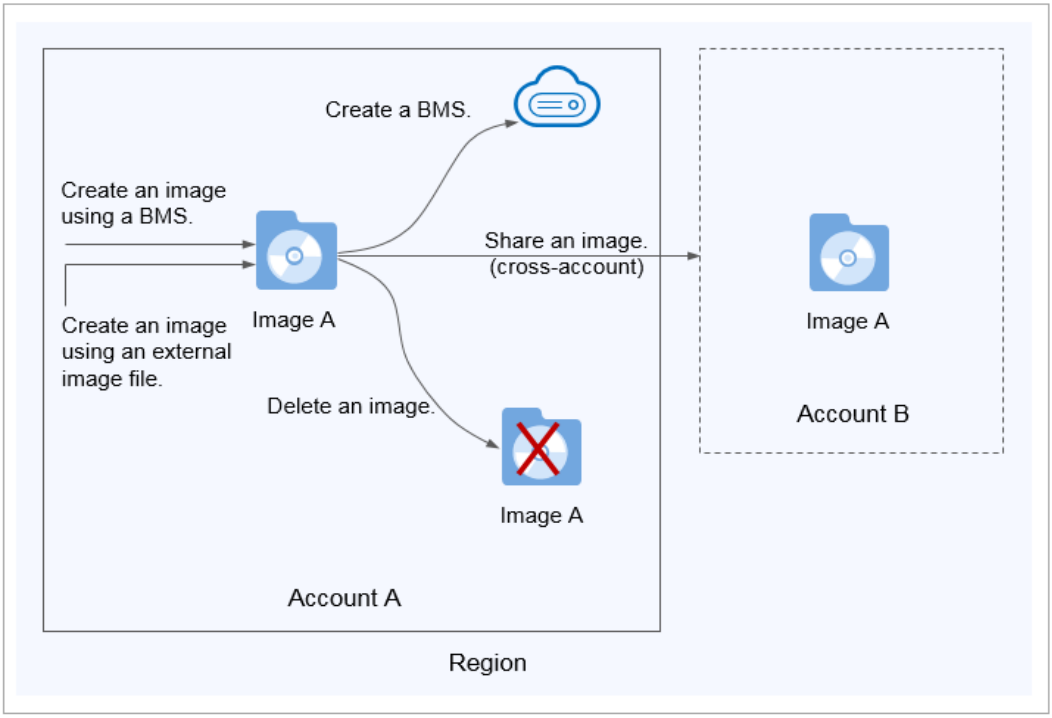
  You can upload external image files to the cloud platform and register them as your private images. Supported external image formats include VMDK, VHD, QCOW2, RAW, VHDX, QED, VDI, QCOW, ZVHD2, and ZVHD.

  NOTE

  Images of other formats must be converted using the image conversion tool before they can be used on BMSs. For details about how to convert the image format, see Image Management Service User Guide.

After a private image is created successfully, the image status becomes **Normal**. You can use the image to create BMSs or share the image with other tenants. The following figure shows how to use private images.

Figure 4-1 Using private images



4.2 Creating a Private Image from a BMS

Scenarios

You can create a private image from a BMS and copy the system disk data of the BMS to the private image. The system disk contains an OS and pre-installed applications for running services.

Constraints

- This operation is supported only when the system disk is an EVS disk.
- Data disks of a BMS cannot be exported as images.
- The BMS must be stopped.
- This operation depends on the bms-network-config and Cloud-Init plug-ins in the BMS image.
  - If the BMS is created using a public image, the image has the bms-network-config and Cloud-Init plug-ins by default.
  - If the BMS is created using a private image, check whether bms-network-config and Cloud-Init are installed by following the instructions in *Bare Metal Server Private Image Creation Guide*.

Precautions

- Delete sensitive data from the BMS before using it to creating a private image to prevent data leak.
- Delete residual files from the OS. For details, see "Deleting Files" in *Bare Metal Server Private Image Creation Guide*.

- During the image creation process, do not change the BMS status. Otherwise, the image will fail to be created.

Procedure

1. Log in to the management console.
2. Under **Computing**, click **Bare Metal Server**.

   The BMS console is displayed.
3. Locate the row that contains the target BMS, click **More** in the **Operation** column, and select **Stop** from the drop-down list.

   Only a BMS in stopped state can be used to create a private image.
4. After the BMS status changes to **Stopped**, click **More** in the **Operation** column and select **Make Image**.

   The page for creating an image is displayed.
5. Enter the image name, set a tag, and enter description as needed.

   Click **Create Now**.
6. On the displayed **Details** page, confirm the configuration and click **Submit**.
7. Return to the image list. If the status of the private image changes to **Normal**, the private image is created successfully.

Follow-up Operations

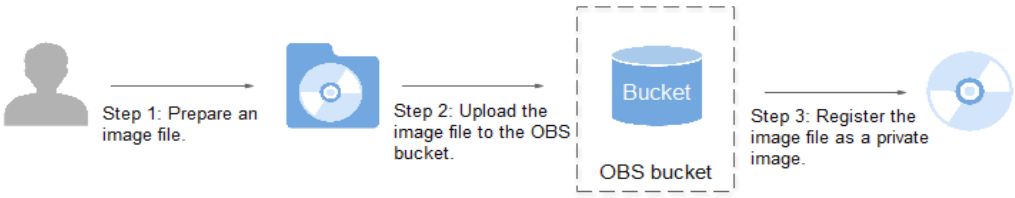
If you want to create BMSs using the private image, see **Creating a BMS Using a Private Image**. On the page for creating BMSs, select the private image you have created.

4.3 Creating a Private Image from an External Image File

Scenarios

You can create and register a private image using an external image file. **Figure 4-2** shows the procedure.

Figure 4-2 Creating a private image from an external image file



The procedure contains the following steps:

1. Prepare an image file. For details, see *Bare Metal Server Private Image Creation Guide*.

2. Upload the image file to your OBS bucket. For details, see **Upload an External Image File**.
3. On the management console, select the uploaded image file and register it as a private image. For details, see **Register a Private Image**.

Upload an External Image File

You can import an image file in VHD, VMDK, QCOW2, RAW, VHDX, QCOW, VDI, QED, ZVHD, or ZVHD2 format to create a private image.

Use OBS Browser to upload external image files. For details, see *Object Storage Service User Guide*.

When uploading the external image file, you must select an OBS bucket with standard storage.

Register a Private Image

1. Log in to the management console.
2. Under **Computing**, click **Image Management Service**.

   The IMS console is displayed.
3. Click **Create Image** in the upper right corner.
4. Configure the following information:

   Image Type and Source

   - **Type**: Select **System disk image**.
   - **Source**: Select **Image file**.

     In the bucket list, select the bucket that stores the image file and select the image file.

   Image Information

   - **Function**: Select **BMS system disk image**.

     Ensure that you have completed initialization configuration on the image file by following the instructions in *Bare Metal Server Private Image Creation Guide*.
   - **OS**: (Optional) Select the OS of the image file.

     To ensure that the image can be created and used properly, select the OS consistent with that of the image file.
   - **System Disk (GB)**: Set the system disk size. You are advised to set the value to the image system disk size plus 2 GB.
   - **Name**: Enter a name for the image to be created. The value can contain only letters, digits, spaces, hyphens (-), underscores (_), and periods (.), and cannot start or end with a space.
   - **Description**: (Optional) Enter description of the image.
5. Click **Create Now**.

   On the displayed **Details** page, confirm the configuration and click **Submit**.
6. Return to the image list. If the status of the private image changes to **Normal**, the private image is registered successfully.

NOTE

The time required for registering a private image varies depending on the size of the image file.

Follow-up Operations

You can use the private image to create a BMS by following the instructions in **Creating a BMS Using a Private Image**.

5 Disk

5.1 Attaching Data Disks

Scenarios

If the existing disks of a BMS fail to meet service requirements, for example, due to insufficient disk space or poor disk performance, you can attach more available disks to the BMS, or create more disks and attach them to the BMS.

Constraints

- The disk and the target BMS must be located in the same AZ.
- The BMS must be in **Running** or **Stopped** state.
- **Device Type** of the EVS disk must be **SCSI**.
- A non-shared EVS disk must be in **Available** state.

  A shared EVS disk must be in **In-use** or **Available** state.
- BMSs using some flavors or images cannot have EVS disks attached because the servers do not have SDI iNICs or for other reasons.

Prerequisites

Disks are available.

For details about how to create disks, see "Creating an EVS Disk" in *Elastic Volume Service User Guide*.

NOTE

If DSS is used, see the *Dedicated Storage Service User Guide* for how to create disks.

Procedure

1. Log in to the management console.
2. Under **Computing**, click **Bare Metal Server**.

   The BMS console is displayed.

3. In the upper right corner of the BMS list, enter the name, private IP address, ID, or flavor of a BMS and click to search for the desired BMS.
4. Click the name of the target BMS.
   The page showing details of the BMS is displayed.
5. Click the **Disks** tab. Then, click **Attach Disk**.
   The **Attach Disk** dialog box is displayed.
6. Select the disk type and target disk, and set the mount point as prompted.

   NOTE

   If no EVS disks are available, click **Create Disk** in the lower part of the list.
7. Click **OK**.
   After the disk is attached, you can view the information about it on the **Disks** tab.

Follow-up Operations

If the attached disk is newly created, the disk can be used only after it is initialized (formatted). For details about how to initialize data disks, see **Initializing Data Disks**.

NOTE

After the BMS is restarted, the drive letter of the EVS disk may change. For the mapping between the EVS disk device and drive letter, see **How Do I Obtain the Drive Letter of an EVS Disk?**

5.2 Initializing Data Disks

5.2.1 Introduction to Data Disk Initialization Scenarios and Partition Styles

Scenarios

After a disk is attached to a BMS, you need to log in to the BMS to initialize (format) the disk before you can use the disk properly.

- System disk
  A system disk does not need to be initialized because it is automatically created and initialized during the BMS creation. The default disk partition style is master boot record (MBR).
- Data disk
  - If a data disk is created during the BMS creation, it will be automatically attached to the BMS.
  - If a data disk is created explicitly, you need to manually attach the data disk to the BMS.

  In both cases, the data disk can only be used after it is initialized. Choose a proper disk partition style based on your service plans.

Disk Partition Style

Table 5-1 lists the common disk partition styles. For Linux OSs, different disk partition styles require different partitioning tools.

Table 5-1 Disk partition styles

Disk Partition Style	Maximum Disk Capacity Supported	Maximum Number of Partitions Supported	Linux Partitioning Tool
Master Boot Record (MBR)	2 TB	• 4 primary partitions • 3 primary partitions and 1 extended partition With the MBR partition style, primary partitions and an extended partition can be included, where the extended partition can contain several logical partitions. For example, if 6 partitions need to be created, you can create the partitions in the following two ways: • 3 primary partitions and 1 extended partition, with the extended partition containing 3 logical partitions • 1 primary partition and 1 extended partition, with the extended partition containing 5 logical partitions	• fdisk • parted
Guid Partition Table (GPT)	18 EB 1 EB = 1048576 TB	Unlimited Disk partitions allocated using GPT are not categorized.	parted

> **CAUTION**
>
> The maximum disk capacity supported by MBR is 2 TB, and that supported by GPT is 18 EB. Currently, an EVS data disk supports up to 32 TB. Therefore, use the GPT partition style if your disk capacity is greater than 2 TB.
>
> If you change the disk partition style after the disk has been used, the original data on the disk will be cleared. Therefore, select a proper disk partition style when initializing the disk.

Partitioning Operation Guide

For a disk with less than 2 TB capacity, see one of the following topics:

- **Initializing a Windows Data Disk (Windows Server 2016)**
- **Initializing a Linux Data Disk (fdisk)**
- **Initializing a Linux Data Disk (parted)**

For a disk with greater than 2 TB capacity, see one of the following topics:

- **Initializing a Windows Data Disk Greater Than 2 TB (Windows Server 2012)**
- **Initializing a Linux Data Disk Greater Than 2 TB (parted)**

5.2.2 Initializing a Windows Data Disk (Windows Server 2016)

Scenarios

This section uses Windows Server 2016 Standard 64bit to describe how to initialize a data disk attached to a BMS running Windows.

The maximum disk capacity supported by MBR is 2 TB, and that supported by GPT is 18 EB. Therefore, use the GPT partition style if your disk capacity is greater than 2 TB. For details about disk partition styles, see **Introduction to Data Disk Initialization Scenarios and Partition Styles**.

The method for initializing a disk varies depending on the OSs running on the BMS. This document is for reference only. For detailed operations and differences, see the product documents of the OSs running on the corresponding BMSs.

Prerequisites

- You have logged in to the BMS.
- A data disk has been attached to the BMS and has not been initialized.

Procedure

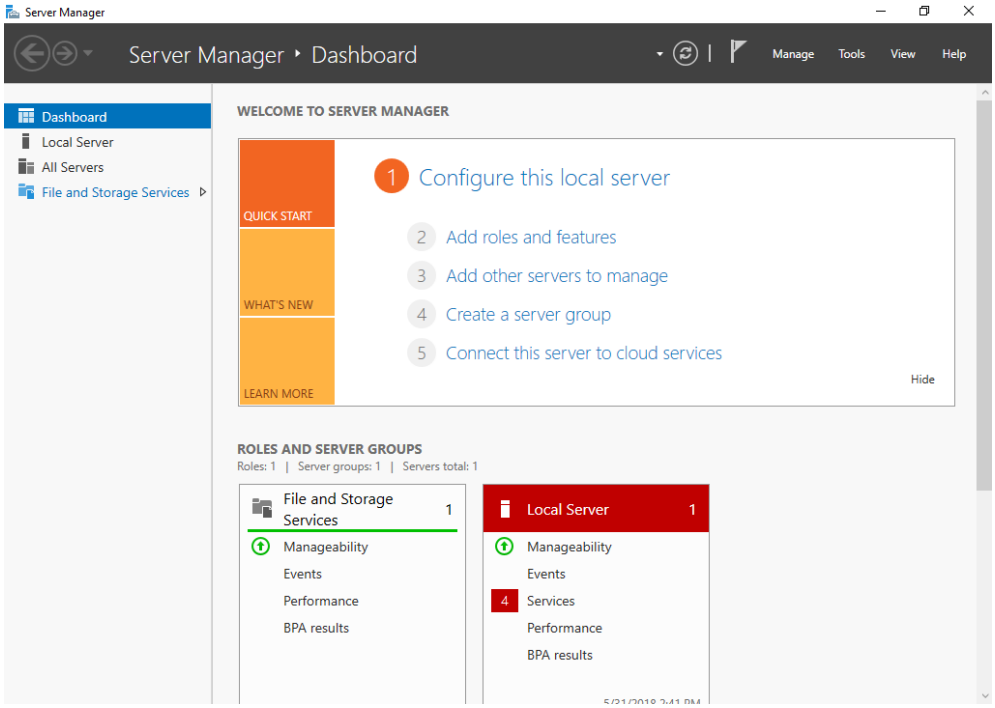
Step 1 On the BMS desktop, click the start icon in the lower left corner.

The **Windows Server** window is displayed.

Step 2 Click **Server Manager**.

The **Server Manager** window is displayed.

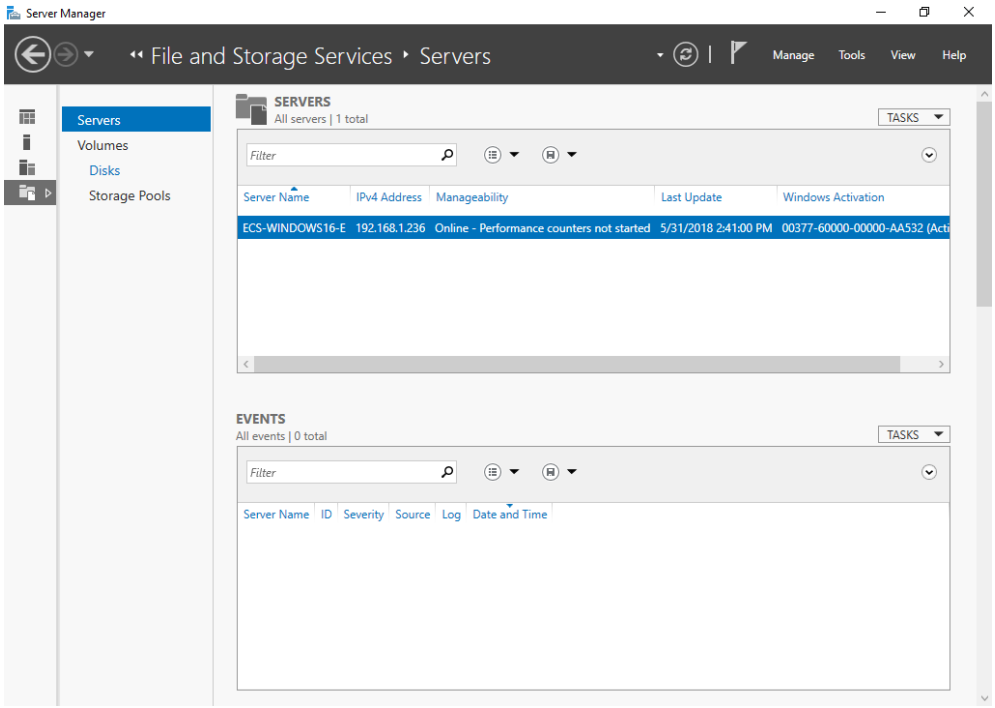
Figure 5-1 Server Manager



Step 3 In the navigation tree on the left, choose **File and Storage Services**.

The **Servers** page is displayed.

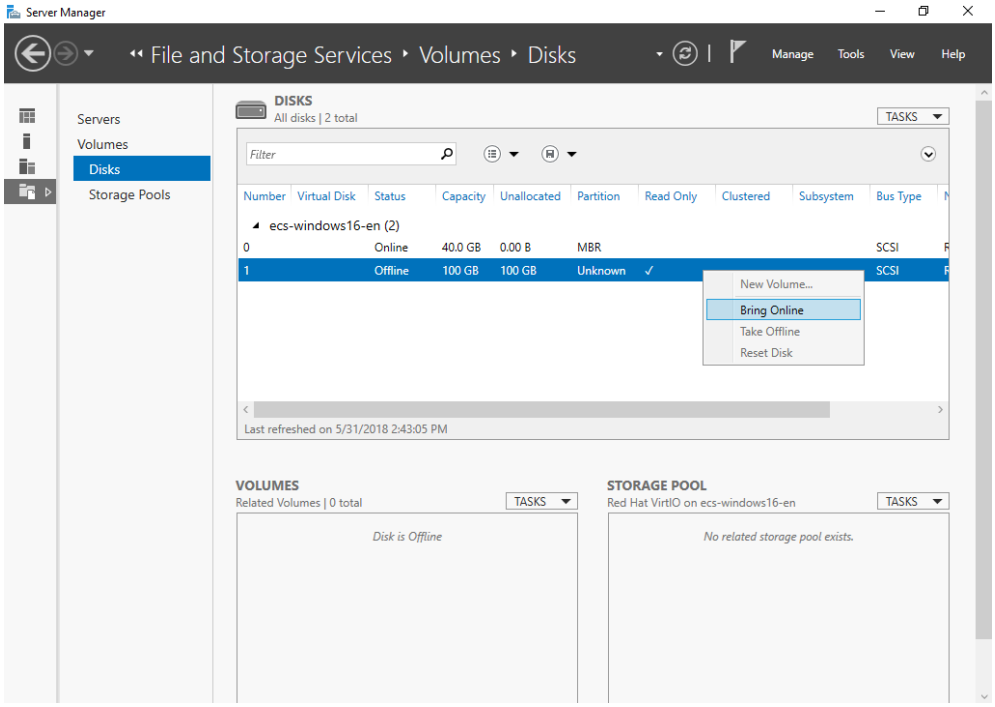
Figure 5-2 Servers



Step 4 In the navigation pane, choose **Disks**.

The **Disks** page is displayed.

Figure 5-3 Disks

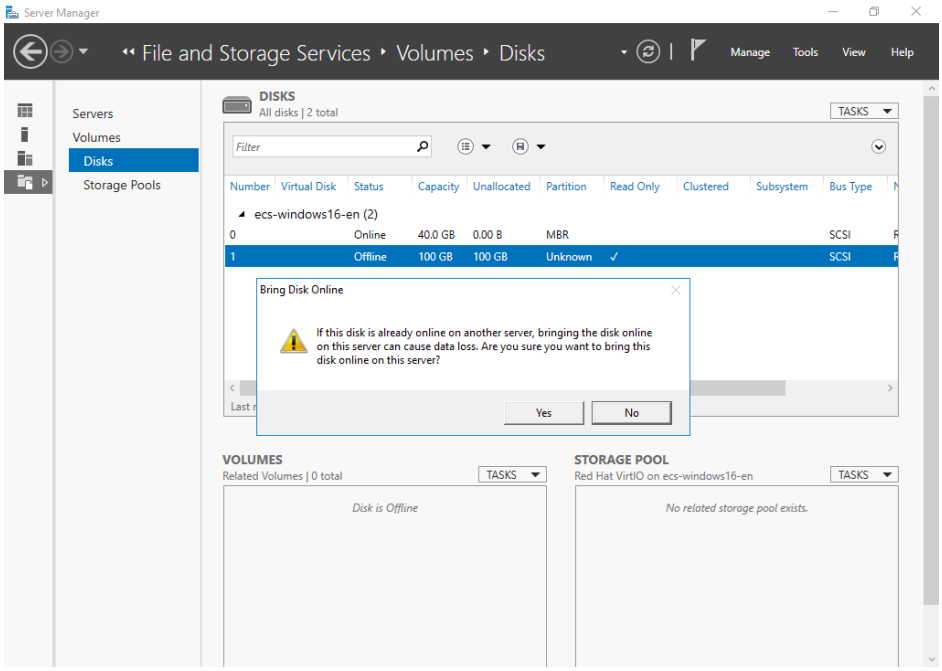


Step 5 Disks are listed in the right pane. If the new disk is in the offline state, bring it online before initialize it.

1. Right-click the new disk and choose **Bring Online** from the shortcut menu.

   The **Bring Disk Online** dialog box is displayed.

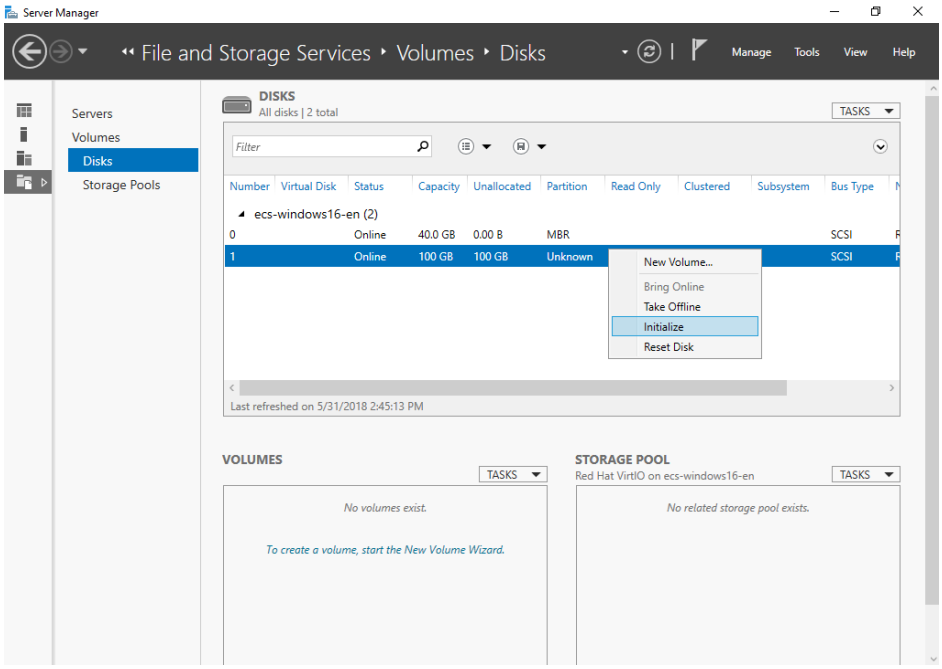
Figure 5-4 Bring Disk Online



2. Click **Yes** to confirm the operation.

3. Click  in the upper area of the page to refresh the disk information.
   When the disk status changes from **Offline** to **Online**, the disk has been brought online.

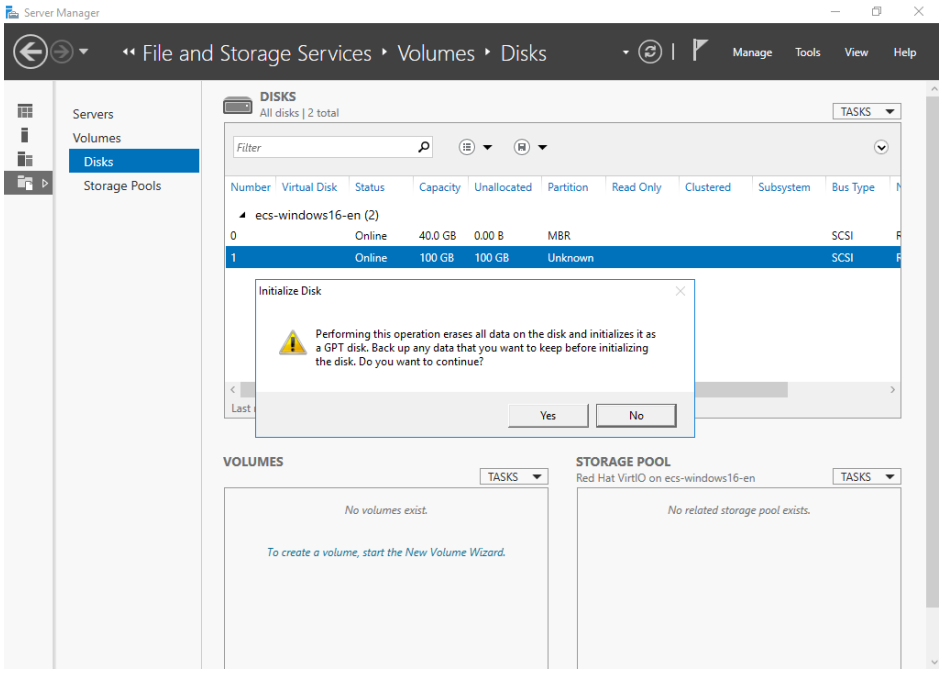
Figure 5-5 Bring online succeeded



Step 6 After the disk has been brought online, initialize the disk.

1. Right-click the new disk and choose **Initialize** from the shortcut menu.
   The **Initialize Disk** dialog box is displayed.

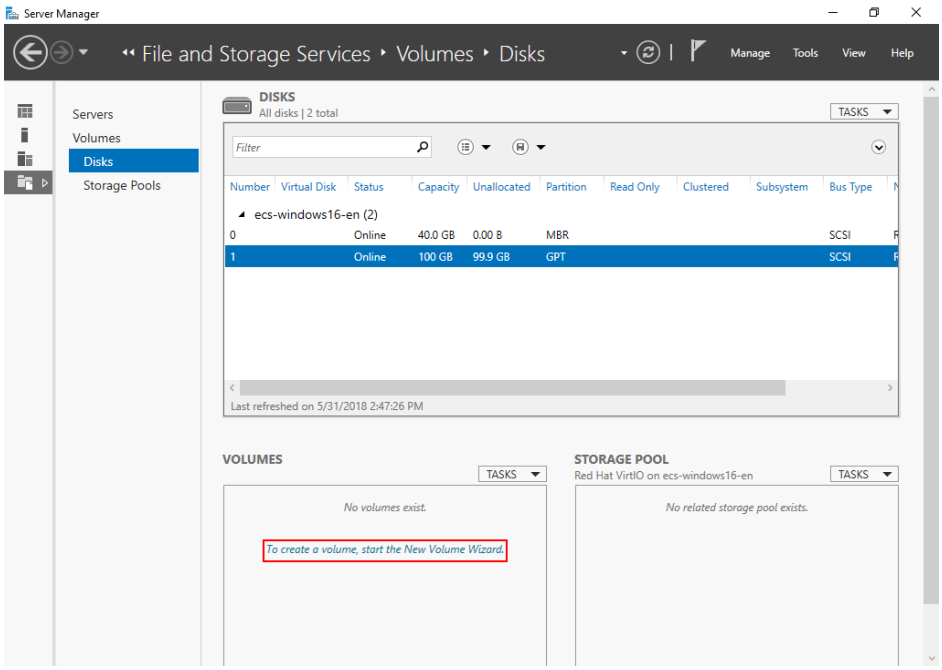
Figure 5-6 Initialize Disk (Windows 2016)



2. Click **Yes** to confirm the operation.
3. Click  in the upper area of the page to refresh the disk information.

   When the disk partition changes from **Unknown** to **GPT**, the initialization is complete.

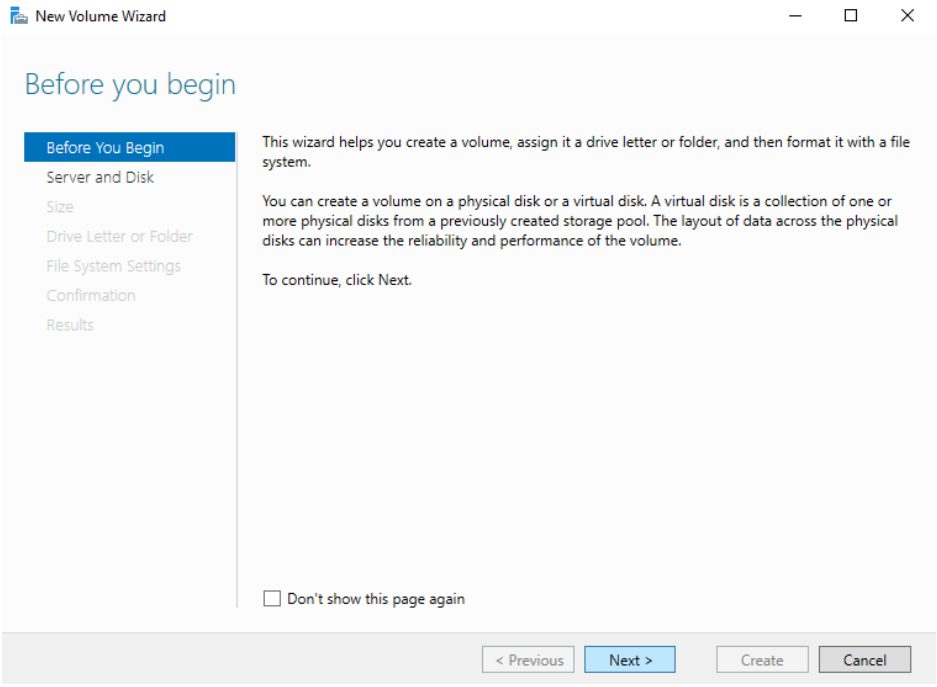
Figure 5-7 Completing initialization



Step 7 In the lower left area of the page, click **To create a volume, start the New Volume Wizard.** to create a new volume.

The **New Volume Wizard** window is displayed.

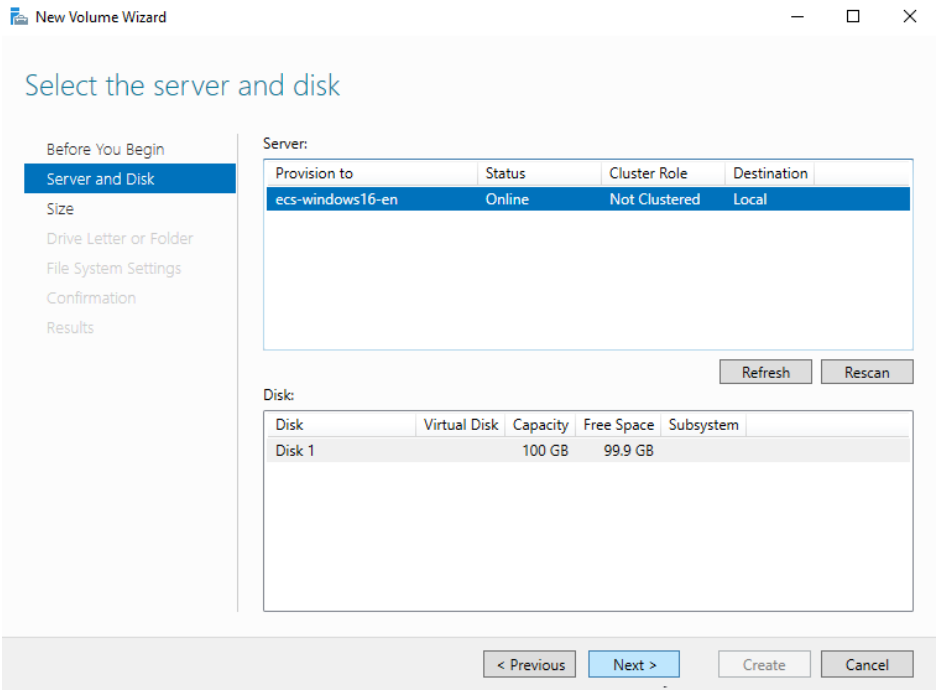
Figure 5-8 New Volume Wizard



Step 8 Follow the prompts and click **Next**.

The **Select the server and disk** page is displayed.

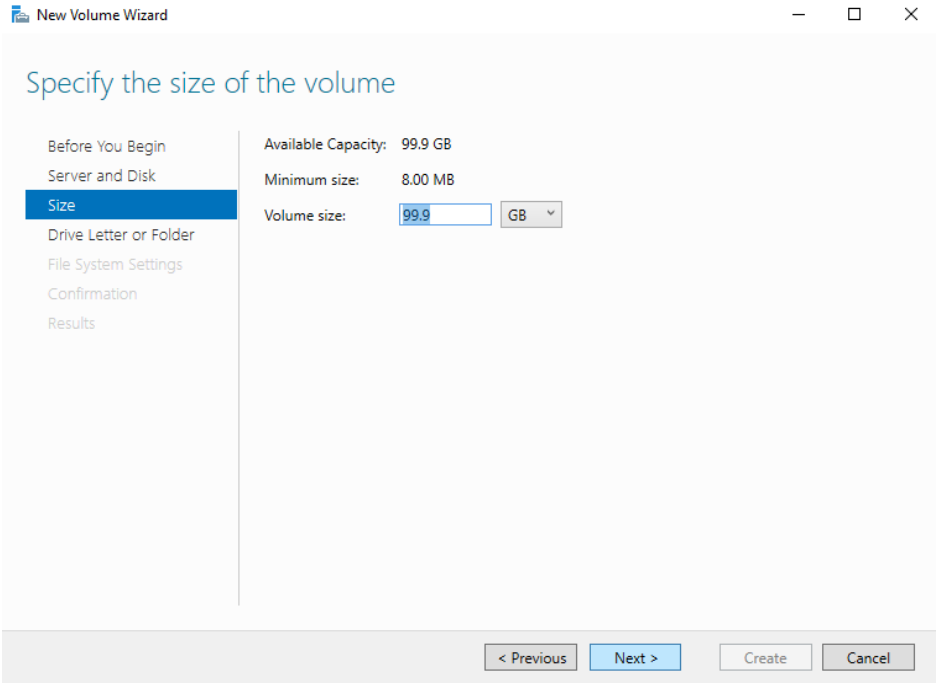
Figure 5-9 Select the server and disk



Step 9 Select the server and disk, and then click **Next**. The system selects the server to which the disk is attached by default. You can specify the server based on your requirements. In this example, the default setting is used.

The **Specify the size of the volume** page is displayed.

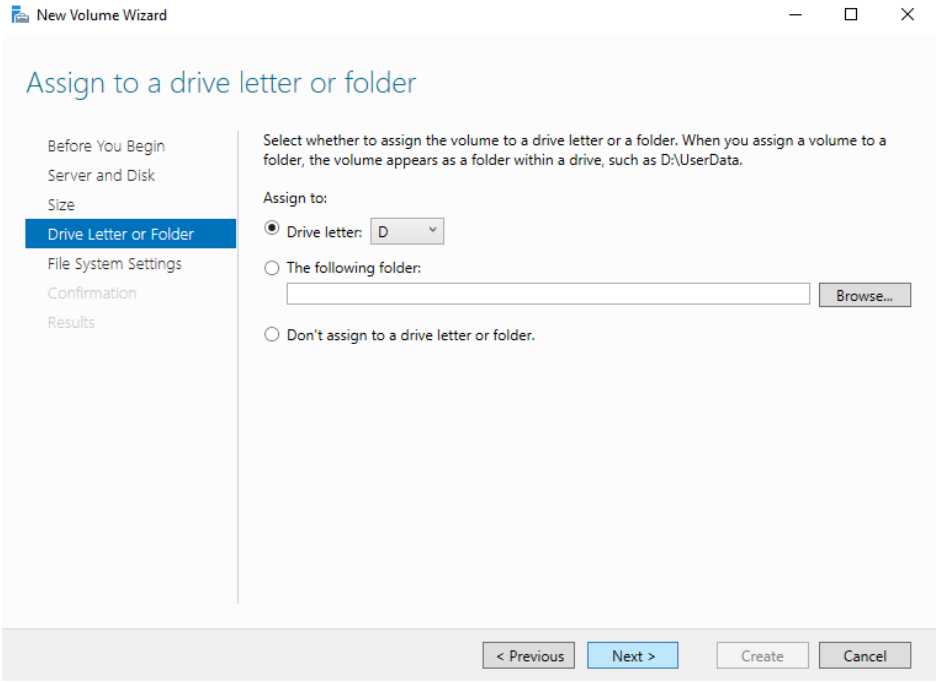
Figure 5-10 Specify Volume Size (Windows 2016)



Step 10 Specify the volume size and click **Next**. The system selects the maximum volume size by default. You can specify the volume size as required. In this example, the default setting is used.

The **Assign to a drive letter or folder** page is displayed.

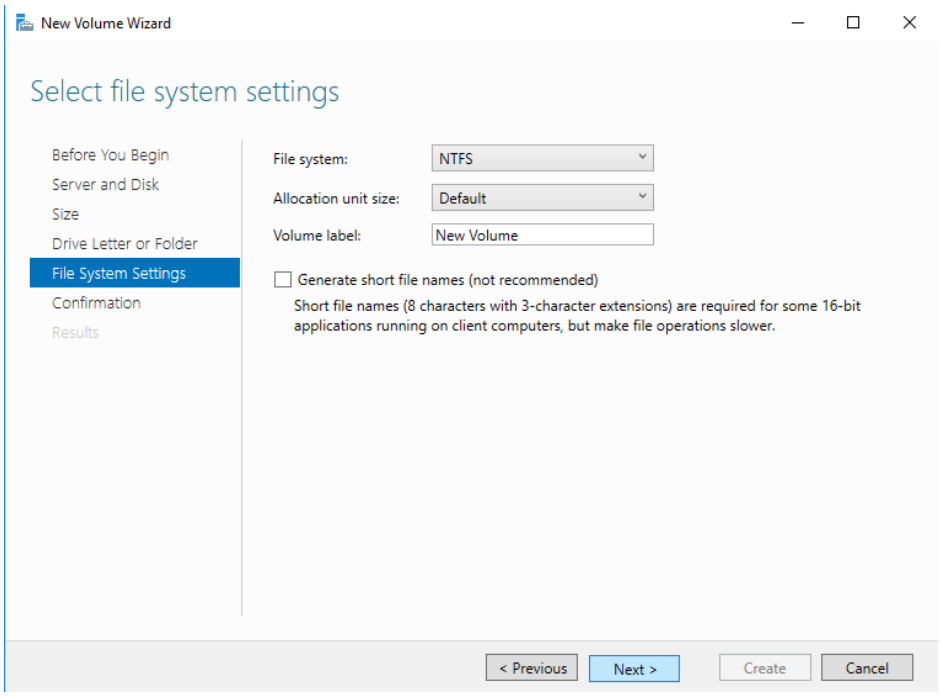
Figure 5-11 Assign to a drive letter or folder



Step 11 Assign the volume to a drive letter or folder and click **Next**. The system assigns the volume to drive letter D by default. In this example, the default setting is used.

The **Select file system settings** page is displayed.

