Alibaba Cloud
Elastic Compute Service

Images

Issue: 20200519
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## Document conventions

<table>
<thead>
<tr>
<th>Style</th>
<th>Description</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>⚠️</td>
<td>A danger notice indicates a situation that will cause major system changes, faults, physical injuries, and other adverse results.</td>
<td>Danger: Resetting will result in the loss of user configuration data.</td>
</tr>
<tr>
<td>⚠️</td>
<td>A warning notice indicates a situation that may cause major system changes, faults, physical injuries, and other adverse results.</td>
<td>Warning: Restarting will cause business interruption. About 10 minutes are required to restart an instance.</td>
</tr>
<tr>
<td>⚠️</td>
<td>A caution notice indicates warning information, supplementary instructions, and other content that the user must understand.</td>
<td>Notice: If the weight is set to 0, the server no longer receives new requests.</td>
</tr>
<tr>
<td>📝</td>
<td>A note indicates supplemental instructions, best practices, tips, and other content.</td>
<td>Note: You can use Ctrl + A to select all files.</td>
</tr>
<tr>
<td>&gt;</td>
<td>Closing angle brackets are used to indicate a multi-level menu cascade.</td>
<td>Click Settings &gt; Network &gt; Set network type.</td>
</tr>
<tr>
<td>**</td>
<td>Bold formatting is used for buttons, menus, page names, and other UI elements.</td>
<td>Click OK.</td>
</tr>
<tr>
<td>**</td>
<td>Bold formatting is used for buttons, menus, page names, and other UI elements.</td>
<td></td>
</tr>
<tr>
<td>Courier font</td>
<td>Courier font is used for commands.</td>
<td>Run the <code>cd /d C:/window</code> command to enter the Windows system folder.</td>
</tr>
<tr>
<td>*</td>
<td>Italic formatting is used for parameters and variables.</td>
<td>bae log list --instanceid Instance_ID</td>
</tr>
<tr>
<td>[ ] or [a</td>
<td>b]</td>
<td>This format is used for an optional value, where only one item can be selected.</td>
</tr>
<tr>
<td>Style</td>
<td>Description</td>
<td>Example</td>
</tr>
<tr>
<td>---------</td>
<td>-----------------------------------------------------------------------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>{} or {a</td>
<td>b}</td>
<td>This format is used for a required value, where only one item can be selected.</td>
</tr>
</tbody>
</table>
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1 Image overview

An ECS image stores information that you need for creating an ECS instance. You must select an image when you create an ECS instance. An image works as a copy that stores data from one or more disks. An ECS image may store data from a system disk or from both system and data disks.

Image types

ECS images are classified into the following types based on their sources. Fees are charged for ECS images. We recommend that you read and understand the pricing details of ECS before you use ECS images. For more information, see Billing overview.

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public image</td>
<td>Public images are licensed by Alibaba Cloud, which are highly secure and stable. Public images include Windows Server system images and mainstream Linux system images. For more information, see Overview.</td>
<td>Only Windows Server and Red Hat Enterprise Linux public images are charged. Check the actual fees when you use them to create instances. The Windows Server and Red Hat Enterprise Linux public images are licensed and maintained by Microsoft and Red Hat, respectively.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Red Hat Enterprise Linux: Fees are calculated based on the instance specification.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Windows Server: Fees are calculated based on the instance specification.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Other public images are free of charge.</td>
</tr>
<tr>
<td>Type</td>
<td>Description</td>
<td>Price</td>
</tr>
<tr>
<td>-----------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Custom image</td>
<td>Custom images are created from instances or snapshots, or imported from your local device. Only the creator of a custom image can use, share, copy, and delete the image. For more information, see Lifecycle of a custom image.</td>
<td>Custom image fees are charged in the following situations: • Daily-use fees. The daily-use fees are equal to the fees incurred by the snapshot where the custom image is created from. Snapshots are charged based on the storage space usage. • Instance creation fees. When you use a custom image to create an instance, fees are charged as follows: - If the custom image is created based on an Alibaba Cloud Marketplace image, the custom image fees are equal to the total amount of fees incurred by the Alibaba Cloud Marketplace image and the corresponding snapshot. - If the custom image is created based on a free image, the custom image fees are equal to the fees of the corresponding snapshot. For more information, see Billing overview and Image FAQ.</td>
</tr>
<tr>
<td>Shared image</td>
<td>Shared images are images shared to you by other Alibaba Cloud accounts. For more information, see Share images.</td>
<td>If a shared image is provided by Alibaba Cloud Marketplace, the shared image is billed according to the pricing standards of the independent software vendor (ISV).</td>
</tr>
<tr>
<td>Type</td>
<td>Description</td>
<td>Price</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>Alibaba Cloud Marketplace image</td>
<td>Alibaba Cloud Marketplace images are classified into the following types based on the ISV.</td>
<td>Alibaba Cloud Marketplace images are billed according to the pricing standards of the ISV.</td>
</tr>
<tr>
<td></td>
<td>• Images provided by Alibaba Cloud accounts</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Images provided by ISVs and licensed by Alibaba Cloud Marketplace</td>
<td></td>
</tr>
</tbody>
</table>

An Alibaba Cloud Marketplace image contains an operating system and pre-installed software. The operating system and pre-installed software are tested and verified by the ISV and Alibaba Cloud to ensure that the images are safe to use. For more information, see [Marketplace images](#).

**Lifecycle of a custom image**

After you create or import a custom image, the image is in the **Available** state. You can then use the image to create an ECS instance, share the image to another Alibaba Cloud account, or copy the image to another region. You can also delete images that you no longer need. The following figure shows the lifecycle of a custom image.
Create a custom image

After you create an ECS instance by using an existing image, you can configure the instance as needed. For example, you can install software and deploy projects on the instance, and then create a custom image for the instance. For more information, see Create a custom image by using an instance. Instances created from the custom image contain all the configuration items that you have defined. For more information, see #unique_10.

You can create a custom image by using the snapshot of the system disk or both the system and data disks. For more information, see Create a custom image by using a snapshot.

You can also import a custom image from a local device. For more information, see Import custom images.

Share and copy a custom image

Each image belongs to a region. For example, if you create a custom image in the China (Beijing) region, you can use the image to create ECS instances in this region only.

- When you share the image with another Alibaba Cloud account, this account can use the image in the China (Beijing) region only. To share the image to an Alibaba Cloud account who needs to use the image in a different region, copy the image to the target region, and then share the image to the target Alibaba Cloud account. For more information, see Share images.
Elastic Compute Service

Images / 1 image overview

- If you need to use the image in another region, copy the image to that region. The image copy is signed a unique UID. It is independent of the original image. For more information, see Copy custom images.

Change images for an ECS instance

After you create an ECS instance, you can change its operating system by changing the image of the system disk.

- You can replace the image of the system disk with a public image. For more information, see #unique_14.
- You can also replace the image of the system disk with a non-public image, for example, a custom, shared, or Alibaba Cloud Marketplace image. For more information, see #unique_15.

Delete a custom image

You can delete custom images that you no longer need. After a custom image is deleted, you can no longer use it to create ECS instances. You cannot #unique_16 of an ECS instance that is created from the image.

A custom image consists of snapshots of disks that are attached to an ECS instance. The delete operation does not delete snapshots contained in the image. To delete the snapshots, navigate to the Snapshots page and delete the target snapshots. For more information, see Delete custom images.

API operations

You can also perform API operations to manage an image. For more information, see API overview.
2 Select an image

This topic describes how to select a suitable image from multiple image types and operating systems based on your needs. You must select an image when you create an ECS instance.

When you select an image, you must consider the following factors:

- Region
- Image type
- Image fee
- Operating system
- Built-in software (such as MySQL and other applications)

Region

An image is tied to its region and can only be used to create instances in the same region. For example, if you want to create an instance in China (Beijing), you can use images only in China (Beijing). For more information about regions, see #unique_20.

If you want to use an image that belongs to a different region, you must first copy the image to your current region. For more information, see Copy custom images.

Image type

ECS images are classified into public images, custom images, shared images, and Alibaba Cloud Marketplace images based on image sources. For more information, see Image types.

Image fee

You may be charged for the images that you use. For more information, see Image overview.

Operating system

When you select an operating system, you must take into account the following factors:
Operating system architecture such as 32-bit or 64-bit

<table>
<thead>
<tr>
<th>Operating system architecture</th>
<th>Applicable memory</th>
<th>Limit</th>
</tr>
</thead>
</table>
| 32-bit                        | A maximum of 4 GiB memory | - If the memory of an instance type is greater than 4 GiB, you cannot use a 32-bit operating system.  
- A 32-bit Windows operating system supports a maximum of four vCPUs. |
| 64-bit                        | A maximum of 4 GiB memory | If you want to use a memory of at least 4 GiB for your applications, use a 64-bit operating system. |

Operating system type such as Windows, Linux, or Unix-like operating system

<table>
<thead>
<tr>
<th>Operating system type</th>
<th>Logon mode</th>
<th>Feature</th>
<th>Scenario</th>
</tr>
</thead>
</table>
| Windows               | Remote Desktop Connection | A Windows public image is installed with a genuine activated system. | - Applicable to programs developed based on Windows, such as .NET  
- Supports SQL Server and other databases (manual installation required) |
| Linux and Unix-like   | SSH        | - A common server-side operating system that features security and stability  
- An open-source operating system that features fast deployment and easy source code compilation | - Typically used for server applications, such as high-performance web servers, and supports common programming languages such as PHP and Python  
- Supports MySQL and other databases (manual installation required) |

Alibaba Cloud provides a list of public images that run the Windows, Linux, or Unix-like operating system. For more information, see Overview.
• **Considerations for Windows**

We recommend that you use a later version of Windows. Compared with earlier versions, a later version of Windows has fewer vulnerabilities. IIS 7.5 provides more features and a more convenient console than IIS 6.