Figure 5-12 Select file system settings



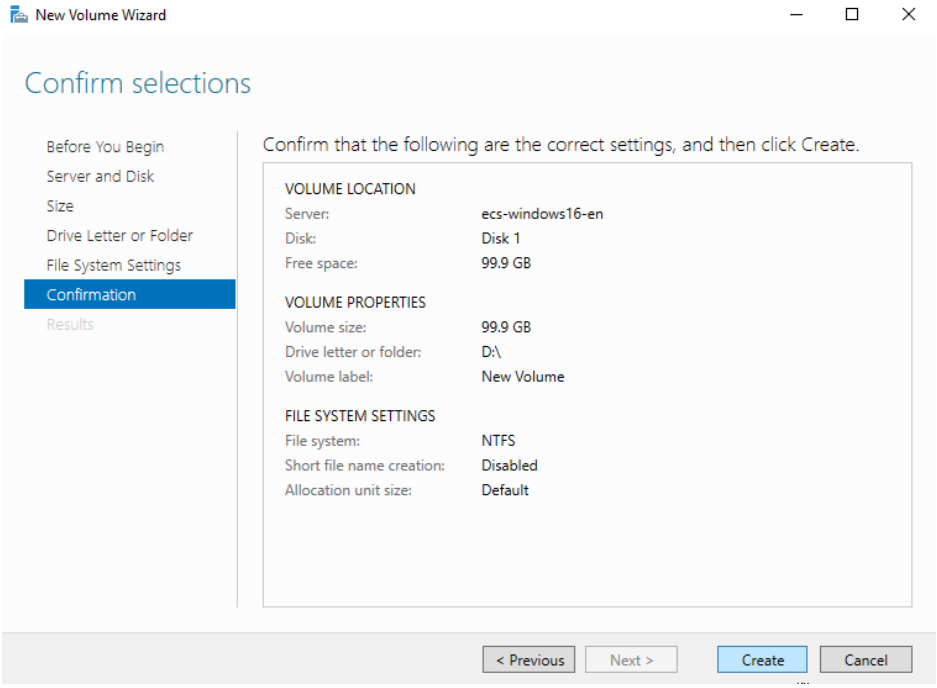
Step 12 Specify file system settings and click **Next**. The system selects the NTFS file system by default. You can specify the file system type based on the actual condition. In this example, the default setting is used.

NOTE

The partition sizes supported by file systems vary. Therefore, you are advised to choose an appropriate file system based on your service requirements.

The **Confirm selections** page is displayed.

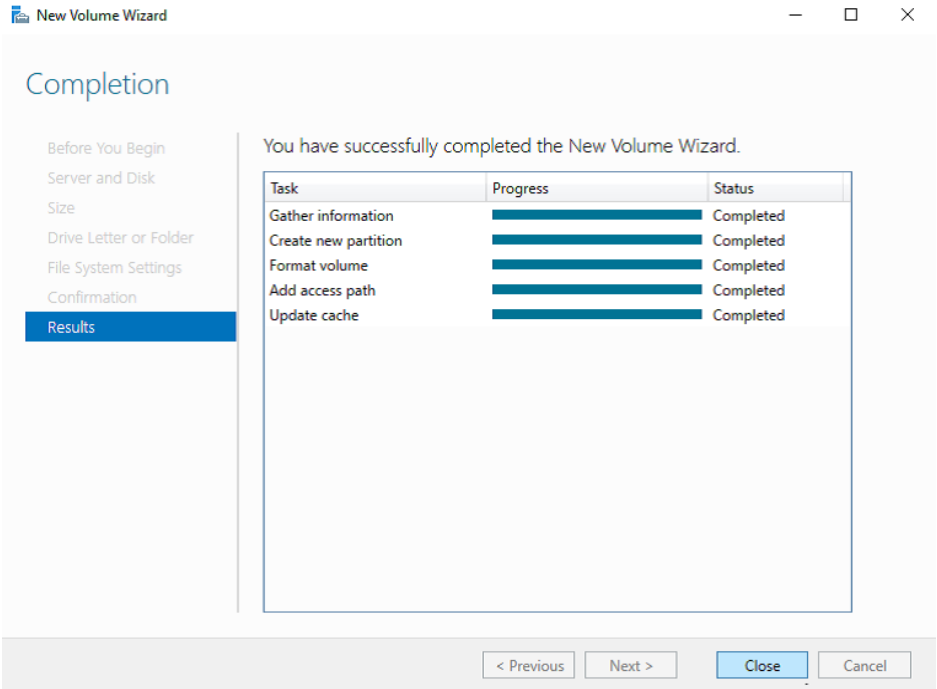
Figure 5-13 Confirm selections



Step 13 Confirm the volume location, volume properties, and file system settings. Then, click **Create** to create a volume.

If the page shown in **Figure 5-14** is displayed, the volume is successfully created.

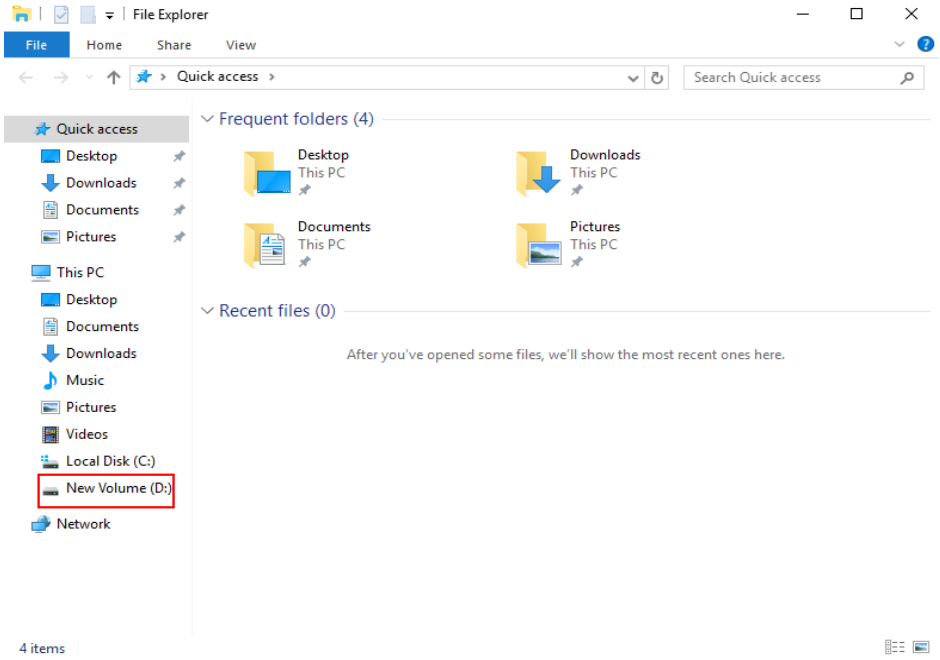
Figure 5-14 Completion



Step 14 After the volume is created, click  and check whether a new volume appears in File Explorer. In this example, New Volume (D:) is the new volume.

- If New Volume (D:) appears, the disk is successfully initialized and no further action is required.

  Figure 5-15 File Explorer

- If New Volume (D:) does not appear, perform the following operations to assign the volume to another drive letter or folder:

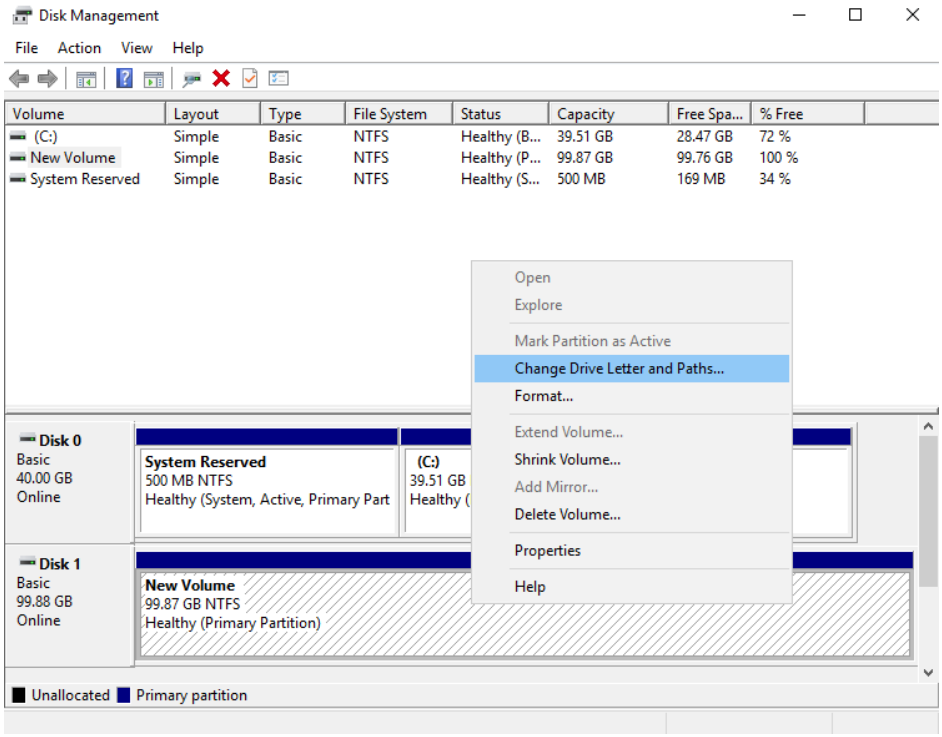
  a. Click  , enter **cmd**, and press **Enter**.

     The **Administrator: Command Prompt** window is displayed.

  b. Run the **diskmgmt** command.

     The **Disk Management** page is displayed.

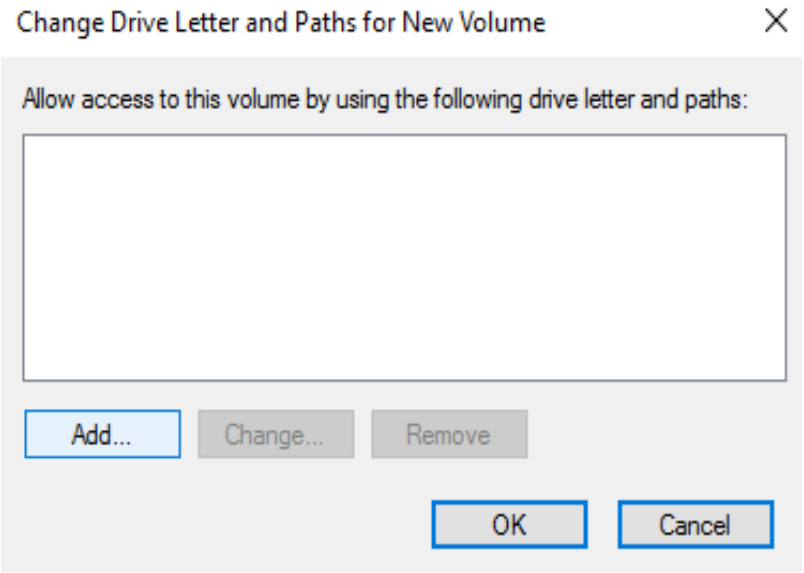
Figure 5-16 Disk Management (Windows 2016)



c. In the right pane of **Disk 1**, right-click and choose **Change Drive Letter and Paths**.

The **Change Drive Letter and Paths for New Volume** dialog box is displayed.

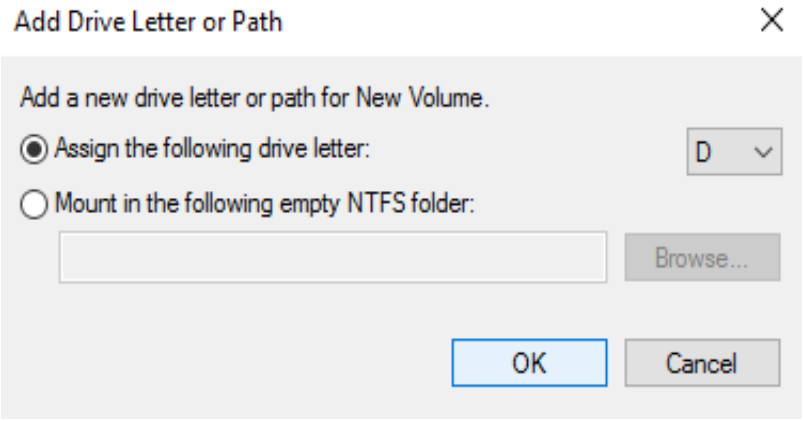
Figure 5-17 Change Drive Letter and Paths for New Volume



d. Click **Add**.

The **Add Drive Letter or Path** dialog box is displayed.

Figure 5-18 Add Drive Letter or Path



e. Select **Assign the following drive letter** to re-assign the volume to a drive letter. Then, click **OK**. Drive letter D is used in this example.

After assigning the drive letter, you can view New Volume (D:) in File Explorer.

NOTE

The drive letter selected here must be the same as that set in **Step 11**.

----End

5.2.3 Initializing a Linux Data Disk (fdisk)

Scenarios

This section uses CentOS 7.0 64-bit as an example.

The maximum disk capacity supported by MBR is 2 TB, and that supported by GPT is 18 EB. Therefore, use the GPT partition style if your disk capacity is greater than 2 TB. In Linux OSs, if the GPT partition style is used, the fdisk partitioning tool cannot be used. The parted partitioning tool must be used. For details about disk partition styles, see **Introduction to Data Disk Initialization Scenarios and Partition Styles**.

The method for initializing a disk varies depending on the OSs running on the BMS. This document is for reference only. For detailed operations and differences, see the product documents of the OSs running on the corresponding BMSs.

Prerequisites

- You have logged in to the BMS.
- A data disk has been attached to the BMS and has not been initialized.

Create Partitions and Attach a Disk

The following example shows you how to use fdisk to create a primary partition on a data disk that has been attached to the BMS. The default partitioning style is MBR and the default file system format is **ext4**. Mount the file system to **/mnt/sdc**, and configure automatic mounting upon system start.

Step 1 Run the following command to query information about the added data disk:

fdisk -l

Information similar to the following is displayed:

```
[root@bms-b656 test]# fdisk -l

Disk /dev/sda: 42.9 GB, 42949672960 bytes, 83886080 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk label type: dos
Disk identifier: 0x000cc4ad

   Device Boot      Start         End      Blocks   Id  System
/dev/xvda1   *        2048     2050047     1024000   83  Linux
/dev/xvda2         2050048    22530047    10240000   83  Linux
/dev/xvda3        22530048    24578047     1024000   83  Linux
/dev/xvda4        24578048    83886079    29654016    5  Extended
/dev/xvda5        24580096    26628095     1024000   82  Linux swap / Solaris

Disk /dev/sdb: 10.7 GB, 10737418240 bytes, 20971520 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
```

The command output shows that the BMS has two disks, system disk **/dev/sda** and data disk **/dev/sdb**.

Step 2 Run the following command to use fdisk to perform the partitioning operations for the added data disk:

fdisk *Newly added data disk*

For example, run the following command to use fdisk to perform the partitioning operations for the **/dev/sdb** data disk:

fdisk /dev/sdb

Information similar to the following is displayed:

```
[root@ecs-b656 test]# fdisk /dev/sdb
Welcome to fdisk (util-linux 2.23.2).
Changes will remain in memory only, until you decide to write them.
Be careful before using the write command.
Device does not contain a recognized partition table
Building a new DOS disklabel with disk identifier 0xb00005bd.
Command (m for help):
```

Step 3 Enter **n** and press **Enter** to create a new partition.

Information similar to the following is displayed:

```
Command (m for help): n
Partition type:
   p   primary (0 primary, 0 extended, 4 free)
   e   extended
```

There are two types of disk partitions:

- Choosing **p** creates a primary partition.
- Choosing **e** creates an extended partition.

Step 4 Recreate the partition with the same partition type as before. In this example a primary partition is used. Therefore, enter **p** and press **Enter** to create a primary partition.

Information similar to the following is displayed:

```
Select (default p): p
Partition number (1-4, default 1):
```

Partition number indicates the serial number of the primary partition. The value can be **1** to **4**.

Step 5 Enter the same partition number as the partition had before and press **Enter**. Primary partition number **1** is used in this example.

Information similar to the following is displayed:

```
Partition number (1-4, default 1): 1
First sector (2048-20971519, default 2048):
```

First sector indicates the start cylinder number. The value can be **2048** to **20971519**, and the default value is **2048**.

Step 6 Ensure that you enter the same first cylinder as the partition had before. In this example, we previously noted down **2048**, so we type in **2048** here and press **Enter**.

Information similar to the following is displayed:

```
First sector (2048-20971519, default 2048):
Using default value 2048
Last sector, +sectors or +size{K,M,G} (2048-20971519, default 20971519):
```

Last sector indicates the end cylinder number. The value can be **2048** to **20971519**, and the default value is **20971519**.

Step 7 In this example, select the default end cylinder number **20971519** and press **Enter**.

Information similar to the following is displayed:

```
Last sector, +sectors or +size{K,M,G} (2048-20971519, default 20971519):
Using default value 20971519
Partition 1 of type Linux and of size 10 GiB is set
Command (m for help):
```

A primary partition has been created for a 10-GB data disk.

Step 8 Enter **p** and press **Enter** to view the details about the created partition.

Information similar to the following is displayed:

```
Command (m for help): p

Disk /dev/sdb: 10.7 GB, 10737418240 bytes, 20971520 sectors
Units = sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk label type: dos
Disk identifier: 0xb00005bd

   Device Boot      Start         End      Blocks   Id  System
/dev/sdb1            2048    20971519    10484736   83  Linux

Command (m for help):
```

Details about the **/dev/sdb1** partition are displayed.

Step 9 Enter **w** and press **Enter** to write the partition result into the partition table.

Information similar to the following is displayed:

```
Command (m for help): w
The partition table has been altered!

Calling ioctl() to re-read partition table.
Syncing disks.
```

The partition is successfully created.

NOTE

In case that you want to discard the changes made before, you can exit fdisk by entering **q**.

Step 10 Run the following command to synchronize the new partition table to the OS:

partprobe

Step 11 Run the following command to set the format for the file system of the newly created partition:

mkfs -t *File system format* **/dev/sdb1**

For example, run the following command to set the **ext4** file system for the **/dev/sdb1** partition:

mkfs -t ext4 /dev/sdb1

Information similar to the following is displayed:

```
[root@bms-b656 test]# mkfs -t ext4 /dev/sdb1
mke2fs 1.42.9 (28-Dec-2013)
Filesystem label=
OS type: Linux
Block size=4096 (log=2)
Fragment size=4096 (log=2)
Stride=0 blocks, Stripe width=0 blocks
655360 inodes, 2621184 blocks
131059 blocks (5.00%) reserved for the super user
First data block=0
Maximum filesystem blocks=2151677952
80 block groups
32768 blocks per group, 32768 fragments per group
8192 inodes per group
Superblock backups stored on blocks:
        32768, 98304, 163840, 229376, 294912, 819200, 884736, 1605632

Allocating group tables: done
Writing inode tables: done
Creating journal (32768 blocks): done
Writing superblocks and filesystem accounting information: done
```

The formatting takes a period of time. Observe the system running status and do not exit.

NOTE

The partition sizes supported by file systems vary. Therefore, you are advised to choose an appropriate file system based on your service requirements.

Step 12 Run the following command to create a mount point:

mkdir *Mount point*

For example, run the following command to create the **/mnt/sdc** mount point:

mkdir /mnt/sdc

Step 13 Run the following command to mount the new partition on the mount point created in **Step 12**:

mount /dev/sdb1 *Mount point*

For example, run the following command to mount the newly created partition on **/mnt/sdc**:

mount /dev/sdb1 /mnt/sdc

Step 14 Run the following command to view the mount result:

df -TH

Information similar to the following is displayed:

```
[root@bms-b656 test]# df -TH
Filesystem     Type      Size  Used Avail Use% Mounted on
/dev/xvda2     xfs        11G  7.4G  3.2G  71% /
devtmpfs       devtmpfs  4.1G     0  4.1G   0% /dev
tmpfs          tmpfs     4.1G   82k  4.1G   1% /dev/shm
tmpfs          tmpfs     4.1G  9.2M  4.1G   1% /run
tmpfs          tmpfs     4.1G     0  4.1G   0% /sys/fs/cgroup
/dev/sda3      xfs       1.1G   39M  1.1G   4% /home
/dev/sda1      xfs       1.1G  131M  915M  13% /boot
/dev/sdb1      ext4       11G   38M  9.9G   1% /mnt/sdc
```

The newly created **/dev/sdb1** is mounted on **/mnt/sdc**.

----End

Set Automatic Disk Attachment Upon BMS Start

To automatically attach a disk when a BMS starts, you should not specify its partition, for example **/dev/sdb1**, in **/etc/fstab**. This is because the sequence of cloud devices may change during the server start or stop process, for example, from **/dev/sdb** to **/dev/sdc**. You are advised to use the universally unique identifier (UUID) in **/etc/fstab** to automatically attach a disk at system start.

NOTE

The universally unique identifier (UUID) is the unique character string for disk partitions in a Linux system.

Step 1 Run the following command to query the partition UUID:

blkid *Disk partition*

For example, run the following command to query the UUID of **/dev/sdb1**:

blkid /dev/sdb1

Information similar to the following is displayed:

```
[root@bms-b656 test]# blkid /dev/sdb1
/dev/sdb1: UUID="1851e23f-1c57-40ab-86bb-5fc5fc606ffa" TYPE="ext4"
```

The UUID of **/dev/sdb1** is displayed.

Step 2 Run the following command to open the **fstab** file using the vi editor:

vi /etc/fstab

Step 3 Press **i** to enter the editing mode.

Step 4 Move the cursor to the end of the file and press **Enter**. Then add the following information:

```
UUID=1851e23f-1c57-40ab-86bb-5fc5fc606ffa /mnt/sdc      ext4 defaults     0   2
```

Step 5 Press **Esc**, enter **:wq**, and press **Enter**.

The system saves the configurations and exits the vi editor.

----End

5.2.4 Initializing a Linux Data Disk (parted)

Scenarios

This section uses CentOS 7.0 64-bit as an example to describe how to initialize a data disk attached to a BMS running Linux and use parted to partition the data disk.

The maximum disk capacity supported by MBR is 2 TB, and that supported by GPT is 18 EB. Therefore, use the GPT partition style if your disk capacity is greater than 2 TB. In Linux OSs, if the GPT partition style is used, the fdisk partitioning tool cannot be used. The parted partitioning tool must be used. For details about disk partition styles, see **Introduction to Data Disk Initialization Scenarios and Partition Styles**.

The method for initializing a disk varies depending on the OSs running on the BMS. This document is for reference only. For detailed operations and differences, see the product documents of the OSs running on the corresponding BMSs.

Prerequisites

- You have logged in to the BMS.
- A data disk has been attached to the BMS and has not been initialized.

Creating Partitions and Attaching a Disk

The following example shows you how to use parted to create a partition on a new data disk that has been attached to the BMS. The default partitioning style is GPT and the default file system format is **ext4**. Mount the file system to **/mnt/sdc**, and configure automatic mounting upon system start.

Step 1 Run the following command to query information about the added data disk:

lsblk

Information similar to the following is displayed:

```
[root@bms-centos-70 linux]# lsblk
NAME    MAJ:MIN RM  SIZE RO TYPE MOUNTPOINT
sda     202:0    0   40G  0 disk
├─sda1 202:1    0    4G  0 part [SWAP]
└─sda2 202:2    0   36G  0 part /
sdb     202:16   0  10G  0 disk
```

The command output shows that the BMS has two disks, system disk **/dev/sda** and data disk **/dev/sdb**.

Step 2 Run the following command to enter parted to partition the added data disk:

parted *Added data disk*

For example, run the following command to use fdisk to perform the partitioning operations for the **/dev/sdb** data disk:

parted /dev/sdb

Information similar to the following is displayed:

```
[root@bms-centos-70 linux]# parted /dev/sdb
GNU Parted 3.1
Using /dev/sdb
Welcome to GNU Parted! Type 'help' to view a list of commands.
```

Step 3 Enter **p** and press **Enter** to view the current disk partition style.

Information similar to the following is displayed:

```
(parted) p
Error: /dev/sdb: unrecognised disk label
Model: Xen Virtual Block Device (xvd)
Disk /dev/sdb: 10.7GB
Sector size (logical/physical): 512B/512B
Partition Table: unknown
Disk Flags:
```

In the command output, the **Partition Table** value is **unknown**, indicating that the disk partition style is unknown.

Step 4 Run the following command to set the disk partition style:

mklabel *Disk partition style*

For example, run the following command to set the partition style to GPT: (Disk partition styles include MBR and GPT.)

mklabel gpt

CAUTION

The maximum disk capacity supported by MBR is 2 TB, and that supported by GPT is 18 EB. Because a data disk currently supports up to 32 TB, use the GPT partition style if your disk capacity is larger than 2 TB.

If you change the disk partition style after the disk has been used, the original data on the disk will be cleared. Therefore, select a proper disk partition style when initializing the disk.

Step 5 Enter **p** and press **Enter** to view the disk partition style.

Information similar to the following is displayed:

```
(parted) mklabel gpt
(parted) p
Model: Xen Virtual Block Device (xvd)
Disk /dev/sdb: 20971520s
Sector size (logical/physical): 512B/512B
Partition Table: gpt
Disk Flags:

Number  Start  End  Size  File system  Name  Flags
```

Step 6 Enter **unit s** and press **Enter** to set the measurement unit of the disk to sector numbers.

Step 7 Enter **mkpart opt** *2048s 100%* and press **Enter**.

In this example, one partition is created for the added data disk. Variable *2048s* indicates the disk start capacity, and variable *100%* indicates the disk end capacity. The two values are used for reference only. You can determine the number of partitions and the partition capacity based on your service requirements.

Information similar to the following is displayed:

```
(parted) mkpart opt 2048s 100%
Warning: The resulting partition is not properly aligned for best performance.
Ignore/Cancel? Ignore
```

If the preceding warning message is displayed, enter **Ignore** to ignore the performance warning.

Step 8 Enter **p** and press **Enter** to view the details about the created partition.

Information similar to the following is displayed:

```
(parted) p
Model: Xen Virtual Block Device (xvd)
Disk /dev/sdb: 20971520s
Sector size (logical/physical): 512B/512B
Partition Table: gpt
Disk Flags:

Number  Start   End        Size       File system  Name  Flags
 1      2048s   20969471s  20967424s               opt
```

Details about the **/dev/sdb1** partition are displayed.

Step 9 Enter **q** and press **Enter** to exit parted.

Step 10 Run the following command to view the disk partition information:

lsblk

Information similar to the following is displayed:

```
[root@bms-centos-70 linux]# lsblk
NAME    MAJ:MIN RM  SIZE RO TYPE MOUNTPOINT
sda     202:0    0   40G  0 disk
├─sda1 202:1    0    4G  0 part [SWAP]
└─sda2 202:2    0   36G  0 part /
sdb     202:16   0  100G  0 disk
└─sdb1 202:17   0  100G  0 part
```

In the command output, **/dev/sdb1** is the partition you created.

Step 11 Run the following command to set the format for the file system of the newly created partition:

mkfs -t *File system format* **/dev/sdb1**

For example, run the following command to set the **ext4** file system for the **/dev/xvdb1** partition:

mkfs -t ext4 /dev/sdb1

Information similar to the following is displayed:

```
[root@bms-centos-70 linux]# mkfs -t ext4 /dev/sdb1
mke2fs 1.42.9 (28-Dec-2013)
```

```
Filesystem label=
OS type: Linux
Block size=4096 (log=2)
Fragment size=4096 (log=2)
Stride=0 blocks, Stripe width=0 blocks
655360 inodes, 2620928 blocks
131046 blocks (5.00%) reserved for the super user
First data block=0
Maximum filesystem blocks=2151677925
80 block groups
32768 blocks per group, 32768 fragments per group
8192 inodes per group
Superblock backups stored on blocks:
32768, 98304, 163840, 229376, 294912, 819200, 884736, 1605632

Allocating group tables: done
Writing inode tables: done
Creating journal (32768 blocks): done
Writing superblocks and filesystem accounting information: done
```

The formatting takes a period of time. Observe the system running status and do not exit.

NOTE

The partition sizes supported by file systems vary. Therefore, you are advised to choose an appropriate file system based on your service requirements.

Step 12 Run the following command to create a mount point:

mkdir *Mount point*

For example, run the following command to create the **/mnt/sdc** mount point:

mkdir /mnt/sdc

Step 13 Run the following command to mount the new partition on the created mount point:

mount /dev/sdb1 *Mount point*

For example, run the following command to mount the newly created partition on **/mnt/sdc**:

mount /dev/sdb1 /mnt/sdc

Step 14 Run the following command to view the mount result:

df -TH

Information similar to the following is displayed:

```
[root@bms-centos-70 linux]# df -TH
Filesystem     Type      Size  Used Avail Use% Mounted on
/dev/sda2      xfs        39G  4.0G   35G  11% /
devtmpfs       devtmpfs  946M     0  946M   0% /dev
tmpfs          tmpfs     954M     0  954M   0% /dev/shm
tmpfs          tmpfs     954M  9.1M  945M   1% /run
tmpfs          tmpfs     954M     0  954M   0% /sys/fs/cgroup
/dev/sdb1      ext4       11G   38M  101G   1% /mnt/sdc
```

The newly created **/dev/sdb1** is mounted on **/mnt/sdc**.

----End

Set Automatic Disk Attachment Upon BMS Start

To automatically attach a disk when a BMS starts, you should not specify its partition, for example **/dev/sdb1**, in **/etc/fstab**. This is because the sequence of cloud devices may change during the server start or stop process, for example, from **/dev/sdb** to **/dev/sdc**. You are advised to use the universally unique identifier (UUID) in **/etc/fstab** to automatically attach a disk at system start.

NOTE

The universally unique identifier (UUID) is the unique character string for disk partitions in a Linux system.

Step 1 Run the following command to query the partition UUID:

blkid *Disk partition*

For example, run the following command to query the UUID of **/dev/sdb1**:

blkid /dev/sdb1

Information similar to the following is displayed:

```
[root@bms-b656 test]# blkid /dev/sdb1
/dev/sdb1: UUID="1851e23f-1c57-40ab-86bb-5fc5fc606ffa" TYPE="ext4"
```

The UUID of **/dev/sdb1** is displayed.

Step 2 Run the following command to open the **fstab** file using the vi editor:

vi /etc/fstab

Step 3 Press **i** to enter the editing mode.

Step 4 Move the cursor to the end of the file and press **Enter**. Then add the following information:

```
UUID=1851e23f-1c57-40ab-86bb-5fc5fc606ffa /mnt/sdc      ext4 defaults     0   2
```

Step 5 Press **Esc**, enter **:wq**, and press **Enter**.

The system saves the configurations and exits the vi editor.

----End

5.2.5 Initializing a Windows Data Disk Greater Than 2 TB (Windows Server 2012)

Scenarios

This section uses Windows Server 2012 R2 Standard 64bit to describe how to initialize a data disk whose capacity is greater than 2 TB. In the following operations, the capacity of the example disk is 3 TB.

The maximum disk capacity supported by MBR is 2 TB, and that supported by GPT is 18 EB. Therefore, use the GPT partition style if your disk capacity is greater than 2 TB. For details about disk partition styles, see **Introduction to Data Disk Initialization Scenarios and Partition Styles**.

The method for initializing a disk varies depending on the OSs running on the BMS. This document is for reference only. For detailed operations and differences, see the product documents of the OSs running on the corresponding BMSs.

Prerequisites

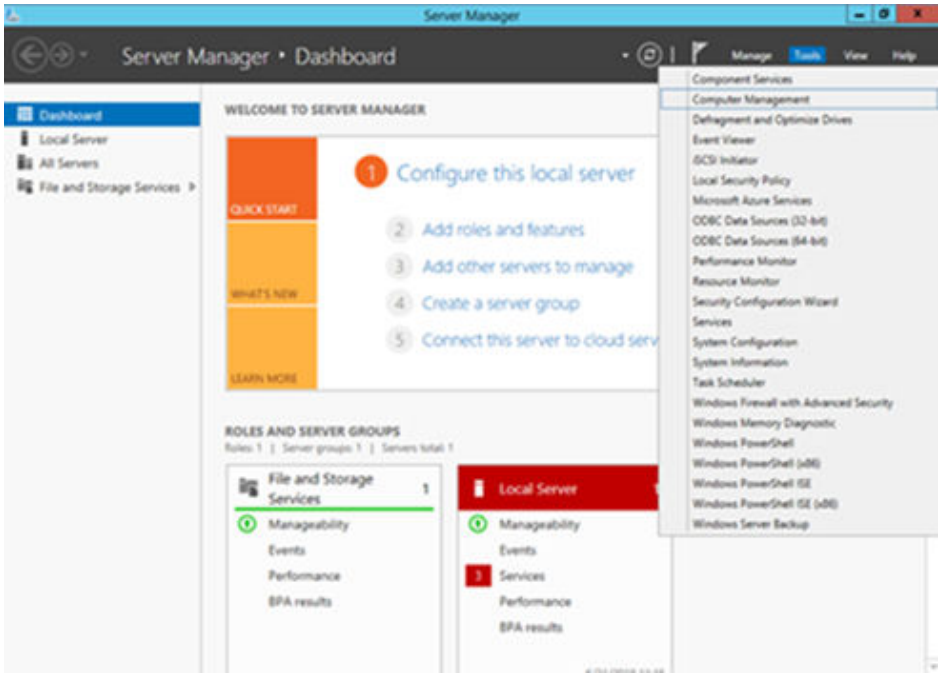
- You have logged in to the BMS.
- A data disk has been attached to the BMS and has not been initialized.

Procedure

Step 1 On the BMS desktop, click  in the lower left corner.

The **Server Manager** window is displayed.

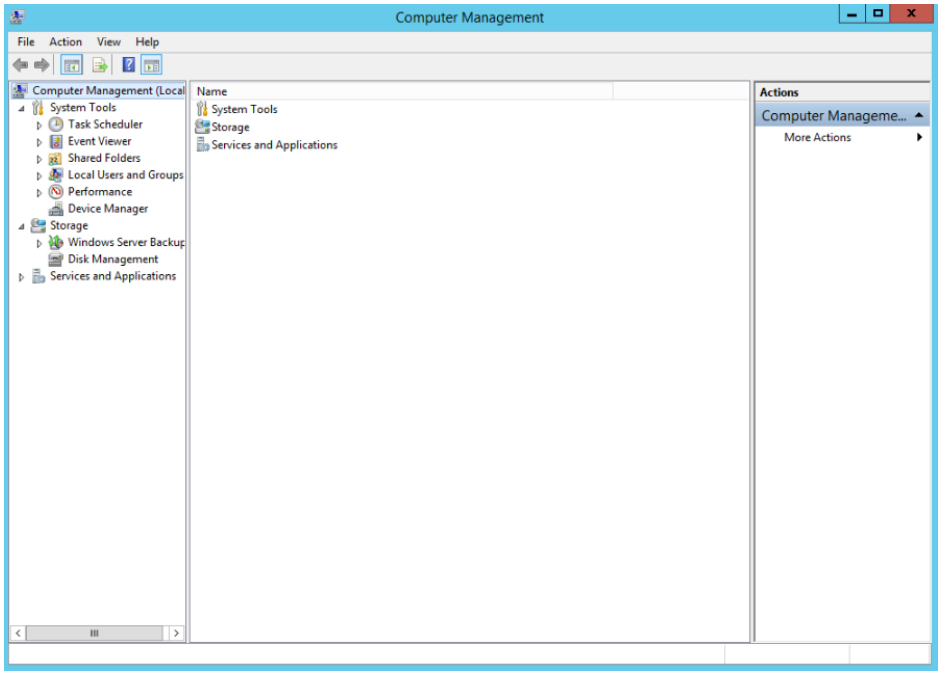
Figure 5-19 Server Manager (Windows 2012)



Step 2 In the upper right corner of the **Server Manager** page, choose **Tools** > **Computer Management**.

The **Computer Management** page is displayed.

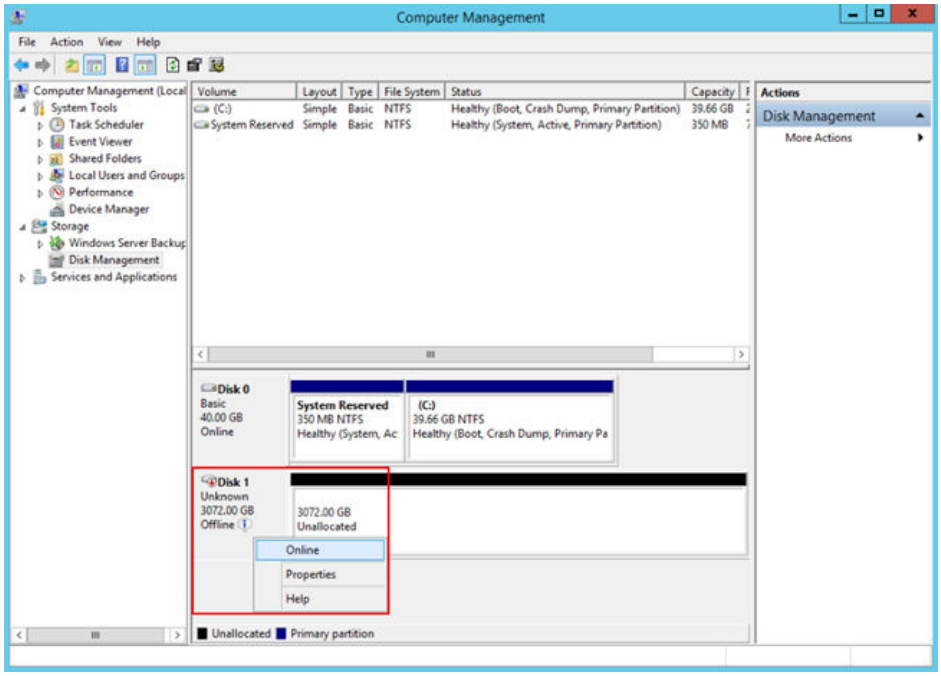
Figure 5-20 Computer Management



Step 3 Choose **Storage** > **Disk Management**.

The disk list is displayed.

Figure 5-21 Disk list

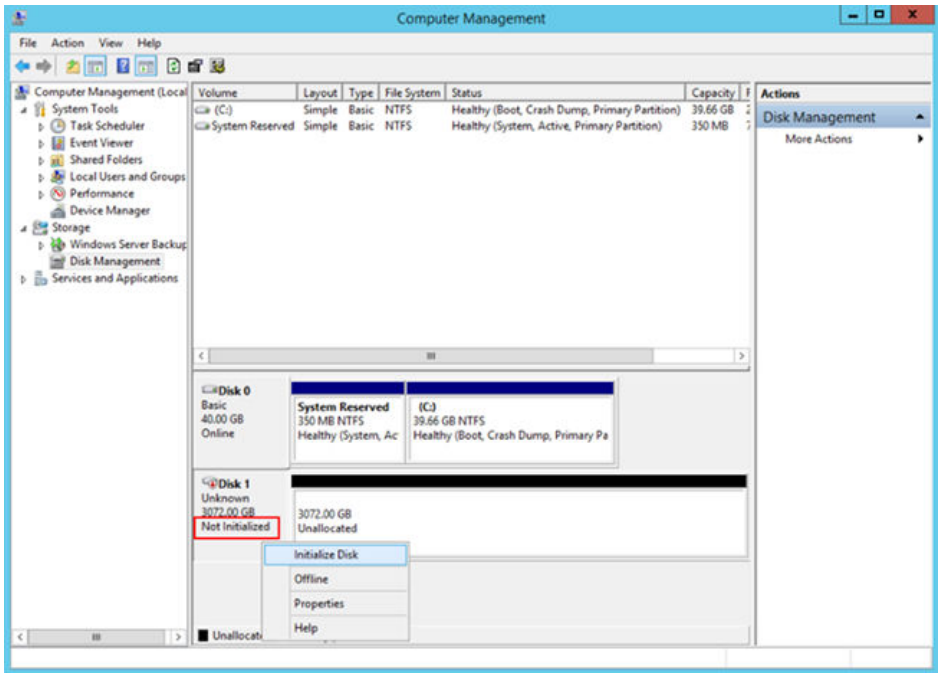


Step 4 Disks are listed in the right pane. If the new disk is in the offline state, bring it online before initialize it.

In the **Disk 1** area, right-click and choose **Online** from the shortcut menu.

When the Disk 1 status changes from **Offline** to **Not Initialized**, the disk has been brought online.

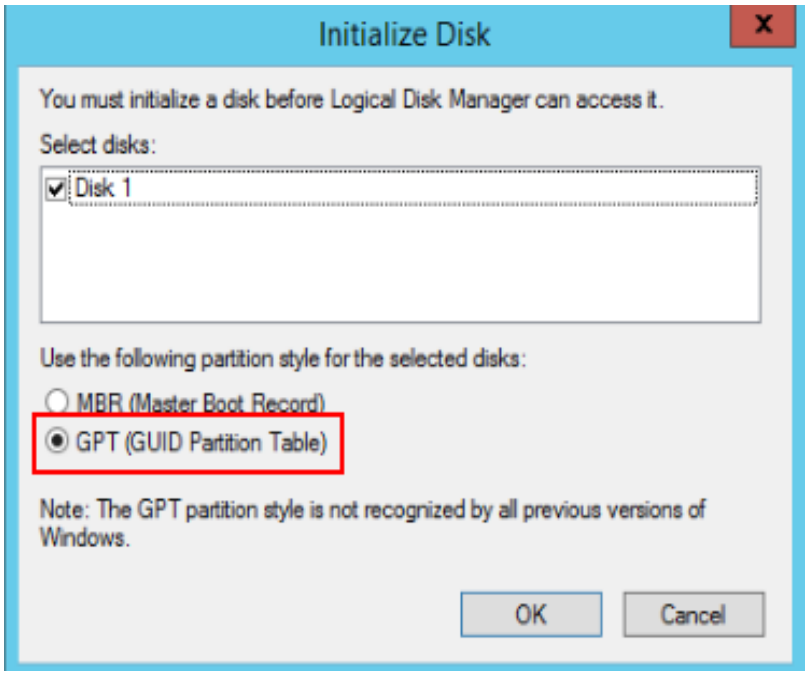
Figure 5-22 Bring online succeeded (Windows 2012)



Step 5 In the **Disk 1** area, right-click and choose **Initialize Disk** from the shortcut menu.

The **Initialize Disk** dialog box is displayed.

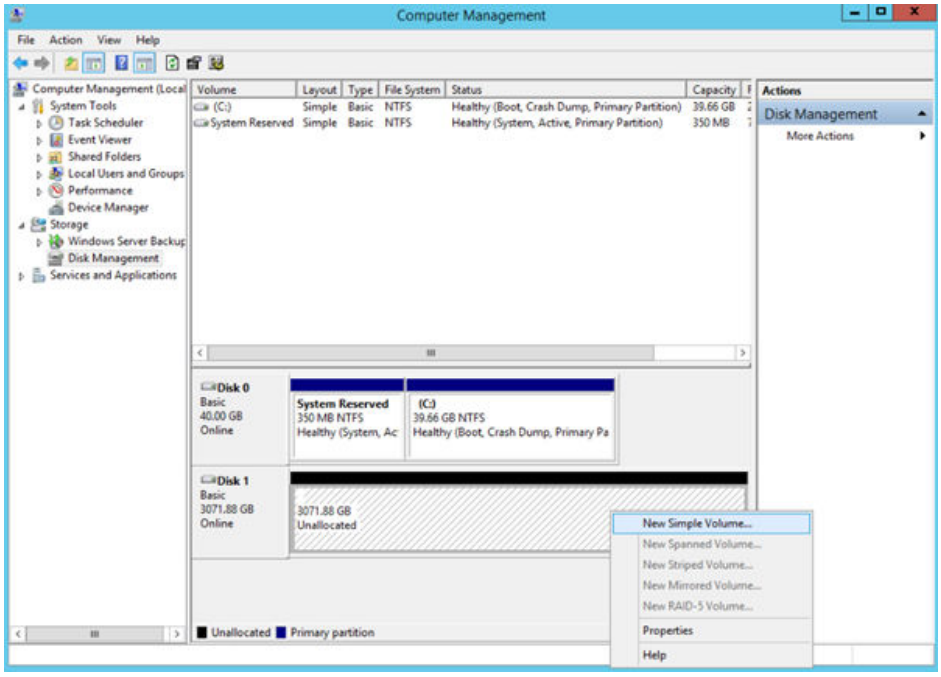
Figure 5-23 Initialize Disk (Windows 2012)



Step 6 The **Initialize Disk** dialog box displays the disk to be initialized. If the disk capacity is greater than 2 TB, select **GPT (GUID Partition Table)** and click **OK**.

The **Computer Management** page is displayed.

Figure 5-24 Computer Management (Windows 2012)



CAUTION

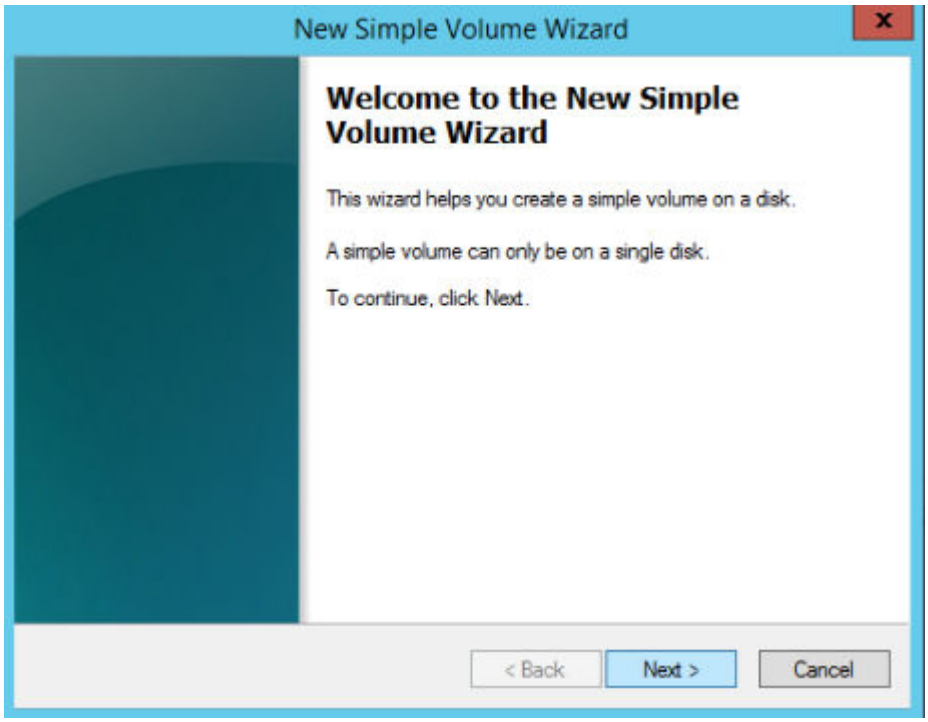
The maximum disk capacity supported by MBR is 2 TB, and that supported by GPT is 18 EB. Because a data disk currently supports up to 32 TB, use the GPT partition style if your disk capacity is larger than 2 TB.

If you change the disk partition style after the disk has been used, the original data on the disk will be cleared. Therefore, select a proper disk partition style when initializing the disk.

Step 7 Right-click at the unallocated disk space and choose **New Simple Volume** from the shortcut menu.

The **New Simple Volume Wizard** window is displayed.

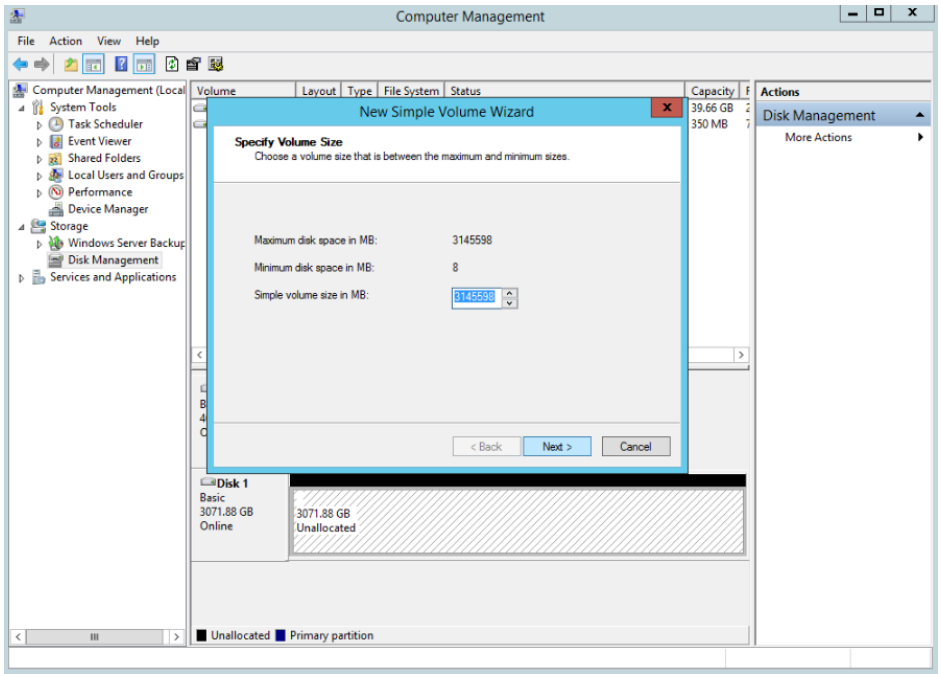
Figure 5-25 New Simple Volume Wizard (Windows 2012)



Step 8 Follow the prompts and click **Next**.

The **Specify Volume Size** page is displayed.

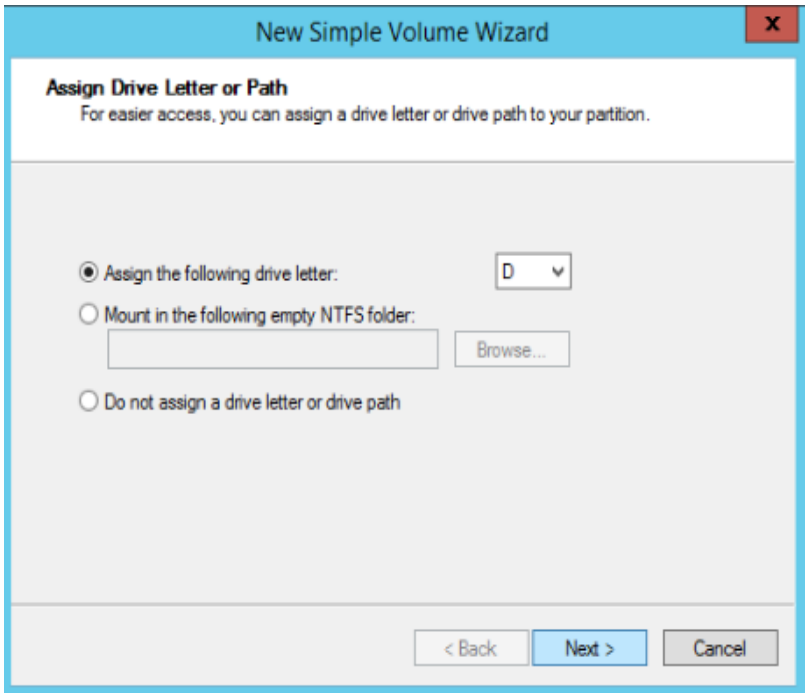
Figure 5-26 Specify Volume Size (Windows 2012)



Step 9 Specify the volume size and click **Next**. The system selects the maximum volume size by default. You can specify the volume size as required. In this example, the default setting is used.

The **Assign Drive Letter or Path** page is displayed.

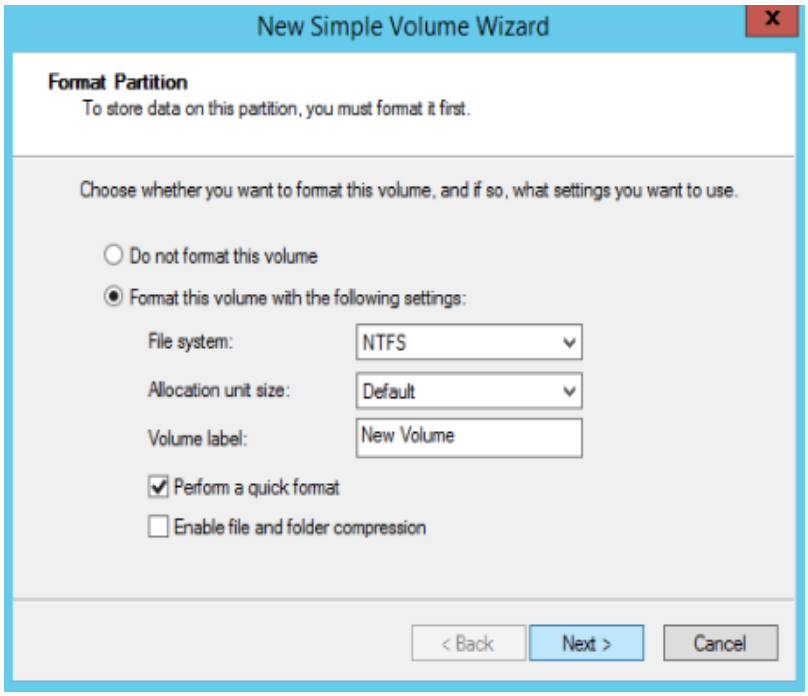
Figure 5-27 Assign Driver Letter or Path (Windows 2012)



Step 10 Assign the volume to a drive letter or folder and click **Next**. The system assigns the volume to drive letter D by default. In this example, the default setting is used.

The **Format Partition** page is displayed.

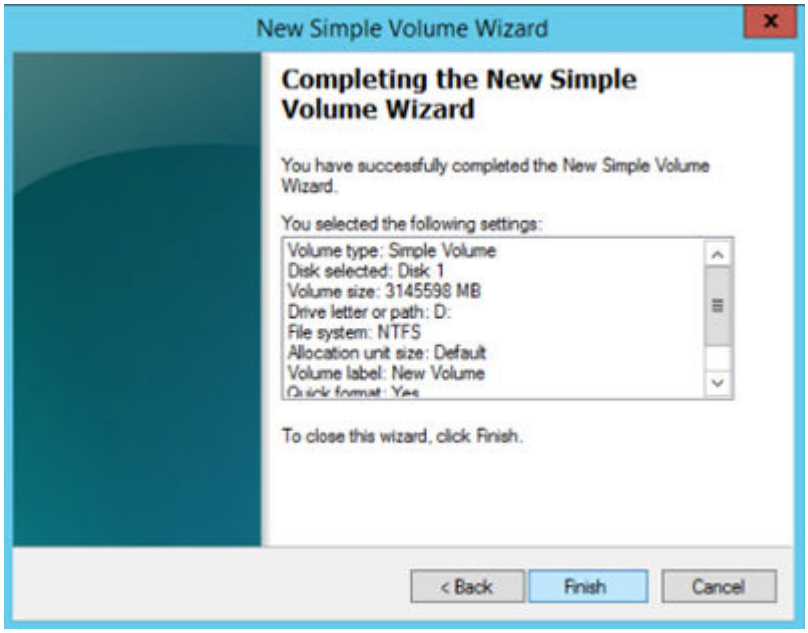
Figure 5-28 Format Partition (Windows 2012)



Step 11 Specify format settings and click **Next**. The system selects the NTFS file system by default. You can specify the file system type based on the actual condition. In this example, the default setting is used.

The **Completing the New Simple Volume Wizard** page is displayed.

Figure 5-29 Completing the New Simple Volume Wizard (Windows 2012)



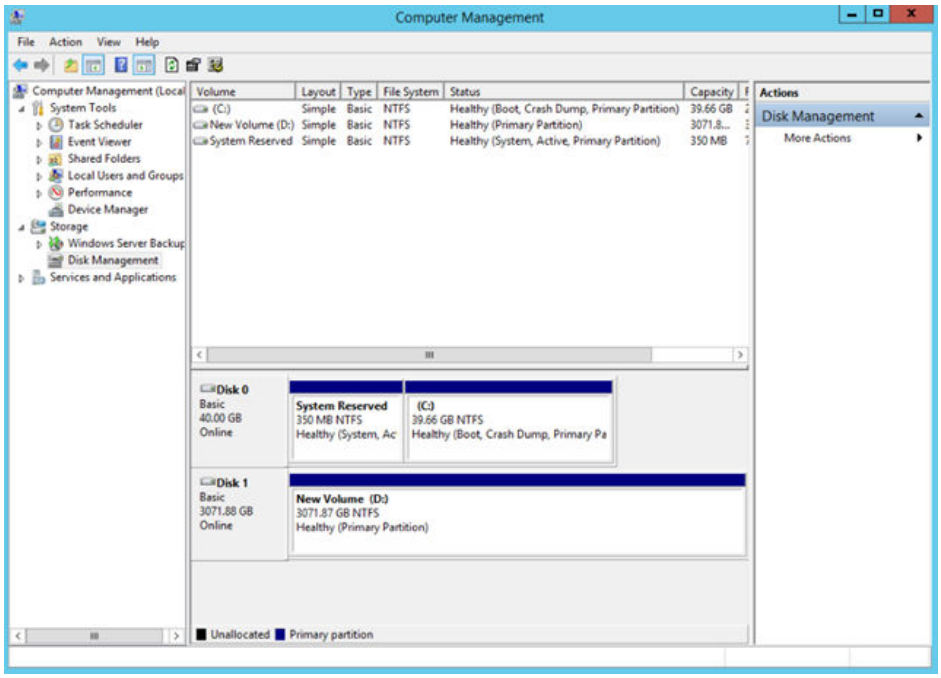
NOTE

The partition sizes supported by file systems vary. Therefore, you are advised to choose an appropriate file system based on your service requirements.

Step 12 Click **Finish**.

Wait for the initialization to complete. When the volume status changes to **Healthy**, the initialization has finished successfully, as shown in **Figure 5-30**.

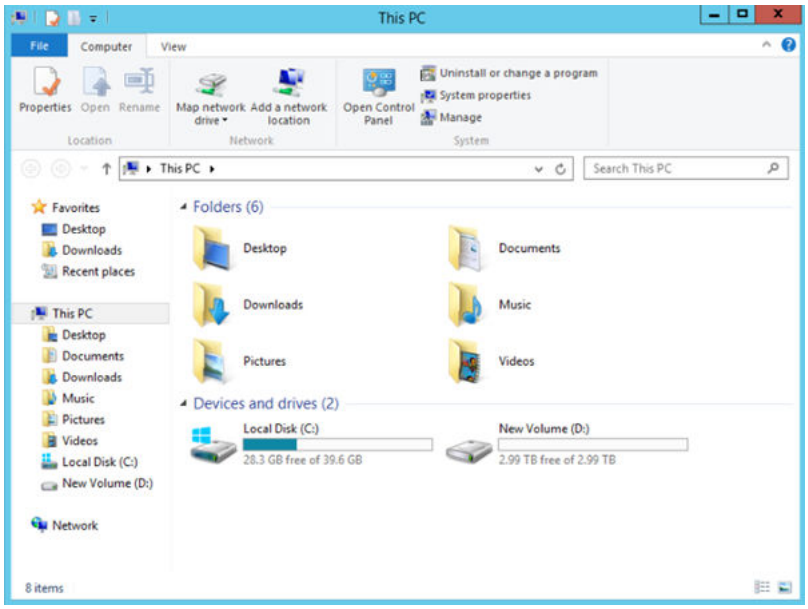
Figure 5-30 Disk initialization succeeded (Windows 2012)



Step 13 After the volume is created, click  and check whether a new volume appears in **This PC**. In this example, New Volume (D:) is the new volume.

If New Volume (D:) appears, the disk is successfully initialized and no further action is required.

Figure 5-31 This PC (Windows 2012)



----End

5.2.6 Initializing a Linux Data Disk Greater Than 2 TB (parted)

Scenarios

This section uses CentOS 7.4 64bit to describe how to use parted to initialize a data disk whose capacity is greater than 2 TB. In the following operations, the capacity of the example disk is 3 TB.

The maximum disk capacity supported by MBR is 2 TB, and that supported by GPT is 18 EB. Therefore, use the GPT partition style if your disk capacity is greater than 2 TB. In Linux OSs, if the GPT partition style is used, the fdisk partitioning tool cannot be used. The parted partitioning tool must be used. For details about disk partition styles, see **Introduction to Data Disk Initialization Scenarios and Partition Styles**.

The method for initializing a disk varies depending on the OSs running on the BMS. This document is for reference only. For detailed operations and differences, see the product documents of the OSs running on the corresponding BMSs.

Prerequisites

- You have logged in to the BMS.
- A data disk has been attached to the BMS and has not been initialized.

Creating Partitions and Attaching a Disk

The following example shows you how to use parted to create a partition on a new data disk that has been attached to the BMS. The default partitioning style is GPT and the default file system format is **ext4**. Mount the file system to **/mnt/sdc**, and configure automatic mounting upon system start.

Step 1 Run the following command to query information about the added data disk:

lsblk

Information similar to the following is displayed:

```
[root@bms-centos74 ~]# lsblk
NAME   MAJ:MIN RM SIZE RO TYPE MOUNTPOINT
vda    253:0    0  40G  0 disk
├─vda1 253:1    0   1G  0 part /boot
└─vda2 253:2    0  39G  0 part /
vdb    253:16   0   3T  0 disk
```

The command output shows that the BMS has two disks, system disk **/dev/vda** and data disk **/dev/vdb**.

Step 2 Run the following command to enter parted to partition the added data disk:

parted *Added data disk*

In this example, **/dev/vdb** is the newly added data disk.

parted /dev/vdb

Information similar to the following is displayed:

```
[root@bms-centos74 ~]# parted /dev/vdb
GNU Parted 3.1
Using /dev/vdb
Welcome to GNU Parted! Type 'help' to view a list of commands.
(parted)
```

Step 3 Enter **p** and press **Enter** to view the current disk partition style.

Information similar to the following is displayed:

```
(parted) p
Error: /dev/vdb: unrecognised disk label
Model: Virtio Block Device (virtblk)
Disk /dev/vdb: 3299GB
Sector size (logical/physical): 512B/512B
Partition Table: unknown
Disk Flags:
(parted)
```

In the command output, the **Partition Table** value is **unknown**, indicating that the disk partition style is unknown.

Step 4 Run the following command to set the disk partition style:

mklabel *Disk partition style*

The disk partition style can be MBR or GPT. If the disk capacity is greater than 2 TB, choose the GPT partition style.

mklabel gpt

CAUTION

The maximum disk capacity supported by MBR is 2 TB, and that supported by GPT is 18 EB. Because a data disk currently supports up to 32 TB, use the GPT partition style if your disk capacity is larger than 2 TB.

If you change the disk partition style after the disk has been used, the original data on the disk will be cleared. Therefore, select a proper disk partition style when initializing the disk.

Step 5 Enter **p** and press **Enter** to view the disk partition style.

Information similar to the following is displayed:

```
(parted) mklabel gpt
(parted) p
Model: Virtio Block Device (virtblk)
Disk /dev/vdb: 3299GB
Sector size (logical/physical): 512B/512B
Partition Table: gpt
Disk Flags:

Number  Start  End  Size  File system  Name  Flags

(parted)
```

Step 6 Enter **unit s** and press **Enter** to set the measurement unit of the disk to sector numbers.

Step 7 Enter **mkpart opt** *2048s 100%* and press **Enter**.

In this example, one partition is created for the added data disk. Variable *2048s* indicates the disk start capacity, and variable *100%* indicates the disk end capacity. The two values are used for reference only. You can determine the number of partitions and the partition capacity based on your service requirements.

Information similar to the following is displayed:

```
(parted) mkpart opt 2048s 100%
Warning: The resulting partition is not properly aligned for best performance.
Ignore/Cancel? Cancel
```

If the preceding warning message is displayed, enter **Cancel** to stop the partitioning. Then, find the first sector with the best disk performance and use that value to partition the disk. In this example, the first sector with the best disk performance is **2048s**. Therefore, the system does not display the warning message.

Step 8 Enter **p** and press **Enter** to view the details about the created partition.

Information similar to the following is displayed:

```
(parted) p
Model: Virtio Block Device (virtblk)
Disk /dev/vdb: 6442450944s
Sector size (logical/physical): 512B/512B
Partition Table: gpt
Disk Flags:

Number  Start  End          Size         File system  Name  Flags
 1      2048s  6442448895s  6442446848s               opt
```

Details about the **dev/vdb1** partition are displayed.

Step 9 Enter **q** and press **Enter** to exit parted.

Step 10 Run the following command to view the disk partition information:

lsblk

Information similar to the following is displayed:

```
[root@bms-centos74 ~]# lsblk
NAME   MAJ:MIN RM SIZE RO TYPE MOUNTPOINT
vda    253:0    0  40G  0 disk
├─vda1 253:1    0   1G  0 part /boot
└─vda2 253:2    0  39G  0 part /
vdb    253:16   0   3T  0 disk
└─vdb1 253:17   0   3T  0 part
```

In the command output, **/dev/vdb1** is the partition you created.

Step 11 Run the following command to set the format for the file system of the newly created partition:

mkfs -t *File system format* **/dev/vdb1**

For example, run the following command to set the **ext4** file system for the **/dev/vdb1** partition:

mkfs -t ext4 /dev/vdb1

Information similar to the following is displayed:

```
[root@bms-centos74 ~]# mkfs -t ext4 /dev/vdb1
mke2fs 1.42.9 (28-Dec-2013)
Filesystem label=
OS type: Linux
Block size=4096 (log=2)
Fragment size=4096 (log=2)
Stride=0 blocks, Stripe width=0 blocks
201326592 inodes, 805305856 blocks
40265292 blocks (5.00%) reserved for the super user
First data block=0
Maximum filesystem blocks=2952790016
24576 block groups
32768 blocks per group, 32768 fragments per group
8192 inodes per group
Superblock backups stored on blocks:
        32768, 98304, 163840, 229376, 294912, 819200, 884736, 1605632, 2654208,
        4096000, 7962624, 11239424, 20480000, 23887872, 71663616, 78675968,
        102400000, 214990848, 512000000, 550731776, 644972544

Allocating group tables: done
Writing inode tables: done
Creating journal (32768 blocks): done
Writing superblocks and filesystem accounting information: done
```

The formatting takes a period of time. Observe the system running status and do not exit.

NOTE

The partition sizes supported by file systems vary. Therefore, you are advised to choose an appropriate file system based on your service requirements.

Step 12 Run the following command to create a mount point:

mkdir *Mount point*

For example, run the following command to create the **/mnt/sdc** mount point:

mkdir /mnt/sdc

Step 13 Run the following command to mount the new partition on the created mount point:

mount /dev/vdb1 *Mount point*

For example, run the following command to mount the newly created partition on **/mnt/sdc**:

mount /dev/vdb1 /mnt/sdc

Step 14 Run the following command to view the mount result:

df -TH

Information similar to the following is displayed:

```
[root@bms-centos74 ~]# df -TH
Filesystem     Type      Size  Used Avail Use% Mounted on
/dev/vda2      ext4       42G  1.5G   38G   4% /
devtmpfs       devtmpfs  2.0G     0  2.0G   0% /dev
tmpfs          tmpfs     2.0G     0  2.0G   0% /dev/shm
tmpfs          tmpfs     2.0G  8.9M  2.0G   1% /run
tmpfs          tmpfs     2.0G     0  2.0G   0% /sys/fs/cgroup
/dev/vda1      ext4      1.1G  153M  801M  17% /boot
tmpfs          tmpfs     398M     0  398M   0% /run/user/0
/dev/vdb1      ext4      3.3T   93M  3.1T   1% /mnt/sdc
```

In the command output, the newly created **dev/vdb1** partition has been mounted on **/mnt/sdc**.

----End

Setting Automatic Disk Mounting at System Start

To automatically attach a disk when a BMS starts, you should not specify its partition, for example **/dev/vdb1**, in **/etc/fstab**. This is because the sequence of cloud devices may change during the BMS stop and start, for example, **/dev/vdb1** may change to **/dev/vdb2**. You are advised to use the UUID in **/etc/fstab** to automatically attach a disk at system start.

NOTE

The universally unique identifier (UUID) is the unique character string for disk partitions in a Linux system.

Step 1 Run the following command to query the partition UUID:

blkid *Disk partition*

For example, run the following command to query the UUID of **/dev/vdb1**:

blkid /dev/vdb1

Information similar to the following is displayed:

```
[root@bms-centos74 ~]# blkid /dev/vdb1
/dev/vdb1: UUID="bdd29fe6-9cee-4d4f-a553-9faad281f89b" TYPE="ext4" PARTLABEL="opt"
PARTUUID="c7122c92-ed14-430b-9ece-259920d5ee74"
```

In the command output, the UUID of **/dev/vdb1** is displayed.

Step 2 Run the following command to open the **fstab** file using the vi editor:

vi /etc/fstab

Step 3 Press **i** to enter the editing mode.

Step 4 Move the cursor to the end of the file and press **Enter**. Then add the following information:

```
UUID=bdd29fe6-9cee-4d4f-a553-9faad281f89b /mnt/sdc      ext4 defaults    0   2
```

Step 5 Press **Esc**, enter **:wq**, and press **Enter**.

The system saves the configurations and exits the vi editor.

----End

5.3 Detaching a Disk

Scenarios

A disk attached to a BMS can be detached.

- A disk mounted to **/dev/sda** functions as the system disk. You can only detach the system disk from a stopped BMS.
- Disks mounted to a mount point other than **/dev/sda** function as data disks and can be detached from a running or stopped BMS.

Constraints

- Detaching the system disk is a mission-critical operation. A BMS without the system disk cannot start. Exercise caution when performing this operation.
- Before detaching a data disk from a running Windows BMS, ensure that no program is reading data from or writing data to the disk. Otherwise, data will be lost.
- Before detaching a data disk from a running Linux BMS, you must log in to the BMS and run the **umount** command to cancel the association between the disk and the file system. In addition, ensure that no program is reading data from or writing data to the disk. Otherwise, detaching the disk will fail.

Procedure

1. Log in to the management console.
2. Under **Computing**, click **Bare Metal Server**.

   The BMS console is displayed.
3. Click the name of the BMS from which the disk is to be detached. The page showing details of the BMS is displayed.
4. Click the **Disks** tab. Locate the row containing the disk to be detached and click **Detach**.

5.4 Expanding Disk Capacity

If a disk does not have sufficient capacity, you can expand its capacity. Both the system disk and data disk can be expanded. The maximum size of a system disk is

1 TB. For details about how to expand the disk capacity, see "Expansion Overview" in *Elastic Volume Service User Guide*.

NOTICE

The system disk capacity of a Windows BMS that is quickly provisioned cannot be expanded. If you need to expand the capacity, contact technical support.

After the capacity expansion is successful, allocate the partition for the extended space of the DSS disk.

- For details about the follow-up operations after a system disk is expanded, see "Extending Disk Partitions and File Systems (Windows)" or "Extending Partitions and File Systems for System Disks (Linux)" in *Elastic Volume Service User Guide*.
- For details about the follow-up operations after a data disk is expanded, see "Extending Disk Partitions and File Systems (Windows)" or "Extending Partitions and File Systems for SCSI Disks (Linux)" in *Elastic Volume Service User Guide*.

6 Key Pair and Password

6.1 Using an SSH Key Pair

Scenarios

To ensure system security, you are advised to use the key authentication mode to authorize the user who attempts to log in to a BMS. Therefore, you must use an existing key pair or create a new one for remote login authentication.

- Creating a Key Pair

  If no key pair is available, create one that contains a public and a private key used for login authentication. You can use either of the following methods:

  – Create a key pair using the management console. After the creation, the public key is automatically stored in the system, and the private key is manually stored in a local directory. For details, see **Create a Key Pair on the Management Console**.

  – Use PuTTYgen to create a key pair, and save both the public and private keys to the local host. For details, see **Create a Key Pair Using PuTTYgen**. After the creation, import the key pair by following the instructions provided in **Import a Key Pair**. Then, the key pair can be used.

  NOTE

  PuTTYgen is a tool for generating public and private keys. You can obtain the tool from **https://www.chiark.greenend.org.uk/~sgtatham/putty/latest.html**.

- Using an existing key pair

  If a key pair is available locally, for example, generated using PuTTYgen, you can import the public key on the management console so that the system maintains the public key file. For details, see **Import a Key Pair**.

Create a Key Pair on the Management Console

1. Log in to the management console.
2. Under **Computing**, click **Bare Metal Server**.

   The BMS console is displayed.

3. In the navigation tree, choose **Key Pair**.
4. On the right side of the page, click **Create Key Pair**.
5. Enter the key name and click **OK**.

   An automatically populated key name consists of **KeyPair-** and a 4-digit random number. Change it to an easy-to-remember one, for example, **KeyPair-***xxxx*_**bms**.
6. Download the private key file. The file name is the specified key pair name with a suffix of .pem. Store the private key file securely. In the displayed dialog box, click **OK**.

CAUTION

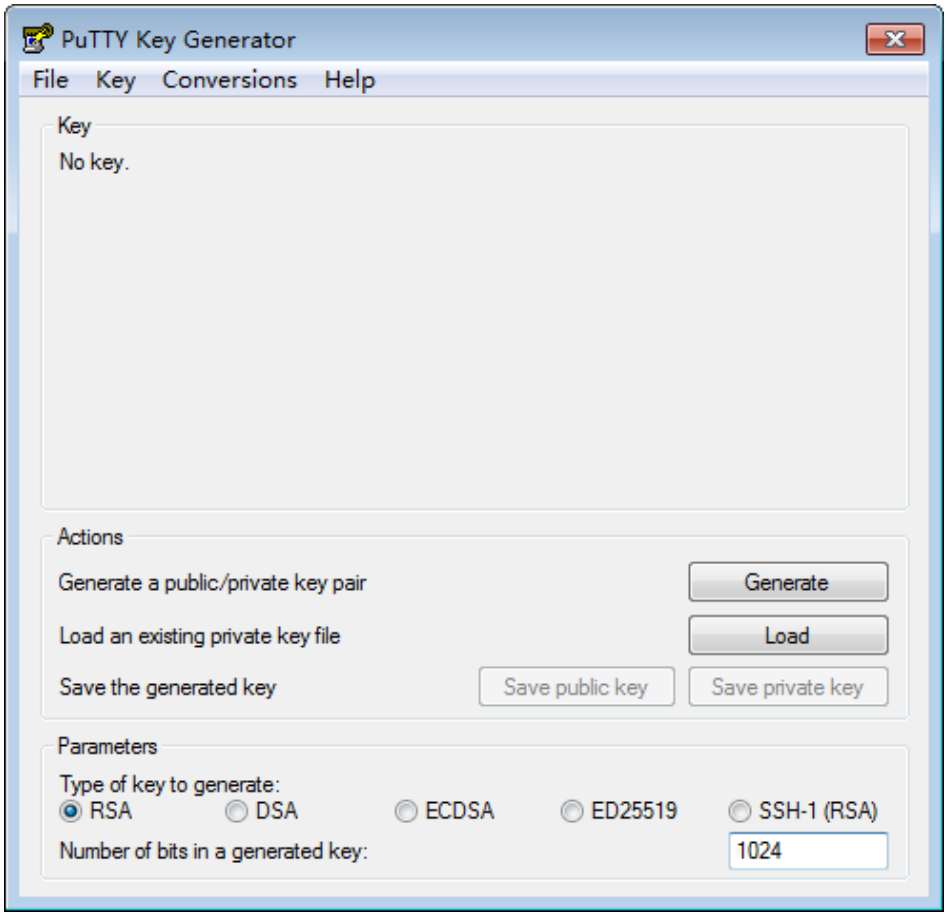
You can save the private key file only once. When you create a BMS, provide the key pair name. Each time you log in to the BMS using SSH, you need to provide the private key.

Create a Key Pair Using PuTTYgen

Step 1 Obtain the public and private keys.

1. Double-click **puttygen.exe**. The **PuTTY Key Generator** window is displayed.

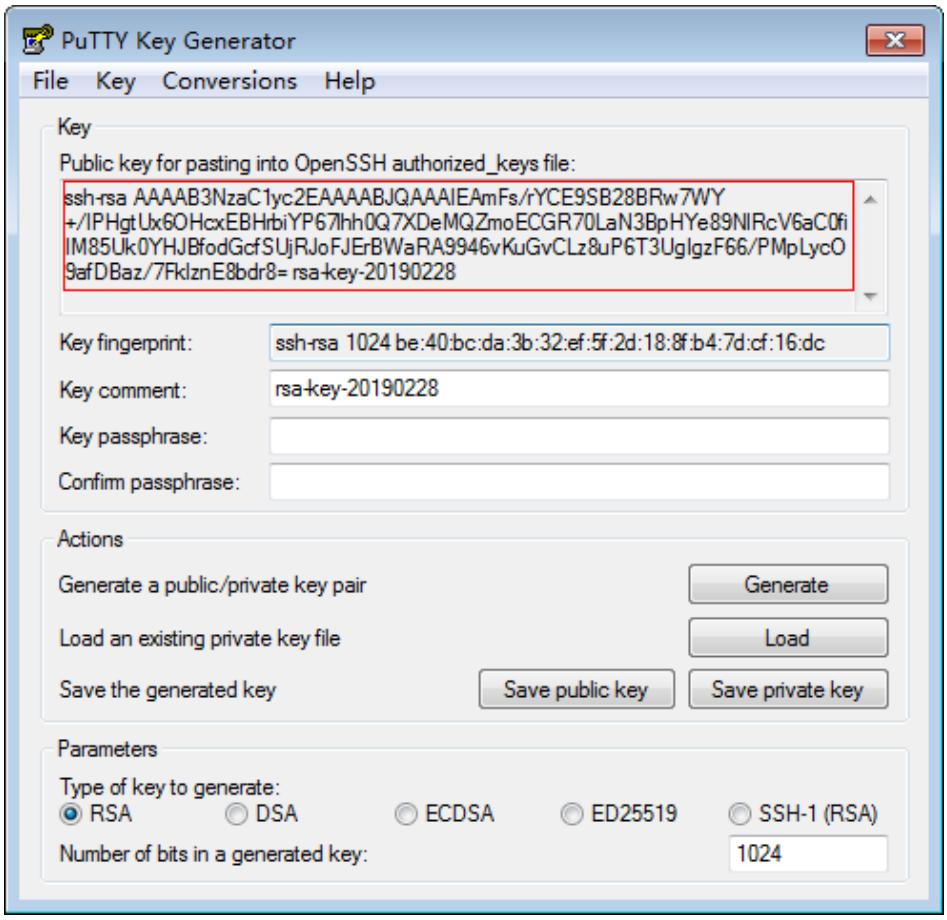
Figure 6-1 PuTTY Key Generator



2. Click **Generate**.

   The key generator automatically generates a key pair that consists of a public key and a private key. The public key is that shown in the red box in **Figure 6-2**.

   Figure 6-2 Obtaining the public and private keys



Step 2 Copy the public key content to a .txt file and save the file in a local directory.

NOTE

Do not save the public key by clicking **Save public key**. Storing a public key by clicking **Save public key** of PuTTYgen will change the format of the public key content. Such a key cannot be imported to the management console.

Step 3 Save the private key file.

The format in which to save your private key varies depending on application scenarios: To ensure BMS security, you are limited to downloading the private key only once.

- Saving the private key in .ppk format

  When you are required to log in to a Linux BMS using PuTTY, you must use the .ppk private key. To save the private key in .ppk format, perform the following operations:

  a. On the **PuTTY Key Generator** page, choose **File** > **Save private key**.

b. Save the private key, for example, **kp-123.ppk**, to the local PC.

- Saving the private key in .pem format

  When you are required to log in to a Linux BMS using Xshell or attempt to obtain the password for logging in to a Windows BMS, you must use the .pem private key for authentication. To save the private key in .ppk format, perform the following operations:

  a. On the **PuTTY Key Generator** page, choose **Conversions** > **Export OpenSSH key**.

  CAUTION

  If you use this private file to obtain the password for logging in to a Windows BMS, when you choose **Export OpenSSH key**, do not configure **Key passphrase**. Otherwise, obtaining the password will fail.

  b. Save the private key, for example, **kp-123.pem**, in a local directory.

Step 4 After the public key file and private key file are saved, import the public key to the system by referring to **Import a Key Pair**.