Read the following considerations and select the suitable hardware configuration and Windows version based on your needs:

- Instance types with one vCPU and 1 GiB memory cannot start the MySQL database.
- Windows instances that are used for website building and web environment deployment must have at least 2 GiB memory.
- To ensure service availability, we recommend that you select instance types of at least 2 GiB memory when you use Windows 2008 or Windows 2012.
- You must select instance types of at least 2 GiB memory when you use Windows 2016 or Windows 2019. Otherwise, Windows 2016 or Windows 2019 may not be displayed in the public images list of the buy page.
- Alibaba Cloud no longer provides technical support for Windows Server 2003 system images. For more information, see Offline announcement of Windows Server 2003 system images.

• **Considerations for Linux and Unix-like operating systems**

Alibaba Cloud Linux and Unix-like public images contain the following distributions:

- **Aliyun Linux**

  Aliyun Linux 2 is an operating system developed by Alibaba Cloud. It provides a safe, stable, and high-performance running environment for applications on ECS instances. Aliyun Linux 2 supports various cloud scenarios and instance types.
(excluding instances of the classic network type and non-I/O optimized instances).
For more information, see Overview of Aliyun Linux 2.

- Red Hat series
  - CentOS
  - Red Hat

The following table compares CentOS with Red Hat.

<table>
<thead>
<tr>
<th>Operating system</th>
<th>Software package format</th>
<th>Package manager</th>
<th>Billing</th>
<th>Feature</th>
<th>Relationship</th>
</tr>
</thead>
<tbody>
<tr>
<td>CentOS</td>
<td>.rpm</td>
<td>yum</td>
<td>Free usage</td>
<td></td>
<td>Stab</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>but less</td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
<td>frequent</td>
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<td></td>
<td></td>
<td>patch updates</td>
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<tr>
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<td>than those</td>
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<td></td>
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<td>of Red Hat.</td>
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<td>supports</td>
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<td>online and</td>
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<td></td>
<td></td>
<td></td>
<td>timely updates</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>same RPM</td>
</tr>
</tbody>
</table>

- Supports online and timely updates.
- They can use the same commands.
- They can use the same RPM package.
- CentOS is an open-source version of Red Hat.
- They can use the same commands.
Red Hat

Red Hat

- Debian series
  - Debian
  - Ubuntu

The following table compares Debian with Ubuntu.

<table>
<thead>
<tr>
<th>Operating system</th>
<th>Software package format</th>
<th>Package manager</th>
<th>Feature</th>
<th>Relationship</th>
</tr>
</thead>
<tbody>
<tr>
<td>Debian</td>
<td>.deb</td>
<td>aptitude</td>
<td>Stable</td>
<td>Ubuntu is built on the Debian architecture and infrastructure. Ubuntu is the enhanced version of Debian.</td>
</tr>
<tr>
<td>Ubuntu</td>
<td></td>
<td>apt-get</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- SUSE series
  - SUSE Linux
The following table compares OpenSUSE with SUSE Linux.

<table>
<thead>
<tr>
<th>Operating system</th>
<th>Feature</th>
<th>Relationship</th>
</tr>
</thead>
<tbody>
<tr>
<td>OpenSUSE</td>
<td>- OpenSUSE is the community edition of SUSE Linux. SUSE Linux Enterprise is the enterprise edition of SUSE Linux.</td>
<td>Starting from version 10.2, SUSE Linux was officially renamed OpenSUSE.</td>
</tr>
<tr>
<td>SUSE Linux</td>
<td>- SUSE Linux Enterprise is more mature and stable, but its official release contains fewer software features than OpenSUSE.</td>
<td>OpenSUSE uses the same kernel as SUSE Linux.</td>
</tr>
<tr>
<td></td>
<td>- OpenSUSE features advanced software versions, better extensibility (desktop and server installation are supported), and free updates (you can also purchase official technical support).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- SUSE Linux Enterprise is more applicable to work and production environments, whereas OpenSUSE is more applicable to personal entertainment and other professional purposes.</td>
<td></td>
</tr>
</tbody>
</table>

- **CoreOS**

CoreOS is an open-source lightweight operating system based on the Linux kernel and designed to provide infrastructure for clustered deployments. CoreOS focuses on automation, ease of application deployment, security, reliability, and scalability. CoreOS provides the underlying functionality required for deploying applications inside software containers, together with a set of built-in tools for service discovery and configuration sharing.

- **FreeBSD**

FreeBSD is a Unix-like operating system for a variety of platforms that focus on features, speed, and stability. FreeBSD provides advanced networking, performance,
security, and compatibility features that are still missing from other operating systems, even some of the best commercial ones. For more information, visit FreeBSD Documentation.

**Built-in software**

Alibaba Cloud Marketplace images are typically preinstalled with a running environment or software applications. You can purchase suitable images to create ECS instances based on your actual needs. For more information, see Marketplace images.

**What to do next**

- Use an image to create an ECS instance. For more information, see #unique_22.
- Use an image to change the operating system. For more information, see Change the operating system.
3 Search for an image

This topic describes how to search for a specific image through the ECS console or by calling the related API action.

Use the ECS console

You can search for a specific image on the Images page of the ECS console.

Procedure

1. Log on to the ECS console.
2. In the top navigation bar, select a region.
3. In the left-side navigation pane, choose Instances & Images > Images.
4. Click the tab of a specific image type.
5. In the drop-down list, select a search item such as image name, image ID, or snapshot ID.
6. Enter one or more keywords in the search bar.
   - For an ID search, you must enter an exact keyword item. For an image name search, you can enter partial keyword items (such as win to return Windows public image results).
7. Click Search.

Call an API action

You can call DescribeImages to search for an image through the API Explorer or Alibaba Cloud CLI. The following procedure uses the API Explorer as an example.

1. Log on to the API Explorer.
2. In the drop-down list of RegionId, select the target region.
3. Optional. Specify other parameters, such as ImageName and ImageId.

Note:

The naming rules of image IDs are as follows:

- Public image: The image ID is named by the version, architecture, language, and release date of the operating system. For example, the image ID of a 64-bit Windows Server 2008 R2 Enterprise Edition (English version) is win2008r2_64_ent_sp1_english_40G_alibase_20190318.vhd.
- Custom image and Marketplace image: The image ID starts with an m.
4. Click **Submit Request**.

5. Click the **Debugging Result** tab.

If the required image is found, detailed information of the image, such as the image ID, image description, and operating system type is displayed on the **Debugging Result** tab. For more information, see #unique_25.

**What to do next**

After you find the required image, you can:

- Create an instance by using the wizard.
- Share custom images.
- Copy custom images.
- Export custom images.
- Delete custom images.
- Modify custom images.
4 Public image

4.1 Overview

Public images provided by Alibaba Cloud are fully licensed to provide a secure and stable operating environment for applications on ECS instances. This topic describes Aliyun Linux images and third-party and open-source images.

Types of public images

The following table describes two types of public images provided by Alibaba Cloud. Except for the Windows Server and Red Hat Enterprise Linux images, you can use any public images for free to create ECS instances. For more information, see Image overview.

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Technical support</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aliyun Linux images</td>
<td>Aliyun Linux images are custom, native operating systems provided by Alibaba Cloud for you to launch ECS instances. Each Aliyun Linux image is rigorously tested to guarantee its security, stability, and normal startup and operation.</td>
<td>Alibaba Cloud provides technical support if any problems occur during the use of Aliyun Linux images.</td>
</tr>
</tbody>
</table>
| Third-party and open-source images | Third-party and open-source images are rigorously tested and released by Alibaba Cloud to guarantee their security, stability, and normal startup and operation. Such images include:  
  - Windows: Windows Server  
  - Linux: Ubuntu, CentOS, Red Hat Enterprise Linux, Debian, SUSE Linux, FreeBSD, and CoreOS | We recommend that you contact the corresponding OS vendors or open-source communities for technical support. Alibaba Cloud also provides information about image- and system-related problems. |

Aliyun Linux images

Aliyun Linux is a Linux public image independently developed by Alibaba Cloud. The following table describes the versions of Aliyun Linux images.
<table>
<thead>
<tr>
<th>Operating system</th>
<th>Version</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aliyun Linux 2</td>
<td>Aliyun Linux 2.1903 64-bit</td>
<td>A next-generation OS that supports various Alibaba Cloud instance types including ECS Bare Metal Instances. By default, Aliyun Linux 2 is also equipped with Alibaba Cloud CLI and other software packages. If you want to replace other Linux distributions with Aliyun Linux 2, you can select Public Image and then Aliyun Linux 2 when creating an ECS instance, or replace the system disk of an existing ECS instance with Aliyun Linux 2. For more information, see Aliyun Linux 2.</td>
</tr>
</tbody>
</table>

### Third-party and open-source images

Alibaba Cloud regularly releases and updates public images of third-party and open-source vendors. For more information, see Release notes. You can view all the available public images on the Public Images page in the corresponding region in the ECS console. For more information, see Search for an image.

The following tables describe the versions of third-party and open-source public images for Windows and Linux provided by Alibaba Cloud.

- **Windows images**

<table>
<thead>
<tr>
<th>Operating system</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>- Windows Server 2019 Datacenter Edition 64-bit (English)</td>
</tr>
<tr>
<td></td>
<td>- Windows Server 2016 Datacenter Edition 64-bit (English)</td>
</tr>
</tbody>
</table>
### Windows Server 2012

- Windows Server 2012 R2 Datacenter Edition 64-bit (Chinese)
- Windows Server 2012 R2 Datacenter Edition 64-bit (English)

### Windows Server Version **** (Semi-Annual Channel)

- Windows Server Version **** Datacenter Edition 64-bit (Chinese)
- Windows Server Version **** Datacenter Edition 64-bit (English)

The asterisks (****) indicates the version number of the latest Semi-Annual Channel release.

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**Note:**

From January 14, 2020, Microsoft stopped providing support for Windows Server 2008 and Windows Server 2008 R2 operating systems. Therefore, Alibaba Cloud no longer provides technical support for ECS instances that use the preceding operating systems. If you have ECS instances that use the preceding operating systems, upgrade them to Windows Server 2012 or later in a timely manner.

### Linux images

<table>
<thead>
<tr>
<th>Operating system</th>
<th>Version</th>
</tr>
</thead>
</table>
| CentOS           | - CentOS 8.0 64-bit  
|                  | - CentOS 7.7 64-bit  
|                  | - CentOS 7.6 64-bit  
|                  | - CentOS 7.5 64-bit  
|                  | - CentOS 7.4 64-bit  
|                  | - CentOS 7.3 64-bit  
|                  | - CentOS 7.2 64-bit  
|                  | - CentOS 6.10 64-bit 
|                  | - CentOS 6.9 64-bit  
|                  | - CentOS 6.8 32-bit  |

**Note:**

If you are using a 32-bit operating system, do not select instance types that have a memory capacity greater than 4 GiB. For more information, see [Select an image](#).
<table>
<thead>
<tr>
<th>Operating system</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>CoreOS</td>
<td>- CoreOS 2303.3.0 64-bit</td>
</tr>
<tr>
<td></td>
<td>- CoreOS 2247.6.0 64-bit</td>
</tr>
<tr>
<td></td>
<td>- CoreOS 2023.4.0 64-bit</td>
</tr>
<tr>
<td></td>
<td>- CoreOS 1745.7.0 64-bit</td>
</tr>
<tr>
<td>Debian</td>
<td>- Debian 10.2 64-bit</td>
</tr>
<tr>
<td></td>
<td>- Debian 9.11 64-bit</td>
</tr>
<tr>
<td></td>
<td>- Debian 9.9 64-bit</td>
</tr>
<tr>
<td></td>
<td>- Debian 9.8 64-bit</td>
</tr>
<tr>
<td></td>
<td>- Debian 9.6 64-bit</td>
</tr>
<tr>
<td></td>
<td>- Debian 8.11 64-bit</td>
</tr>
<tr>
<td></td>
<td>- Debian 8.9 64-bit</td>
</tr>
<tr>
<td>FreeBSD</td>
<td>FreeBSD 11.2 64-bit</td>
</tr>
<tr>
<td>openSUSE</td>
<td>- openSUSE 15.1 64-bit</td>
</tr>
<tr>
<td></td>
<td>- openSUSE 42.3 64-bit</td>
</tr>
<tr>
<td>Red Hat</td>
<td>- Red Hat Enterprise Linux 8 64-bit</td>
</tr>
<tr>
<td></td>
<td>- Red Hat Enterprise Linux 7.6 64-bit</td>
</tr>
<tr>
<td></td>
<td>- Red Hat Enterprise Linux 7.5 64-bit</td>
</tr>
<tr>
<td></td>
<td>- Red Hat Enterprise Linux 7.4 64-bit</td>
</tr>
<tr>
<td></td>
<td>- Red Hat Enterprise Linux 6.10 64-bit</td>
</tr>
<tr>
<td></td>
<td>- Red Hat Enterprise Linux 6.9 64-bit</td>
</tr>
<tr>
<td>SUSE Linux</td>
<td>- SUSE Linux Enterprise Server 15 SP1 64-bit</td>
</tr>
<tr>
<td></td>
<td>- SUSE Linux Enterprise Server 12 SP4 64-bit</td>
</tr>
<tr>
<td></td>
<td>- SUSE Linux Enterprise Server 12 SP2 64-bit</td>
</tr>
<tr>
<td></td>
<td>- SUSE Linux Enterprise Server 11 SP4 64-bit</td>
</tr>
<tr>
<td>Ubuntu</td>
<td>- Ubuntu 18.04 64-bit</td>
</tr>
<tr>
<td></td>
<td>- Ubuntu 16.04 64-bit</td>
</tr>
<tr>
<td></td>
<td>- Ubuntu 16.04 32-bit</td>
</tr>
<tr>
<td></td>
<td>- Ubuntu 14.04 64-bit</td>
</tr>
<tr>
<td></td>
<td>- Ubuntu 14.04 32-bit</td>
</tr>
</tbody>
</table>

**Note:**
If you are using a 32-bit operating system, do not select instance types that have a memory capacity greater than 4 GiB. For more information, see [Select an image](#).
## 4.2 Release notes

This topic describes the updates to the features of ECS images in order of release time. Unless otherwise stated, the released updates apply to all Alibaba Cloud regions where Elastic Compute Service (ECS) is provided.

### CentOS

<table>
<thead>
<tr>
<th>Release</th>
<th>Image ID</th>
<th>Release date</th>
<th>Description</th>
</tr>
</thead>
</table>
| CentOS 7.7 | centos_7_7_x64_20G_alibase_20200329.vhd     | March 29, 2020| • Kernel version: 3.10.0-1062.18.1.el7.x86_64  
• Changes:  
  - Updated to include the latest operating system patches  
  - Upgraded cloud-init to version 19.1 |
| CentOS 8.1 | centos_8_1_x64_20G_alibase_20200329.vhd     | March 29, 2020| • Kernel version: 4.18.0-147.5.1.el8_1.x86_64  
• Changes: Updated to include the latest operating system patches |
| CentOS 6.10 | centos_6_10_x64_20G_alibase_20200319.vhd    | March 19, 2020| • Kernel version: 2.6.32-754.28.1.el6.x86_64  
• Changes: Updated to include the latest operating system patches |

**Note:**
cloud-init dynamically generates network configurations. For more information about custom network configurations, see the "(Optional) Custom network configurations" section in Install cloud-init.
<table>
<thead>
<tr>
<th>Release</th>
<th>Image ID</th>
<th>Release date</th>
<th>Description</th>
</tr>
</thead>
</table>
| CentOS 8.0| centos_8_0_x64_20G_alibase_20200218.vhd      | February 18, 2020 | - Kernel version: 4.18.0-147.5.1.el8_1.x86_64  
- Changes:
  - Updated to include the latest operating system patches  
  - Added the EPEL source and Chinese Simplified (zh-CN) Language Pack  
  - Enabled IPv6 by default  
- Known issues: The system version of ECS instances created from the centos_8_0_x64_20G_alibase_20200218.vhd public image is CentOS 8.1. For more information about the issue, see CentOS 8.0: Naming of the public image. |
| CentOS 7.7| centos_7_7_x64_20G_alibase_20200220.vhd      | February 20, 2020 | - Kernel version: 3.10.0-1062.12.1.el7.x86_64  
- Changes: Updated to include the latest operating system patches |
| CentOS 6.10| centos_6_10_x64_20G_alibase_20200214.vhd     | February 14, 2020 | - Kernel version: 2.6.32-754.27.1.el6.x86_64  
- Changes: Updated to include the latest operating system patches |
<table>
<thead>
<tr>
<th>Release</th>
<th>Image ID</th>
<th>Release date</th>
<th>Description</th>
</tr>
</thead>
</table>
| CentOS 6.10 | centos_6_10_x64_20G_alibase_20200103.vhd | January 3, 2020 | - Kernel version: 2.6.32-754.25.1.el6.x86_64  
- Changes: Updated to include the latest operating system patches  
- Applicable regions: China (Beijing), US (Virginia), China (Hong Kong), China (Zhangjiakou-Beijing Winter Olympics), China (Hohhot), China (Hangzhou), China (Qingdao), China (Chengdu), and Singapore |
| CentOS 7.7 | centos_7_7_x64_20G_alibase_20191225.vhd | December 25, 2019 | - Kernel version: 3.10.0-1062.9.1.el7.x86_64  
- Changes: Updated to include the latest operating system patches |
| CentOS 8.0 | centos_8_0_x64_20G_alibase_20191225.vhd | December 25, 2019 | - Kernel version: 4.18.0-80.11.2.el8_0.x86_64  
- Changes:  
  - Updated to include the latest operating system patches  
  - Upgraded cloud-init to version 19.1 |