----End

Import a Key Pair

If you store a public key by clicking **Save public key** of PuTTYgen, the format of the public key content will change. Such a key cannot be imported to the management console. To resolve this issue, obtain the public key content in correct format and import the content to the management console. For details, see **What Do I Do If a Key Pair Created Using PuTTYgen Cannot Be Imported to the Management Console?**

1. Log in to the management console.
2. Under **Computing**, click **Bare Metal Server**.

   The BMS console is displayed.
3. In the navigation tree, choose **Key Pair**.
4. On the right side of the page, click **Import Key Pair**.
5. Use either of the following methods to import the key pair:
   - Selecting a file
     i. On the **Import Key Pair** page of the management console, click **Select File** and select the local public key file, for example, the .txt file saved in **Step 2**.

     NOTE

     When importing a key pair, ensure that the public key is imported. Otherwise, importing the key pair will fail.

     ii. Click **OK**.

     After the public key is imported, you can change its name.
   - Copying the public key content

i. Copy the content of the public key in .txt file into the **Public Key Content** text box.

ii. Click **OK**.

Delete a Key Pair

If you no longer need a key pair, you can delete it. After a key pair is deleted, it cannot be restored. However, you can still use the private key saved locally to log in to the BMS, and the deleted key pair is still displayed in the BMS details.

NOTE

- If your key pair has been bound to a BMS and you do not unbind the key pair from the BMS before deleting the key pair, you cannot create a key pair of the same name. When you enter this name when creating or importing a key pair, the console displays an error message indicating that the key pair already exists.
- If your key pair is not bound to any BMS or has been unbound from the BMS before it is deleted, you can create a key pair of the same name.

1. Log in to the management console.
2. Under **Computing**, click **Bare Metal Server**.

   The BMS console is displayed.
3. In the navigation tree, choose **Key Pair**.
4. Locate the row that contains the target key pair and click **Delete** in the **Operation** column.

6.2 Obtaining the Password of a Windows BMS

Scenarios

Password authentication mode is required to log in to a Windows BMS. Therefore, you must use the key file used when you created the BMS to obtain the administrator password generated when the BMS was initially installed. The administrator user is **Administrator** or the user configured using Cloudbase-Init. This password is randomly generated, offering high security.

Prerequisites

You have obtained the private key file used during BMS creation.

Procedure

1. Log in to the management console.
2. Under **Computing**, click **Bare Metal Server**.

   The BMS console is displayed.
3. Locate the row that contains the Windows BMS, click **More** in the **Operation** column, and select **Obtain Password**.
4. Use either of the following methods to obtain the password through the private key:
   - Click **Select File** and upload the private key from a local directory.

- Copy the private key content to the text field.

5. Click **Get Password** to obtain a random password.

6.3 Deleting the Password of a Windows BMS

Scenarios

To ensure security, you are advised to delete the initial password recorded in the system.

Deleting the initial password does not affect BMS operation or login. Once deleted, the password cannot be retrieved. Before deleting a password, you are advised to record it.

Procedure

1. Log in to the management console.
2. Under **Computing**, click **Bare Metal Server**.
   The BMS console is displayed.
3. Locate the target BMS in the BMS list.
4. In the **Operation** column, click **More** and select **Delete Password**.
   The following dialog box is displayed.
5. Click **OK** to delete the password.

7 Network

7.1 EIP

7.1.1 Binding an EIP to a BMS

Scenarios

To allow your BMS to communicate with the Internet, bind an EIP to the BMS.

Prerequisites

An EIP is available.

Procedure

1. Log in to the management console.
2. Under **Computing**, click **Bare Metal Server**.
   The BMS console is displayed.
3. Click a BMS.
   The page showing details of the BMS is displayed.
4. Click the **EIPs** tab and then **Bind EIP**.
   The **Bind EIP** dialog box is displayed.
5. Select the EIP to be bound and click **OK**.

   NOTE

   Only one EIP can be bound to a NIC.

7.1.2 Unbinding an EIP from a BMS

Scenarios

This section describes how to unbind an EIP from a BMS.

Procedure

1. Log in to the management console.
2. Under **Computing**, click **Bare Metal Server**.
   The BMS console is displayed.
3. Click a BMS.
   The page showing details of the BMS is displayed.
4. Click the **EIPs** tab. On the displayed page, locate the target EIP and click **Unbind**. In the displayed dialog box, click **Yes**.

7.2 VPC

7.2.1 Overview

VPC

A VPC provides a logically isolated network environment for BMSs. You can configure EIPs, security groups, and VPNs in a VPC and use the VPC for communication between ECSs and BMSs.

View VPC NICs

You can view the network interfaces of the VPC on the **NICs** tab page of the BMS details page. For Linux images, you can also locate the VLAN sub-interface or bond interface in the OS based on the allocated IP address.

Take CentOS 7.4 64-bit as an example. Log in to the OS and view the NIC configuration files **ifcfg-eth0**, **ifcfg-eth1**, **ifcfg-bond0**, **ifcfg-bond0.3030**, **ifcfg-bond0.2601**, and **ifcfg-bond0.2602** in the **/etc/sysconfig/network-scripts** directory. You need to use IP mapping to match the network.

Run the **ifconfig** command. The private IP address and MAC address of VPC NIC 1 is 192.168.0.190 and fa:16:3e:02:67:66. The private IP address and MAC address of VPC NIC 2 are 192.168.1.175 and fa:16:3e:16:45:4e. eth0 and eth1 automatically form bond0, and they have the same MAC address. In addition, it can be determined that **ifcfg-eth0**, **ifcfg-eth1**, **ifcfg-bond0**, and **ifcfg-bond0.3030** are VPC NIC configuration files.

```
[root@bms-ef79 network-scripts]# ifconfig
bond0: flags=5187<UP,BROADCAST,RUNNING,MASTER,MULTICAST>  mtu 8888
        inet 192.168.0.190  netmask 255.255.255.0  broadcast 192.168.0.255
        inet6 fe80::f816:3eff:fe02:6766  prefixlen 64  scopeid 0x20<link>
        ether fa:16:3e:02:67:66  txqueuelen 1000  (Ethernet)
        RX packets 329  bytes 105378 (102.9 KiB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 328  bytes 29116 (28.4 KiB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

bond0.2601: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 8888
        inet 192.168.5.23  netmask 255.255.255.0  broadcast 192.168.5.255
        inet6 fe80::f816:3eff:fe9d:7780  prefixlen 64  scopeid 0x20<link>
        ether fa:16:3e:9d:77:80  txqueuelen 1000  (Ethernet)
        RX packets 0  bytes 0 (0.0 B)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 18  bytes 1068 (1.0 KiB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

bond0.2602: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 8888
        inet 10.27.194.203  netmask 255.0.0.0  broadcast 10.255.255.255
        inet6 fe80::f816:3eff:fe5e:bbb  prefixlen 64  scopeid 0x20<link>
        ether fa:16:3e:5e:0b:bb  txqueuelen 1000  (Ethernet)
        RX packets 0  bytes 0 (0.0 B)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 18  bytes 1068 (1.0 KiB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

bond0.3030: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 8888
        inet 192.168.1.175  netmask 255.255.255.0  broadcast 192.168.1.255
        inet6 fe80::f816:3eff:fe16:454e  prefixlen 64  scopeid 0x20<link>
        ether fa:16:3e:16:45:4e  txqueuelen 1000  (Ethernet)
        RX packets 6  bytes 880 (880.0 B)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 13  bytes 1458 (1.4 KiB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

eth0: flags=6211<UP,BROADCAST,RUNNING,SLAVE,MULTICAST>  mtu 8888
        ether fa:16:3e:02:67:66  txqueuelen 1000  (Ethernet)
        RX packets 234  bytes 67810 (66.2 KiB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 328  bytes 29116 (28.4 KiB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

eth1: flags=6211<UP,BROADCAST,RUNNING,SLAVE,MULTICAST>  mtu 8888
        ether fa:16:3e:02:67:66  txqueuelen 1000  (Ethernet)
        RX packets 95  bytes 37568 (36.6 KiB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 0  bytes 0 (0.0 B)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING>  mtu 65536
        inet 127.0.0.1  netmask 255.0.0.0
        inet6 ::1  prefixlen 128  scopeid 0x10<host>
        loop  txqueuelen 1  (Local Loopback)
        RX packets 3  bytes 210 (210.0 B)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 3  bytes 210 (210.0 B)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```

The following figures show the NIC and bond configuration information.

```
[root@bms-ef79 network-scripts]# cat ifcfg-eth0
USERCTL=no
MTU=8888
NM_CONTROLLED=no
BOOTPROTO=dhcp
TYPE=Ethernet

MASTER=bond0

[root@bms-ef79 network-scripts]# cat ifcfg-eth1

MTU=8888no

BOOTPROTO=dhcpno

TYPE=Ethernet

MASTER=bond0

[root@bms-ef79 network-scripts]# cat ifcfg-bond0

USERCTL=no:16:3e:02:67:66

BONDING_MASTER=yesT=1

NM_CONTROLLED=no

BONDING_OPTS="mode=1 miimon=100"

TYPE=Bondnd0

MACADDR=fa:16:3e:16:45:4eripts]# cat ifcfg-bond0.3030

PERSISTENT_DHCLIENT=1

VLAN=yesbond0

BOOTPROTO=dhcpno

TYPE=Ethernet3030
```

7.2.2 Binding a Virtual IP Address to a BMS

Scenarios

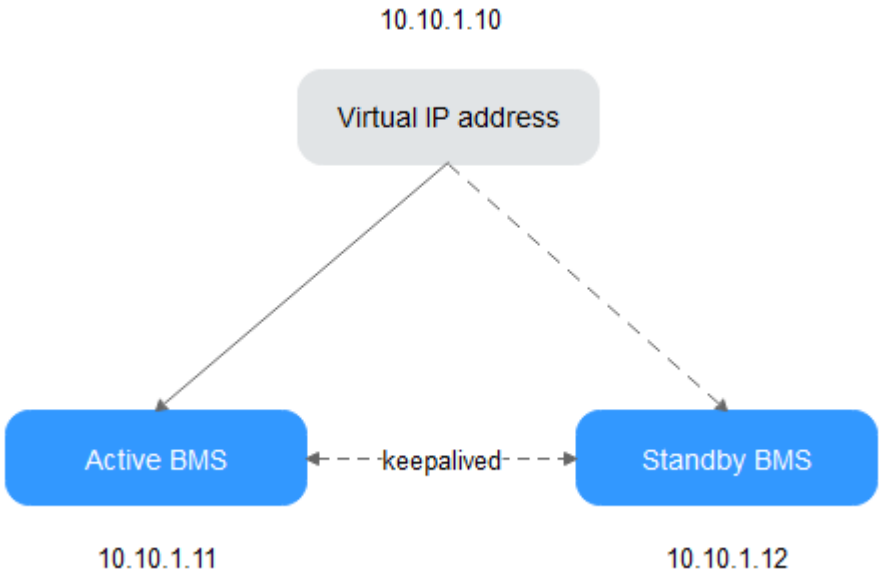
You can bind a virtual IP address to a BMS for connection redundancy. This section describes how to bind a virtual IP address to a BMS.

What Is a Virtual IP Address?

Virtual IP addresses, also called floating IP addresses, are used for active and standby switchover of servers to achieve high availability. If the active server is faulty and cannot provide services, the virtual IP address is dynamically switched to the standby server to provide services.

If you want to improve service high availability and avoid single points of failure, you can use BMSs that are deployed to work in the active/standby mode or one active and multiple standby modes. These BMSs use the same virtual IP address.

Figure 7-1 Networking diagram of the HA mode



- Bind two BMSs in the same subnet to the same virtual IP address.
- Configure Keepalived for the two BMSs to work in the active/standby mode. For details about Keepalived configurations, see the common configuration methods in the industry.

NOTE

For more information about virtual IP addresses, see *Virtual Private Cloud User Guide*.

Procedure

1. Log in to the management console.
2. Under **Computing**, click **Bare Metal Server**.
   The BMS console is displayed.
3. Click the name of the BMS to which a virtual IP address needs to be bound.
   The page showing details of the BMS is displayed.
4. Click the **NICs** tab. Then, click **Manage Virtual IP Address**.
   The page showing details of the particular VPC is displayed.
5. On the **Virtual IP Address** tab, select a desired one or click **Assign Virtual IP Address** for a new one.
6. Click **Bind to Server** in the **Operation** column and select the target BMS and the NIC to bind the virtual IP address to the NIC.

7.2.3 Setting the Source/Destination Check for a NIC

Scenarios

After source/destination check is enabled, the system checks whether source IP addresses contained in the packets sent by BMSs are correct. If the IP addresses

are incorrect, the system does not allow the BMSs to send the packets. This mechanism prevents packet spoofing, thereby improving system security.

Procedure

1. Log in to the management console.
2. Under **Computing**, click **Bare Metal Server**.

   The BMS console is displayed.
3. Click the name of the target BMS.

   The page showing details of the BMS is displayed.
4. Select the **NICs** tab. Expand the details of the target NIC.
5. Enable or disable **Source/Destination Check**.

   By default, **Source/Destination Check** is enabled. In this case, the system checks whether source IP addresses contained in the packets sent by BMSs are correct. If the IP addresses are incorrect, the system does not allow the BMSs to send the packets. If the BMS functions as a NAT server, router, or firewall, you must disable the source/destination check for the BMS.

7.3 High-Speed Network

7.3.1 Overview

High-Speed Network

A high-speed network is an internal network among BMSs and shares the same physical plane with VPC. After you create a high-speed network on the management console, the system will create a dedicated VLAN sub-interface in the BMS OS for network data communication. It uses the 10 Gbit/s port. A high-speed network has only east-west traffic and supports only communication at layer 2 because it does not support layer 3 routing.

View High-Speed NICs

You can view the network interfaces of the high-speed network on the **NICs** tab page of the BMS details page. For Linux images, you can also locate the VLAN sub-interface or bond interface in the OS based on the allocated IP address.

Take CentOS 7.4 64-bit as an example. Log in to the OS and view the NIC configuration files **ifcfg-eth0**, **ifcfg-eth1**, **ifcfg-bond0**, **ifcfg-bond0.3441**, **ifcfg-bond0.2617**, and **ifcfg-bond0.2618** in the **/etc/sysconfig/network-scripts** directory. You need to use IP mapping to match the network.

Run the **ifconfig** command. The private IP addresses of the two high-speed NICs on the console are 192.168.5.58 and 10.34.247.26. It can be determined that **ifcfg-bond0.2617** and **ifcfg-bond0.2618** are configuration files of the high-speed NICs.

```
[root@bms-373896 network-scripts]# ifconfig
bond0: flags=5187<UP,BROADCAST,RUNNING,MASTER,MULTICAST>  mtu 8888
        inet 192.168.0.153  netmask 255.255.255.0  broadcast 192.168.0.255
        inet6 fe80::f816:3eff:feb0:d27c  prefixlen 64  scopeid 0x20<link>
        ether fa:16:3e:b0:d2:7c  txqueuelen 1000  (Ethernet)
        RX packets 8119  bytes 4222333 (4.0 MiB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 459  bytes 38566 (37.6 KiB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

bond0.2617: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 8888
        inet 192.168.5.58  netmask 255.255.255.0  broadcast 192.168.5.255
        inet6 fe80::f816:3eff:fe79:b493  prefixlen 64  scopeid 0x20<link>
        ether fa:16:3e:79:b4:93  txqueuelen 1000  (Ethernet)
        RX packets 0  bytes 0 (0.0 B)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 18  bytes 1068 (1.0 KiB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

bond0.2618: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 8888
        inet 10.34.247.26  netmask 255.0.0.0  broadcast 10.255.255.255
        inet6 fe80::f816:3eff:fe5f:b999  prefixlen 64  scopeid 0x20<link>
        ether fa:16:3e:5f:b9:99  txqueuelen 1000  (Ethernet)
        RX packets 0  bytes 0 (0.0 B)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 18  bytes 1068 (1.0 KiB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

bond0.3441: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 8888
        inet 192.168.0.49  netmask 255.255.255.0  broadcast 192.168.0.255
        inet6 fe80::f816:3eff:fe86:31f4  prefixlen 64  scopeid 0x20<link>
        ether fa:16:3e:86:31:f4  txqueuelen 1000  (Ethernet)
        RX packets 219  bytes 10677 (10.4 KiB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 12  bytes 1416 (1.3 KiB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

eth0: flags=6211<UP,BROADCAST,RUNNING,SLAVE,MULTICAST>  mtu 8888
        ether fa:16:3e:b0:d2:7c  txqueuelen 1000  (Ethernet)
        RX packets 4164  bytes 2129931 (2.0 MiB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 459  bytes 38566 (37.6 KiB)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

eth1: flags=6211<UP,BROADCAST,RUNNING,SLAVE,MULTICAST>  mtu 8888
        ether fa:16:3e:b0:d2:7c  txqueuelen 1000  (Ethernet)
        RX packets 3955  bytes 2092402 (1.9 MiB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 0  bytes 0 (0.0 B)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING>  mtu 65536
        inet 127.0.0.1  netmask 255.0.0.0
        inet6 ::1  prefixlen 128  scopeid 0x10<host>
        loop  txqueuelen 1  (Local Loopback)
        RX packets 48  bytes 2640 (2.5 KiB)
        TX packets 48  bytes 2640 (2.5 KiB) frame 0
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
```

The following figures show the NIC and bond configuration information.

```
[root@bms-373896 network-scripts]# cat ifcfg-bond0.2617
MACADDR=fa:16:3e:79:b4:93
USERCTL=no
PHYSDEV=bond0
VLAN=yes
IPADDR=192.168.5.58
NM_CONTROLLED=no
NETMASK=255.255.255.0
BOOTPROTO=static
DEVICE=bond0.2617
ONBOOT=yesnet
You have new mail in /var/spool/mail/root
[root@bms-373896 network-scripts]# cat ifcfg-bond0.2618
MACADDR=fa:16:3e:5f:b9:99
USERCTL=no
PHYSDEV=bond0
VLAN=yes
IPADDR=10.34.247.26
NM_CONTROLLED=no
NETMASK=255.0.0.0
BOOTPROTO=static
DEVICE=bond0.2618
TYPE=Ethernet
ONBOOT=yes
[root@bms-373896 network-scripts]#
```

7.3.2 Managing High-Speed Networks

Scenarios

A high-speed network is an internal network among BMSs and provides high bandwidth for connecting BMSs in the same AZ. If you want to deploy services requiring high throughput and low latency, you can create high-speed networks.

Constraints

- When creating a BMS, the network segment used by common NICs cannot overlap with that used by high-speed NICs.
- The high-speed network does not support security groups, EIPs, DNS, VPNs, and Direct Connect connections.
- You must select different high-speed networks for different high-speed NICs of a BMS.
- After a BMS is provisioned, you cannot configure a high-speed network.

Create a High-Speed Network

1. Log in to the management console.
2. Under **Computing**, click **Bare Metal Server**.

   The BMS console is displayed.
3. Click the **High-Speed Networks** tab and then click **Create High-Speed Network**.
4. Set the name and subnet for the high-speed network and click **OK**.

Change the Name of a High-Speed Network

1. Log in to the management console.
2. Under **Computing**, click **Bare Metal Server**.

   The BMS console is displayed.
3. Click the **High-Speed Networks** tab. Locate the target high-speed network and click **Modify** in the **Operation** column.
4. Change the high-speed network name and click **OK**.

Manage Private IP Addresses

1. Log in to the management console.
2. Under **Computing**, click **Bare Metal Server**.

   The BMS console is displayed.
3. Click the **High-Speed Networks** tab. Locate the target high-speed network, click **More** in the **Operation** column, and select **Manage Private IP Address** from the drop-down list.
   - To reserve a private IP address in the high-speed network for binding the IP address to a BMS during BMS creation or for other purposes, perform steps **4** to **5**.
   - To delete a private IP address, perform step **6**.
4. Click **Assign Private IP Address**.
   - If you select **Automatic Assignment**, the system automatically assigns a private IP address.
   - If you select **Manual Assignment**, you can specify a specific IP address in the high-speed network segment as the private IP address.
5. Click **OK**.
6. Locate the row that contains the target private IP address, and click **Delete** in the **Operation** column. In the displayed dialog box, click **OK** to delete the IP address.

7.4 User-defined VLAN

7.4.1 Overview

User-defined VLAN

You can use the 10GE Ethernet NICs that are not being by the system to configure a user-defined VLAN. The QinQ technology is used to isolate networks and provide additional physical planes and bandwidths. You can create VLANs to isolate network traffic. User-defined VLAN NICs are in pairs. You can configure NIC bonding to achieve high availability. User-defined VLANs in different AZs cannot communicate with each other.

Ethernet NICs not used by the system by default do not have configuration files and are in **down** state during the system startup. You can run **ifconfig -a** to view the NIC name and run **ifconfig** *eth2* **up** to configure the NIC. The configuration method varies depending on the OS.

For example, on a Linux BMS, eth0 and eth1 are automatically bonded in a VPC network, and eth2 and eth3 are used in a user-defined VLAN. You can send packets with any VLAN tags through the two network interfaces. If you want to allocate a VLAN, configure eth2 and eth3 bonding and create the target VLAN network interface on the bond device. The method is similar to that of creating a bond device and a VLAN sub-interface in a VPC.

NOTE

In a user-defined VLAN, ports can be bonded or not, and they can only be bonded in active/standby mode.

For more information about NIC bond, visit **https://www.kernel.org/doc/Documentation/networking/bonding.txt**.

For details about how to configure a user-defined VLAN for BMSs running different OSs, see sections **Configuring a User-defined VLAN (SUSE Linux Enterprise Server 12)** to **Configuring a User-defined VLAN (Windows Server)**.

View User-defined VLANs

User-defined VLANs are presented to you through the BMS specifications. For example, if the extended configuration of a flavor is 2 x 2*10GE, a BMS created using this flavor provides one two-port 10GE NIC for connecting to the VPC as well as one two-port 10GE extension NIC for a high-speed interconnection between BMSs. You can configure VLANs on the extension NIC as needed.

7.4.2 Configuring a User-defined VLAN (SUSE Linux Enterprise Server 12)

NOTE

The network segment of the user-defined VLAN cannot overlap the network information configured on the BMS.

This section uses SUSE Linux Enterprise Server 12 SP1 (x86_64) as an example to describe how to configure a user-defined VLAN for BMSs.

Step 1 Use a key or password to log in to the BMS as user **root**.

Step 2 On the BMS CLI, run the following command to check the NIC information:

ip link

Information similar to the following is displayed.

```
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN mode DEFAULT group default
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
2: eth0: <BROADCAST,MULTICAST,SLAVE,UP,LOWER_UP> mtu 8888 qdisc mq master bond0 state UP mode DEFAULT group default qlen 1000
    link/ether fa:16:3e:3d:1c:e0 brd ff:ff:ff:ff:ff:ff
3: eth1: <BROADCAST,MULTICAST,SLAVE,UP,LOWER_UP> mtu 8888 qdisc mq master bond0 state UP mode DEFAULT group default qlen 1000
    link/ether fa:16:3e:3d:1c:e0 brd ff:ff:ff:ff:ff:ff
4: eth2: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc mq state DOWN mode DEFAULT group default qlen 1000
    link/ether 38:4c:4f:89:55:8d brd ff:ff:ff:ff:ff:ff
5: eth3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc mq state DOWN mode DEFAULT group default qlen 1000
    link/ether 38:4c:4f:89:55:8e brd ff:ff:ff:ff:ff:ff
```

```
6: bond0: <BROADCAST,MULTICAST,MASTER,UP,LOWER_UP> mtu 8888 qdisc noqueue state UP mode
DEFAULT group default
    link/ether fa:16:3e:3d:1c:e0 brd ff:ff:ff:ff:ff:ff
7: bond0.3133@bond0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 8888 qdisc noqueue state UP mode
DEFAULT group default
    link/ether fa:16:3e:57:87:6e brd ff:ff:ff:ff:ff:ff
```

NOTE

Among the devices, eth0 and eth1 bear the VPC, and eth2 and eth3 bear the user-defined VLAN.

Step 3 Configure the udev rules:

Run the following command to create the **80-persistent-net.rules** file:

cp /etc/udev/rules.d/70-persistent-net.rules /etc/udev/rules.d/80-persistent-net.rules

Write the NIC MAC address and name that are queried in **Step 2** and that are not displayed in **80-persistent-net.rules** to the file. In this way, after the BMS is restarted, the NIC name and sequence will not change.

NOTE

Ensure that the NIC MAC address and name are lowercase letters.

vim /etc/udev/rules.d/80-persistent-net.rules

The modification result is as follows:

```
SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ATTR{address}=="38:4c:4f:29:0b:e0", NAME="eth0"
SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ATTR{address}=="38:4c:4f:29:0b:e1", NAME="eth1"
SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ATTR{address}=="38:4c:4f:89:55:8d", NAME="eth2"
SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ATTR{address}=="38:4c:4f:89:55:8e", NAME="eth3"
```

After the modification, save the change and exit.

Step 4 Run the following command to check the NIC IP address:

ifconfig

Information similar to the following is displayed, where **bond0** and **bond0.313** show the NIC IP addresses automatically allocated by the system when you apply for the BMS:

```
bond0     Link encap:Ethernet  HWaddr FA:16:3E:3D:1C:E0
          inet addr:10.0.1.2  Bcast:10.0.1.255  Mask:255.255.255.0
          inet6 addr: fe80::f816:3eff:fe3d:1ce0/64 Scope:Link
          UP BROADCAST RUNNING MASTER MULTICAST  MTU:8888  Metric:1
          RX packets:852 errors:0 dropped:160 overruns:0 frame:0
          TX packets:1121 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:125429 (122.4 Kb)  TX bytes:107221 (104.7 Kb)

bond0.313 Link encap:Ethernet  HWaddr FA:16:3E:57:87:6E
          inet addr:10.0.3.2  Bcast:10.0.3.255  Mask:255.255.255.0
          inet6 addr: fe80::f816:3eff:fe57:876e/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:8888  Metric:1
          RX packets:169 errors:0 dropped:0 overruns:0 frame:0
          TX packets:13 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:8684 (8.4 Kb)  TX bytes:1696 (1.6 Kb)

eth0      Link encap:Ethernet  HWaddr FA:16:3E:3D:1C:E0
          UP BROADCAST RUNNING SLAVE MULTICAST  MTU:8888  Metric:1
```

```
          RX packets:428 errors:0 dropped:10 overruns:0 frame:0
          TX packets:547 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:64670 (63.1 Kb)  TX bytes:50132 (48.9 Kb)

eth1      Link encap:Ethernet  HWaddr FA:16:3E:3D:1C:E0
          UP BROADCAST RUNNING SLAVE MULTICAST  MTU:8888  Metric:1
          RX packets:424 errors:0 dropped:7 overruns:0 frame:0
          TX packets:574 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:60759 (59.3 Kb)  TX bytes:57089 (55.7 Kb)

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:8 errors:0 dropped:0 overruns:0 frame:0
          TX packets:8 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:520 (520.0 b)  TX bytes:520 (520.0 b)
```

Step 5 Run the following commands to check the names of bonded NICs:

The in-service bonded NICs cannot be used on the internal communication plane. Therefore, you must obtain them by name.

cd /etc/sysconfig/network

vi ifcfg-*bond0*

Information similar to the following is displayed, where **bond0** is composed of NICs **eth0** and **eth1**:

```
BONDING_MASTER=yes
TYPE=Bond
STARTMODE=auto
BONDING_MODULE_OPTS="mode=4 xmit_hash_policy=layer3+4 miimon=100"
NM_CONTROLLED=no
BOOTPROTO=dhcp
DEVICE=bond0
USERCONTRL=no
LLADDR=fa:16:3e:3d:1c:e0
BONDING_SLAVE1=eth1
BONDING_SLAVE0=eth0
```

After the query, exit.

Step 6 Run the following commands to check the statuses of all NICs:

ip link

Information similar to the following is displayed.

```
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN mode DEFAULT group
default
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
2: eth0: <BROADCAST,MULTICAST,SLAVE,UP,LOWER_UP> mtu 8888 qdisc mq master bond0 state UP mode
DEFAULT group default qlen 1000
    link/ether fa:16:3e:3d:1c:e0 brd ff:ff:ff:ff:ff:ff
3: eth1: <BROADCAST,MULTICAST,SLAVE,UP,LOWER_UP> mtu 8888 qdisc mq master bond0 state UP mode
DEFAULT group default qlen 1000
    link/ether fa:16:3e:3d:1c:e0 brd ff:ff:ff:ff:ff:ff
4: eth2: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc mq state DOWN mode DEFAULT group
default qlen 1000
    link/ether 38:4c:4f:89:55:8d brd ff:ff:ff:ff:ff:ff
5: eth3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc mq state DOWN mode DEFAULT group
default qlen 1000
    link/ether 38:4c:4f:89:55:8e brd ff:ff:ff:ff:ff:ff
```

```
6: bond0: <BROADCAST,MULTICAST,MASTER,UP,LOWER_UP> mtu 8888 qdisc noqueue state UP mode
DEFAULT group default
    link/ether fa:16:3e:3d:1c:e0 brd ff:ff:ff:ff:ff:ff
7: bond0.3133@bond0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 8888 qdisc noqueue state UP mode
DEFAULT group default
    link/ether fa:16:3e:57:87:6e brd ff:ff:ff:ff:ff:ff
```

Step 7 Run the following commands to change the NIC status **qdisc mq state DOWN** to **qdisc mq state UP**. The following commands use NICs **eth2** and **eth3** as examples.

ip link set *eth2* **up**

ip link set *eth3* **up**

Step 8 Run the following commands to check the statuses of all NICs:

ip link

Information similar to the following is displayed.

```
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN mode DEFAULT group
default
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
2: eth0: <BROADCAST,MULTICAST,SLAVE,UP,LOWER_UP> mtu 8888 qdisc mq master bond0 state UP mode
DEFAULT group default qlen 1000
    link/ether fa:16:3e:3d:1c:e0 brd ff:ff:ff:ff:ff:ff
3: eth1: <BROADCAST,MULTICAST,SLAVE,UP,LOWER_UP> mtu 8888 qdisc mq master bond0 state UP mode
DEFAULT group default qlen 1000
    link/ether fa:16:3e:3d:1c:e0 brd ff:ff:ff:ff:ff:ff
4: eth2: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc mq state UP mode DEFAULT group
default qlen 1000
    link/ether 38:4c:4f:89:55:8d brd ff:ff:ff:ff:ff:ff
5: eth3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc mq state UP mode DEFAULT group
default qlen 1000
    link/ether 38:4c:4f:89:55:8e brd ff:ff:ff:ff:ff:ff
6: bond0: <BROADCAST,MULTICAST,MASTER,UP,LOWER_UP> mtu 8888 qdisc noqueue state UP mode
DEFAULT group default
    link/ether fa:16:3e:3d:1c:e0 brd ff:ff:ff:ff:ff:ff
7: bond0.3133@bond0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 8888 qdisc noqueue state UP mode
DEFAULT group default
    link/ether fa:16:3e:57:87:6e brd ff:ff:ff:ff:ff:ff
```

Step 9 Check the statuses of the NICs in **Step 8** and obtain the names of the NICs in **qdisc mq state UP** state.

Only the NICs that are in **qdisc mq state UP** state and have not been used can be bonded. In this example, such NICs are **eth2** and **eth3**.

The LLADR values of NICs **eth2** and **eth3** are **38:4c:4f:89:55:8d** and **38:4c:4f:89:55:8e**, respectively.

Step 10 Run the following commands to create the configuration files of NICs **eth2** and **eth3**:

You can copy an existing NIC configuration file and modify it to improve the creation efficiency.

cp *ifcfg-eth0 ifcfg-eth2*

cp *ifcfg-eth1 ifcfg-eth3*

Step 11 Run the following commands to modify the configuration files of NICs **eth2** and **eth3**:

vi *ifcfg-eth2*

vi *ifcfg-eth3*

Modified configuration file of NIC **eth2** is as follows.

In this configuration file, set **MTU** to **8888**, **BOOTPROTO** to **STATIC**, and configure **DEVICE** and **LLADDR** as required.

```
STARTMODE=auto
MTU=8888
NM_CONTROLLED=no
BOOTPROTO=STATIC
DEVICE=eth2
USERCONTRL=no
LLADDR=38:4c:4f:89:55:8d
TYPE=Ethernet
```

Modified configuration file of NIC **eth3** is as follows:

```
STARTMODE=auto
MTU=8888
NM_CONTROLLED=no
BOOTPROTO=STATIC
DEVICE=eth3
USERCONTRL=no
LLADDR=38:4c:4f:89:55:8e
TYPE=Ethernet
```

After the modification, save the change and exit.

Step 12 Run the following command to bond NICs **eth2** and **eth3** to a NIC, for example, **bond1**:

Run the following commands to create the **ifcfg-bond1** file and modify the configuration file:

cp *ifcfg-bond0 ifcfg-bond1*

vi *ifcfg-bond1*

Modified configuration file of NIC **bond1** is as follows.

In this configuration file, **MTU** is set to **8888**, **BONDING_MODULE_OPTS** is set to **mode=1 miimon=100**, **BOOTPROTO** is set to **STATIC**. **DEVICE**, **BONDING_SLAVE1**, **BONDING_SLAVE0**, **IPADDR**, **NETMASK**, and **NETWORK** are configured as required. **LLADDR** is set to the LLADDR value of the **BONDING_SLAVE1** NIC.

```
BONDING_MASTER=yes
TYPE=Bond
MTU=8888
STARTMODE=auto
BONDING_MODULE_OPTS="mode=1 miimon=100"
NM_CONTROLLED=no
BOOTPROTO=STATIC
DEVICE=bond1
USERCONTRL=no
LLADDR=38:4c:4f:89:55:8d
BONDING_SLAVE1=eth2
BONDING_SLAVE0=eth3
IPADDR=10.0.2.2
NETMASK=255.255.255.0
NETWORK=10.0.2.0
```

After the modification, save the change and exit.

Step 13 Make the configuration file take effect.

1. Run the following commands to create a temporary directory and copy the NIC configuration file to this directory:

   mkdir /opt*/tmp/*

   mkdir /opt/tmp/*xml*

   cp /etc/sysconfig/network/ifcfg* /opt/tmp/

   cp /etc/sysconfig/network/config /opt/tmp/

   cp /etc/sysconfig/network/dhcp /opt/tmp/

2. Run the following commands to stop NICs to form **bond1**:

   ip link set *eth2* **down**

   ip link set *eth3* **down**

3. Run the following command to convert the NIC configuration file to a configuration file that can be recognized by the OS:

   /usr/sbin/wicked --log-target=stderr --log-level=debug3 --debug all convert --output /opt/tmp/xml /opt/tmp/

4. Run the following commands to restart the NICs to form **bond1**:

   ip link set *eth2* **up**

   /usr/sbin/wicked --log-target=stderr --log-level=debug3 --debug all ifup --ifconfig /opt/tmp/xml/*eth2***.xml** *eth2*

   ip link set *eth3* **up**

   /usr/sbin/wicked --log-target=stderr --log-level=debug3 --debug all ifup --ifconfig /opt/tmp/xml/*eth3***.xml** *eth3*

   /usr/sbin/wicked --log-target=stderr --log-level=debug3 --debug all ifup --ifconfig /opt/tmp/xml/bond1.xml *bond1*

Step 14 Run the following command to query IP addresses:

ip addr show

An example is provided as follows:

```
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
       valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
       valid_lft forever preferred_lft forever
2: eth0: <BROADCAST,MULTICAST,SLAVE,UP,LOWER_UP> mtu 8888 qdisc mq master bond0 state UP group default qlen 1000
    link/ether fa:16:3e:3d:1c:e0 brd ff:ff:ff:ff:ff:ff
3: eth1: <BROADCAST,MULTICAST,SLAVE,UP,LOWER_UP> mtu 8888 qdisc mq master bond0 state UP group default qlen 1000
    link/ether fa:16:3e:3d:1c:e0 brd ff:ff:ff:ff:ff:ff
4: eth2: <BROADCAST,MULTICAST,SLAVE,UP,LOWER_UP> mtu 8888 qdisc mq master bond1 state UP group default qlen 1000
    link/ether 38:4c:4f:89:55:8d brd ff:ff:ff:ff:ff:ff
5: eth3: <BROADCAST,MULTICAST,SLAVE,UP,LOWER_UP> mtu 8888 qdisc mq master bond1 state UP group default qlen 1000
    link/ether 38:4c:4f:89:55:8d brd ff:ff:ff:ff:ff:ff
6: bond0: <BROADCAST,MULTICAST,MASTER,UP,LOWER_UP> mtu 8888 qdisc noqueue state UP group default
    link/ether fa:16:3e:3d:1c:e0 brd ff:ff:ff:ff:ff:ff
    inet 10.0.1.2/24 brd 10.0.1.255 scope global bond0
       valid_lft forever preferred_lft forever
    inet6 fe80::f816:3eff:fe3d:1ce0/64 scope link
       valid_lft forever preferred_lft forever
7: bond0.3133@bond0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 8888 qdisc noqueue state UP group
```

```
default
    link/ether fa:16:3e:57:87:6e brd ff:ff:ff:ff:ff:ff
    inet 10.0.3.2/24 brd 10.0.2.255 scope global bond0.3133
       valid_lft forever preferred_lft forever
    inet6 fe80::f816:3eff:fe57:876e/64 scope link
       valid_lft forever preferred_lft forever
8: bond1: <BROADCAST,MULTICAST,MASTER,UP,LOWER_UP> mtu 8888 qdisc noqueue state UP group
default
    link/ether 38:4c:4f:89:55:8d brd ff:ff:ff:ff:ff:ff
    inet 10.0.2.2/24 brd 10.0.2.255 scope global bond1
       valid_lft forever preferred_lft forever
    inet6 fe80::3a4c:4fff:fe29:b36/64 scope link
       valid_lft forever preferred_lft forever
```

Step 15 Run the following commands to delete the temporary directory:

cd /opt

rm -rf tmp/

Step 16 Repeat the preceding operations to configure other BMSs.

----End

7.4.3 Configuring a User-defined VLAN (SUSE Linux Enterprise Server 11)

This section uses SUSE Linux Enterprise Server 11 SP4 as an example to describe how to configure a user-defined VLAN for BMSs.

Step 1 Use a key or password to log in to the BMS as user **root**.

Step 2 On the BMS CLI, run the following command to check the NIC information:

ip link

Information similar to the following is displayed:

```
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 16436 qdisc noqueue state UNKNOWN
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
2: eth0: <BROADCAST,MULTICAST,SLAVE,UP,LOWER_UP> mtu 8888 qdisc mq master bond0 state UP qlen
1000
    link/ether fa:16:3e:0d:13:7c brd ff:ff:ff:ff:ff:ff
3: eth1: <BROADCAST,MULTICAST,SLAVE,UP,LOWER_UP> mtu 8888 qdisc mq master bond0 state UP qlen
1000
    link/ether fa:16:3e:0d:13:7c brd ff:ff:ff:ff:ff:ff
4: eth4: <BROADCAST,MULTICAST> mtu 1500 qdisc noop state DOWN qlen 1000
    link/ether 40:7d:0f:f4:ff:5c brd ff:ff:ff:ff:ff:ff
5: eth5: <BROADCAST,MULTICAST> mtu 1500 qdisc noop state DOWN qlen 1000
    link/ether 40:7d:0f:f4:ff:5d brd ff:ff:ff:ff:ff:ff
6: bond0: <BROADCAST,MULTICAST,MASTER,UP,LOWER_UP> mtu 8888 qdisc noqueue state UP
    link/ether fa:16:3e:0d:13:7c brd ff:ff:ff:ff:ff:ff
```

NOTE

Among the devices, eth0 and eth1 bear the VPC, and eth4 and eth5 bear the user-defined VLAN.

Step 3 Run the following command to check whether the **/etc/udev/rules.d/** directory contains the **80-persistent-net.rules** file:

ll /etc/udev/rules.d/ | grep 80-persistent-net.rules

- If yes, and the file contains all NICs except **bond0** and **lo** obtained in step **Step 2** and their MAC addresses, go to step **Step 6**.

- If no, go to step **Step 4**.

Step 4 Run the following command to copy the **/etc/udev/rules.d/70-persistent-net.rules** file and name the copy as **/etc/udev/rules.d/80-persistent-net.rules**.

cp -p /etc/udev/rules.d/70-persistent-net.rules /etc/udev/rules.d/80-persistent-net.rules

Step 5 Configure the udev rules:

Add the NICs and their MAC addresses obtained in step **Step 2**, except **lo**, **eth0**, **eth1**, and **bond0**, to the **/etc/udev/rules.d/80-persistent-net.rules** file. This ensures that the names and sequence of NICs will not change after the BMS is restarted.

NOTE

Ensure that NIC MAC addresses and names are lowercase letters.

vim /etc/udev/rules.d/80-persistent-net.rules

The modification result is as follows:

```
SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ATTR{address}=="e8:4d:d0:c8:99:67", NAME="eth0"
SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ATTR{address}=="e8:4d:d0:c8:99:68", NAME="eth1"
SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ATTR{address}=="40:7d:0f:f4:ff:5c", NAME="eth4"
SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ATTR{address}=="40:7d:0f:f4:ff:5d", NAME="eth5"
```

After the modification, press **Esc**, enter **:wq**, save the configuration, and exit.

Step 6 Run the following commands to copy the network configuration file **/etc/sysconfig/network/ifcfg-bond0** to generate the **/etc/sysconfig/network/ifcfg-bond1** file, and copy the **/etc/sysconfig/network/ifcfg-eth0** file to generate the **/etc/sysconfig/network/ifcfg-eth4** and **/etc/sysconfig/network/ifcfg-eth5** files:

cp -p /etc/sysconfig/network/ifcfg-bond0 /etc/sysconfig/network/ifcfg-bond1

cp -p /etc/sysconfig/network/ifcfg-eth0 /etc/sysconfig/network/ifcfg-eth4

cp -p /etc/sysconfig/network/ifcfg-eth0 /etc/sysconfig/network/ifcfg-eth5

Step 7 Run the following commands to edit the **/etc/sysconfig/network/ifcfg-eth4** and **/etc/sysconfig/network/ifcfg-eth5** files:

- **vim /etc/sysconfig/network/ifcfg-eth4**

  Edit the eth4 network configuration file as follows:

  ```
  STARTMODE=auto
  MTU=8888
  NM_CONTROLLED=no
  BOOTPROTO=static
  DEVICE=eth4
  USERCONTRL=no
  LLADDR=40:7d:0f:f4:ff:5c
  TYPE=Ethernet
  ```

  Change the value of **BOOTPROTO** to **static**, that of **DEVICE** to **eth4**, and that of **LLADDR** to the MAC address of eth4, which you can obtain in step **Step 2**. Retain values of other parameters.

- **vim /etc/sysconfig/network/ifcfg-eth5**

  Edit the eth5 network configuration file as follows (similar to eth4):

```
STARTMODE=auto
MTU=8888
NM_CONTROLLED=no
BOOTPROTO=static
DEVICE=eth5
USERCONTRL=no
LLADDR=40:7d:0f:f4:ff:5d
TYPE=Ethernet
```

Step 8 Run the following command to edit the **/etc/sysconfig/network/ifcfg-bond1** file:

vim /etc/sysconfig/network/ifcfg-bond1

Edit the file as follows:

```
BONDING_MASTER=yes
TYPE=Bond
STARTMODE=auto
BONDING_MODULE_OPTS="mode=1 miimon=100"
NM_CONTROLLED=no
BOOTPROTO=static
DEVICE=bond1
USERCONTRL=no
LLADDR=40:7d:0f:f4:ff:5c
BONDING_SLAVE1=eth4
BONDING_SLAVE0=eth5
IPADDR=10.10.10.4
NETMASK=255.255.255.0
MTU=8888
```

Where,

- Change the value of **BOOTPROTO** to **static**.
- Change the value of **DEVICE** to **bond1**.
- Change the value of **LLADDR** to the MAC address of a network device in step **Step 7**, for example, **40:7d:0f:f4:ff:5c**.
- Change the values of **BONDING_SLAVE1** and **BONDING_SLAVE0** to the device names in step **Step 7**, that is, **eth4** and **eth5**.
- Change the value of **IPADDR** to the IP address to be allocated to bond1. If the IP address planned for the user-defined VLAN does not conflict with the VPC network segment, you can plan the IP address as needed, only to ensure that BMSs communicating through the user-defined VLAN are in the same network segment as the user-defined VLAN. An example value is **10.10.10.4**.
- Set the value of **NETMASK** to the subnet mask of the IP address allocated to bond1.
- Change the value of **MTU** to **8888**.

Retain values of other parameters.

After the modification, press **Esc**, enter **:wq**, save the configuration, and exit.

Step 9 Run the following commands to restart the network:

ifup *eth4*

ifup *eth5*

ifup *bond1*

```
bms-multinics-test-0002:/etc/sysconfig/network # ifup eth4
    eth4      device: Intel Corporation 82599ES 10-Gigabit SFI/SFP+ Network Connection (rev 01)
bms-multinics-test-0002:/etc/sysconfig/network # ifup eth5
    eth5      device: Intel Corporation 82599ES 10-Gigabit SFI/SFP+ Network Connection (rev 01)
bms-multinics-test-0002:/etc/sysconfig/network # ifup bond1
    bond1
    bond1     enslaved interface: eth5
    bond1     enslaved interface: eth4
bms-multinics-test-0002:/etc/sysconfig/network #
```

NOTE

eth4 and eth5 are the network ports bear the user-defined VLAN and bond1 is the port group of the user-defined VLAN.

Step 10 Run the following commands to check the NIC device status and whether the **bond1** configuration file takes effect:

ip link

```
bms-multinics-test-0002:/etc/sysconfig/network # ip link
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 16436 qdisc noqueue state UNKNOWN
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
2: eth0: <BROADCAST,MULTICAST,SLAVE,UP,LOWER_UP> mtu 8888 qdisc mq master bond0 state UP qlen 1000
    link/ether fa:16:3e:0d:13:7c brd ff:ff:ff:ff:ff:ff
3: eth1: <BROADCAST,MULTICAST,SLAVE,UP,LOWER_UP> mtu 8888 qdisc mq master bond0 state UP qlen 1000
    link/ether fa:16:3e:0d:13:7c brd ff:ff:ff:ff:ff:ff
4: eth4: <BROADCAST,MULTICAST,SLAVE,UP,LOWER_UP> mtu 8888 qdisc mq master bond1 state UP qlen 1000
    link/ether 40:7d:0f:f4:ff:5c brd ff:ff:ff:ff:ff:ff
5: eth5: <BROADCAST,MULTICAST,SLAVE,UP,LOWER_UP> mtu 8888 qdisc mq master bond1 state UP qlen 1000
    link/ether 40:7d:0f:f4:ff:5c brd ff:ff:ff:ff:ff:ff
6: bond0: <BROADCAST,MULTICAST,MASTER,UP,LOWER_UP> mtu 8888 qdisc noqueue state UP
    link/ether fa:16:3e:0d:13:7c brd ff:ff:ff:ff:ff:ff
7: bond1: <BROADCAST,MULTICAST,MASTER,UP,LOWER_UP> mtu 8888 qdisc noqueue state UP
    link/ether 40:7d:0f:f4:ff:5c brd ff:ff:ff:ff:ff:ff
```

ifconfig

```
bms-multinics-test-0002:/etc/sysconfig/network # ifconfig
bond0     Link encap:Ethernet  HWaddr FA:16:3E:0D:13:7C
          inet addr:192.168.20.143  Bcast:192.168.20.255  Mask:255.255.255.0
          inet6 addr: fe80::f816:3eff:fe0d:137c/64 Scope:Link
          UP BROADCAST RUNNING MASTER MULTICAST  MTU:8888  Metric:1
          RX packets:5300 errors:0 dropped:1627 overruns:0 frame:0
          TX packets:1926 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:392043 (382.8 Kb)  TX bytes:424419 (414.4 Kb)

bond1     Link encap:Ethernet  HWaddr 40:7D:0F:F4:FF:5C
          inet addr:10.10.10.4  Bcast:10.10.10.255  Mask:255.255.255.0
          inet6 addr: fe80::427d:fff:fef4:ff5c/64 Scope:Link
          UP BROADCAST RUNNING MASTER MULTICAST  MTU:8888  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:15 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:0 (0.0 b)  TX bytes:1194 (1.1 Kb)

eth0      Link encap:Ethernet  HWaddr FA:16:3E:0D:13:7C
          UP BROADCAST RUNNING SLAVE MULTICAST  MTU:8888  Metric:1
          RX packets:3673 errors:0 dropped:0 overruns:0 frame:0
          TX packets:1926 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:293157 (286.2 Kb)  TX bytes:424419 (414.4 Kb)

eth1      Link encap:Ethernet  HWaddr FA:16:3E:0D:13:7C
          UP BROADCAST RUNNING SLAVE MULTICAST  MTU:8888  Metric:1
          RX packets:1627 errors:0 dropped:1627 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:98886 (96.5 Kb)  TX bytes:0 (0.0 b)

eth4      Link encap:Ethernet  HWaddr 40:7D:0F:F4:FF:5C
          UP BROADCAST RUNNING SLAVE MULTICAST  MTU:8888  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:11 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 b)  TX bytes:866 (866.0 b)

eth5      Link encap:Ethernet  HWaddr 40:7D:0F:F4:FF:5C
          UP BROADCAST RUNNING SLAVE MULTICAST  MTU:8888  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:4 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 b)  TX bytes:328 (328.0 b)

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
```

Step 11 Perform the preceding operations to configure other BMSs.

Step 12 After all BMSs are configured, ping the IP addresses of other BMSs from each BMS.

```
bms-multinics-test-0001:/etc/sysconfig/network # tcpdump -i bond1 -nne host 10.10.10.4
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on bond1, link-type EN10MB (Ethernet), capture size 96 bytes
18:51:55.196928 40:7d:0f:f4:ff:5c > ff:ff:ff:ff:ff:ff, ethertype ARP (0x0806), length 60: arp who-has 10.10.10.3 tel
l 10.10.10.4
18:51:55.196951 f4:4c:7f:3f:da:07 > 40:7d:0f:f4:ff:5c, ethertype ARP (0x0806), length 42: arp reply 10.10.10.3 is-at
 f4:4c:7f:3f:da:07
18:51:55.197005 40:7d:0f:f4:ff:5c > f4:4c:7f:3f:da:07, ethertype IPv4 (0x0800), length 98: 10.10.10.4 > 10.10.10.3:
ICMP echo request, id 25888, seq 1, length 64
18:51:55.197031 f4:4c:7f:3f:da:07 > 40:7d:0f:f4:ff:5c, ethertype IPv4 (0x0800), length 98: 10.10.10.3 > 10.10.10.4:
ICMP echo reply, id 25888, seq 1, length 64
18:51:56.196847 40:7d:0f:f4:ff:5c > f4:4c:7f:3f:da:07, ethertype IPv4 (0x0800), length 98: 10.10.10.4 > 10.10.10.3:
ICMP echo request, id 25888, seq 2, length 64
18:51:56.196852 f4:4c:7f:3f:da:07 > 40:7d:0f:f4:ff:5c, ethertype IPv4 (0x0800), length 98: 10.10.10.3 > 10.10.10.4:
```

```
bms-multinics-test-0002:/etc/sysconfig/network # ping 10.10.10.3
PING 10.10.10.3 (10.10.10.3) 56(84) bytes of data.
64 bytes from 10.10.10.3: icmp_seq=1 ttl=64 time=0.546 ms
64 bytes from 10.10.10.3: icmp_seq=2 ttl=64 time=0.047 ms
64 bytes from 10.10.10.3: icmp_seq=3 ttl=64 time=0.040 ms
64 bytes from 10.10.10.3: icmp_seq=4 ttl=64 time=0.038 ms
64 bytes from 10.10.10.3: icmp_seq=5 ttl=64 time=0.036 ms
64 bytes from 10.10.10.3: icmp_seq=6 ttl=64 time=0.035 ms
64 bytes from 10.10.10.3: icmp_seq=7 ttl=64 time=0.038 ms
64 bytes from 10.10.10.3: icmp_seq=8 ttl=64 time=0.036 ms
^C
--- 10.10.10.3 ping statistics ---
8 packets transmitted, 8 received, 0% packet loss, time 7000ms
rtt min/avg/max/mdev = 0.035/0.102/0.546/0.167 ms
```

----End

7.4.4 Configuring a User-defined VLAN (Red Hat, CentOS, Oracle Linux, and EulerOS)

This section uses CentOS 6.8 (x86_64) as an example to describe how to configure a user-defined VLAN for BMSs.

NOTE

The configuration methods of Red Hat, Oracle Linux, EulerOS, and CentOS are similar.

Step 1 Use a key or password to log in to the BMS as user **root**.

Step 2 On the BMS CLI, run the following command to check the NIC information:

ip link

Information similar to the following is displayed.

```
[root@bms-qinq-demo ~]# ip link
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
2: eth0: <BROADCAST,MULTICAST,SLAVE,UP,LOWER_UP> mtu 8888 qdisc mq master bond0 state UP qlen 1000
    link/ether fa:16:3e:e5:ec:6a brd ff:ff:ff:ff:ff:ff
3: eth1: <BROADCAST,MULTICAST,SLAVE,UP,LOWER_UP> mtu 8888 qdisc mq master bond0 state UP qlen 1000
    link/ether fa:16:3e:e5:ec:6a brd ff:ff:ff:ff:ff:ff
4: eth3: <BROADCAST,MULTICAST> mtu 1500 qdisc noop state DOWN qlen 1000
    link/ether f4:4c:7f:3f:da:07 brd ff:ff:ff:ff:ff:ff
5: eth5: <BROADCAST,MULTICAST> mtu 1500 qdisc noop state DOWN qlen 1000
    link/ether f4:4c:7f:3f:da:08 brd ff:ff:ff:ff:ff:ff
6: bond0: <BROADCAST,MULTICAST,PROMISC,MASTER,UP,LOWER_UP> mtu 8888 qdisc noqueue state UP
    link/ether fa:16:3e:e5:ec:6a brd ff:ff:ff:ff:ff:ff
[root@bms-qinq-demo ~]#
```

NOTE

Among the devices, eth0 and eth1 bear the VPC, and eth3 and eth5 bear the user-defined VLAN.

Step 3 Run the following command to check whether the **/etc/udev/rules.d/** directory contains the **80-persistent-net.rules** file:

ll /etc/udev/rules.d/ | grep 80-persistent-net.rules

- If yes, and the file contains all NICs except **bond0** and **lo** obtained in step **Step 2** and their MAC addresses, go to step **Step 6**.
- If no, go to step **Step 4**.

Step 4 Run the following command to copy the **/etc/udev/rules.d/70-persistent-net.rules** file and name the copy as **/etc/udev/rules.d/80-persistent-net.rules**.

cp -p /etc/udev/rules.d/70-persistent-net.rules /etc/udev/rules.d/80-persistent-net.rules

Step 5 Configure the udev rules:

Write the MAC addresses and names of NICs except eth0 and eth1 obtained in step **Step 2** (those not contained in the **/etc/udev/rules.d/70-persistent-net.rules** file) to the **/etc/udev/rules.d/80-persistent-net.rules** file so that the names and sequence of NICs do not change after the BMS is restarted.

NOTE

Ensure that the NIC MAC address and name are lowercase letters.

vim /etc/udev/rules.d/80-persistent-net.rules

The modification result is as follows:

```
SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ATTR{address}=="e8:4d:d0:c8:99:5b", NAME="eth0"
SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ATTR{address}=="e8:4d:d0:c8:99:5c", NAME="eth1"
SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ATTR{address}=="f4:4c:7f:3f:da:07", NAME="eth3"
SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ATTR{address}=="f4:4c:7f:3f:da:08", NAME="eth5"
~
```

After the modification, press **Esc**, enter **:wq**, save the configuration, and exit.

Step 6 Run the following commands to copy the network configuration file **/etc/sysconfig/network-scripts/ifcfg-bond0** to generate the **/etc/sysconfig/network-scripts/ifcfg-bond1** file, and copy the **/etc/sysconfig/network-scripts/ifcfg-eth0** file to generate the **/etc/sysconfig/network-scripts/ifcfg-eth3** and **/etc/sysconfig/network/ ifcfg-eth5** files:

cp -p /etc/sysconfig/network-scripts/ifcfg-bond0 /etc/sysconfig/network-scripts/ifcfg-bond1

cp -p /etc/sysconfig/network-scripts/ifcfg-eth0 /etc/sysconfig/network-scripts/ifcfg-eth3

cp -p /etc/sysconfig/network-scripts/ifcfg-eth0 /etc/sysconfig/network-scripts/ifcfg-eth5

Step 7 Run the following commands to edit the **/etc/sysconfig/network-scripts/ifcfg-eth3** and **/etc/sysconfig/network-scripts/ifcfg-eth5** files:

- **vim /etc/sysconfig/network-scripts/ifcfg-eth3**

  Edit the eth3 network configuration file as follows:

  ```
  USERCTL=no
  MTU=8888
  NM_CONTROLLED=no
  BOOTPROTO=static
  DEVICE=eth3
  TYPE=Ethernet
  ONBOOT=yes
  MASTER=bond1
  SLAVE=yes
  ```

Change the value of **BOOTPROTO** to **static**, that of **DEVICE** to the network device name **eth3**, and that of **MASTER** to the port name of the user-defined VLAN (**bond1**). Retain values of other parameters.

- **vim /etc/sysconfig/network-scripts/ifcfg-eth5**

  Edit the eth5 network configuration file as follows (similar to eth3):

```
USERCTL=no
MTU=8888
NM_CONTROLLED=no
BOOTPROTO=static
DEVICE=eth5
TYPE=Ethernet
ONBOOT=yes
MASTER=bond1
SLAVE=yes
```

Step 8 Run the following command to edit the **/etc/sysconfig/network-scripts/ifcfg-bond1** file:

vim /etc/sysconfig/network-scripts/ifcfg-bond1

Edit the file as follows:

```
MACADDR=f4:4c:7f:3f:da:07
BONDING_MASTER=yes
USERCTL=no
ONBOOT=yes
NM_CONTROLLED=no
BOOTPROTO=static
BONDING_OPTS="mode=1 miimon=100"
DEVICE=bond1
TYPE=Bond
IPADDR=10.10.10.3
NETMASK=255.255.255.0
MTU=8888
```

Where,

- Change the value of **MACADDR** to the MAC address of eth3 or eth5.
- Change the value of **BOOTPROTO** to **static**.
- Change the value of **DEVICE** to **bond1**.
- Change the value of **IPADDR** to the IP address to be allocated to bond1. If the IP address planned for the user-defined VLAN does not conflict with the VPC network segment, you can plan the IP address as needed, only to ensure that BMSs communicating through the user-defined VLAN are in the same network segment as the user-defined VLAN. An example value is **10.10.10.3**.
- Set the value of **NETMASK** to the subnet mask of the IP address configured for bond1.

Retain values of other parameters.

After the modification, press **Esc**, enter **:wq**, save the configuration, and exit.

Step 9 Run the following command to enable port group bond1 of the user-defined VLAN:

ifup *bond1*

```
Determining if ip address 10.10.10.3 is already in use for device bond1...
```

Step 10 Perform the preceding operations to configure other BMSs.

Step 11 After all BMSs are configured, ping the IP addresses of other BMSs from each BMS.

```
bms-multinics-test-0001:/etc/sysconfig/network # tcpdump -i bond1 -nne host 10.10.10.4
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on bond1, link-type EN10MB (Ethernet), capture size 96 bytes
18:51:55.196928 40:7d:0f:f4:ff:5c > ff:ff:ff:ff:ff:ff, ethertype ARP (0x0806), length 60: arp who-has 10.10.10.3 tel
l 10.10.10.4
18:51:55.196951 f4:4c:7f:3f:da:07 > 40:7d:0f:f4:ff:5c, ethertype ARP (0x0806), length 42: arp reply 10.10.10.3 is-at
 f4:4c:7f:3f:da:07
18:51:55.197005 40:7d:0f:f4:ff:5c > f4:4c:7f:3f:da:07, ethertype IPv4 (0x0800), length 98: 10.10.10.4 > 10.10.10.3:
ICMP echo request, id 25888, seq 1, length 64
18:51:55.197031 f4:4c:7f:3f:da:07 > 40:7d:0f:f4:ff:5c, ethertype IPv4 (0x0800), length 98: 10.10.10.3 > 10.10.10.4:
ICMP echo reply, id 25888, seq 1, length 64
18:51:56.196847 40:7d:0f:f4:ff:5c > f4:4c:7f:3f:da:07, ethertype IPv4 (0x0800), length 98: 10.10.10.4 > 10.10.10.3:
ICMP echo request, id 25888, seq 2, length 64
18:51:56.196852 f4:4c:7f:3f:da:07 > 40:7d:0f:f4:ff:5c, ethertype IPv4 (0x0800), length 98: 10.10.10.3 > 10.10.10.4:
```

```
bms-multinics-test-0002:/etc/sysconfig/network # ping 10.10.10.3
PING 10.10.10.3 (10.10.10.3) 56(84) bytes of data.
64 bytes from 10.10.10.3: icmp_seq=1 ttl=64 time=0.546 ms
64 bytes from 10.10.10.3: icmp_seq=2 ttl=64 time=0.047 ms
64 bytes from 10.10.10.3: icmp_seq=3 ttl=64 time=0.040 ms
64 bytes from 10.10.10.3: icmp_seq=4 ttl=64 time=0.038 ms
64 bytes from 10.10.10.3: icmp_seq=5 ttl=64 time=0.036 ms
64 bytes from 10.10.10.3: icmp_seq=6 ttl=64 time=0.035 ms
64 bytes from 10.10.10.3: icmp_seq=7 ttl=64 time=0.038 ms
64 bytes from 10.10.10.3: icmp_seq=8 ttl=64 time=0.036 ms
^C
--- 10.10.10.3 ping statistics ---
8 packets transmitted, 8 received, 0% packet loss, time 7000ms
rtt min/avg/max/mdev = 0.035/0.102/0.546/0.167 ms
```

----End

7.4.5 Configuring a User-defined VLAN (Ubuntu)

This section uses Ubuntu 16.04 LTS (Xenial Xerus x86_64) as an example to describe how to configure a user-defined VLAN for BMSs.

NOTE

The configuration methods of other Ubuntu OSs are similar to that of Ubuntu 16.04 LTS (Xenial Xerus x86_64).

Step 1 Use a key or password to log in to the BMS as user **root**.

Step 2 On the BMS CLI, run the following command to check the NIC information:

ip link

Information similar to the following is displayed:

```
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN mode DEFAULT group
default qlen 1
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
2: eth0: <BROADCAST,MULTICAST,SLAVE,UP,LOWER_UP> mtu 8888 qdisc mq master bond0 state UP mode
DEFAULT group default qlen 1000
    link/ether fa:16:3e:1c:35:37 brd ff:ff:ff:ff:ff:ff
3: eth1: <BROADCAST,MULTICAST,SLAVE,UP,LOWER_UP> mtu 8888 qdisc mq master bond0 state UP mode
DEFAULT group default qlen 1000
    link/ether fa:16:3e:1c:35:37 brd ff:ff:ff:ff:ff:ff
4: enp129s0f0: <BROADCAST,MULTICAST> mtu 1500 qdisc noop state DOWN mode DEFAULT group default
qlen 1000
    link/ether f4:4c:7f:3f:da:07 brd ff:ff:ff:ff:ff:ff
5: enp129s0f1: <BROADCAST,MULTICAST> mtu 1500 qdisc noop state DOWN mode DEFAULT group default
qlen 1000
    link/ether f4:4c:7f:3f:da:08 brd ff:ff:ff:ff:ff:ff
6: bond0: <BROADCAST,MULTICAST,MASTER,UP,LOWER_UP> mtu 8888 qdisc noqueue state UP mode
DEFAULT group default qlen 1000
    link/ether fa:16:3e:1c:35:37 brd ff:ff:ff:ff:ff:ff
```

NOTE

Among the devices, eth0 and eth1 bear the VPC, and enp129s0f0 and enp129s0f1 bear the user-defined VLAN. In the following steps, enp129s0f0 and enp129s0f1 are used to configure a user-defined VLAN.

Step 3 Run the following command to check whether the **/etc/udev/rules.d/** directory contains the **80-persistent-net.rules** file:

ll /etc/udev/rules.d/ | grep 80-persistent-net.rules

- If yes, and the file contains all NICs except **bond0** and **lo** obtained in step **Step 2** and their MAC addresses, go to step **Step 6**.
- If no, go to step **Step 4**.

Step 4 Run the following command to copy the **/etc/udev/rules.d/70-persistent-net.rules** file and name the copy as **/etc/udev/rules.d/80-persistent-net.rules**.

cp -p /etc/udev/rules.d/70-persistent-net.rules /etc/udev/rules.d/80-persistent-net.rules

Step 5 Configure the udev rules:

Add the NICs and their MAC addresses obtained in step **Step 2**, except **lo**, **eth0**, **eth1**, and **bond0**, to the **/etc/udev/rules.d/80-persistent-net.rules** file. This ensures that the names and sequence of NICs will not change after the BMS is restarted.

NOTE

Ensure that the NIC MAC address and names are lowercase letters.

vim /etc/udev/rules.d/80-persistent-net.rules

The modification result is as follows:

```
SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ATTR{address}=="e8:4d:d0:c8:99:5b", NAME="eth0"
SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ATTR{address}=="e8:4d:d0:c8:99:5c", NAME="eth1"
SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ATTR{address}=="f4:4c:7f:3f:da:07",
NAME="enp129s0f0"
SUBSYSTEM=="net", ACTION=="add", DRIVERS=="?*", ATTR{address}=="f4:4c:7f:3f:da:08",
NAME="enp129s0f1"
```

After the modification, press **Esc**, enter **:wq**, save the configuration, and exit.

Step 6 Run the following command to copy the **/etc/network/interfaces.d/50-cloud-init.cfg** file to generate the **/etc/network/interfaces.d/60-cloud-init.cfg** file:

cp -p /etc/network/interfaces.d/50-cloud-init.cfg /etc/network/interfaces.d/60-cloud-init.cfg

NOTE

If the **/etc/network/interfaces.d/50-cloud-init.cfg** file does not exist, copy the **/etc/network/interfaces** file and run the following commands:

mkdir /etc/network/interfaces.d

cp -p /etc/network/interfaces /etc/network/interfaces.d/60-cloud-init.cfg

Step 7 Run the following command to edit the **/etc/network/interfaces.d/60-cloud-init.cfg** file of devices **enp129s0f0** and **enp129s0f1**:

vim /etc/network/interfaces.d/60-cloud-init.cfg

Edit the file as follows:

```
auto enp129s0f0
iface enp129s0f0 inet manual
bond_mode 1
bond-master bond1
bond_miimon 100
mtu 8888
auto enp129s0f1
iface enp129s0f1 inet manual
bond_mode 1
bond-master bond1
bond_miimon 100
mtu 8888
auto bond1
iface bond1 inet static
bond_miimon 100
bond-slaves none
bond_mode 1
address 10.10.10.3
netmask 255.255.255.0
hwaddress f4:4c:7f:3f:da:07
mtu 8888
```

Where,

- **enp129s0f0** and **enp129s0f1** are the NICs that bear the user-defined VLAN.
- **hwaddress** is the MAC address of enp129s0f0.
- Change the value of **address** to the IP address allocated to bond1. If the IP address planned for the user-defined VLAN does not conflict with the VPC network segment, you can plan the IP address as needed, only to ensure that BMSs communicating through the user-defined VLAN are in the same network segment as the user-defined VLAN.
- Set the value of **netmask** to the subnet mask of the IP address configured for bond1.

Set values of other parameters. For example, set **mtu** to **8888**, **bond_miimon** to **100**, and **bond_mode** to **1**.

After the modification, press **Esc**, enter **:wq**, save the configuration, and exit.

Step 8 Run the following commands to restart the network:

ifup *enp129s0f0*

ifup *enp129s0f1*

NOTE

enp129s0f0 and **enp129s0f1** are the NICs that bear the user-defined VLAN.

Step 9 Run the following commands to check the NIC device status and whether the **bond1** configuration file takes effect:

ip link

```
root@bms-af1d:~# ip link
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN mode DEFAULT group default qlen 1
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
2: eth0: <BROADCAST,MULTICAST,SLAVE,UP,LOWER_UP> mtu 8888 qdisc mq master bond0 state UP mode DEFAULT group default qlen 1000
    link/ether fa:16:3e:1c:35:37 brd ff:ff:ff:ff:ff:ff
3: eth1: <BROADCAST,MULTICAST,SLAVE,UP,LOWER_UP> mtu 8888 qdisc mq master bond0 state UP mode DEFAULT group default qlen 1000
    link/ether fa:16:3e:1c:35:37 brd ff:ff:ff:ff:ff:ff
4: enp129s0f0: <BROADCAST,MULTICAST,SLAVE,UP,LOWER_UP> mtu 8888 qdisc mq master bond1 state UP mode DEFAULT group default qlen 1000
    link/ether f4:4c:7f:3f:da:07 brd ff:ff:ff:ff:ff:ff
5: enp129s0f1: <BROADCAST,MULTICAST,SLAVE,UP,LOWER_UP> mtu 8888 qdisc mq master bond1 state UP mode DEFAULT group default qlen 1000
    link/ether f4:4c:7f:3f:da:07 brd ff:ff:ff:ff:ff:ff
7: bond0: <BROADCAST,MULTICAST,MASTER,UP,LOWER_UP> mtu 8888 qdisc noqueue state UP mode DEFAULT group default qlen 1000
    link/ether fa:16:3e:1c:35:37 brd ff:ff:ff:ff:ff:ff
8: bond1: <BROADCAST,MULTICAST,MASTER,UP,LOWER_UP> mtu 8888 qdisc noqueue state UP mode DEFAULT group default qlen 1000
    link/ether f4:4c:7f:3f:da:07 brd ff:ff:ff:ff:ff:ff
root@bms-af1d:~#
```

ifconfig

```
root@bms-af1d:~# ifconfig
bond0     Link encap:Ethernet  HWaddr fa:16:3e:1c:35:37
          inet addr:192.168.20.195  Bcast:192.168.20.255  Mask:255.255.255.0
          inet6 addr: fe80::f816:3eff:fe1c:3537/64 Scope:Link
          UP BROADCAST RUNNING MASTER MULTICAST  MTU:8888  Metric:1
          RX packets:77 errors:0 dropped:18 overruns:0 frame:0
          TX packets:74 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:6569 (6.5 KB)  TX bytes:12236 (12.2 KB)

bond1     Link encap:Ethernet  HWaddr f4:4c:7f:3f:da:07
          inet addr:10.10.10.3  Bcast:10.10.10.255  Mask:255.255.255.0
          inet6 addr: fe80::f64c:7fff:fe3f:da07/64 Scope:Link
          UP BROADCAST RUNNING MASTER MULTICAST  MTU:8888  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:10 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 B)  TX bytes:776 (776.0 B)

enp129s0f0 Link encap:Ethernet  HWaddr f4:4c:7f:3f:da:07
          UP BROADCAST RUNNING SLAVE MULTICAST  MTU:8888  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)

enp129s0f1 Link encap:Ethernet  HWaddr f4:4c:7f:3f:da:07
          UP BROADCAST RUNNING SLAVE MULTICAST  MTU:8888  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:10 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 B)  TX bytes:776 (776.0 B)

eth0      Link encap:Ethernet  HWaddr fa:16:3e:1c:35:37
          UP BROADCAST RUNNING SLAVE MULTICAST  MTU:8888  Metric:1
          RX packets:3236 errors:0 dropped:3177 overruns:0 frame:0
          TX packets:78 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:197273 (197.2 KB)  TX bytes:12847 (12.8 KB)

eth1      Link encap:Ethernet  HWaddr fa:16:3e:1c:35:37
          UP BROADCAST RUNNING SLAVE MULTICAST  MTU:8888  Metric:1
          RX packets:6366 errors:0 dropped:18 overruns:0 frame:0
          TX packets:18224 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:444846 (444.8 KB)  TX bytes:1550404 (1.5 MB)

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
```

Step 10 Perform the preceding operations to configure other BMSs.

Step 11 After all BMSs are configured, ping the IP addresses of other BMSs from each BMS.

```
root@bms-7b5c:/etc/network/interfaces.d# ifconfig bond1
bond1     Link encap:Ethernet  HWaddr 40:7d:0f:f4:ff:5c
          inet addr:10.10.10.4  Bcast:10.10.10.255  Mask:255.255.255.0
          inet6 addr: fe80::427d:fff:fef4:ff5c/64 Scope:Link
          UP BROADCAST RUNNING MASTER MULTICAST  MTU:8888  Metric:1
          RX packets:11 errors:0 dropped:7 overruns:0 frame:0
          TX packets:20 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:736 (736.0 B)  TX bytes:1308 (1.3 KB)

root@bms-7b5c:/etc/network/interfaces.d# ping 10.10.10.3
PING 10.10.10.3 (10.10.10.3) 56(84) bytes of data.
64 bytes from 10.10.10.3: icmp_seq=1 ttl=64 time=0.061 ms
64 bytes from 10.10.10.3: icmp_seq=2 ttl=64 time=0.053 ms
64 bytes from 10.10.10.3: icmp_seq=3 ttl=64 time=0.046 ms
64 bytes from 10.10.10.3: icmp_seq=4 ttl=64 time=0.038 ms
64 bytes from 10.10.10.3: icmp_seq=5 ttl=64 time=0.050 ms
64 bytes from 10.10.10.3: icmp_seq=6 ttl=64 time=0.035 ms
^C
--- 10.10.10.3 ping statistics ---
6 packets transmitted, 6 received, 0% packet loss, time 4997ms
rtt min/avg/max/mdev = 0.035/0.047/0.061/0.009 ms
root@bms-7b5c:/etc/network/interfaces.d#
root@bms-7b5c:/etc/network/interfaces.d#
```

```
root@bms-af1d:~# ifconfig bond1
bond1     Link encap:Ethernet  HWaddr f4:4c:7f:3f:da:07
          inet addr:10.10.10.3  Bcast:10.10.10.255  Mask:255.255.255.0
          inet6 addr: fe80::f64c:7fff:fe3f:da07/64 Scope:Link
          UP BROADCAST RUNNING MASTER MULTICAST  MTU:8888  Metric:1
          RX packets:5 errors:0 dropped:1 overruns:0 frame:0
          TX packets:14 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:376 (376.0 B)  TX bytes:1056 (1.0 KB)

root@bms-af1d:~# tcpdump -i bond1 -nne host 10.10.10.4
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on bond1, link-type EN10MB (Ethernet), capture size 262144 bytes
10:04:52.930343 40:7d:0f:f4:ff:5c > f4:4c:7f:3f:da:07, ethertype IPv4 (0x0800), length 98: 10.10.10.4 > 10
.10.10.3: ICMP echo request, id 19052, seq 1, length 64
10:04:52.930360 f4:4c:7f:3f:da:07 > 40:7d:0f:f4:ff:5c, ethertype IPv4 (0x0800), length 98: 10.10.10.3 > 10
.10.10.4: ICMP echo reply, id 19052, seq 1, length 64
10:04:53.929346 40:7d:0f:f4:ff:5c > f4:4c:7f:3f:da:07, ethertype IPv4 (0x0800), length 98: 10.10.10.4 > 10
.10.10.3: ICMP echo request, id 19052, seq 2, length 64
10:04:53.929354 f4:4c:7f:3f:da:07 > 40:7d:0f:f4:ff:5c, ethertype IPv4 (0x0800), length 98: 10.10.10.3 > 10
.10.10.4: ICMP echo reply, id 19052, seq 2, length 64
```

----End

7.4.6 Configuring a User-defined VLAN (Windows Server)

This section uses Windows Server 2012 R2 Standard as an example to describe how to configure a user-defined VLAN for BMSs.

NOTE

The configuration methods of other Windows Server OSs are similar to that of Windows Server 2012 R2 Standard.

Step 1 Log in to a Windows BMS.

Step 2 On the Windows PowerShell CLI of the BMS, run the following command to check the NIC information:

Get-NetAdapter

Information similar to the following is displayed.