**Note:** cloud-init dynamically generates network configurations. For more information about custom network configurations, see the "(Optional) Custom network configurations" section in Install cloud-init.
<table>
<thead>
<tr>
<th>Release</th>
<th>Image ID</th>
<th>Release date</th>
<th>Description</th>
</tr>
</thead>
</table>
| CentOS 6.10 | centos_6_10_x64_20G_alibase_20191223.vhd | December 25, 2019 | • Kernel version: 2.6.32-754.24.3.el6.x86_64  
• Changes: Updated to include the latest operating system patches |
| CentOS 7.7 | centos_7_7_64_20G_alibase_20191008.vhd | October 8, 2019 | • Kernel version: 3.10.0-1062.1.2.el7.x86_64  
• Changes: New release |
| CentOS 7.6 | centos_7_06_64_20G_alibase_20190711.vhd | July 11, 2019 | • Kernel version: 3.10.0-957.21.3.el7.x86_64  
• Changes: Updated to include the latest operating system patches |
| CentOS 6.10 | centos_6_10_64_20G_alibase_20190709.vhd | July 9, 2019 | • Kernel version: 2.6.32-754.17.1.el6.x86_64  
• Changes: Updated to include the latest operating system patches |
| CentOS 6.10 | centos_6_10_64_20G_alibase_20190621.vhd | June 21, 2019 | • Kernel version: 2.6.32-754.15.3.el6.x86_64  
• Changes: Updated to include the latest operating system patches and fixed the CVE-2019-11477 vulnerability |
| CentOS 7.6 | centos_7_06_64_20G_alibase_20190619.vhd | June 19, 2019 | • Kernel version: 3.10.0-957.21.3.el7.x86_64  
• Changes:  
  - Updated to include the latest patches and fixed the CVE-2019-11477 vulnerability  
  - Set the default CPU mode to performance |
<table>
<thead>
<tr>
<th>Release</th>
<th>Image ID</th>
<th>Release date</th>
<th>Description</th>
</tr>
</thead>
</table>
| CentOS 7.6 | centos_7_06_64_20G_alibase_20190218.vhd | February 18, 2019 | - Kernel version: 3.10.0-957.5.1.el7.x86_64  
  - Changes: Updated to include the latest operating system patches |
| CentOS 7.6 | centos_7_05_64_20G_alibase_20181212.vhd | December 12, 2018 | - Kernel version: 3.10.0-957.1.3.el7.x86_64  
  - Changes: Updated to include the latest operating system patches |
| CentOS 7.5 | centos_7_05_64_20G_alibase_20181210.vhd | December 10, 2018 | - Kernel version: 3.10.0-862.3.3.el7.x86_64  
  - Changes:  
    - Updated to include the latest operating system patches  
    - Upgraded the cloud-init version  
    - Enabled the chrony time synchronization service  
    - Disabled password authentication by default  
    - Set GRUB_TIMEOUT to 1 |

**Debian**

<table>
<thead>
<tr>
<th>Release</th>
<th>Image ID</th>
<th>Release date</th>
<th>Description</th>
</tr>
</thead>
</table>
| Debian 10.3 | debian_10_3_x64_20G_alibase_20200329.vhd | March 29, 2020 | - Kernel version: 4.19.0-8-amd64  
  - Changes:  
    - Updated to include the latest operating system patches  
    - Enabled IPv6 by default |
<table>
<thead>
<tr>
<th>Release</th>
<th>Image ID</th>
<th>Release date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Debian 9.12</td>
<td>debian_9_12_x64_20G_alibase_20200324.vhd</td>
<td>March 24, 2020</td>
<td>• Kernel version: 4.9.0-12-amd64 • Changes: Updated to include the latest operating system patches</td>
</tr>
<tr>
<td>Debian 9.12</td>
<td>debian_9_12_x64_20G_alibase_20200220.vhd</td>
<td>February 20, 2020</td>
<td>• Kernel version: 4.9.0-12-amd64 • Changes: Updated to include the latest operating system patches</td>
</tr>
<tr>
<td>Debian 10.3</td>
<td>debian_10_3_x64_20G_alibase_20200218.vhd</td>
<td>February 18, 2020</td>
<td>• Kernel version: 4.19.0-8-amd64 • Changes: Updated to include the latest operating system patches</td>
</tr>
<tr>
<td>Debian 9.11</td>
<td>debian_9_11_x64_20G_alibase_20191225.vhd</td>
<td>December 25, 2019</td>
<td>• Kernel version: 4.9.0-11-amd64 • Changes: Updated to include the latest operating system patches</td>
</tr>
<tr>
<td>Release</td>
<td>Image ID</td>
<td>Release date</td>
<td>Description</td>
</tr>
<tr>
<td>-------------</td>
<td>--------------------------------------</td>
<td>--------------</td>
<td>-------------</td>
</tr>
</tbody>
</table>
| Debian 10.2 | debian_10_2_x64_20G_alibase_20191223.vhd | December 24, 2019 | • Kernel version: 4.19.0-6-amd64  
  • Changes:  
    - Updated to include the latest operating system patches  
    - Upgraded cloud-init to version 19.1  

**Note:**  
cloud-init dynamically generates network configurations. For more information about custom network configurations, see the "(Optional) Custom network configurations" section in Install cloud-init.

| Debian 9.9  | debian_9_09_64_20G_alibase_20190702.vhd | July 2, 2019  | • Kernel version: 4.9.0-9-amd64  
  • Changes: Updated to include the latest operating system patches |

| Debian 9.9  | debian_9_09_64_20G_alibase_20190510.vhd | May 10, 2019  | • Kernel version: 4.9.0-9-amd64  
  • Changes: Updated to include the latest operating system patches |
<table>
<thead>
<tr>
<th>Release</th>
<th>Image ID</th>
<th>Release date</th>
<th>Description</th>
</tr>
</thead>
</table>
| Debian 8.11 | 11_64_20G_alibase_20190311.vhd | March 11, 2019 | - Kernel version: 3.16.0-7-amd64  
- Changes:  
  - Updated to include the latest operating system patches  
  - Fixed invalid apt source configurations in Debian 8.9 |
| Debian 9.8 | debian_9_08_64_20G_alibase_20190225.vhd | February 25, 2019 | - Kernel version: 4.9.0-8-amd64  
- Changes: Updated to include the latest operating system patches |
| Debian 9.6 | debian_9_06_64_20G_alibase_20190103.vhd | January 3, 2019 | - Kernel version: 4.9.0-8-amd64  
- Changes: Enabled the systemd-networkd service |
| Debian 9.6 | debian_9_06_64_20G_alibase_20181212.vhd | December 12, 2018 | - Kernel version: 4.9.0-8-amd64  
- Changes:  
  - Updated to include the latest operating system patches  
  - Upgraded the cloud-init version  
  - Enabled the chrony time synchronization service  
  - Set GRUB_TIMEOUT to 1  
- Known issues: Classic network configuration issues |
### FreeBSD

<table>
<thead>
<tr>
<th>Release</th>
<th>Image ID</th>
<th>Release date</th>
<th>Description</th>
</tr>
</thead>
</table>
| FreeBSD 11.2  | freebsd_11_02_64_30G_alibase_20190806.vhd    | August 6, 2019 | • Kernel version: 11.2-RELEASE  
• Changes:  
  - Fixed the clock offset issue  
  - Fixed the issue that caused 30-GiB system disk creation to fail |

### Ubuntu

<table>
<thead>
<tr>
<th>Release</th>
<th>Image ID</th>
<th>Release date</th>
<th>Description</th>
</tr>
</thead>
</table>
| Ubuntu 18.04  | ubuntu_18_04_x64_20G_alibase_20200329.vhd    | March 29, 2020 | • Kernel version: 4.15.0-91-generic  
• Changes:  
  - Updated to include the latest operating system patches  
  - Enabled IPv6 by default |
| Ubuntu 16.04  | ubuntu_16_04_x64_20G_alibase_20200319.vhd    | March 19, 2020 | • Kernel version: 4.4.0-176-generic  
• Changes: Updated to include the latest operating system patches |
| Ubuntu 18.04  | ubuntu_18_04_x64_20G_alibase_20200220.vhd    | February 20, 2020 | • Kernel version: 4.15.0-88-generic  
• Changes: Updated to include the latest operating system patches |
<table>
<thead>
<tr>
<th>Release</th>
<th>Image ID</th>
<th>Release date</th>
<th>Description</th>
</tr>
</thead>
</table>
| Ubuntu 16.04 | ubuntu_16_04_x64_20G_alibase_20200220.vhd | February 20, 2020 | • Kernel version: 4.4.0-174-generic  
• Changes: Updated to include the latest operating system patches |
| Ubuntu 18.04 | ubuntu_18_04_x64_20G_alibase_20191225.vhd | December 25, 2019 | • Kernel version: 4.15.0-72-generic  
• Changes: Updated to include the latest operating system patches |
| Ubuntu 16.04 | ubuntu_16_04_x64_20G_alibase_20191225.vhd | December 25, 2019 | • Kernel version: 4.4.0-170-generic  
• Changes: Updated to include the latest operating system patches |
| Ubuntu 18.04 | ubuntu_18_04_x64_20G_alibase_20190624.vhd | June 24, 2019 | • Kernel version: 4.15.0-52-generic  
• Changes: Updated to include the latest operating system patches and fixed the CVE-2019-11477 vulnerability |
| Ubuntu 16.04 | ubuntu_16_04_x64_20G_alibase_20190620.vhd | June 20, 2019 | • Kernel version: 4.4.0-151-generic  
• Changes: Updated to include the latest operating system patches and fixed the CVE-2019-11477 vulnerability |
| Ubuntu 16.04 | ubuntu_16_04_x64_20G_alibase_20190513.vhd | May 13, 2019 | • Kernel version: 4.4.0-146-generic  
• Changes: Updated to include the latest operating system patches |
<table>
<thead>
<tr>
<th>Release</th>
<th>Image ID</th>
<th>Release date</th>
<th>Description</th>
</tr>
</thead>
</table>
| Ubuntu 18.04 | ubuntu_18_04_64_20G_alibase_20190509.vhd | May 9, 2019 | - Kernel version: 4.15.0-48-generic  
- Changes:  
  - Upgraded cloud-init to speed up boot time  
  - Updated to include the latest operating system patches |
| Ubuntu 16.04 | ubuntu_16_04_64_20G_alibase_20190301.vhd | March 1, 2019 | - Kernel version: 4.4.0-142-generic  
- Changes: Updated to include the latest operating system patches |
| Ubuntu 18.04 | ubuntu_18_04_64_20G_alibase_20190223.vhd | February 23, 2019 | - Kernel version: 4.15.0-45-generic  
- Changes: Updated to include the latest operating system patches |
| Ubuntu 18.04 | ubuntu_18_04_64_20G_alibase_20181212.vhd | December 12, 2018 | - Kernel version: 4.15.0-42-generic  
- Changes:  
  - Updated to include the latest operating system patches  
  - Upgraded the cloud-init version  
  - Enabled the chrony time synchronization service  
  - Set GRUB_TIMEOUT to 1 |
### CoreOS

<table>
<thead>
<tr>
<th>Release</th>
<th>Image ID</th>
<th>Release date</th>
<th>Description</th>
</tr>
</thead>
</table>
| CoreOS 2345_3.0 | coreos_2345_3.0_x64_30G_alibase_20200325.vhd | March 25, 2020 | • Kernel version: 4.19.106-coreos  
• Changes: Updated to include the latest operating system patches |
| CoreOS 2303_4.0 | coreos_2303_4.0_x64_30G_alibase_20200217.vhd | February 17, 2020 | • Kernel version: 4.19.95-coreos  
• Changes: Updated to include the latest operating system patches |
| CoreOS 2303_3.0 | coreos_2303_3_x64_30G_alibase_20191223.vhd | December 23, 2019 | • Kernel version: 4.19.86-coreos  
• Changes: Updated to include the latest operating system patches |

### openSUSE

<table>
<thead>
<tr>
<th>Release</th>
<th>Image ID</th>
<th>Release date</th>
<th>Description</th>
</tr>
</thead>
</table>
| openSUSE 15.1 | opensuse_15_1_x64_20G_alibase_20200331.vhd | March 31, 2020 | • Kernel version: 4.12.14-lp151.28.44-default  
• Changes: Updated to include the latest operating system patches |
| OpenSUSE 15.1 | opensuse_15_1_x64_20G_alibase_20200222.vhd | February 22, 2020 | • Kernel version: 4.12.14-lp151.28.36-default  
• Changes: Updated to include the latest operating system patches |
<table>
<thead>
<tr>
<th>Release</th>
<th>Image ID</th>
<th>Release date</th>
<th>Description</th>
</tr>
</thead>
</table>
| OpenSUSE 15.1       | opensuse_15_1_x64_20G_alibase_20191219.vhd  | December 19, 2019 | • Kernel version: 4.12.14-lp151.28.36-default  
  • Changes:  
    - Updated to include the latest operating system patches  
    - Upgraded cloud-init to version 19.1 |

**SUSE Linux Enterprise Server**

<table>
<thead>
<tr>
<th>Release</th>
<th>Image ID</th>
<th>Release date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUSE Linux Enterprise Server 15 SP1</td>
<td>sles_15_sp1_x64_20G_alibase_20200329.vhd</td>
<td>March 29, 2020</td>
<td>Updated to include the latest patches</td>
</tr>
<tr>
<td>SUSE Linux Enterprise Server 12 SP4</td>
<td>sles_12_sp4_x64_20G_alibase_20200319.vhd</td>
<td>March 19, 2020</td>
<td>Updated to include the latest patches</td>
</tr>
<tr>
<td>SUSE Linux Enterprise Server 12 SP4</td>
<td>sles_12_sp4_x64_20G_alibase_20200227.vhd</td>
<td>February 27, 2020</td>
<td>Updated to include the latest patches</td>
</tr>
<tr>
<td>SUSE Linux Enterprise Server 15 SP1</td>
<td>sles_15_sp1_x64_20G_alibase_20200218.vhd</td>
<td>February 18, 2020</td>
<td>Updated to include the latest patches</td>
</tr>
<tr>
<td>SUSE Linux Enterprise Server 15 SP1</td>
<td>sles_15_sp1_x64_20G_alibase_20200107.vhd</td>
<td>January 7, 2020</td>
<td>New release</td>
</tr>
</tbody>
</table>
## Windows Server 2012

<table>
<thead>
<tr>
<th>Release</th>
<th>Image ID</th>
<th>Release date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Windows Server 2012 R2 Datacenter Edition</td>
<td>• Chinese version: win2012r2_9600_x64_dtc_zh-cn_40G_alibase_20200314.vhd</td>
<td>March 14, 2020</td>
<td>• Updated to include the operating system patches released in March 2020&lt;br&gt;• Fixed the CVE-2020-0684, CVE-2020-0881, and CVE-2020-0787 vulnerabilities</td>
</tr>
<tr>
<td></td>
<td>• English version: win2012r2_9600_x64_dtc_en-us_40G_alibase_20200314.vhd</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Windows Server 2012 R2 Datacenter Edition</td>
<td>• Chinese version: win2012r2_9600_x64_dtc_zh-cn_40G_alibase_20200213.vhd</td>
<td>February 13, 2020</td>
<td>• Updated to include the operating system patches released in February 2020&lt;br&gt;• Fixed the CVE-2020-0738, CVE-2020-0689, CVE-2020-0681, CVE-2020-0683, CVE-2020-0686, CVE-2020-0674, CVE-2020-0674, and CVE-2020-0706 vulnerabilities</td>
</tr>
<tr>
<td></td>
<td>• English version: win2012r2_9600_x64_dtc_en-us_40G_alibase_20200213.vhd</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Windows Server 2012 R2 Datacenter Edition</td>
<td>• Chinese version: win2012r2_9600_x64_dtc_zh-cn_40G_alibase_20200116.vhd</td>
<td>January 16, 2020</td>
<td>• Updated to include the operating system patches released in January 2020&lt;br&gt;• Fixed the CVE-2020-0609, CVE-2020-0625, CVE-2020-0611, and CVE-2020-0640 vulnerabilities</td>
</tr>
<tr>
<td></td>
<td>• English version: win2012r2_9600_x64_dtc_en-us_40G_alibase_20200116.vhd</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Windows Server 2012 R2 Datacenter Edition</td>
<td>• Chinese version: win2012r2_9600_x64_dtc_zh-cn_40G_alibase_20191218.vhd</td>
<td>December 18, 2019</td>
<td>Updated to include the security patches released in December 2019</td>
</tr>
<tr>
<td></td>
<td>• English version: win2012r2_9600_x64_dtc_en-us_40G_alibase_20191218.vhd</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Release</td>
<td>Image ID</td>
<td>Release date</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------</td>
<td>--------------------------------------------------------------------------</td>
<td>--------------------</td>
<td>-----------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| Windows Server 2012 R2 Datacenter Edition | • Chinese version: win2012r2_64_dtc_9600_zh-cn_40G_alibase_20191012.vhd  
• English version: win2012r2_64_dtc_9600_en-us_40G_alibase_20191012.vhd | October 12, 2019   | Updated to include the security patches released in October 2019                              |
| Windows Server 2012 R2 Datacenter Edition | • Chinese version: win2012r2_64_dtc_9600_zh-cn_40G_alibase_20190816.vhd  
• English version: win2012r2_64_dtc_9600_en-us_40G_alibase_20190816.vhd | August 16, 2019    | • Updated to include the operating system patches released in August 2019                      
• Fixed the CVE-2019-1181 and CVE-2019-1182 vulnerabilities |
| Windows Server 2012 R2 Datacenter Edition | • Chinese version: win2012r2_64_dtc_9600_zh-cn_40G_alibase_20190718.vhd  
• English version: win2012r2_64_dtc_9600_en-us_40G_alibase_20190718.vhd | July 18, 2019      | • Updated to include the operating system patches released in July 2019                      
• Upgraded .NET Framework to version 4.8 |
| Windows Server 2012 R2 Datacenter Edition | • Chinese version: win2012r2_64_dtc_9600_zh-cn_40G_alibase_20190523.vhd  
• English version: win2012r2_64_dtc_9600_en-us_40G_alibase_20190523.vhd | May 23, 2019       | Updated to include the operating system patches released in May 2019                           |
| Windows Server 2012 R2 Datacenter Edition | • Chinese version: win2012r2_64_dtc_9600_zh-cn_40G_alibase_20190318.vhd  
• English version: win2012r2_64_dtc_9600_en-us_40G_alibase_20190318.vhd | March 18, 2019     | Updated to include the operating system patches released in March 2019                        |
<table>
<thead>
<tr>
<th>Release</th>
<th>Image ID</th>
<th>Release date</th>
<th>Description</th>
</tr>
</thead>
</table>
| Windows Server 2012 R2 Datacenter Edition | • Chinese version: win2012r2_64_dtc_9600_zh-cn_40G_alibase_20181220.vhd  
  • English version: win2012r2_64_dtc_9600_en-us_40G_alibase_20181220.vhd | December 20, 2018 | • Updated to include the security patch KB4471320 released in December 2018. You must update Windows clients with the latest patches to establish RDP connections.  
  • Upgraded .NET Framework to version 4.7.2  
  • Used the Sysprep tool to generalize the image |