```
PS C:\Users\Administrator> Get-NetAdapter

Name                      InterfaceDescription                ifIndex Status   MacAddress             LinkSpeed
----                      --------------------                ------- ------   ----------             ---------
eth3                      Intel(R) 82599 10 Gigabit ???????        18 Up       F4-4C-7F-3F-DA-08     10 Gbps
eth2                      Intel(R) 82599 10 Gigabit ???????        16 Up       F4-4C-7F-3F-DA-07     10 Gbps
eth1                      Intel(R) 82599 10 Gigabit ???????        15 Up       E8-4D-D0-C8-99-5C     10 Gbps
eth0                      Intel(R) 82599 10 Gigabit ???????        17 Up       E8-4D-D0-C8-99-5B     10 Gbps
Team1                     Microsoft Network Adapter Multiplexo...  23 Up       FA-16-3E-C8-C4-73     10 Gbps


PS C:\Users\Administrator>
```

NOTE

Among the devices, eth0 and eth1 bear the VPC, and eth2 and eth3 bear the user-defined VLAN. The following steps use eth2 and eth3 to configure a user-defined VLAN.

Step 3 To improve the outbound traffic on the OS, perform the operations in **Method 1**. If there is no special requirement on traffic, perform the operations in **Method 2**.

- **Method 1: Use the switch independent mode for the team in the OS. The outbound traffic is distributed across all active NICs, and the inbound traffic is received through one of the NICs in the team.**

1. Run the following command to create a port group for the user-defined VLAN:

   New-NetLbfoTeam -Name *qinq* -TeamMembers "*eth2*","*eth3*" -TeamingMode SwitchIndependent -LoadBalancingAlgorithm Dynamic -Confirm:$false

```
PS C:\Users\Administrator> New-NetLbfoTeam -Name qinq -TeamMembers "eth2","eth3" -TeamingMode SwitchIndependent
-LoadBalancingAlgorithm Dynamic -Confirm:$false


Name                   : qinq
Members                : {eth2, eth3}
TeamNics               : qinq
TeamingMode            : SwitchIndependent
LoadBalancingAlgorithm : Dynamic
Status                 : Degraded
```

NOTE

In the command, *qinq* is the name of the port group planned for the user-defined VLAN, and *eth2* and *eth3* are the network devices that bear the user-defined VLAN obtained in step **Step 2**.

2. Run the following command to query the network adapters:

   Get-NetLbfoTeamMember

```
PS C:\Users\Administrator> Get-NetLbfoTeamMember


Name                   : eth0_d7a1277d-7cd9-4fd4-a1ff-a7c4d8009361
InterfaceDescription   : Intel(R) Ethernet Connection X722 for 10GbE SFP+
Team                   : Team1
AdministrativeMode     : Standby
OperationalStatus      : Standby
TransmitLinkSpeed(Gbps) : 10
ReceiveLinkSpeed(Gbps) : 10
FailureReason          : AdministrativeDecision

Name                   : eth1_d7a1277d-7cd9-4fd4-a1ff-a7c4d8009361
InterfaceDescription   : Intel(R) Ethernet Connection X722 for 10GbE SFP+ #2
Team                   : Team1
AdministrativeMode     : Active
OperationalStatus      : Active
TransmitLinkSpeed(Gbps) : 10
ReceiveLinkSpeed(Gbps) : 10
FailureReason          : NoFailure

Name                   : eth2
InterfaceDescription   : Intel(R) 82599 10 Gigabit ???????
Team                   : qinq
AdministrativeMode     : Active
OperationalStatus      : Active
TransmitLinkSpeed(Gbps) : 10
ReceiveLinkSpeed(Gbps) : 10
FailureReason          : NoFailure

Name                   : eth3
InterfaceDescription   : Intel(R) 82599 10 Gigabit ???????
Team                   : qinq
AdministrativeMode     : Active
OperationalStatus      : Active
TransmitLinkSpeed(Gbps) : 10
ReceiveLinkSpeed(Gbps) : 10
FailureReason          : NoFailure
```

   Get-NetAdapter

```
PS C:\Users\Administrator> Get-NetAdapter

Name                      InterfaceDescription                    ifIndex Status       MacAddress
----                      --------------------                    ------- ------       ----------
qinq                      Microsoft Network Adapter Multiple...#2      33 Up           DC-99-14-93-DE-C2
eth1_d7a1277d-7...8009361 Intel(R) Ethernet Connection X722 ...#2      19 Up           2C-97-B1-D2-B4-87
LOM4                      Intel(R) Ethernet Connection X722 fo...      17 Disconnected 2C-97-B1-D2-B4-89
Team1                     Microsoft Network Adapter Multiplexo...      24 Up           FA-16-3E-35-C9-F3
eth0_d7a1277d-7...8009361 Intel(R) Ethernet Connection X722 fo...      15 Up           2C-97-B1-D2-B4-86
LOM3                      Intel(R) Ethernet Connection X722 ...#2      18 Disconnected 2C-97-B1-D2-B4-88
eth3                      Intel(R) 82599 10 Gigabit ???????            14 Up           DC-99-14-93-DE-C3
eth2                      Intel(R) 82599 10 Gigabit ???????            16 Up           DC-99-14-93-DE-C2
```

- **Method 2: Use the active-active mode for the team in the OS.**

1. Run the following command to create a port group for the user-defined VLAN:

   New-NetLbfoTeam -Name *Team2* **-TeamMembers "***eth2***","***eth3***" -TeamingMode SwitchIndependent -LoadBalancingAlgorithm IPAddresses -Confirm:$false**

```
PS C:\Users\Administrator> New-NetLbfoTeam -Name Team2 -TeamMembers "eth2","eth3" -TeamingMode SwitchIndependent
 -LoadBalancingAlgorithm IPAddresses -Confirm:$false


Name                   : Team2
Members                : {eth2, eth3}
TeamNics               : Team2
TeamingMode            : SwitchIndependent
LoadBalancingAlgorithm : IPAddresses
Status                 : Down


PS C:\Users\Administrator>
```

   NOTE

   In the command, *Team2* is the name of the port group planned for the user-defined VLAN, and *eth2* and *eth3* are the network devices that bear the user-defined VLAN obtained in step **Step 2**.

2. Run the following command to set a network port of port group Team2 created in **Step 3.1** to the standby port:

   Set-NetLbfoTeamMember -Name "*eth2***" -AdministrativeMode Standby -Confirm:$false**

   NOTE

   The port group configured for the user-defined VLAN supports only the active/standby mode. *eth2* is one of the ports of the port group. You can determine which port is configured as the standby port based on your planning.

   get-NetLbfoTeamMember

```
PS C:\Users\Administrator> get-NetLbfoTeamMember


Name                   : eth2
InterfaceDescription   : Intel(R) 82599 10 Gigabit ???????    #2
Team                   : Team2
AdministrativeMode     : Standby
OperationalStatus      : Standby
TransmitLinkSpeed(Gbps) : 10
ReceiveLinkSpeed(Gbps)  : 10
FailureReason          : AdministrativeDecision

Name                   : eth3
InterfaceDescription   : Intel(R) 82599 10 Gigabit ???????    #4
Team                   : Team2
AdministrativeMode     : Active
OperationalStatus      : Active
TransmitLinkSpeed(Gbps) : 10
ReceiveLinkSpeed(Gbps)  : 10
FailureReason          : NoFailure

Name                   : eth0
InterfaceDescription   : Intel(R) 82599 10 Gigabit ???????    #3
Team                   : Team1
AdministrativeMode     : Standby
OperationalStatus      : Standby
TransmitLinkSpeed(Gbps) : 10
ReceiveLinkSpeed(Gbps)  : 10
FailureReason          : AdministrativeDecision

Name                   : eth1
InterfaceDescription   : Intel(R) 82599 10 Gigabit ???????
Team                   : Team1
AdministrativeMode     : Active
OperationalStatus      : Active
TransmitLinkSpeed(Gbps) : 10
ReceiveLinkSpeed(Gbps)  : 10
FailureReason          : NoFailure
```

Get-NetAdapter

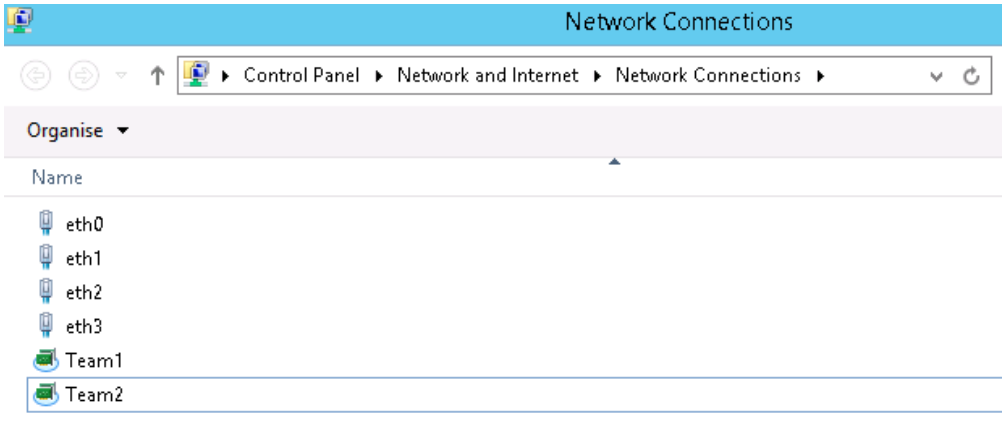
```
PS C:\Users\Administrator> Get-NetAdapter

Name                      InterfaceDescription                    ifIndex Status       MacAddress             LinkSpeed
----                      --------------------                    ------- ------       ----------             ---------
Team2                     Microsoft Network Adapter Multiple...#2      33 Up           F4-4C-7F-3F-DA-08      10 Gbps
eth3                      Intel(R) 82599 10 Gigabit ???????            18 Up           F4-4C-7F-3F-DA-08      10 Gbps
eth2                      Intel(R) 82599 10 Gigabit ???????            16 Up           F4-4C-7F-3F-DA-07      10 Gbps
eth1                      Intel(R) 82599 10 Gigabit ???????            15 Up           E8-4D-D0-C8-99-5C      10 Gbps
eth0                      Intel(R) 82599 10 Gigabit ???????            17 Up           E8-4D-D0-C8-99-5B      10 Gbps
Team1                     Microsoft Network Adapter Multiplexo...      23 Up           FA-16-3E-C8-04-73      10 Gbps
```

Step 4 Run the following command to enter the **Network Connections** page:

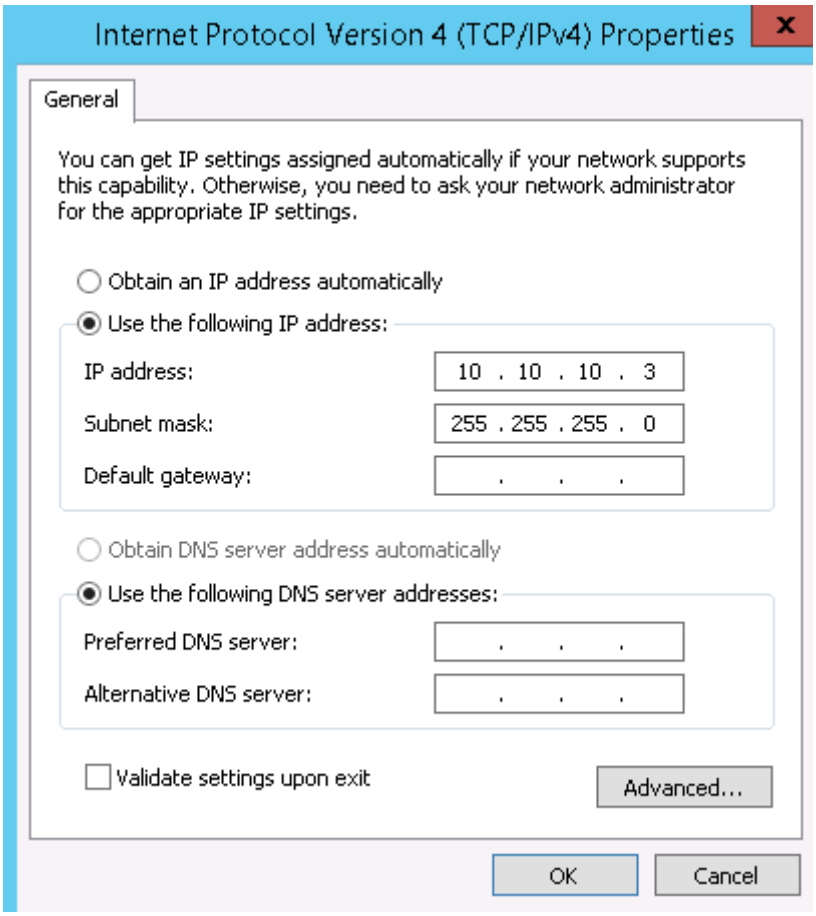
ncpa.cpl

Then enter the following page.



Step 5 Configure a user-defined VLAN.

1. On the **Network Connections** page, double-click port group **Team2** created in **Step 3** to switch to the **Team2 Status** page.
2. Click **Next** to switch to the **Team2 Properties** page.
3. On the **Networking** tab page, double-click **Internet Protocol Version 4 (TCP/IPv4)** to switch to the **Internet Protocol Version 4 (TCP/IPv4) Properties** page.
4. Select **Use the following IP address**, configure the IP address and subnet mask, and click **OK**.



NOTE

If the IP address planned for the user-defined VLAN does not conflict with the VPC network segment, you can plan the IP address as needed, only to ensure that BMSs communicating through the user-defined VLAN are in the same network segment as the user-defined VLAN.

Step 6 Perform the preceding operations to configure other BMSs.

Step 7 After all BMSs are configured, ping the IP addresses of other BMSs from each BMS.

```
PS C:\Users\Administrator> ping 10.10.10.4

Pinging 10.10.10.4 with 32 bytes of data:
Reply from 10.10.10.4: bytes=32 time<1ms TTL=128
Reply from 10.10.10.4: bytes=32 time<1ms TTL=128
Reply from 10.10.10.4: bytes=32 time<1ms TTL=128
Reply from 10.10.10.4: bytes=32 time<1ms TTL=128

Ping statistics for 10.10.10.4:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
PS C:\Users\Administrator>
```

Step 8 If you want to configure VLAN sub-interfaces to isolate network planes, perform the following operations:

Run the following command to create a VLAN sub-interface based on the existing Team2:

Add-NetLbfoTeamNIC -Team "Team2" -VlanID *XXX* **-Confirm:$false**

In the preceding command, **Team2** indicates the bond name, and *XXX* indicates the VLAN ID.

```
PS C:\Users\Administrator> Add-NetLbfoTeamNIC -Team "Team2" -VlanID 500 -Confirm:$false


Name                   : Team2 - VLAN 500
InterfaceDescription   : Microsoft Network Adapter Multiplexor Driver #3
Team                   : Team2
VlanID                 : 500
Primary                : False
Default                : False
TransmitLinkSpeed(Gbps) : 20
ReceiveLinkSpeed(Gbps)  : 20
```

After the VLAN sub-interface is created, configure the IP address and subnet mask of network port Team2-VLAN 500 by referring to **Step 4** and **Step 5**.

----End

7.5 IB Network

7.5.1 Overview

IB Network

The IB network features low latency and high bandwidth and is used in a number of High Performance Computing (HPC) projects. It uses the 100 Gbit/s Mellanox IB NIC, dedicated IB switch, and controller software UFM to ensure network communication and management, and uses the Partition Key to isolate IB networks of different tenants (similar to VLANs in the Ethernet). The IB network supports two communication modes, RDMA and IPoIB.

To create an IB network, you must select a flavor that supports the IB network during BMS creation. After an IB network is provisioned, BMSs can communicate with each other in RDMA mode. In the IPoIB communication mode, you need to configure IP addresses on the IB network port. You can use static IP addresses or

IP addresses dynamically assigned by DHCP. Examples of static IP addresses are as follows:

```
#/etc/sysconfig/network/ifcfg-ib0
DEVICE=ib0
TYPE=InfiniBand
ONBOOT=yes
HWADDR=80:00:00:4c:fe:80:00:00:00:00:00:00:f4:52:14:03:00:7b:cb:a1
BOOTPROTO=none
IPADDR=172.31.0.254
PREFIX=24
NETWORK=172.31.0.0
BROADCAST=172.31.0.255
IPV4_FAILURE_FATAL=yes
IPV6INIT=no
MTU=65520
CONNECTED_MODE=yes
NAME=ib0
```

CAUTION

In the IB network, an IP address is assigned to a new BMS in DHCP mode by default. You can manually specify a static IP address not in use to the BMS.

For more information about the IPoIB communication mode, see **https://www.kernel.org/doc/Documentation/infiniband/ipoib.txt**.

View IB Networks

IB networks are presented to you through the BMS specifications. For example, if the extended configuration of a flavor is 1*100G IB + 2*10GE, the BMS has IB NICs. You need to configure and plan the VLANs and IP addresses.

8 Security

8.1 Security Group

8.1.1 Adding Security Group Rules

Scenarios

The default security group rule allows all outgoing data packets. BMSs in a security group can access each other without the need to add access rules. After a security group is created, you can create different access rules for the security group to protect the BMSs that are added to this security group.

NOTE

You can add only one security group when creating a BMS. After the BMS is created, you can modify the security group of each NIC on the BMS details page.

Suggestions

- When adding a security group rule for a BMS, grant the minimum permissions possible:
  - Enable specific ports rather than a port range, for example, port 80.
  - Be cautious to authorize source address 0.0.0.0/0 (entire network segment).
- You are not advised to use one security group to manage all applications because isolation requirements for different layers vary.
- Configuring a security group for each BMS is unnecessary. Instead, you can add BMSs with the same security protection requirements to the same security group.
- Simple security group rules are recommended. For example, if you add a BMS to multiple security groups, the BMS may comply with hundreds of security group rules, and a change to any rule may cause network disconnection for the BMS.

Procedure

1. Log in to the management console.
2. Under **Computing**, click **Bare Metal Server**.

   The BMS console is displayed.
3. In the BMS list, click the name of the BMS whose security group rules you want to modify.

   The page showing details of the BMS is displayed.
4. Click the **Security Groups** tab and then to view security group rules.
5. Click the security group ID.

   The system automatically switches to the **Security Group** page.
6. Click **Manage Rule** in the **Operation** column. On the security group details page, add a rule.

   Value **Inbound** indicates that traffic enters the security group, and value **Outbound** indicates that traffic leaves the security group.

Table 8-1 Parameter description

Parameter	Description	Example Value
Protocol	Specifies the network protocol for which the security group rule takes effect. The value can be **TCP**, **UDP**, **ICMP**, **HTTP**, or others.	TCP
Port	Specifies the port or port range for which the security group rule takes effect. The value ranges from **0** to **65535**.	22 or 22-30
Source	Specifies the traffic source (inbound rule). This parameter is required for an inbound rule. The value can be an IP address or a security group.	0.0.0.0/0 default
Destination	Specifies the traffic destination (outbound rule). This parameter is required for an outbound rule. The value can be an IP address or a security group.	0.0.0.0/0 default

NOTE

The default source IP address **0.0.0.0/0** indicates that all IP addresses can access BMSs in the security group.

8.1.2 Security Group Configuration Examples

Case 1: BMSs in Different Security Groups Need to Communicate with Each Other Through an Internal Network

- Scenario

  Resources on a BMS in a security group need to be copied to a BMS in another security group. The two BMSs are in the same VPC. Then, you can enable internal network communication between the two BMSs and copy resources.

- Security group configuration

  In the same VPC, BMSs associated with the same security group can communicate with one another by default, and no additional configuration is required. However, BMSs in different security groups cannot communicate with each other by default. You must add security group rules to enable the BMSs to communicate with each other through an internal network.

  However, BMSs in different security groups cannot communicate with each other by default. You must add security group rules to enable the BMSs to communicate with each other through an internal network.

Protocol	Direction	Port Range/ ICMP Protocol Type	Source
Protocol to be used for internal network communication. Supported values are **TCP**, **UDP**, **ICMP**, and **All**.	Inbound	Port number range or ICMP protocol type	IPv4 address, IPv4 CIDR block, or another security group ID

Case 2: Only Specified IP Addresses Can Remotely Access BMSs in a Security Group

- Scenario

  To prevent BMSs from being attacked, you can change the port number for remote login and configure security group rules that allow only specified IP addresses to remotely access the BMSs.

- Security group configuration

  To allow IP address **192.168.20.2** to remotely access Linux BMSs in a security group over the SSH protocol and port 22, you can configure the following security group rule.

Protocol	Direction	Port Range	Source
SSH (22)	Inbound	22	IPv4 address, IPv4 CIDR block, or another security group ID For example, 192.168.20.2

Case 3: Remotely Connecting to a Linux BMS Through SSH

- Scenario

  To remotely connect to a Linux BMS through SSH, you need to add a security group rule.

  NOTE

  The default security group comes with this rule. If you use the default security group, you do not need to configure the rule again.

- Security group configuration

Protocol	Direction	Port Range	Source
SSH (22)	Inbound	22	0.0.0.0/0

Case 3: Remotely Connecting to a Windows BMS Through RDP

- Scenario

  To remotely connect to a Windows BMS through RDP, you need to add a security group rule.

  NOTE

  The default security group comes with this rule. If you use the default security group, you do not need to configure the rule again.

- Security group configuration

Protocol	Direction	Port Range	Source
RDP (3389)	Inbound	3389	0.0.0.0/0

Case 5: Pinging a BMS from the Internet

- Scenario

  To ping BMSs from each other to check connectivity, you need to add a security group rule.

- Security group configuration

Protocol	Direction	Port Range	Source
ICMP	Inbound	All	0.0.0.0/0

8.1.3 Changing a Security Group

Scenarios

This section describes how to change the security group of the BMS NIC or associate multiple security groups with the BMS.

NOTE

When multiple security groups are associated with the BMS, all the security group rules take effect.

Procedure

1. Log in to the management console.
2. Under **Computing**, click **Bare Metal Server**.
   The BMS console is displayed.
3. Click the name of the target BMS.
   The page showing details of the BMS is displayed.
4. Click the **Security Groups** tab. Then, click **Change Security Group**.
5. In the displayed **Change Security Group** dialog box, select the target security group and click **OK**.
   To associate multiple security groups with the BMS, select the groups.

Result

On the BMS details page, click the **Security Groups** tab. The security group has been changed, or new security groups are contained in the list.

9 Server Monitoring

9.1 Installing and Configuring Agent

Scenarios

This section describes how to install and configure Agent on a BMS.

Prerequisites

The BMS is running properly.

Constraints

- BMSs in a DeC do not support this function.
- Private images do not support this function.
  Table 9-1 lists the Linux images that support server monitoring.

Table 9-1 Linux images that support server monitoring

OS Type	Version
Red Hat	6.5, 6.7, 6.8, 7.2, 7.3, and 7.4
SUSE	11.4 and 12.1
Oracle Linux	6.5, 7.3, and 7.4
CentOS	6.9, 7.2, 7.3, and 7.4
EulerOS	2.2

Procedure

1. Perform the following steps to create an agency for server monitoring of the BMS:

a. On the management console homepage, choose **Service List** > **Management & Deployment** > **Identity and Access Management**.

b. In the navigation pane on the left, choose **Agency** and then click **Create Agency** in the upper right corner.

- **Agency Name**: Enter **bms_monitor_agency**.
- **Agency Type**: Select **Cloud service**.
- **Cloud Service**: This parameter is available if you select **Cloud service** for **Agency Type**. Click **Select**, select **ECS BMS** in the displayed **Select Cloud Service** dialog box, and click **OK**.
- **Validity Period**: Select **Permanent**.
- **Description**: This parameter is optional. You can enter **Support BMS server monitoring**.
- **Permissions**: Locate the region where the BMS resides and click **Modify** in the **Operation** column. In the displayed dialog box, enter **CES** in the **Available Policies** search box. Then select **CES (CES Administrator)** and click **OK**.

  NOTE

  If the BMS belongs to a sub-project, ensure that the sub-project has the CES Administrator permission.

c. Click **OK**.

The operations to create an agency for server monitoring of the BMS are complete.

2. Inject the agency.
   - To inject an agency into a new BMS, select the agency created in **1** when you create the BMS.
   - To inject an agency into an existing BMS, click the BMS name to enter its details page, click **Monitoring**, and select the agency created in **1**.
3. Install and configure Agent on the BMS. For details, see "Installing and Configuring the Agent on a Linux ECS or BMS" in *Cloud Eye User Guide*.
4. Log in to the management console and choose **Management & Deployment** > **Cloud Eye**. On the **Server Monitoring** page, you can view the monitoring data of the BMS.

9.2 Supported Monitoring Metrics (with Agent Installed)

Description

This section describes monitoring metrics reported by BMS to Cloud Eye as well as their namespaces and dimensions. You can use the management console or APIs provided by Cloud Eye to query the metrics of the monitored objects and alarms generated for BMS.

NOTE

After installing the Agent on a BMS, you can view its OS monitoring metrics. Monitoring data is collected at an interval of 1 minute.

Namespace

SERVICE.BMS

Metrics

Table 9-2 lists the metrics supported by BMS.

Table 9-2 Metrics

Metric ID	Metric	Description	Value Range	Monitored Object	Monitoring Interval (Raw Data)
cpu_usage	(Agent) CPU Usage	CPU usage of the monitored object Obtain its value by checking metric value changes in the **/proc/stat** file in a collection period. Run the **top** command to check the **%Cpu(s)** value. Unit: percent	0-100 %	BMS	1 minute
load_average5	(Agent) 5-Minute Load Average	CPU load averaged from the last 5 minutes Obtain its value by dividing the **load5/** value in **/proc/loadavg** by the number of logical CPUs. Run the **top** command to check the **load5** value in the **/proc/loadavg** file.	≥ 0	BMS	1 minute
mem_usedPercent	(Agent) Memory Usage	Memory usage of the monitored object Obtain its value by checking the file **/proc/meminfo**. **Memory Usage** = (**MemTotal** - **MemAvailable**)/**MemTotal** Unit: percent	0-100 %	BMS	1 minute

Metric ID	Metric	Description	Value Range	Monitored Object	Monitoring Interval (Raw Data)
mountPointPrefix_disk_free	(Agent) Available Disk Space	Available disk space of the monitored object Run the **df -h** command to check the data in the **Avail** column. The path of the mount point prefix cannot exceed 64 characters. It must start with a letter, and contain only digits, letters, hyphens (-), dots (.), and swung dashes (~). Unit: GB	≥ 0 GB	BMS	1 minute
mountPointPrefix_disk_usedPercent	(Agent) Disk Usage	Disk usage of the monitored object. It is calculated as follows: **Disk Usage** = **Used Disk Space**/**Disk Storage Capacity**. **Disk Usage** = **Used Disk Space**/**Disk Storage Capacity** The path of the mount point prefix cannot exceed 64 characters. It must start with a letter, and contain only digits, letters, hyphens (-), dots (.), and swung dashes (~). Unit: percent	0-100 %	BMS	1 minute

Metric ID	Metric	Description	Value Range	Monitored Object	Monitoring Interval (Raw Data)
disk_ioUtils	(Agent) Disk I/O Usage	Disk I/O usage of the monitored object Obtain its value by checking data changes in the thirteenth column of the corresponding device in the **/proc/diskstats** file in a collection period. The path of the mount point prefix cannot exceed 64 characters. It must start with a letter, and contain only digits, letters, hyphens (-), dots (.), and swung dashes (~). Unit: percent	0-100 %	BMS	1 minute
disk_inodesUsedPercent	(Agent) Percentage of Total inode Used	Percentage of used index nodes on the disk Run the **df -i** command to check data in the **IUse%** column. The path of the mount point prefix cannot exceed 64 characters. It must start with a letter, and contain only digits, letters, hyphens (-), dots (.), and swung dashes (~). Unit: percent	0-100 %	BMS	1 minute
net_bitSent	(Agent) Inbound Bandwidth	Number of bits sent by this NIC per second Check metric value changes in the **/proc/net/dev** file in a collection period. Unit: bit/s	≥ 0 bit/s	BMS	1 minute
net_bitRecv	(Agent) Outbound Bandwidth	Number of bits received by this NIC per second Check metric value changes in the **/proc/net/dev** file in a collection period. Unit: bit/s	≥ 0 bit/s	BMS	1 minute

Metric ID	Metric	Description	Value Range	Monitored Object	Monitoring Interval (Raw Data)
net_packetRecv	(Agent) NIC Packet Receive Rate	Number of packets received by this NIC per second Check metric value changes in the **/proc/net/dev** file in a collection period. Unit: count/s	≥ 0 counts/s	BMS	1 minute
net_packetSent	(Agent) NIC Packet Send Rate	Number of packets sent by this NIC per second Check metric value changes in the **/proc/net/dev** file in a collection period. Unit: count/s	≥ 0 counts/s	BMS	1 minute
net_tcp_total	(Agent) TCP TOTAL	Total number of TCP connections of this NIC	≥0	BMS	1 minute
net_tcp_established	(Agent) TCP ESTABLISHED	Number of ESTABLISHED TCP connections of this NIC	≥0	BMS	1 minute

10 Troubleshooting

10.1 What Do I Do If I Cannot Log In to My BMS or the BMS EVS Disk Is Lost After the BMS Is Started or Restarted?

Symptom

After a BMS is started or restarted, the user cannot log in to the BMS or the BMS EVS disk is lost.

Possible Causes

The BMS cannot obtain the IP address or the EVS disk cannot be attached to the BMS because packet loss caused by network congestion occurs.

Solution

Restart the BMS. If the fault still exists after you restart the BMS for several times, contact the customer service.

10.2 What Do I Do If a Key Pair Created Using PuTTYgen Cannot Be Imported to the Management Console?

Symptom

When a key pair created using PuTTYgen was imported to the management console, the system displayed a message indicating that importing the public key failed.

Possible Causes

The format of the public key content does not meet system requirements.

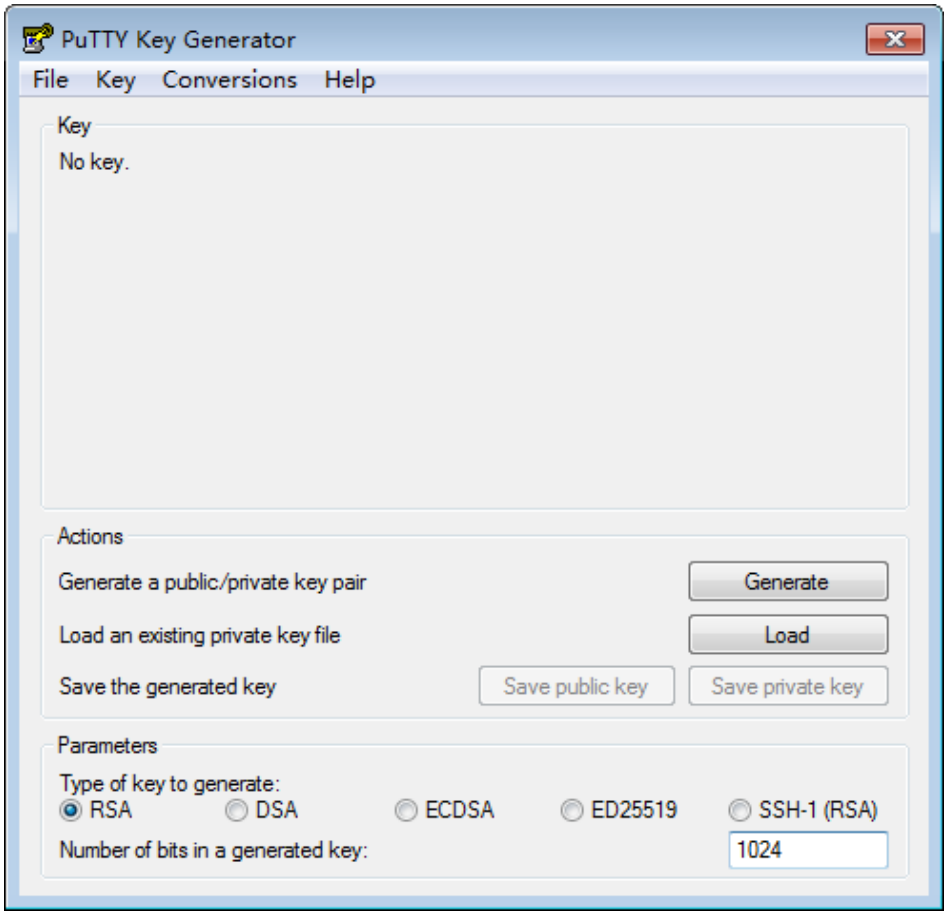
Storing a public key by clicking **Save public key** of PuTTYgen will change the format of the public key content. Such a key cannot be imported to the management console.

Solution

Use the locally stored private key and **PuTTY Key Generator** to restore the format of the public key content. Then, import the public key to the management console.

1. Double-click **puttygen.exe**. The **PuTTY Key Generator** window is displayed.

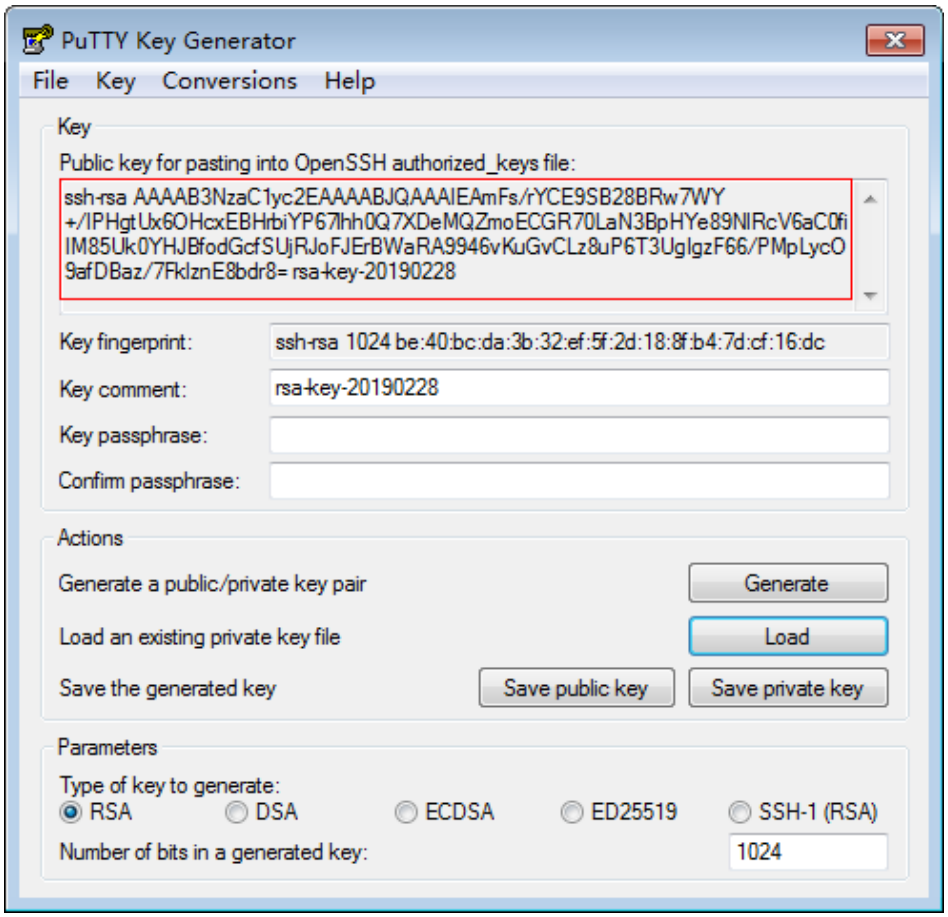
   Figure 10-1 PuTTY Key Generator

2. Click **Load** and select the private key.

   The system automatically loads the private key and restores the format of the public key content in **PuTTY Key Generator**. The content in the red box in **Figure 10-2** is the public key with the format meeting system requirements.

Figure 10-2 Restoring the format of the public key content



3. Copy the public key content to a .txt file and save the file in a local directory.
4. Import the public key to the management console.
   a. Log in to the management console.
   b. Under **Computing**, click **Bare Metal Server**.
      The BMS console is displayed.
   c. In the navigation tree, choose **Key Pair**.
   d. On the right side of the page, click **Import Key Pair**.
   e. Copy the public key content in the .txt file to **Public Key Content** and click **OK**.

10.3 What Do I Do If Disks Cannot Be Attached to a BMS That Restarts Abnormally?

Symptom

After a BMS provisioned using a local disk with data volumes restarts abnormally, no volume information exists in the BMS OS, and disks cannot be attached to the BMS on the management console.

Abnormal restart indicates that a BMS is powered off and then powered on abnormally, which is not caused by the tenant's operation on the management console.

Solution

Locate the row that contains the BMS, click **More** in the **Operation** column, and select **Restart**. Disks are attached to the BMS automatically after the BMS restarts.

If disks still cannot be attached to the BMS after it is restarted, contact the customer service.

10.4 What Do I Do If an EVS Disk Attached to a Windows BMS Is in Offline State?

Symptom

After an EVS disk is attached to a Windows BMS, start **Control Panel**, choose **System and Security** > **Administrative Tools**, and double-click **Computer Management**. On the **Computer Management** page, choose **Storage** > **Disk Management**. The EVS disk attached to the BMS is in **Offline** state.

Solution

1. Log in to the Windows BMS.
2. Click **Start**, enter **cmd** in **Search programs and files**, and press **Enter** to open the command-line interface (CLI).
3. Type **diskpart**.
   ```
   C:\Users\Administrator>diskpart
   ```
4. Type **san**.
   ```
   DISKPART> san
   SAN Policy: Online All
   ```
5. Type **san policy=onlineall**.
   ```
   DISKPART> san policy=onlineall
   DiskPart successfully changed the SAN policy for the current operating system
   ```
6. Type **list disk** to display all disks of the BMS.
   ```
   DISKPART> list disk
   Disk ### Status    Size    Free     Dyn    Gpt
   Disk 0   Online   838 GB    0B
   Disk 1   Offline   838 GB    838 GB
   Disk 2   Offline   838 GB    838 GB
   Disk 3   Offline   838 GB    838 GB
   ...
   ```
7. Type **select disk** *num*. *num* indicates the disk number. Replace it with the specific disk number.
   ```
   DISKPART> select disk 4
   ```
8. Type **attributes disk clear readonly**.
   ```
   DISKPART> attributes disk clear readonly
   DiskPart succeed to clear disk attributes.
   ```
9. Type **online disk**.
   ```
   DISKPART> online disk
   DiskPart succeed to make the selected disk online.
   ```

10. After the modification, format the EVS disk.

11 FAQs

11.1 General FAQs

11.1.1 What Are the Restrictions on Using BMSs?

- External hardware devices (such as USB devices, bank U keys, external hard disks, and dongles) cannot be directly loaded.
- Live migration is not supported. If a BMS is faulty, your services running on it may be affected. It is good practice to deploy your services in a cluster or in primary/standby mode to ensure high availability.
- You cannot create a raw server with no OS, that is, a BMS must have an OS.
- The OS of a BMS can be reinstalled but cannot be changed.
- The OSs of Windows BMSs using public images are activated by default. You must manually activate the virtual OSs you installed on the BMSs.
- You can only select a flavor with specified CPU, memory, and local disks when you create a BMS. The CPU, memory, and local disks in a flavor cannot be modified. However, you can expand the capacity of attached EVS disks.
- You can only attach EVS disks whose device type is **SCSI** to a BMS.
- You cannot attach EVS disks to BMSs of certain flavors or BMSs created from certain images because these BMSs do not have SDI iNICs or lack compatibility.
- Do not delete or modify built-in plug-ins of an image, such as Cloud-Init and bms-network-config. Otherwise, basic BMS functions will be affected.
- If you choose to assign an IP address automatically when you create a BMS, do not change the private IP address of the BMS after the BMS is provisioned. Otherwise, the IP address may conflict with that of another BMS.
- BMSs do not support bridge NICs because they will cause network interruptions.
- Do not upgrade the OS kernel. Otherwise, the hardware driver may become incompatible with the BMS and adversely affect its BMS reliability.

11.1.2 How Are BMSs Different from ECSs?

Tenants share physical resources of ECSs, but can exclusively use physical resources of BMSs. BMSs can better meet your requirements in scenarios such as key applications, services that require high performance (such as big data clusters and enterprise middleware systems), and a secure and reliable running environment.

11.1.3 What Are the Differences Between BMSs and Traditional Physical Servers?

Compared with traditional physical servers, BMSs support automatic provisioning, automatic O&M, communication through the VPC, and interconnection with shared storage. You can provision and use BMSs as easily as ECSs while enjoying the excellent computing, storage, and network capabilities provided by BMSs.

11.2 Instance FAQs

11.2.1 How Long Does It Take to Create a BMS?

Generally, a Linux BMS is created in 30 minutes and a Windows BMS is created in one to two hours. BMSs supporting quick provisioning can be created in about five minutes.

11.2.2 Why Is Failed Displayed for a BMS Application Task But the BMS List Shows the Obtained BMS?

Symptom

After I apply for a BMS that requires an EIP on the management console, the BMS application request was successfully processed but binding the EIP failed due to insufficient EIPs. In this case, **Failed** was displayed for the task in the **Task Status** area. However, the requested BMS was displayed in the BMS list.

Root Cause

- The BMS list shows the details about obtained BMSs.
- The **Task Status** area shows the processing status of the BMS application task, including statuses of sub-tasks, such as preparing for the BMS resource and binding an EIP. Only when all subtasks have succeeded, the task status becomes **Succeeded**. Otherwise, the task status is **Failed**.

If the BMS is successfully provisioned but EIP binding fails, **Failed** is displayed for the task. The provisioned BMS is temporarily displayed in the BMS list. After the system rolls back the failed task, the BMS is removed from the list.

11.2.3 How Can I Quickly Provision BMSs Using EVS Disks?

When provisioning a common BMS, you need to download its OS from the cloud and install it. The download costs a long time. BMSs using EVS disks as system disks can be provisioned quickly.

On the page for creating a BMS, select a flavor that supports quick BMS provisioning, set the system disk type and capacity, and configure other required parameters to obtain a BMS.

11.2.4 What Are the Advanced Features of BMSs Using EVS Disks?

You are advised to select BMSs using EVS disks as their system disks to achieve quick service recovery.

Such BMSs have the following advanced features:

- BMSs booted from EVS disks can be provisioned within about 5 minutes.
- BMSs support CSBS backups, ensuring data security.
- BMS rebuilding upon faults is supported, enabling quick service recovery.
- An Image of a BMS can be exported to apply configurations of the BMS to other BMSs without the need of configuring the BMSs again.

Helpful Links

Creating a BMS Supporting Quick Provisioning

11.2.5 Is the BMS Host Name with Suffix novalocal Normal?

Symptom

Host names of some BMSs have suffix **.novalocal**.

For example, the host name is set to **abc** during BMS creation. **Table 11-1** lists the host names (obtained by running the **hostname** command) of BMSs created using different images and those displayed after the BMSs are restarted.

Table 11-1 Hostnames of BMSs created from different images

Image	Host Name Before BMS Restart	Host Name After BMS Restart
CentOS 6.8	abc	abc.novalocal
CentOS 7.3	abc.novalocal	abc.novalocal
Ubuntu 16	abc	abc

Host names of BMSs created from some types of images have suffix **.novalocal**, while others do not.

Troubleshooting

This is a normal phenomenon.

The static host name of a Linux BMS is user-defined and injected using Cloud-Init during the BMS creation. According to the test results, Cloud-Init adapts to OSs

differently. As a result, hostnames of some ECSs have suffix **.novalocal**, while others do not.

If you want to ensure that all host names do not have suffix **.novalocal**, you can change the hostname. For details, see **Changing the Name of a BMS**

11.2.6 How Can I Check the BMS Monitoring Status?

The BMS monitoring software is installed in the **/usr/local/telescope** directory. Logs are in the **/usr/local/telescope/log/** directory, in which **ces.log** is the data log and **common.log** is the run log.

- If data is not sent successfully and **403** or **401** is returned, check whether **AccessKey** and **SecretKey** are specified correctly.
- If data is not sent successfully and **500** or other codes are returned, contact the customer service.

11.2.7 How Do I Create an Agency for Server Monitoring of the BMS?

1. On the management console homepage, choose **Service List** > **Management & Deployment** > **Identity and Access Management**.
2. In the navigation pane on the left, choose **Agency** and then click **Create Agency** in the upper right corner.
   - **Agency Name**: Enter **bms_monitor_agency**.
   - **Agency Type**: Select **Cloud service**.
   - **Cloud Service**: This parameter is available if you select **Cloud service** for **Agency Type**. Click **Select**, select **ECS BMS** in the displayed **Select Cloud Service** dialog box, and click **OK**.
   - **Validity Period**: Select **Permanent**.
   - **Description**: This parameter is optional. You can enter **"Support BMS server monitoring"**.
   - **Permissions**: Locate the region where the BMS resides or the sub-project of the region and click **Modify** in the **Operation** column. In the displayed dialog box, enter **CES** in the **Available Policies** search box. Then select **CES (CES Administrator)** and click **OK**.

     NOTE

     If the BMS belongs to a sub-project, ensure that the sub-project has the CES Administrator permission.
3. Click **OK**.

   The operations to create an agency for server monitoring of the BMS are complete.

11.3 Login FAQs

11.3.1 What Browser Versions Can Be Used to Remotely Log In to a BMS?

When you use a browser to remotely log in to a BMS, ensure that the browser version meets the requirements listed in **Table 11-2**.

Table 11-2 Browser version requirements

Browser	Version
Google Chrome	31.0-75.0
Mozilla FireFox	27.0-62.0
Internet Explorer	10.0-11.0

11.3.2 What Do I Do If the Login Page Does Not Respond?

Symptom

On the page for remotely logging in to a BMS, after you press **Enter**, the page does not respond.

Possible Causes

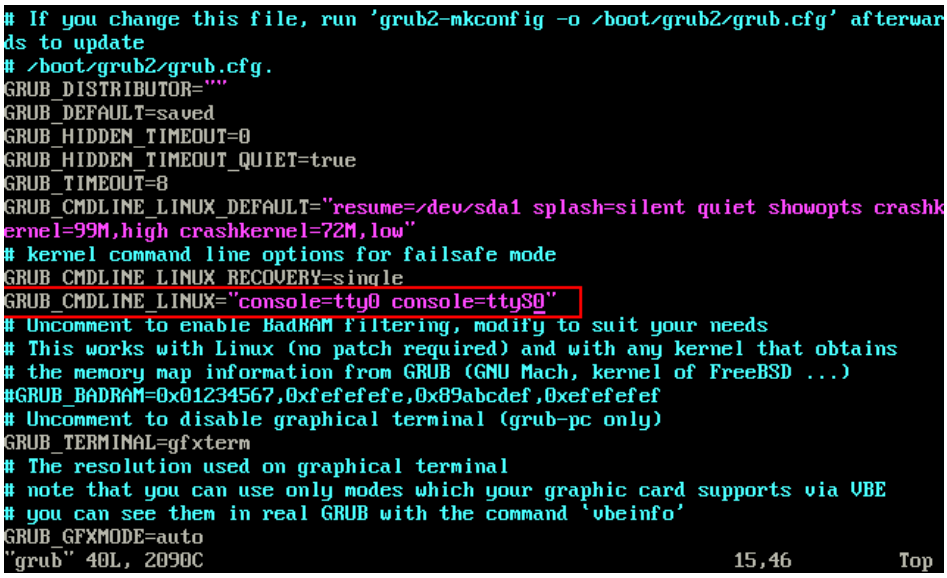
The BMS OS configuration does not allow remote login to the BMS.

Solution

Use a key pair to log in to the BMS and configure the OS as required. The configuration varies depending on the OS. The following part provides configurations of some OSs as examples. For details, see "Configuring Remote Login to a BMS" in *Bare Metal Server Private Image Creation Guide*.

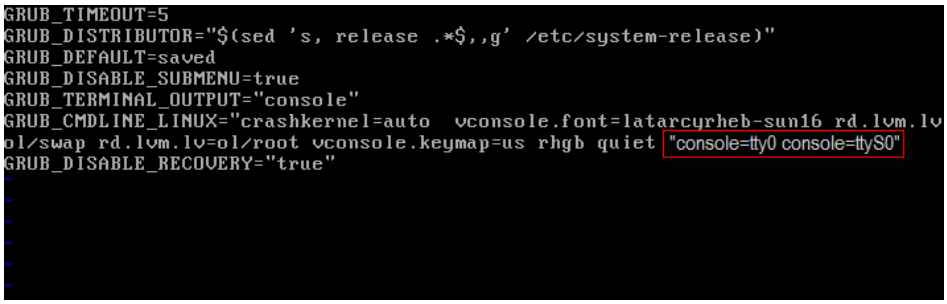
1. Modify the configuration file.
   - For SUSE Linux Enterprise Server 12 SP2, SUSE Linux Enterprise Server 12 SP1, Ubuntu 16.04 Server, CentOS Linux 7.3, and EulerOS 2.2, use the vi editor to open the **/etc/default/grub** file and add **console=tty0 console=ttyS0** after **GRUB_CMDLINE_LINUX**.

Figure 11-1 Example



- For Oracle Linux 7.3 and Red Hat Enterprise Linux 7.3, use the vi editor to open the **/etc/sysconfig/grub** file and add **console=tty0 console=ttyS0** after **GRUB_CMDLINE_LINUX**.

Figure 11-2 Example



2. Update the configuration.
   - For SUSE Linux Enterprise Server 12 SP2, Oracle Linux 7.3, Red Hat Enterprise Linux 7.3, CentOS Linux 7.3, and EulerOS 2.2, run the following commands to update the configuration:

     stty -F /dev/ttyS0 speed 115200

     grub2-mkconfig -o /boot/grub2/grub.cfg

     systemctl enable serial-getty@ttyS0
   - For Ubuntu 16.04 Server, run the following commands to update the configuration:

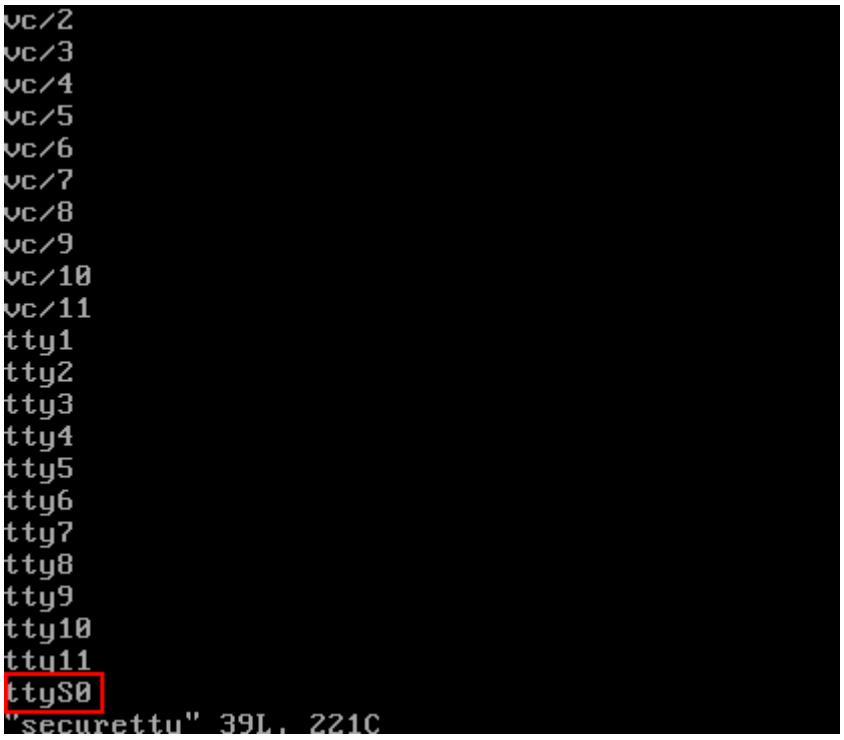
     stty -F /dev/ttyS0 speed 115200

     grub-mkconfig -o /boot/grub/grub.cfg

     systemctl enable serial-getty@ttyS0
3. (Optional) Modify the security configuration file.

   If you log in to the BMS through the serial port as user **root**, you need to modify the security configuration file. Add the following information to the end of **/etc/securetty**:

Figure 11-3 Example



4. Run the **reboot** command to restart the OS.

After configuring the BMS OS, check whether you can log in to the BMS remotely.

11.3.3 What Do I Do If the BMS Console Is Displayed Improperly After I Remotely Log In to a BMS?

Symptom

The following symptoms occur:

- After you exit the vim editor, only half space of the screen is editable.
- When you enter more than 80 characters, the current row is covered.
- If you adjust the size of the browser window when using a text editor such as vim, rows are broken on the screen.

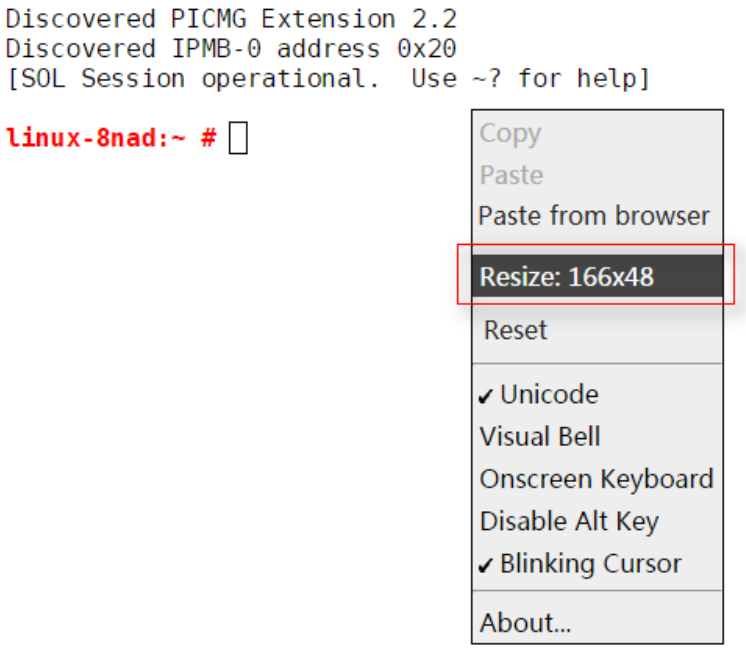
Possible Causes

Remote login to a BMS is subject to the communication on the serial port. The BMS console cannot automatically adapt to the screen. The default number of rows is 24, and that of columns is 80.

Solution

After you log in to the BMS remotely, right-click the blank area and select **Resize: *xxx***. A command will be pasted on the command line, such as **stty cols 166 rows 48**. Then press **Enter** and adjust the console size.

Figure 11-4 Selecting Resize: xxx



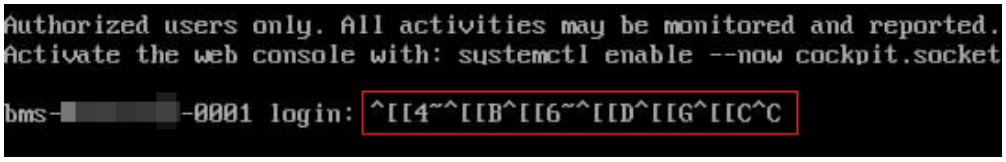
CAUTION

When you are using a text editor such as vim, do not adjust the window size. If you do need to adjust the window size, exit the editor first, adjust the window size, and adjust the console size based on the solution provided in this section.

11.3.4 What Do I Do If the Numeric Keypad Does Not Work During Remote Login?

Symptom

When I enter numbers using the numeric keypad for remote login, the numbers are not displayed properly.

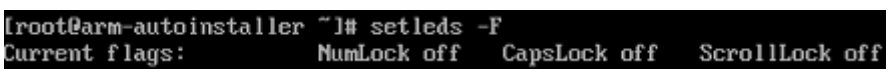


Solution

Run the Linux **setleds** command to turn on the numeric keypad.

1. On the remote login page, run the following command to query the status of the numeric keypad:

   setleds -F

NumLock is **off**, indicating that the numeric keypad is turned off.

2. Run the following command to turn on the numeric keypad:

   setleds +num

3. Run the **setleds -F** command again. If **NumLock** changes to **on**, the issue is fixed.

11.4 Network and Security FAQs

11.4.1 Can BMSs of Different Accounts Communicate with Each Other over an Internal Network?

Generally, BMSs of different accounts cannot communicate with each other for security concerns.

However, if you do need to allow BMSs of different accounts to communicate with each other through an internal network, you can create a VPC peering connection between VPCs in different accounts. For details, see *Virtual Private Cloud User Guide*.

11.4.2 How Do Two BMSs in the Same Region But Different AZs Communicate with Each Other?

If they are in the same VPC, they communicate with each other through an internal network. If they are on the same subnet of a VPC, they communicate with each other through the layer-2 network. If they are on different subnets of a VPC, they communicate with each other through the layer-3 network. An EIP must be bound to the primary NIC of each BMS so that they can communicate with each other.

11.4.3 Are My BMSs in the Same Subnet?

You can customize your networks. Therefore, no matter your BMSs use the common network or high-speed network, you can control whether they are in the same subnet.

11.4.4 Can BMSs Communicate with ECSs in the Same VPC?

Yes, BMSs can communicate with ECSs in the same VPC.

Your VPC may consist of multiple network segments. If the BMSs and ECSs are in the same segment, they communicate with each other through the Layer 2 network. If they are in different segments, they communicate with each other through the Layer 3 network.

In addition, you must configure security group rules for the BMSs to communicate with the ECSs. In addition, to enable an ECS to access a Windows BMS, disable the firewall of Windows.

11.4.5 Can Multiple EIPs Be Bound to a BMS?

Only one EIP can be bound to a NIC. If you want to bind multiple EIPs to a BMS, you can bind them to extension NICs and then perform required operations on the

BMS, such as adding policy-based routes or namespaces, to ensure network connectivity.

11.4.6 Can I Configure the EIP?

No. The EIP is automatically allocated from the DHCP address pool.

11.4.7 How Can I Modify the Network Configuration or Restart the Network If I Can Log In to a BMS Using Only SSH?

The network automatically allocated by the BMS cannot be modified. If you modify the network configuration, you may fail to log in to the BMS. If the BMS has a NIC of the user-defined VLAN, you can configure or modify the network to which the NIC connects.

11.4.8 What Do I Do If the Communication Between the Primary NIC and Extension NIC of the BMS is Abnormal?

Cause

If two NICs on the same network segment are added to a BMS, communication between the primary NIC and extension NIC is abnormal because the BMS gateway strictly verifies the source MAC addresses. For example, in **Figure 11-5**, the primary NIC and extension NIC are both on the 172.22.9.*X* network segment. A policy-based route needs to be configured to enable communication between the NICs.

Figure 11-5 Network segment of the NICs

Solution

1. Run the following command to add two routing table names (**net1** and **net2**) and priorities (**252** and **251**) to the **/etc/iproute2/rt_tables** file:

   vi /etc/iproute2/rt_tables

   ```
   252    net1
   251    net2
   ```

2. Run the following command to add the NIC routing information to the **/etc/rc.local** file:

   vi /etc/rc.local

   For example, the IP address of the primary NIC is 172.22.9.7, that of the extension NIC is 172.22.9.206, and that of the BMS gateway is 172.22.9.1, add the following routes:

```
ip route add 172.22.9.0/24 dev bond0 src 172.22.9.7 table net1
ip route add default via 172.22.9.1 dev bond0 table net1
ip route add 172.22.9.0/24 dev bond0.3935 src 172.22.9.206 table net2
ip route add default via 172.22.9.1 dev bond0.3935 table net2
ip rule add from 172.22.9.7/32 table net1
ip rule add from 172.22.9.206/32 table net2
```

11.4.9 How Can I Configure a Static IP Address for a BMS?

Scenarios

To customize the DNS server information of a BMS, you need to configure a static IP address for the BMS. If you change the IP address assignment mode from DHCP to the static mode, the IP address and gateway must be consistent with those when the BMS is provisioned. Otherwise, network disconnections may occur. This section takes CentOS 7 as an example to describe how to configure a static IP address for a BMS.

Procedure

1. Query the IP address and gateway of the BMS.

   Run the following command to query the IP address of the BMS:

   ifconfig bond0

   ```
   [root@bms-2178 ~]# ifconfig bond0
   bond0: flags=5187<UP,BROADCAST,RUNNING,MASTER,MULTICAST>  mtu 8888
           inet 192.168.20.238  netmask 255.255.255.0  broadcast 192.168.20.255
           inet6 fe80::f816:3eff:fe4b:c31c  prefixlen 64  scopeid 0x20<link>
           ether fa:16:3e:4b:c3:1c  txqueuelen 1000  (Ethernet)
           RX packets 7153  bytes 644462 (629.3 KiB)
           RX errors 0  dropped 0  overruns 0  frame 0
           TX packets 9435  bytes 1703746 (1.6 MiB)
           TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0
   ```

   Run the following command to query the gateway address of the BMS:

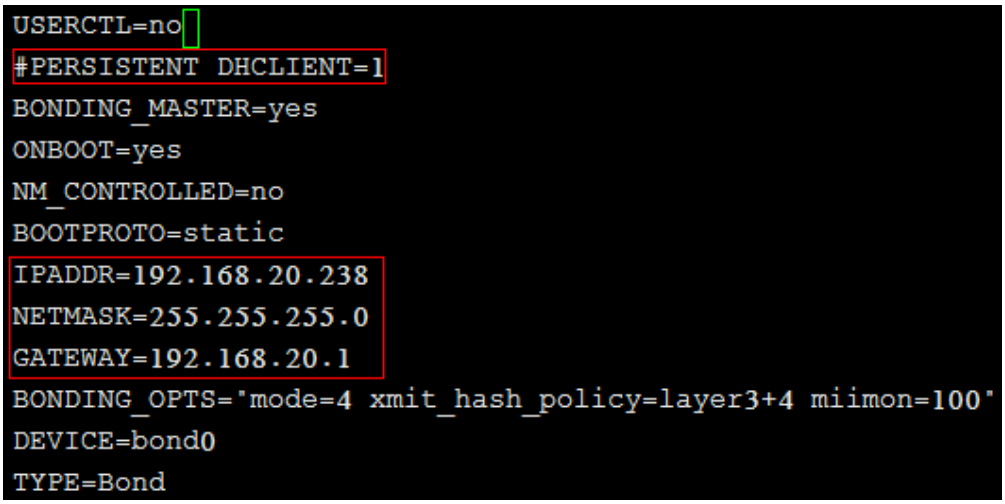
   ip ro

   ```
   [root@bms-2178 ~]# ip ro
   default via 192.168.20.1 dev bond0
   169.254.0.0/16 dev bond0  scope link  metric 1008
   169.254.169.254 via 192.168.20.1 dev bond0  proto static
   192.168.20.0/24 dev bond0  proto kernel  scope link  src 192.168.20.238
   ```

2. Modify the network configuration file.

   Run the **vi /etc/sysconfig/network-scripts/ifcfg-bond0** command to open the **/etc/sysconfig/network-scripts/ifcfg-bond0** file, change the network information from DHCP to static, or delete **PERSISTENT_DHCLIENT=1** and add configuration items **IPADDR**, **NETMASK**, and **GATEWAY** (indicating the IP address, subnet mask, and gateway).

Figure 11-6 Modifying the network configuration file



NOTE

The IP address, subnet mask, and gateway must be consistent with those when the BMS is provisioned. Otherwise, network disconnections may occur.

3. Run the **systemctl disable bms-network-config.service** command to disable the bms-network-config network script.
4. Restart the BMS to make the network configuration take effect, or run the **kill dhclient** command to restart the network service to make the configuration take effect.

11.4.10 How Do I Configure the DNS Server?

When installing Agent on a BMS, ensure that the DNS server of the BMS runs properly. This section describes how to configure the DNS server and how to verify the DNS server status.

Linux

1. Log in to the BMS as user **root**.
2. Run the following command to edit the **resolv.conf** file:

   vi /etc/resolv.conf
3. Press **i** to enter editing mode and enter **nameserver** *DNS server IP address* before existing **nameserver** configurations.

   The format is as follows:

   ```
   nameserver 100.125.1.250
   nameserver 100.125.17.29
   ```
4. Press **Esc** and enter **:wq** to save the change and exit.
5. Run the following commands to restart the network:

   rcnetwork restart

   service network restart

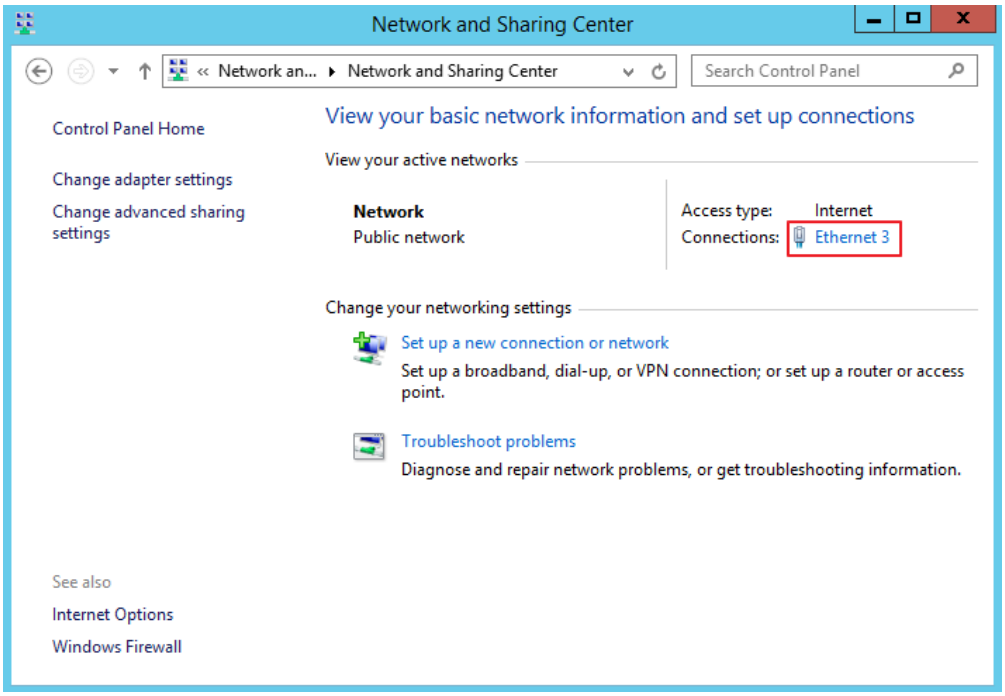
   /etc/init.d/network restart

Windows

The following steps use Windows Server 2012 R2 as an example to describe how to configure the DNS server for Windows:

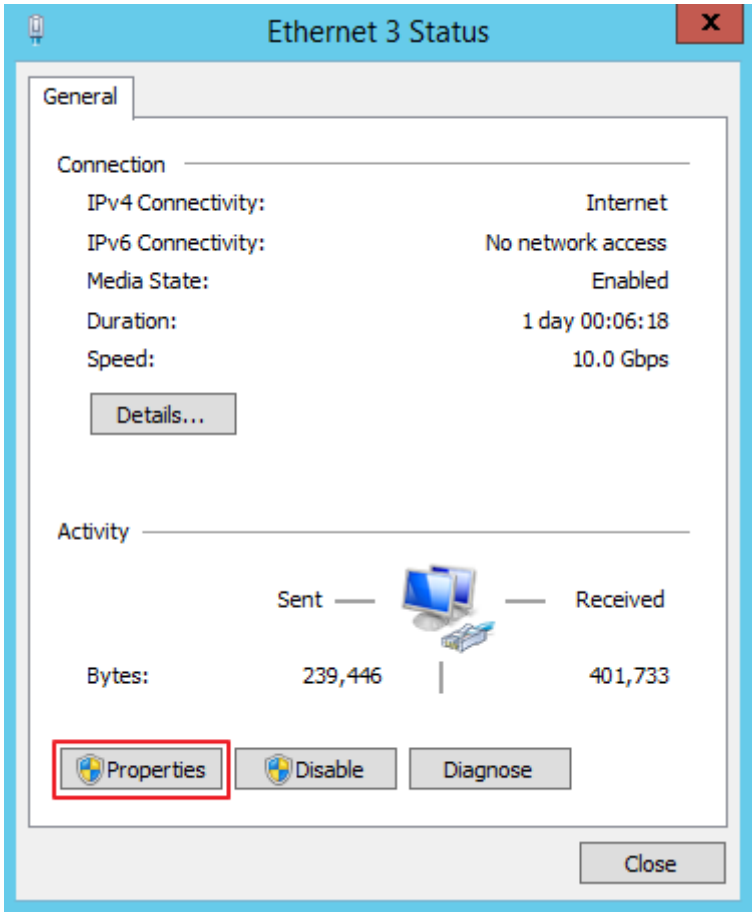
1. Log in to the BMS as user **Administrator**.
2. Click  in the lower left corner to start **Control Panel**.
3. Choose **Network and Internet** > **Network and Sharing Center**. Then, click the NIC for which you are to configure the DNS server, such as **Ethernet 3**.

   Figure 11-7 Network and Sharing Center

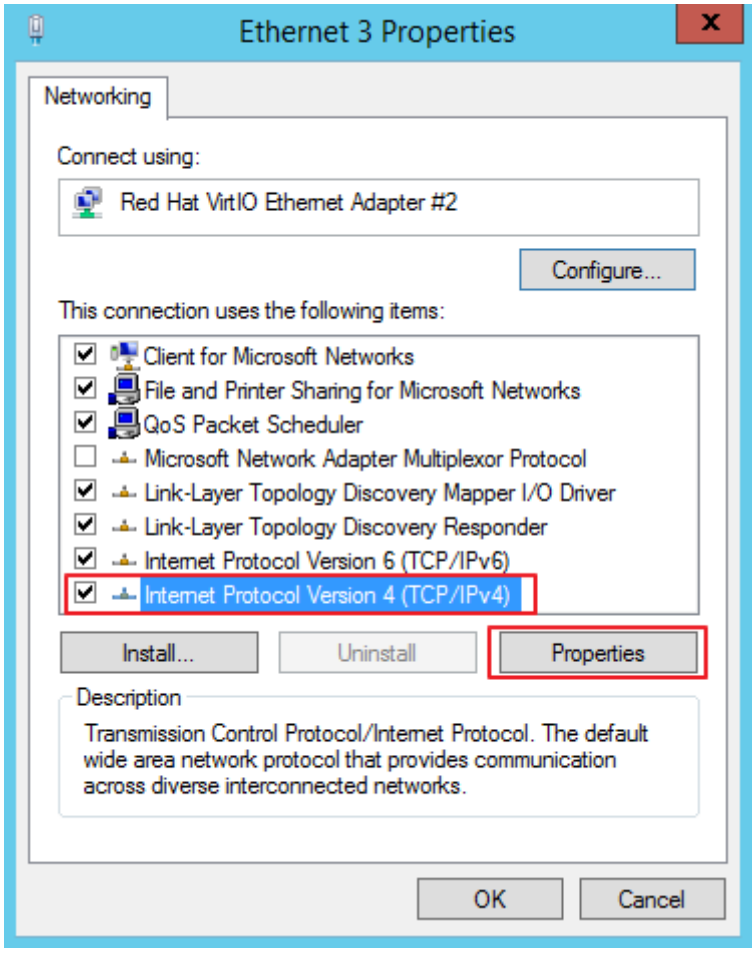
4. Click **Properties**. **Figure 11-8** shows the **Ethernet 3 Status**.

Figure 11-8 Ethernet 3 Status



5. In the displayed **Ethernet 3 Status** dialog box, select **Internet Protocol Version 4 (TCP/IPv4)** and click **Properties**.

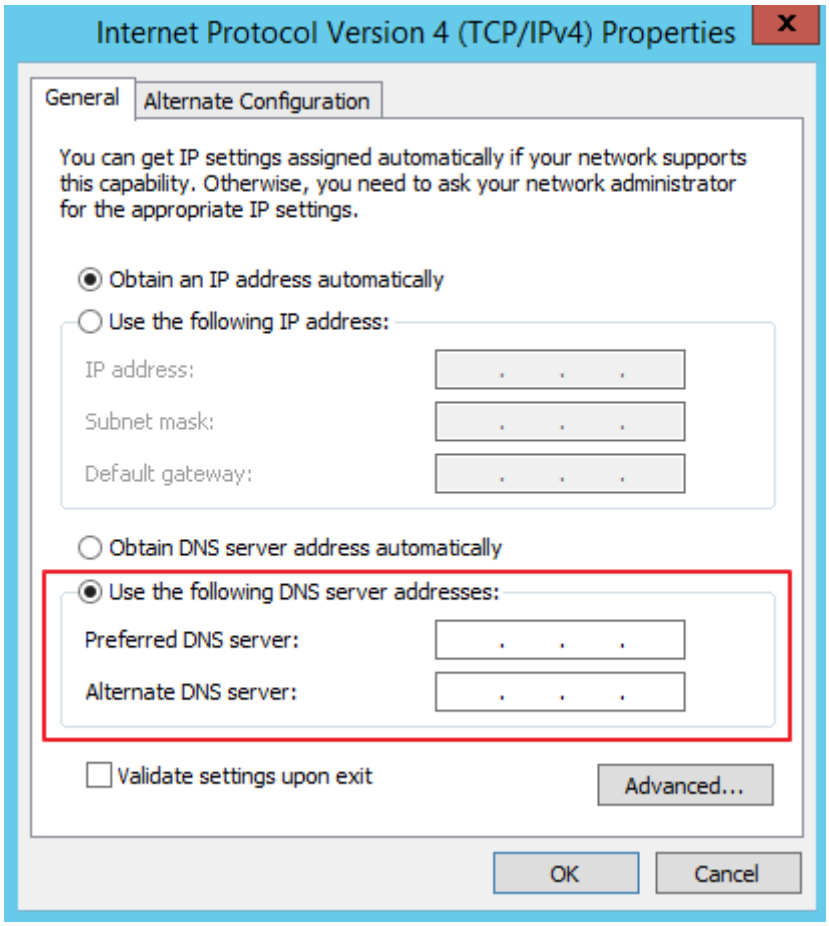
Figure 11-9 Ethernet 3 Properties



6. In the displayed **Internet Protocol Version 4 (TCP/IPv4) Properties** dialog box, select **Use the following DNS server addresses:** and configure the required parameters shown in **Figure 11-10**.

   The DNS server IP address in Northeast China is 100.125.6.250. For details about DNS server IP addresses in other regions, see **What Are Private DNS Servers and What Are Their Addresses?** After completing the configuration, click **OK**.

Figure 11-10 Configuring the DNS server



7. After completing the configuration, click , select **Windows PowerShell**, and enter the **ipconfig /all** command. The configured IP address is displayed in **DNS Servers**.

11.5 Disk FAQs

11.5.1 Can EVS Disks Be Attached to BMSs?

Yes. Ultra-high I/O, high I/O, and common I/O EVS disks can be attached to BMSs.

NOTE

If you need to attach an EVS disk to an existing BMS, **Device Type** of the EVS disk must be **SCSI**. If you need to create an EVS disk and attach it to the BMS, you must select **SCSI** in **Advanced Settings** when you create the EVS disk.

11.5.2 What Are the Restrictions for Attaching a Disk to a BMS?

- The disk and the target BMS must be located in the same AZ.
- The BMS must be in **Running** or **Stopped** state.

- **Device Type** of the EVS disk must be **SCSI**.
- A non-shared EVS disk must be in **Available** state.

  A shared EVS disk must be in **In-use** or **Available** state.
- BMSs using some flavors or images cannot have EVS disks attached because the servers do not have SDI iNICs or for other reasons.

11.5.3 How Do I Change the Disk Identifier in the fstab file to UUID?

Scenarios

After attaching disks to a Linux BMS, you must change the disk identifier in the **fstab** file to UUID. Otherwise, you cannot enter the BMS OS or the BMS becomes unavailable due to a mount point disorder after you stop and start the BMS, or restart the BMS.

NOTE

Universally Unique Identifier (UUID) is a 128-bit number used to identify information in computer systems.

Procedure

This section takes CentOS 7 as an example to describe how to change the disk identifier in the **fstab** file to UUID.

1. Log in to the BMS as user **root**. Run the **blkid** command to query all types of file systems that have been mounted to the BMS and UUIDs of the corresponding devices.
   ```
   /dev/sda2: UUID="4eb40294-4c6f-4384-bbb6-b8795bbb1130" TYPE="xfs"
   /dev/sda1: UUID="2de37c6b-2648-43b4-a4f5-40162154e135" TYPE="swap"
   ```
2. Run the **cat /etc/fstab** command to open the **fstab** file.
   ```
   /dev/sda2 /      xfs     defaults    0 0
   /dev/sda1 swap    swap    defaults    0 0
   ```
3. Check the disk identifier in the **fstab** file.
   - If the disk identifier is UUID, no further action is required.
   - If the disk identifier is the device name, go to **4**.
4. Run the **vi /etc/fstab** command to open the **fstab** file, press **i** to enter editing mode, and change the disk identifier to UUID.
   ```
   UUID=4eb40294-4c6f-4384-bbb6-b8795bbb1130 /      xfs     defaults    0 0
   UUID=2de37c6b-2648-43b4-a4f5-40162154e135 swap    swap    defaults    0 0
   ```
   Press **Esc** and enter **:wq** to save and exit the file.

11.5.4 How Do I Obtain the Drive Letter of an EVS Disk?

After a BMS is restarted, the drive letter of an EVS disk attached to the BMS may change. This section describes how to find the mapping between an EVS disk and its drive letter.

1. Record **Device Identifier** of the EVS disk on the BMS details page.
2. Log in to the BMS OS, switch to the **/dev/disk/by-id** directory, and run the **ll** command to check the mapping between the WWN and drive letter. In Linux,

WWN is in the format **wwn-0x** + *Device identifier*, for example, **wwn-0x50000397c80b685d -> ../../sdc**.

Figure 11-11 Checking the mapping between the WWN and drive letter