**Windows Server 2016**

<table>
<thead>
<tr>
<th>Release</th>
<th>Image ID</th>
<th>Release date</th>
<th>Description</th>
</tr>
</thead>
</table>
| Windows Server 2016 Datacenter Edition | • Chinese version: win2016_1607_x64_dtc_zh-cn_40G_alibase_20200314.vhd  
  • English version: win2016_1607_x64_dtc_en-us_40G_alibase_20200314.vhd | March 14, 2020 | • Updated to include the operating system patches released in March 2020  
  • Fixed the CVE-2020-0684, CVE-2020-0801, CVE-2020-0881, and CVE-2020-0787 vulnerabilities |
| Windows Server 2016 Datacenter Edition | • Chinese version: win2016_1607_x64_dtc_zh-cn_40G_alibase_20200213.vhd  
  • English version: win2016_1607_x64_dtc_en-us_40G_alibase_20200213.vhd | February 13, 2020 | • Updated to include the operating system patches released in February 2020  
  • Fixed the CVE-2020-0738, CVE-2020-0689, CVE-2020-0681, CVE-2020-0683, CVE-2020-0686, CVE-2020-0674, CVE-2020-0674, and CVE-2020-0706 vulnerabilities |
<table>
<thead>
<tr>
<th>Release</th>
<th>Image ID</th>
<th>Release date</th>
<th>Description</th>
</tr>
</thead>
</table>
| Windows Server 2016 Datacenter Edition | • Chinese version: win2016_1607_x64_dtc_zh-cn_40G_alibase_20200116.vhd  | January 16, 2020 | • Updated to include the operating system patches released in January 2020  
• Fixed the CVE-2020-0609, CVE-2020-0601, CVE-2020-0625, CVE-2020-0611, and CVE-2020-0640 vulnerabilities |
| Windows Server 2016 Datacenter Edition | • Chinese version: win2016_1607_x64_dtc_zh-cn_40G_alibase_20191220.vhd  | December 24, 2019 | Updated to include the security patches released in December 2019  
• Updated to include the security patches released in October 2019 |
| Windows Server 2016 Datacenter Edition | • Chinese version: win2016_64_dtc_1607_zh-cn_40G_alibase_20191012.vhd  | October 12, 2019 | Updated to include the security patches released in October 2019  
• Updated to include the operating system patches released in August 2019  
• Fixed the CVE-2019-1181 and CVE-2019-1182 vulnerabilities |
| Windows Server 2016 Datacenter Edition | • Chinese version: win2016_64_dtc_1607_zh-cn_40G_alibase_20190816.vhd  | August 16, 2019 | Updated to include the operating system patches released in August 2019  
• Fixed the CVE-2019-1181 and CVE-2019-1182 vulnerabilities |
| Windows Server 2016 Datacenter Edition | • Chinese version: win2016_64_dtc_1607_zh-cn_40G_alibase_20190718.vhd  | July 18, 2019 | Updated to include the operating system patches released in July 2019  
• Upgraded .NET Framework to version 4.8 |

Issue: 20200519
<table>
<thead>
<tr>
<th>Release</th>
<th>Image ID</th>
<th>Release date</th>
<th>Description</th>
</tr>
</thead>
</table>
• English version: win2016_64_dtc_1607_en-us_40G_alibase_20190523.vhd | May 23, 2019 | Updated to include the operating system patches released in May 2019 |
• English version: win2016_64_dtc_1607_en-us_40G_alibase_20190318.vhd | March 18, 2019 | Updated to include the operating system patches released in March 2019 |
• English version: win2016_64_dtc_1607_en-us_40G_alibase_20181220.vhd | December 20, 2018 | • Updated to include the security patch KB4471321 released in December 2018. You must update Windows clients with the latest patches to establish RDP connections.  
• Upgraded .NET Framework to version 4.7.2  
• Used the Sysprep tool to generalize the image |
## Windows Server 2019

<table>
<thead>
<tr>
<th>Release</th>
<th>Image ID</th>
<th>Release date</th>
<th>Description</th>
</tr>
</thead>
</table>
| Windows Server 2019 with Container Datacenter Edition | • Chinese version: win2019_1809_x64_dtc_zh-cn_40G_container_alibase_20200314.vhd  
• English version: win2019_1809_x64_dtc_en-us_40G_container_alibase_20200314.vhd | March 14, 2020 | • Updated to include the operating system patches released in March 2020  
• Added the Docker runtime environment  
• Fixed the CVE-2020-0684, CVE-2020-0801, CVE-2020-0881, and CVE-2020-0787 vulnerabilities |
• English version: win2019_1809_x64_dtc_en-us_40G_alibase_20200314.vhd | March 14, 2020 | • Updated to include the operating system patches released in March 2020  
• Fixed the CVE-2020-0684, CVE-2020-0801, CVE-2020-0881, and CVE-2020-0787 vulnerabilities |
• English version: win2019_1809_x64_dtc_en-us_40G_alidocker_20200225.vhd | February 25, 2020 | • Updated to include the operating system patches released in February 2020  
• Added the Docker runtime environment  
• Fixed the CVE-2020-0738, CVE-2020-0689, CVE-2020-0681, CVE-2020-0683, CVE-2020-0686, CVE-2020-0674, CVE-2020-0674, and CVE-2020-0706 vulnerabilities |
• English version: win2019_1809_x64_dtc_en-us_40G_alibase_20200213.vhd | February 13, 2020 | • Updated to include the operating system patches released in February 2020  
• Fixed the CVE-2020-0738, CVE-2020-0689, CVE-2020-0681, CVE-2020-0683, CVE-2020-0686, CVE-2020-0674, CVE-2020-0674, and CVE-2020-0706 vulnerabilities |
<table>
<thead>
<tr>
<th>Release</th>
<th>Image ID</th>
<th>Release date</th>
<th>Description</th>
</tr>
</thead>
</table>
| Windows Server 2019 Datacenter Edition      | • Chinese version: win2019_1809_x64_dtc_zh-cn_40G_alibase_20200116.vhd    | January 16, 2020   | • Updated to include the operating system patches released in January 2020  
• Fixed the CVE-2020-0609, CVE-2020-0601, CVE-2020-0625, CVE-2020-0611, and CVE-2020-0640 vulnerabilities |
|                                             | • English version: win2019_1809_x64_dtc_en-us_40G_alibase_20200116.vhd     |                    |                                                                                                                                                                   |
| Windows Server 2019 Datacenter Edition      | • Chinese version: win2019_1809_x64_dtc_zh-cn_40G_alibase_20191220.vhd     | December 20, 2019  | Updated to include the security patches released in December 2019                                                                                               |
|                                             | • English version: win2019_1809_x64_dtc_en-us_40G_alibase_20191220.vhd     |                    |                                                                                                                                                                   |
| Windows Server 2019 Datacenter Edition      | • Chinese version: win2019_64_dtc_1809_zh-cn_40G_alibase_20191012.vhd      | October 12, 2019   | Updated to include the security patches released in October 2019                                                                                            |
|                                             | • English version: win2019_64_dtc_1809_en-us_40G_alibase_20191012.vhd      |                    |                                                                                                                                                                   |
| Windows Server 2019 Datacenter Edition      | • Chinese version: win2019_64_dtc_1809_zh-cn_40G_alibase_20190816.vhd      | August 16, 2019    | • Updated to include the operating system patches released in August 2019  
• Fixed the CVE-2019-1181 and CVE-2019-1182 vulnerabilities |
|                                             | • English version: win2019_64_dtc_1809_en-us_40G_alibase_20190816.vhd      |                    |                                                                                                                                                                   |
| Windows Server 2019 Datacenter Edition      | • Chinese version: win2019_64_dtc_1809_zh-cn_40G_alibase_20190718.vhd      | July 18, 2019      | Updated to include the operating system patches released in July 2019  
• Upgraded .NET Framework to version 4.8 |
|                                             | • English version: win2019_64_dtc_1809_en-us_40G_alibase_20190718.vhd      |                    |                                                                                                                                                                   |
### Windows Server Version 1809

<table>
<thead>
<tr>
<th>Release</th>
<th>Image ID</th>
<th>Release date</th>
<th>Description</th>
</tr>
</thead>
</table>
   • English version: win2019_64_dtc_1809_en-us_40G_alibase_20190528.vhd | May 28, 2019 | Updated to include the operating system patches released in May 2019                                |
|                               |                                                                           |              |                                                                                                        |
   • English version: win2019_64_dtc_1809_en-us_40G_alibase_20190318.vhd | March 18, 2019 | New release                                                                                |
|                               |                                                                           |              |                                                                                                        |

**Windows Server Version 1809**
<table>
<thead>
<tr>
<th>Release</th>
<th>Image ID</th>
<th>Release date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Windows Server Version 1809</td>
<td>- Chinese version: winsvr_64_dtcC_1809_zh-cn_40G_ali_base_20181222.vhd</td>
<td>December 22, 2018</td>
<td>• Updated to include the patch KB4483235 released in December 2018</td>
</tr>
<tr>
<td>Datacenter Edition</td>
<td>- English version: winsvr_64_dtcC_1809_en-us_40G_ali_base_20181222.vhd</td>
<td></td>
<td>• Used the Sysprep tool to generalize the image</td>
</tr>
<tr>
<td>Windows Server Version 1903</td>
<td>- Chinese version: winsvr_64_dtcC_1903_zh-cn_40G_ali_base_20191012.vhd</td>
<td>October 12, 2019</td>
<td>Updated to include the security patches released in October 2019</td>
</tr>
<tr>
<td>Datacenter Edition</td>
<td>- English version: winsvr_64_dtcC_1903_en-us_40G_ali_base_20191012.vhd</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Windows Server Version 1903</td>
<td>- Chinese version: winsvr_64_dtcC_1903_zh-cn_40G_ali_base_20190816.vhd</td>
<td>August 16, 2019</td>
<td>• Updated to include the operating system patches released in August 2019</td>
</tr>
<tr>
<td>Windows Server Version 1903</td>
<td>- Chinese version: winsvr_64_dtcC_1903_zh-cn_40G_ali_base_20190718.vhd</td>
<td>July 18, 2019</td>
<td>• Updated to include the operating system patches released in July 2019</td>
</tr>
<tr>
<td>Datacenter Edition</td>
<td>- English version: winsvr_64_dtcC_1903_en-us_40G_ali_base_20190718.vhd</td>
<td></td>
<td>• Upgraded .NET Framework to version 4.8</td>
</tr>
</tbody>
</table>
### Windows Server Version 1909

<table>
<thead>
<tr>
<th>Release</th>
<th>Image ID</th>
<th>Release date</th>
<th>Description</th>
</tr>
</thead>
</table>
| Windows Server Version 1909 with Container Datacenter Edition | • Chinese version: wincore_1909_x64_dtc_zh-cn_40G_container_alibase_20200416.vhd  
• English version: wincore_1909_x64_dtc_en-us_40G_container_alibase_20200416.vhd | April 16, 2020 | • Updated to include the patches KB4549951 and KB4552152 released in April 2020  
• Added the Docker runtime environment  
• Add disk drives for Windows Recovery mode  
• Fixed the CVE-2020-1020, CVE-2020-0687, CVE-2020-0910, CVE-2020-0938, CVE-2020-0965, and CVE-2020-0968 vulnerabilities  
• Applicable regions: China (Zhangjiakou-Beijing Winter Olympics), China (Hohhot), Singapore, US (Silicon Valley), and US (Virginia) |
• English version: wincore_1909_x64_dtc_en-us_40G_alibase_20200315.vhd | March 15, 2020 | • Updated to include the operating system patches released in March 2020  
• Fixed the CVE-2020-0684, CVE-2020-0801, CVE-2020-0881, CVE-2020-0787, and CVE-2020-0796 vulnerabilities |
• English version: wincore_1909_x64_dtc_en-us_40G_alibase_20200213.vhd | February 13, 2020 | • Updated to include the operating system patches released in February 2020  
• Fixed the CVE-2020-0738, CVE-2020-0689, CVE-2020-0681, CVE-2020-0683, CVE-2020-0686, CVE-2020-0674, CVE-2020-0674, and CVE-2020-0706 vulnerabilities |
### Windows Server 2008

<table>
<thead>
<tr>
<th>Release</th>
<th>Image ID</th>
<th>Release date</th>
<th>Description</th>
</tr>
</thead>
</table>
  • English version: wincore_1909_x64_dtc_en-us_40G_alibase_20200116.vhd | January 16, 2020 | • Updated to include the operating system patches released in January 2020  
  • Fixed the CVE-2020-0601, CVE-2020-0625, and CVE-2020-0611 vulnerabilities |
  • English version: wincore_1909_x64_dtc_en-us_40G_alibase_20191219.vhd | December 19, 2019 | Updated to include the security patches released in December 2019          |

**Note:**

From January 14, 2020, Microsoft stopped providing support for Windows Server 2008 and Windows Server 2008 R2 operating systems. Therefore, Alibaba Cloud no longer provides technical support for ECS instances that use the preceding operating systems. If you have ECS instances that use the preceding operating systems, upgrade them to Windows Server 2012 or later in a timely manner.
<table>
<thead>
<tr>
<th>Release</th>
<th>Image ID</th>
<th>Release date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Windows Server 2008 R2</td>
<td>• Chinese version: win2008r2_sp1_x64_ent_zh-cn_40G_alibase_20191218.vhd</td>
<td>December 20, 2019</td>
<td>Updated to include the security patches released in December 2019</td>
</tr>
<tr>
<td>Enterprise Edition</td>
<td>• English version: win2008r2_sp1_x64_ent_en-us_40G_alibase_20191220.vhd</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Chinese version: win2008r2_64_ent_sp1_zh-cn_40G_alibase_20191012.vhd</td>
<td>October 12, 2019</td>
<td>Updated to include the security patches released in October 2019</td>
</tr>
<tr>
<td></td>
<td>• English version: win2008r2_64_ent_sp1_en-us_40G_alibase_20191012.vhd</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Chinese version: win2008r2_64_ent_sp1_zh-cn_40G_alibase_20190816.vhd</td>
<td>August 16, 2019</td>
<td>• Updated to include the operating system patches released in August 2019</td>
</tr>
<tr>
<td></td>
<td>• English version: win2008r2_64_ent_sp1_en-us_40G_alibase_20190816.vhd</td>
<td></td>
<td>• Fixed the CVE-2019-1181 and CVE-2019-1182 vulnerabilities</td>
</tr>
<tr>
<td></td>
<td>• Chinese version: win2008r2_64_ent_sp1_zh-cn_40G_alibase_20190816.vhd</td>
<td>August 16, 2019</td>
<td>• Updated to include the operating system patches released in August 2019</td>
</tr>
<tr>
<td></td>
<td>• English version: win2008r2_64_ent_sp1_en-us_40G_alibase_20190816.vhd</td>
<td></td>
<td>• Fixed the CVE-2019-1181 and CVE-2019-1182 vulnerabilities</td>
</tr>
<tr>
<td></td>
<td>• Chinese version: win2008r2_64_ent_sp1_zh-cn_40G_alibase_20190718.vhd</td>
<td>July 18, 2019</td>
<td>• Updated to include the operating system patches released in July 2019</td>
</tr>
<tr>
<td></td>
<td>• English version: win2008r2_64_ent_sp1_en-us_40G_alibase_20190718.vhd</td>
<td></td>
<td>• Upgraded .NET Framework to version 4.8</td>
</tr>
</tbody>
</table>

Issue: 20200519
<table>
<thead>
<tr>
<th>Release</th>
<th>Image ID</th>
<th>Release date</th>
<th>Description</th>
</tr>
</thead>
</table>
• English version: win2008_32_std_sp2_en-us_40G_alibase_20190517.vhd | May 17, 2019 | • Updated to include the operating system patches released in May 2019  
• Fixed the CVE-2019-0708 remote code execution vulnerability in Microsoft Windows Remote Desktop Services |
| Windows Server 2008 R2 Enterprise Edition | • Chinese version: win2008r2_64_ent_sp1_zh-cn_40G_alibase_20190515.vhd  
• English version: win2008r2_64_ent_sp1_en-us_40G_alibase_20190515.vhd | May 15, 2019 | • Updated to include the operating system patches released in May 2019  
• Fixed the CVE-2019-0708 remote code execution vulnerability in Microsoft Windows Remote Desktop Services |
| Windows Server 2008 R2 Enterprise Edition | • Chinese version: win2008r2_64_ent_sp1_zh-cn_40G_alibase_20190318.vhd  
• English version: win2008r2_64_ent_sp1_en-us_40G_alibase_20190318.vhd | March 18, 2019 | Updated to include the operating system patches released in March 2019                                                                                                                                   |
| Windows Server 2008 R2 Enterprise Edition | • Chinese version: win2008r2_64_ent_sp1_zh-cn_40G_alibase_20181220.vhd  
• English version: win2008r2_64_ent_sp1_en-us_40G_alibase_20181220.vhd | December 20, 2018 | • Updated to include the security patch KB4471318 released in December 2018. You must update Windows clients with the latest patches to establish RDP connections.  
• Upgraded .NET Framework to version 4.7.2  
• Used the Sysprep tool to generalize the image |
4.3 Known issues

This topic describes known issues of Alibaba Cloud images for different operating systems, the scope of these issues, and their corresponding solutions.

CentOS 8.0: Naming of the public image

- Problem description: After you establish a remote connection to an instance created from the `centos_8_0_x64_20G_alibase_20200218.vhd` public image, you check the system version of the instance, and find that the system version is CentOS 8.1.

  ```
  root@ecshost:~$ lsb_release -a
  LSB Version:    :core-4.1-amd64:core-4.1-noarch
  Distributor ID:    CentOS
  Description:    CentOS Linux release 8.1.1911 (Core)
  Release:    8.1.1911
  Codename:    Core
  ```

- Cause: The `centos_8_0_x64_20G_alibase_20200218.vhd` public image is in the public image list and was updated with the latest community update package. The image was upgraded and the actual system version is CentOS 8.1.

- Involved image: `centos_8_0_x64_20G_alibase_20200218.vhd`.

- Solution: You can call APIs such as `#unique_33` and set `ImageId=centos_8_0_x64_20G_alibase_20191225.vhd` to create an instance whose system version is CentOS 8.0.

Debian 9.6: Classic network configuration

- Problem description: Classic network-type instances created from Debian 9 public images cannot be pinged.

- Cause: Classic network-type instances created from Debian 9 public images cannot be automatically assigned IP addresses through the Dynamic Host Configuration Protocol (DHCP) because the systemd-networkd service is disabled by default in Debian 9.

- Involved image: `debian_9_06_64_20G_alibase_20181212.vhd`. 
• Solution: Run the following commands:

```bash
systemctl enable systemd-networkd
systemctl start systemd-networkd
```

**CentOS 6.8: An instance installed with the NFS client fails to respond**

- **Problem description:** A CentOS 6.8 instance installed with the NFS client fails to respond and must be restarted.

- **Cause:** When you use the NFS service on instances whose kernel versions are 2.6.32-696 to 2.6.32-696.10, the NFS client will attempt to end a TCP connection if a glitch occurs due to communication latency. Specifically, if the NFS server is delayed in sending a response to the NFS client, the connection initiated by the NFS client may be stalled in the FIN_WAIT2 state. Normally, the connection will expire and close a minute after the connection enters the FIN_WAIT2 state and the NFS client will initiate another connection. However, kernel versions 2.6.32-696 to 2.6.32-696.10 have issues with establishing TCP connections. As a result, the connection will remain in the FIN_WAIT2 state, the NFS client will be unable to recover the TCP connection, and a new TCP connection cannot be initiated. The requests will hang, and the only way to fix the issue is to restart the instance.