```
rwxrwxrwx. 1 root root  9 Mar 20 17:20 wwn-0x50000397c8088c61 -> ../../sdb
rwxrwxrwx. 1 root root  9 Mar 20 17:20 wwn-0x50000397c80b2539 -> ../../sde
rwxrwxrwx. 1 root root  9 Mar 20 17:20 wwn-0x50000397c80b685d -> ../../sdc
rwxrwxrwx. 1 root root  9 Mar 20 17:20 wwn-0x50000397c80ba3e9 -> ../../sdg
rwxrwxrwx. 1 root root  9 Mar 20 17:20 wwn-0x50000397c80bb905 -> ../../sdf
rwxrwxrwx. 1 root root  9 Mar 20 17:20 wwn-0x50000397c810e531 -> ../../sdd
rwxrwxrwx. 1 root root  9 Mar 20 17:20 wwn-0x600508e0000000002ab14603b88fa90b -> ../../sda
rwxrwxrwx. 1 root root 10 Mar 20 17:20 wwn-0x600508e0000000002ab14603b88fa90b-part1 -> ../../sda1
rwxrwxrwx. 1 root root 10 Mar 20 17:20 wwn-0x600508e0000000002ab14603b88fa90b-part2 -> ../../sda2
rwxrwxrwx. 1 root root 10 Mar 20 17:20 wwn-0x600508e0000000002ab14603b88fa90b-part3 -> ../../sda3
rwxrwxrwx. 1 root root 10 Mar 20 17:20 wwn-0x600508e0000000002ab14603b88fa90b-part4 -> ../../sda4
rwxrwxrwx. 1 root root 10 Mar 20 17:20 wwn-0x600508e0000000002ab14603b88fa90b-part5 -> ../../sda5
rwxrwxrwx. 1 root root  9 Mar 20 17:20 wwn-0x68886030000369fafa17a17502223655 -> ../../sdh
rwxrwxrwx. 1 root root 10 Mar 20 17:20 wwn-0x68886030000369fafa17a17502223655-part1 -> ../../sdh1
rwxrwxrwx. 1 root root 10 Mar 20 17:20 wwn-0x68886030000369fafa17a17502223655-part2 -> ../../sdh2
rwxrwxrwx. 1 root root 10 Mar 20 17:20 wwn-0x68886030000369fafa17a17502223655-part3 -> ../../sdh3
rwxrwxrwx. 1 root root  9 Mar 21 14:16 wwn-0x6888603000036b61fa17a17502223655 -> ../../sdo
```

NOTE

You are advised to use the WWN to perform operations on disks. For example, run the **mount** *wwn-0x50000397c80b685d Folder name* command to attach a disk. You are not advised to use the drive letter directly because drive letter drift may cause the failure to find the disk.

Obtaining the drive letter of a disk by using the WWN is only supported by Linux.

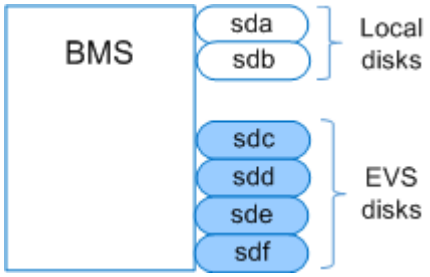
11.5.5 Are the EVS Disk Device Names on the Console and the Device Names in BMS OSs Consistent?

Local System Disk

The EVS disk device names displayed on the BMS details page on the VPC console are inconsistent with the device names displayed in the BMS OS. To prevent impact of device name changes on services, you are advised to use EVS disks by UUID.

If EVS disks are specified during BMS allocation, the EVS disk device names displayed on the BMS details page start from **/dev/sdb** and the device names displayed in the BMS OS start after the BMS local disk names, as shown in **Figure 11-12**.

Figure 11-12 Device names in the BMS OS



If EVS disks are attached to an allocated BMS, the device names displayed on the BMS details page are those specified by the tenant during disk attaching. After the EVS disks are detached from the BMS, the disks will not be displayed on the BMS details page, and the device names will be released.

If EVS disks are detached from an allocated BMS, the device names displayed in the BMS OS vary depending on whether the BMS OS restarts.

After EVS disks are attached to a BMS, if the BMS OS does not restart, the device names displayed in the BMS OS start from the smallest device name that is not used by other devices. For example, if device names **/dev/sda** and **/dev/sdc** are in use, the device names will start from **dev/sdb**. After EVS disks are detached from the BMSs, if the BMS OS does not restart, the BMS OS will release the device names.

If the BMS OS restarts, the device names displayed in the BMS OS will change based on the number of disks the BMS has and the disk attaching sequence. **Figure 11-13** shows the device names displayed in the BMS OS after EVS disks are attached to the BMS (before and after BMS restart). **Figure 11-14** shows the device names displayed in the BMS OS after EVS disks are detached from the BMS (before and after BMS restart).

Figure 11-13 Attaching EVS disks to a BMS

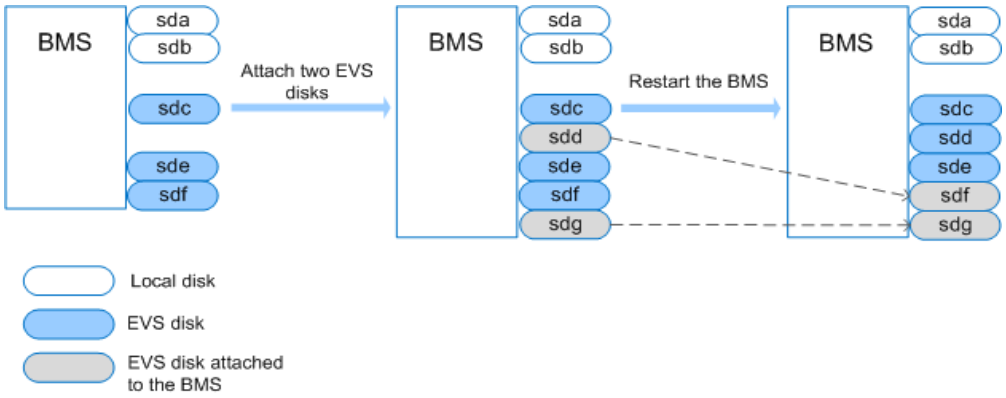
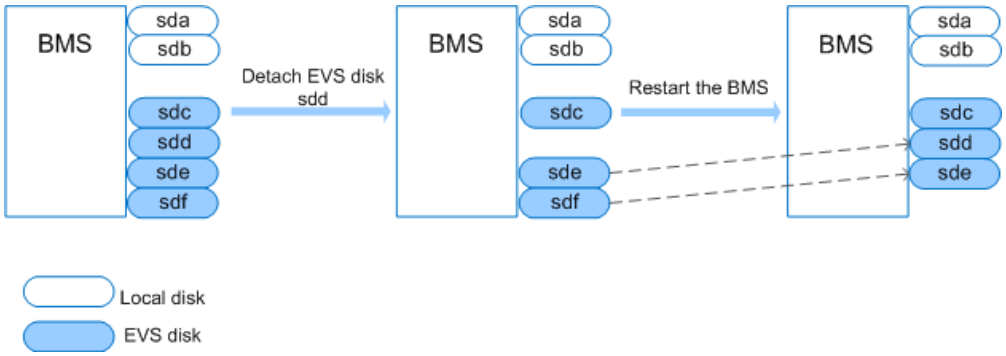


Figure 11-14 Detaching EVS disks from a BMS



EVS System Disk

The EVS disk device names displayed on the BMS details page on the VPC console may be inconsistent with the device names displayed in the BMS OS.

If EVS disks are specified during BMS allocation, the EVS disk device names displayed on the BMS details page start from **/dev/sda** and the device names in the BMS OS are displayed in a sequence determined by system scanning. There are two situations as shown in **Figure 11-15** and **Figure 11-16**, and the EVS system disk always has the smallest drive letter of all the EVS disks.

Figure 11-15 Device names in the BMS OS (situation 1)

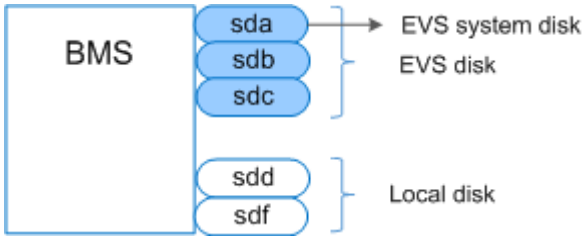
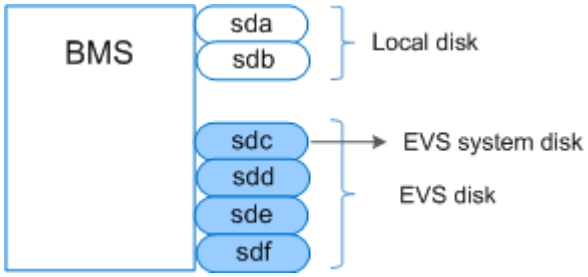


Figure 11-16 Device names in the BMS OS (situation 2)



If EVS disks are attached to an allocated BMS, the device names displayed on the BMS details page are those specified by the tenant during disk attaching. After the EVS disks are detached from the BMS, the disks will not be displayed on the BMS details page, and the device names will be released.

If EVS disks are detached from an allocated BMS, the device names displayed in the BMS OS vary depending on whether the BMS OS restarts.

After EVS disks are attached to a BMS, if the BMS OS does not restart, the device names displayed in the BMS OS start from the smallest device name that is not used by other devices. For example, if device names **/dev/sda** and **/dev/sdc** are in use, the device names will start from **dev/sdb**. After EVS disks are detached from the BMSs, if the BMS OS does not restart, the BMS OS will release the device names.

If the BMS OS restarts, the device names displayed in the BMS OS will change based on the number of disks the BMS has and the disk attaching sequence. **Figure 11-17** and **Figure 11-18** show the device names displayed in the BMS OS after EVS disks are attached to the BMS (before and after BMS restart). **Figure 11-19** and **Figure 11-20** show the device names displayed in the BMS OS after EVS disks are detached from the BMS (before and after BMS restart).

Figure 11-17 Attaching an EVS disk (before the BMS restart)

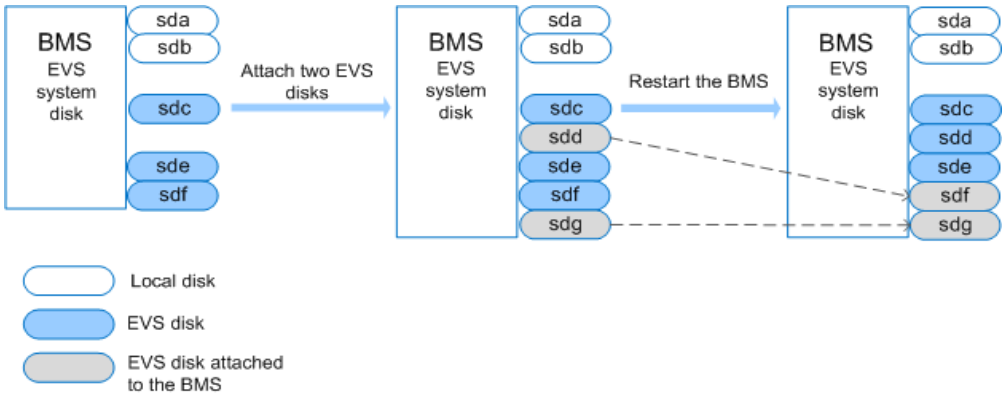


Figure 11-18 Attaching an EVS disk (after the BMS restart)

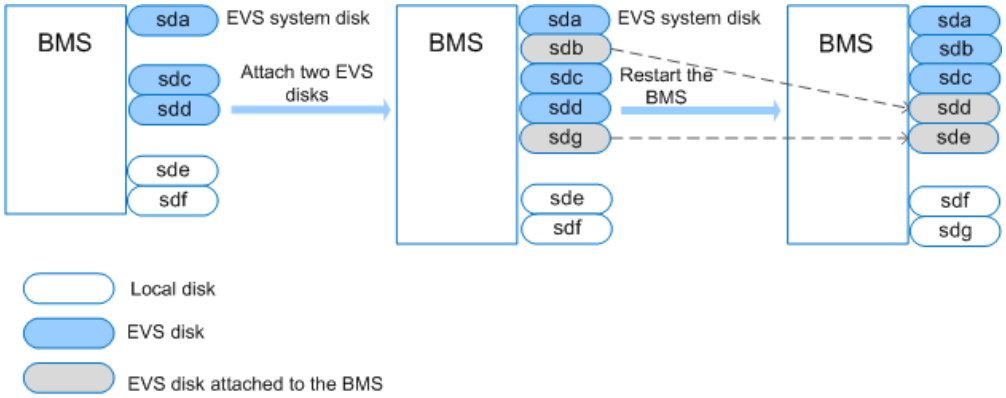


Figure 11-19 Detaching an EVS disk (before the BMS restart)

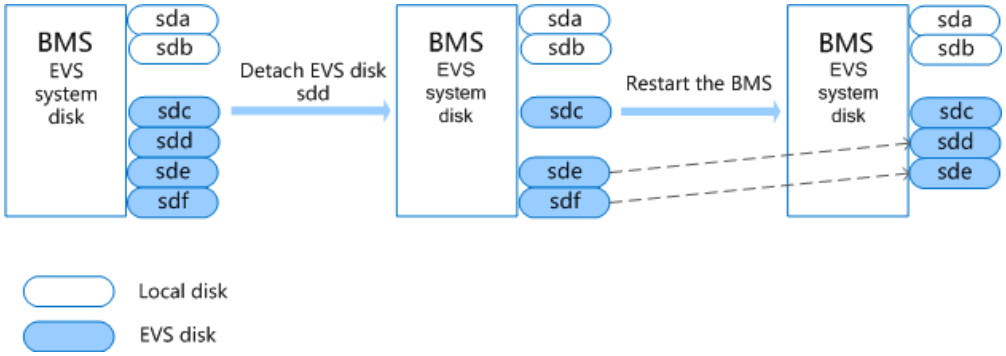
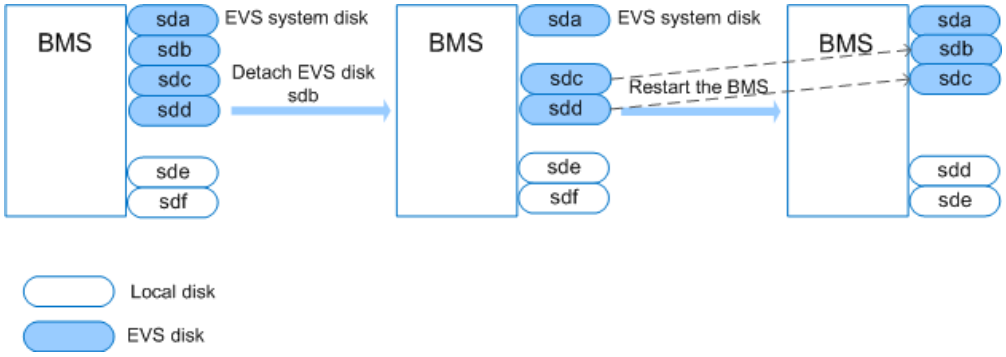


Figure 11-20 Detaching an EVS disk (after the BMS restart)



11.5.6 Why Is the EVS Disk Size Not Updated in the BMS OS After the EVS Disk Capacity Has Been Expanded?

If this occurs, scan block devices in the BMS OS. Take the sdh disk of Red Hat as an example, run the **echo 1 > /sys/block/sdh/device/rescan** command.

11.5.7 How Can I Restore System Disk Data Using the Snapshot?

You can create snapshots of the BMS system disk on the EVS console periodically. To restore the system disk data, mount the target system disk to the **sda** mount point.

NOTE

BMSs using the physical.o3.small flavor can use an EVS disk as the system disk. You can only restore system disk data of this type of BMS.

1. Power off the BMS.
   a. Log in to the management console.
   b. Under **Computing**, click **Bare Metal Server**.
      The BMS console is displayed.
   c. Locate the target BMS and click **Stop**.
2. Detach the system disk.
   a. Click the BMS after it is powered off.
      The page showing details of the BMS is displayed.
   b. Locate the target system disk and click **Detach**.
      In the displayed dialog box, click **OK**.
3. Attach the system disk.
   a. On the page showing the BMS details, click **Attach Disk**.
      The **Attach Disk** page is displayed.
   b. Select the system disk and mount point **/dev/sda**, and click **Attach Disk**.
      In the displayed dialog box, click **OK**.

11.5.8 What Do I Do to Prevent Risks of Attaching or Detaching the System Disk?

Attaching or detaching the system disk is a high-risk operation. You can attach or detach the system disk only when you need to restore the system disk data using the snapshot. In other cases, you are forbidden to attach or detach the system disk.

11.5.9 How Should I Select Storage?

When you create a BMS, you can select one from the following storage types:

- Elastic Volume Service (EVS): provides EVS disks of different QoS configurations to meet performance requirements in various scenarios.

- Dedicated Storage Service (DSS): provides exclusive storage resources. You can create disks of different specifications as needed and attach them to BMSs.

11.5.10 Why Is the Disk Capacity Displayed in the BMS OS Less Than That Displayed on the Official Website?

Possible causes of this issue are as follows:

1. Hardware vendors have a different method of calculating storage capacity from that of the OS. Hardware vendors use decimal notation to calculate disk capacity, in which 1 GB = 1000 x 1000 x 1000 bytes. In the OS, the capacity is calculated in binary mode, in which 1 GB = 1024 x 1024 x 1024 bytes.
2. The system contains hidden partitions, such as the boot partition, system backup, and restoration partition.
3. The file system consumes some disk capacity. Before using a hard disk, the OS partitions the disk and initializes the file system. The configuration also occupies a small amount of disk capacity.
4. The RAID array occupies some disk capacity. For example, if two 600 GB hard disks form RAID 1, only 600 GB capacity of one disk can be used.

11.6 OS FAQs

11.6.1 Can I Install or Upgrade BMS OSs by Myself?

You can reinstall a BMS OS. If an upgrade or patch installation is involved and the kernel version changes, confirm with the cloud service vendor whether drivers, such as RAID controller card drivers and NIC drivers, need to be reinstalled. If the required drivers of the corresponding kernel version are not installed, the OS may fail to start or basic functions of the OS may be unavailable.

11.6.2 Can the BMS OS Be Replaced?

No. The BMS OS cannot be replaced.

11.6.3 Is a GUI Provided for BMS OSs?

The Linux OSs provided for BMSs are managed using the command line interface (CLI). If you want to manage OSs using GUI, configure the GUI.

11.6.4 Is an Upload Tool Delivered with BMS OSs?

No. You must install and configure the upload tool, for example, the FTP tool, by yourself.

11.6.5 How Do I Configure the Static Host Name of a BMS?

Symptom

The static host name of a Linux BMS is user-defined and injected on the console during the BMS creation. You can use the console or run the **hostname** command

to change the host name of a BMS. However, if you restart the BMS, its host name will be automatically changed to the user-defined one injected on the console.

Automatically Updating the Host Name (Recommended)

Change the host name of the BMS on the console and enable automatic host name synchronization in the BMS OS. In this way, after the BMS is restarted, it automatically synchronizes the host name from the console.

This method has the following restrictions:

- The host name contains a maximum of 63 characters.
- Special characters except hyphens (-), underscores (_), and periods (.) are not supported.
- Uppercase letters are not supported.
- This method does not apply to Windows BMSs.

1. Log in to the management console, click **Bare Metal Server** under **Computing**.
2. Click the name of the BMS whose name is to be changed.
3. On the displayed page, click next to **Name**, enter a new name that meets the preceding requirements, and click to save the change.
4. Log in to the BMS OS and run the following command to enable automatic hostname synchronization:

   vi /opt/huawei/network_config/bms-network-config.conf

   Set the value of **auto_synchronize_hostname** to **True**.

   ```
   auto_synchronize_hostname = True
   ```

   Press **Esc** and enter **:wq** to save and exit the file.
5. Log in to the management console again. Locate the row that contains the BMS, click **More** in the **Operation** column, and select **Restart**.

   After about 10 minutes, verify that the BMS is restarted and its hostname is automatically updated.

   NOTE

   If you set the value of **auto_synchronize_hostname** in step **4** to **False**, the host name configured during BMS creation will be retained.

Manually Updating the Host Name

To make the changed host name take effect even after the BMS is stopped or restarted, save the changed name into configuration files.

For example, if the changed host name is *new_hostname*, perform the following steps:

1. Modify the **/etc/hostname** configuration file.
   a. Run the following command to edit the **/etc/hostname** configuration file:

      sudo vim /etc/hostname

b. Change the host name to *new_hostname*.

c. Run the following command to save and exit the configuration file:

:wq

2. (Optional) For Red Hat Enterprise Linux, CentOS, and Fedora 6, modify the configuration file **/etc/sysconfig/network**.

a. Run the following command to edit the **/etc/sysconfig/network** configuration file:

sudo vim /etc/sysconfig/network

b. Change the **HOSTNAME** value to *new_hostname*.

HOSTNAME=*new_hostname*

c. Run the following command to save and exit the configuration file:

:wq

3. Modify the **/etc/cloud/cloud.cfg** configuration file.

a. Run the following command to edit the **/etc/cloud/cloud.cfg** configuration file:

sudo vim /etc/cloud/cloud.cfg

b. Use either of the following methods to modify the configuration file:

- Method 1: Change the **preserve_hostname** parameter value or add the **preserve_hostname** parameter to the configuration file.

  If **preserve_hostname: false** is already available in the **/etc/cloud/cloud.cfg** configuration file, change it to **preserve_hostname: true**.

  If **preserve_hostname: false** is unavailable in the **/etc/cloud/cloud.cfg** configuration file, add **preserve_hostname: true** before **cloud_init_modules**.

- Method 2: Delete or comment out the following content:

  update_hostname

c. Run the following command to save and exit the configuration file:

:wq

4. Change the BMS network configuration script **bms-network-config.conf**.

The value of parameter **enable_preserve_hostname** in the **bms-network-config.conf** file is **False** by default, indicating that the host name is updated each time the board resets. To disable this function, change its value to **True**.

a. Run the following command to edit the configuration script **bms-network-config.conf**:

sudo vim /opt/huawei/network_config/bms-network-config.conf

b. Set the value of **enable_preserve_hostname** to **True**.

enable_preserve_hostname: True

c. Run the following command to save and exit the configuration file:

:wq!

5. (Optional) For SUSE, modify the configuration file **/etc/sysconfig/network/dhcp**.

a. Run the following command to edit the **/etc/sysconfig/network/dhcp** configuration file:

sudo vim /etc/sysconfig/network/dhcp

b. Set the value of **DHCLIENT_SET_HOSTNAME** to **no** to ensure that DHCP does not automatically allocate host names.

DHCLIENT_SET_HOSTNAME="no"

c. Run the following command to save and exit the configuration file:

:wq

6. Run the following command to restart the BMS:

sudo reboot

7. Run the following command to check whether the static host name is changed:

sudo hostname

If the changed host name *new_hostname* is displayed in the command output, the host name is changed and the new name permanently takes effect.

11.6.6 How Do I Set the Password Validity Period?

If you cannot log in to a BMS due to password expiry, contact the administrator.

If you can log in to the BMS, perform the following operations to set the password validity period:

1. Log in to the BMS OS and run the following command to query the password validity period:

vi /etc/login.defs

The value of parameter **PASS_MAX_DAYS** indicates the password validity period.

2. Run the following command to change the value of parameter **PASS_MAX_DAYS** in 1:

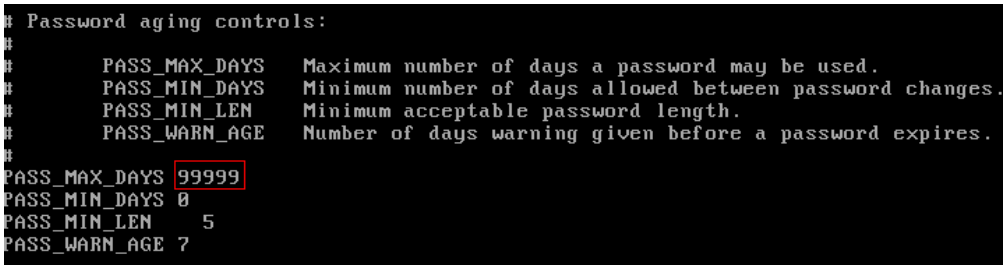
chage -M *99999 user_name*

99999 is the validity period of the password, and *user_name* is a system user.

You are advised to set the password validity period as needed and change it on a regular basis.

3. Run **vi /etc/login.defs** to verify that the configuration has taken effect.

Figure 11-21 Configuration verification



11.6.7 How Do I Set SSH Configuration Items?

You can select the BMS login mode or account type. If you have requirements for special configuration, perform the following operations:

1. To improve security of the BMS, disable remote login using the password and retain only the certificate login mode. Configure the following parameters:
   - Check whether the **/etc/cloud/cloud.cfg** file contains parameter **ssh_pwauth** and its value is **false**. If not, add the parameter or change its value to **false**. This ensures that password cannot be used to log in to the BMS using Xshell.
   - Check whether the value of parameter **ChallengeResponseAuthentication** in the **/etc/ssh/sshd_config** file is **no**. If not, change it to **no**. This ensures that password cannot be entered using the keyboard inactive method to log in to the BMS using Xshell.
2. To enable remote login as user **root** and enable SSH permissions of user **root**, perform the following operations:

   CAUTION

   This operation may cause risks. Exercise caution before performing this operation.

   a. Modify the Cloud-Init configuration file.

      Take CentOS 6.7 as an example. Modify the following parameters:

      ```
      users:
        - name: root
          lock_passwd: false

      disable_root: 0
      ssh_pwauth: 1
      ```

      In the preceding information:

      - If the value of **lock_passwd** is set to **false**, user password is not locked.
      - **disable_root** specifies whether to disable remote SSH login as user **root**. Set the value to **0**, indicating that the remote SSH login as user **root** is enabled (In some OSs, value **true** indicates disabled and **false** indicates enabled).
      - **ssh_pwauth** specifies whether to support SSH password login. Set this parameter to **1**, indicating that SSH password login is supported.

   b. Run the following command to open the **/etc/ssh/sshd_config** file using the vi editor:

      vi /etc/ssh/sshd_config

      Change the value of **PasswordAuthentication** in the **sshd_config** file to **yes**.

      NOTE

      - For SUSE and openSUSE, set **PasswordAuthentication** and **ChallengeResponseAuthentication** in the **sshd_config** file to **yes**.
      - For **Ubuntu**, set **PermitRootLogin** to **yes**.

   c. Lock the initial password of user **root** in the image template by modifying the **shadow** file to prevent risks.

i. Run the following command to open the **/etc/shadow** configuration file using the vim editor:

vim /etc/shadow

Add **!!** to the password hash value of the root account. The modified configuration file is as follows:

```
# cat /etc/shadow | grep root
 root:!!$6$SphQRPXu$Nvg6izXbhDPrcY3j1vRiHaQFVRpNiV3HD/
bjDgnZrACOWPXwJahx78iaut1IigIUrwavVGSYQ1JOIw.rDlVh7.:17376:0:99999:7::
```

ii. After the configuration file is modified, press **Esc** and enter **:wq** to save and exit the file.

NOTE

For Ubuntu, delete the user created during the OS installation. For example, run the **userdel -rf ubuntu** command to delete user **ubuntu** created during OS installation.

11.6.8 How Can I Handle the Eight-Hour Difference Between the Windows BMS and Local Time

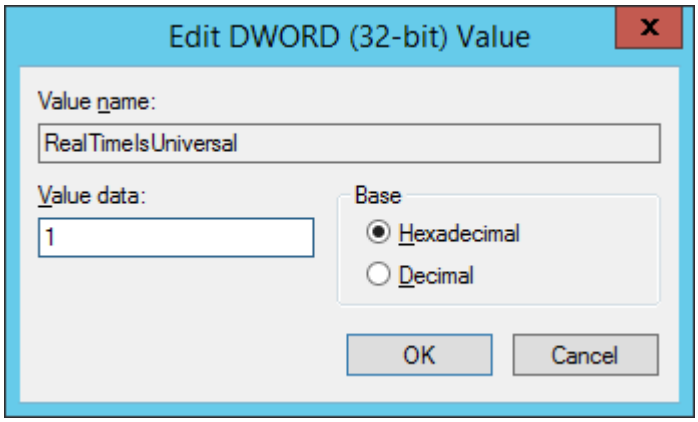
Cause

Linux uses the time of the motherboard CMOS chip as the Coordinated Universal Time (UTC) and determines the system time based on the configured time zone. However, Windows uses the CMOS time as the system time directly without converting it based on the time zone.

Solution

1. Log in to the Windows BMS.
2. Click  in the lower left corner, choose **Windows PowerShell**, and enter **regedit.exe** to open the registry.
3. In the displayed **Registry Editor** window, choose **HKEY_LOCAL_MACHINE** > **SYSTEM** > **CurrentControlSet** > **Control** > **TimeZoneInformation**.
4. In the right pane, right-click a blank area and choose **New** > **DWORD (32-bit) Value** to add a REG_DWORD code. Set its name to **RealTimeIsUniversal** and value to **1**.

Figure 11-22 Adding a code



5. After the modification, restart the BMS.
   After the BMS restarts, its system time is consistent with the local time.

11.6.9 How Can I Activate a Windows BMS?

Perform the following operations to manually activate a Windows BMS:

1. Log in to the Windows BMS.
2. Click  in the lower left corner and choose **Windows PowerShell**.
3. Run the following command to configure the IP address of the KMS server:
   slmgr -skms *x.x.x.x*
   x.x.x.x indicates the IP address of the KMS server. Contact the administrator to obtain the IP address.
4. Run the following command to check whether the BMS has been activated:
   slmgr -ato
   If error 0xC004F074 occurs, the BMS cannot be activated. In such an event, go to **5**.
5. Verify that the time in the BMS is the same as the standard time. If the time is significantly different, the BMS cannot be activated.
6. Run the following command on the BMS to check whether the link between the BMS and the KMS server port is reachable:
   telnet *x.x.x.x* **1688**
   If the link is unreachable, port 1688 is not enabled on the BMS firewall. You must disable the firewall or enable port 1688 on the firewall. If the BMS has any security software such as safedog, stop using it.
7. Run the following command to check whether the BMS has been activated:
   slmgr -ato

11.6.10 How Do I Change the SID of a Windows Server 2012 BMS?

Scenarios

A Security Identifier (SID) is a unique value that identifies a user, group, or computer account (administrator account). When an account is created for the first time, a unique SID is assigned to each account on the network. A SID is determined by the computer name, current time, and CPU use time of the current user-mode thread.

A complete SID contains:

- User and group security description
- 48-bit ID authority
- Revision level
- Variable sub-authority values

An example SID is S-1-5-21-287469276-4015456986-3235239863-500.

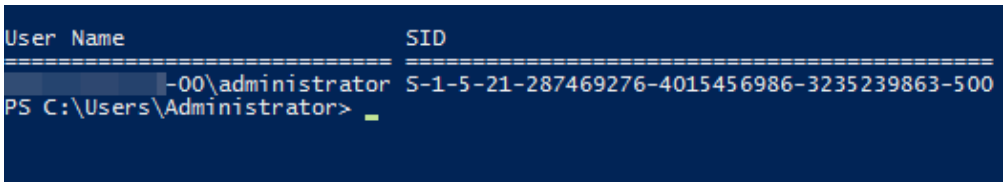
S	1	5	21-287469276-4015456986-3235239863	500
The string is a SID.	SID version	SID authority, which is NT in this example	SID sub-authorities	Accounts and groups in the domain

Currently, all the Windows Server 2012 BMSs have the same SID. In the cluster deployment scenario, you need to change the SID of the BMSs to ensure that each BMS uses a unique SID.

Procedure

1. Log in to the BMS OS.
2. Click  in the lower left corner, choose **Windows PowerShell**, and run the **whoami /user** command to query the SID.

   Figure 11-23 Querying the original SID

3. Modify the Cloudbase-Init configuration files.
   a. Open the **cloudbase-init.conf** and **cloudbase-init-unattend.con** files in the **C:\Program Files\Cloudbase Solutions\Cloudbase-Init\conf** directory.
   b. Add **first_logon_behaviour=no** to both files.

      ```
      [DEFAULT]
      username=Administrator
      groups=Administrators
      first_logon_behaviour=no
      netbios_host_name_compatibility=false
      metadata_services=cloudbaseinit.metadata.services.httpser
      inject_user_password=true
      ...
      ```

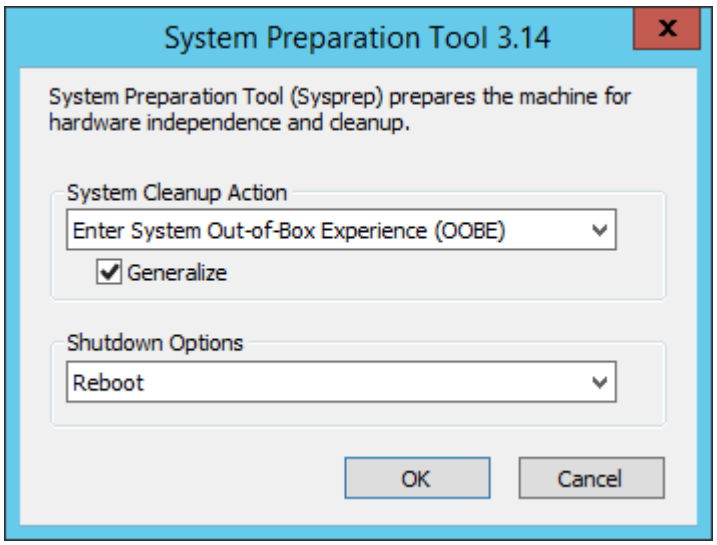
   c. Delete **cloudbaseinit.plugins.common.sethostname.SetHostNamePlugin** from the **cloudbase-init-unattend.conf** file.

      ```
      se Solutions\Cloudbase-Init\log\
      .log
      0, suds=INFO, iso8601=WARN, requests=WARN
      M1, 115200, N, 8


      iles\Cloudbase Solutions\Cloudbase-Init\LocalScripts\
      .metadata.services.configdrive.ConfigDriveService, cloudbaseinit.metadata.services.httpservi
      ommon.mtu.MTUPlugin, cloudbaseinit.plugins.common.sethostname.SetHostNamePlugin, cloudbaseini
      ```

4. Open the CLI and enter the following command to open the Sysprep window:
   ```
   C:\Program Files\Cloudbase Solutions\Cloudbase-Init\conf> C:\Windows\System32\Sysprep
   \sysprep.exe /unattend:Unattend.xml
   ```
5. In the **System Preparation Tool 3.14** dialog box, configure parameters and click **OK**.

   Figure 11-24 System Preparation Tool settings

6. After the configuration is complete, the BMS automatically restarts. You need to encapsulate and decompress the package again. After the BMS restarts, you need to reset the password for the Windows OS. Contact the customer service.
7. Log in to the BMS OS and check the SID using the method in 2.

   Figure 11-25 Querying the new SID

   ```
   User Name                      SID
   ============================== ============================================
   win-ck7r022vrh0\administrator S-1-5-21-3812874840-1741028955-636704118-500
   PS C:\Users\Administrator>
   ```

   As shown in the preceding figure, the SID has been changed successfully.

11.6.11 How Do I Reserve Log Space If the Root Partition Automatically Expands Disks?

Scenarios

In the scenario where the root partition automatically expands disks, the initial root partition may occupy all space of the system disk. This section describes how to reserve log space.

Procedure

1. Run the **lsblk** command. The following command output indicates that the initial root partition has occupied all space of the system disk.

```
Last login: Fri Mar  2 01:26:34 2018
root@bms-ubuntu-0001:~# lsblk
NAME   MAJ:MIN RM   SIZE RO TYPE MOUNTPOINT
sda      8:0    0 837.3G  0 disk
├─sda1   8:1    0   953M  0 part /boot
├─sda2   8:2    0   4.7G  0 part [SWAP]
├─sda3   8:3    0 831.6G  0 part /
└─sda4   8:4    0    64M  0 part
root@bms-ubuntu-0001:~#
```

2. Run the following command to create a directory for storing logs:

   mkdir log

```
root@bms-ubuntu-0001:~# mkdir log
root@bms-ubuntu-0001:~# ll
total 44
drwx------  6 root root 4096 May 31 08:48 ./
drwxr-xr-x 24 root root 4096 May 31 08:47 ../
-rw-------  1 root root    1 Mar  2 01:35 .bash_history
-rw-r--r--  1 root root 3106 Feb 19  2014 .bashrc
drwx------  2 root root 4096 Dec 22 23:49 .cache/
drwxr-xr-x  2 root root 4096 May 31 08:48 log/
drwxr-xr-x  2 root root 4096 Feb 28 01:41 .oracle_jre_usage/
-rw-r--r--  1 root root  140 Feb 19  2014 .profile
drwx------  2 root root 4096 Dec 11 22:21 .ssh/
-rw-------  1 root root 4835 Mar  2 01:35 .viminfo
```

3. Run the following command to create a 200 GB image file for storing logs.

   dd if=/dev/zero of=disk.img bs=1M count=200000

```
root@bms-ubuntu-0001:~# dd if=/dev/zero of=disk.img bs=1M count=200000
200000+0 records in
200000+0 records out
209715200000 bytes (210 GB) copied, 807.411 s, 260 MB/s
root@bms-ubuntu-0001:~# df -h
Filesystem      Size  Used Avail Use% Mounted on
/dev/sda3       819G  198G  588G  26% /
none            4.0K     0  4.0K   0% /sys/fs/cgroup
udev            158G   12K  158G   1% /dev
tmpfs            32G  1.1M   32G   1% /run
none            5.0M     0  5.0M   0% /run/lock
none            158G     0  158G   0% /run/shm
none            100M     0  100M   0% /run/user
/dev/sda1       922M   54M  806M   7% /boot
root@bms-ubuntu-0001:~#
```

4. Run the following commands to virtualize the generated file into a block device and format it:

   losetup /dev/loop0 disk.img

mkfs.ext4 /dev/loop0

```
root@bms-ubuntu-0001:~# losetup /dev/loop0 disk.img
root@bms-ubuntu-0001:~# mkfs.ext4 /dev/loop0
mke2fs 1.42.9 (4-Feb-2014)
Discarding device blocks: done
Filesystem label=
OS type: Linux
Block size=4096 (log=2)
Fragment size=4096 (log=2)
Stride=0 blocks, Stripe width=0 blocks
12804096 inodes, 51200000 blocks
2560000 blocks (5.00%) reserved for the super user
First data block=0
Maximum filesystem blocks=4294967296
1563 block groups
32768 blocks per group, 32768 fragments per group
8192 inodes per group
Superblock backups stored on blocks:
        32768, 98304, 163840, 229376, 294912, 819200, 884736, 1605632, 2654208,
        4096000, 7962624, 11239424, 20480000, 23887872

Allocating group tables: done
Writing inode tables: done
Creating journal (32768 blocks): done
Writing superblocks and filesystem accounting information: done
```

5. Run the following command to mount the image file to the log directory:
   mount disk.img log

```
root@bms-ubuntu-0001:~# mount disk.img log/
root@bms-ubuntu-0001:~# df -h
Filesystem      Size  Used Avail Use% Mounted on
/dev/sda3       819G  1.7G  784G   1% /
none            4.0K     0  4.0K   0% /sys/fs/cgroup
udev            158G   12K  158G   1% /dev
tmpfs            32G  1.1M   32G   1% /run
none            5.0M     0  5.0M   0% /run/lock
none            158G     0  158G   0% /run/shm
none            100M     0  100M   0% /run/user
/dev/sda1       922M   54M  806M   7% /boot
/dev/loop1      193G   60M  183G   1% /root/log
```

6. Create a file in the log directory.

```
root@bms-ubuntu-0001:~# cd log/
root@bms-ubuntu-0001:~/log# ll
total 24
drwxr-xr-x 3 root root  4096 May 31 09:09 ./
drwx------ 6 root root  4096 May 31 08:50 ../
drwx------ 2 root root 16384 May 31 09:09 lost+found/
root@bms-ubuntu-0001:~/log# vim test
root@bms-ubuntu-0001:~/log# cat test
helloworld!
```

7. Run the following command to add the mount command to **/etc/rc.local**:
   mount /root/disk.img /root/log

```
#
# By default this script does nothing.
mount /root/disk.img /root/log
exit 0
~
```

8. Run the following command to restart the OS:
   reboot

```
The system is going down for reboot NOW!
Connection closing...Socket close.

Connection closed by foreign host.

Disconnected from remote host(10.185.78.41:22) at 21:20:32.
```

9. Run the **lsblk** command. The command output indicates that the image file has been mounted.

```
Last login: Thu May 31 08:51:44 2018 from 10.190.179.88
root@bms-ubuntu-0001:~# lsblk
NAME   MAJ:MIN RM   SIZE RO TYPE MOUNTPOINT
sda      8:0    0 837.3G  0 disk
├─sda1   8:1    0   953M  0 part /boot
├─sda2   8:2    0   4.7G  0 part [SWAP]
├─sda3   8:3    0 831.6G  0 part /
└─sda4   8:4    0    64M  0 part
loop0    7:0    0 195.3G  0 loop /root/log
root@bms-ubuntu-0001:~# cat /root/log/test
helloworld!
root@bms-ubuntu-0001:~#
```

11.6.12 How Do I Roll Back the Kernel Version If I Mistakenly Upgrade the Kernel?

Scenarios

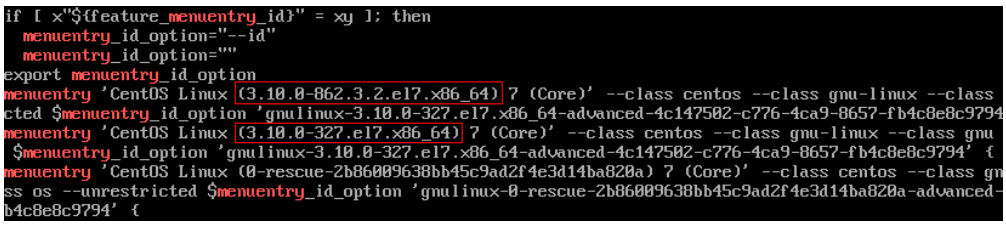
SDI, RAID, and IB hardware drivers of the BMS are related to the kernel. You are not advised to upgrade the kernel version.

If you have upgraded the kernel, perform the operations in this section. This section uses CentOS 7.2 as an example to describe how to set the BMS OS to start from the default kernel if you have upgraded the kernel.

Upgrade Scenario

1. Run the **uname -a** command to query the current kernel version.
   ```
   [root@bms-centos ~]# uname -a
   Linux bms-centos 3.10.0-327.el7.x86_64 #1 SMP Thu Nov 29 14:49:43 UTC 2018 x86_64 x86_64
   x86_64 GNU/Linux
   ```
2. Run the **yum update kernel** command to upgrade the kernel.
3. Run the **cat /boot/grub2/grub.cfg |grep menuentry** command to check the kernel information of the OS after the upgrade.

   As shown in the following figure, **3.10.0-327.el7.x86_64** is the default kernel version and **3.10.0-862.3.2.el7.x86_64** is the upgraded kernel version.

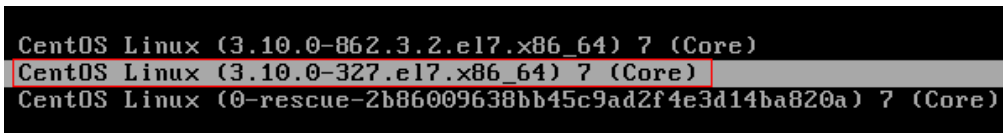
Emergency Settings After Kernel Upgrade

1. Run the following commands to set the original kernel version as the default startup kernel and verify the modification result:

   grub2-set-default "CentOS Linux (3.10.0-327.el7.x86_64) 7 (Core)"

   grub2-editenv list

   ```
   [root@bms-centos ~]# grub2-editenv list
   saved_entry-CentOS Linux (3.10.0-327.el7.x86_64) 7 (Core)
   ```
2. After the verification is complete, restart the OS from the default kernel.

3. Run the **uname -a** command to check whether the kernel version is restored.

11.6.13 How Do I Increase the Swap Partition Size?

Scenarios

When you install the Oracle database for a Linux OS, the swap partition size will be checked. If the swap partition cannot meet requirements, you can perform the operations in this section to increase the swap partition size.

NOTE

The swap partition is similar to the virtual memory of the Windows OS. When the memory is insufficient, some hard disk space is virtualized into memory to improve the system running efficiency.

Procedure

1. Log in to the BMS OS.
2. Run the **lsblk** command to check the size of the swap partition.

```
[root@bms-          ~]# lsblk
NAME          MAJ:MIN RM  SIZE RO TYPE MOUNTPOINT
sda             8:0    0  1.1T  0 disk
├─sda1          8:1    0  500M  0 part /boot
├─sda2          8:2    0 29.5G  0 part
│ ├─rhel-root 253:0    0 26.5G  0 lvm  /
│ └─rhel-swap 253:1    0    3G  0 lvm  [SWAP]
└─sda3          8:3    0   64M  0 part
```

   The size of the swap partition is 3 GB.
3. Run the following command to increase the swap partition size by 5 GB (example):

   dd if=/dev/zero of=/swapfile bs=1M count=5000

   chmod 600 /swapfile

   mkswap /swapfile swapon /swapfile echo "/swapfile swap swap defaults 0 0" >>/etc/fstab
4. Run the **lsblk** command to check the size of the expanded swap partition.

```
[root@bms-          ~]# free
              total        used        free      shared  buff/cache   available
Mem:      263564592    87360740    18486896      805268   157716956   174200612
Swap:       8265716     2362592     5903124
```

   The size of the swap partition is 8 GB.

A Change History

Released On	Description
2020-06-20	This issue is the sixth official release. Added the **physical.s4.3xlarge** flavor in **Instance Family**.
2019-07-30	This issue is the fifth official release. Added the following content: • **Changing the Name of a BMS** • **Private Image Overview** Modified the following content: • Adjusted the outline of **Instance**. • Added a table displaying the requirements and differences between login methods in **Linux BMS Login Methods**. • Added suggestions for using security groups in **Adding Security Group Rules**.
2019-04-25	This issue is the fourth official release. Optimized the whole document, including adjusting the outline, optimizing feature descriptions, and adding scenario descriptions.
2018-12-30	This issue is the third official release. Added constraints in **How Can I Restore System Disk Data Using the Snapshot?**
2018-10-15	This issue is the second official release. Added **Instance Family**.
2018-08-15	This issue is the first official release.