- **Involved images:** centos_6_08_32_40G_alibase_20170710.vhd and centos_6_08_64_20G_alibase_20170824.vhd.

- **Solution:** Run the `yum update` command to upgrade the kernel to 2.6.32-696.11 or later versions.

---

**Notice:**

Before you perform any operations on the instance, you must create a snapshot to back up your data. For more information, see #unique_34.
CentOS 7: The hostname changes from uppercase to lowercase letters after the instance restarts

- Problem description: When ECS instances are restarted for the first time, the hostnames of some instances that run CentOS 7 change from uppercase to lowercase letters. The following table describes some examples.

<table>
<thead>
<tr>
<th>Hostname</th>
<th>Hostname after the instance is restarted for the first time</th>
<th>Does the hostname remain in lowercase after the restart?</th>
</tr>
</thead>
<tbody>
<tr>
<td>iZm5e1qe*****sxx1ps5zX</td>
<td>izm5e1qe*****sxx1ps5zX</td>
<td>Yes</td>
</tr>
<tr>
<td>ZZHost</td>
<td>zzhost</td>
<td>Yes</td>
</tr>
<tr>
<td>NetworkNode</td>
<td>networknode</td>
<td>Yes</td>
</tr>
</tbody>
</table>

- Involved images: The following CentOS public images and custom images derived of these public images are affected:

  - centos_7_2_64_40G_base_20170222.vhd
  - centos_7_3_64_40G_base_20170322.vhd
  - centos_7_03_64_40G_alibase_20170503.vhd
  - centos_7_03_64_40G_alibase_20170523.vhd
  - centos_7_03_64_40G_alibase_20170625.vhd
  - centos_7_03_64_40G_alibase_20170710.vhd
  - centos_7_02_64_20G_alibase_20170818.vhd
  - centos_7_03_64_20G_alibase_20170818.vhd
  - centos_7_04_64_20G_alibase_201701015.vhd
• Involved hostnames: If the hostnames of your applications are case-sensitive, restarting such instances may affect the availability of corresponding services. The following table describes whether the hostname will change after an instance is restarted.

<table>
<thead>
<tr>
<th>Current state of hostname</th>
<th>Will the hostname change after an instance restart?</th>
<th>When will the change occur?</th>
<th>Continue reading this section?</th>
</tr>
</thead>
<tbody>
<tr>
<td>The hostname contains uppercase letters when the instance was created (either through the ECS console or by calling ECS API operations).</td>
<td>Yes</td>
<td>When the instance is restarted for the first time</td>
<td>Yes</td>
</tr>
<tr>
<td>The hostname contains no uppercase letters when the instance was created (either through the ECS console or by calling ECS API operations).</td>
<td>No</td>
<td>N/A</td>
<td>No</td>
</tr>
<tr>
<td>You log on to the instance and modify its hostname to contain uppercase letters.</td>
<td>No</td>
<td>N/A</td>
<td>Yes</td>
</tr>
</tbody>
</table>

• Solution: To retain uppercase letters in a hostname after you restart an instance, follow these steps:

1. Establish a remote connection to the instance. For more information, see #unique_35/unique_35_Connect_42_section_fjm_rgx_wdb.

2. View the existing hostname.

   [root@izbp193*****3i161uynzzx ~]# hostname
   iZbp193*****3i161uynzzx

3. Run the following command to staticize the hostname:

   hostnamectl set-hostname --static iZbp193*****3i161uynzzX

4. Run the following commands to view the updated hostname:

   [root@izbp193*****3i161uynzzx ~]# hostname
   iZbp193*****3i161uynzzX

• Additional actions: If you are using a custom image, we recommend that you update cloud-init to the latest version and create a custom image again to prevent the previous issue from occurring to the custom image. For more information, see Install cloud-init and Create a custom image by using an instance.
Linux: Pip requests time out

- Problem description: Pip requests occasionally time out or fail.
- Involved images: CentOS, Debian, Ubuntu, SUSE, openSUSE, and Aliyun Linux.
- Cause: Alibaba Cloud provides three pip source addresses. The default address is mirrors.aliyun.com. To access this address, instances must be able to access the Internet. If your instance does not have a public IP address assigned to it, pip requests will time out.
  - The Internet source address (Default): mirrors.aliyun.com
  - The internal source address of VPCs: mirrors.cloud.aliyuncs.com
  - The internal source address of the classic network: mirrors.aliyuncs.com
- Solution: You can solve the problem by using one of the following methods:
  - Method 1
    Assign a public IP address to your instance by associating an Elastic IP Address (EIP) to your instance. For more information, see #unique_36.
    A subscription instance can also be reassigned a public IP address by changing its specifications. For more information, see #unique_37.
  - Method 2
    If a pip request fails, you can run the fix_pypi.sh script in your ECS instance and retry the pip operation. The procedure is as follows:
    1. Establish a remote connection to the instance. For more information, see #unique_38.
    2. Run the following command to obtain the script file:

      ```bash
      ```
    3. Run one of the following scripts based on the network type of the instance:
      - For instances in VPCs, run the bash fix_pypi.sh "mirrors.cloud.aliyuncs.com" script.
      - For instances in the classic network, run the bash fix_pypi.sh "mirrors.aliyuncs.com" script.
    4. Retry the pip operation.

    The content of the fix_pypi.sh script is as follows:

    ```bash
    #!/bin/bash
    ```
function config_pip() {
    pypi_source=$1

    if [[ ! -f ~/.pydistutils.cfg ]]; then
        cat > ~/.pydistutils.cfg << EOF
            [easy_install]
            index-url=http://$pypi_source/pypi/simple/
        EOF
    else
        sed -i "s#index-url.*#index-url=http://$pypi_source/pypi/simple/#" ~/.pydistutils.cfg
        fi

    if [[ ! -f ~/.pip/pip.conf ]]; then
        mkdir -p ~/.pip
        cat > ~/.pip/pip.conf << EOF
            [global]
            index-url=http://$pypi_source/pypi/simple/
            [install]
            trusted-host=$pypi_source
        EOF
        else
            sed -i "s#index-url.*#index-url=http://$pypi_source/pypi/simple/#" ~/.pip/pip.conf
            sed -i "s#trusted-host.*#trusted-host=$pypi_source#" ~/.pip/pip.conf
        fi
    }
5 Aliyun Linux 2

5.1 Overview of Aliyun Linux 2

Aliyun Linux 2 is a next-generation operating system developed by Alibaba Cloud. It provides a safe, stable, and high-performance customized running environment for applications on ECS instances. Aliyun Linux 2 is a native Linux distribution that is optimized for cloud infrastructure and can deliver a better runtime experience to you. You can create an instance by using the Aliyun Linux 2 image. Aliyun Linux 2 is free to use, and Alibaba Cloud provides long-term technical support.

For more information, see the Aliyun Linux 2 product page.

Scenarios

Aliyun Linux 2 is suitable for the following scenarios:

- Various workloads in cloud environments, such as databases, cloud-native containers, data analytics, web applications, and other workloads in the production environment.
- Various instance families including ECS Bare Metal Instance families. For more information, see #unique_40.
  - Aliyun Linux 2 supports instance types that have 1 to 160 vCPUs.
  - Aliyun Linux 2 supports instance types that have a memory of 0.5 GiB to 3,840 GiB.
  - Aliyun Linux 2 does not support non-I/O optimized instances.

Benefits

Compared with other Linux distributions, Aliyun Linux 2 has the following benefits:

- It is optimized for ECS instances, and features faster system startup and better runtime performance.
- It provides the latest enhanced features of the Linux community to power cloud-based application environments.
- It features a custom Linux kernel, user mode packages, and toolkits that provide additional features to the operating system.
- It has streamlined the kernel and reduced potential security risks.
- It is free to use and is provided with Alibaba Cloud technical support.
Features

- Aliyun Linux 2 is distributed with the latest version of the Alibaba Cloud kernel. The kernel provides the following features:
  - The Alibaba Cloud kernel is based on Linux kernel V4.19, and features optimization for cloud-based scenarios, improved performance, and bug fixes.
  - Aliyun Linux 2 provides customized and optimized kernel startup parameters and system configuration parameters for the ECS instance environment.
  - Aliyun Linux 2 provides the kernel failure dumping mechanism Kdump when the operating system fails. You can enable or disable this feature without the need to restart the operating system.
  - Aliyun Linux 2 provides Kernel Live Patching (KLP).

- Pre-installed software and updates:
  - Aliyun Linux 2 is pre-installed with Alibaba Cloud CLI.
  - The network module is changed from `network.service` to `systemd-networkd`.
  - The user-mode package is compatible with the latest version of CentOS 7 and can run on Aliyun Linux 2.
  - Fixes for Common Vulnerabilities and Exposures (CVE) will be continuously updated until the end of life (EOL) of Aliyun Linux 2. For more information, see Aliyun Linux 2.1903 Security Advisories.

- Aliyun Linux 2 speeds up the startup process and improves runtime performance in the following ways:
  - Aliyun Linux 2 is greatly optimized for the startup speed in ECS instance environments.
  - Aliyun Linux 2 is optimized for multi-threaded scenarios in ECS instance environments and delivers improved multi-threaded performance for high-specification instances.
  - Aliyun Linux 2 is optimized holistically for MySQL database scenarios and can be used in combination with Enhanced SSDs to deliver improved performance.

Billing

Aliyun Linux 2 images are provided free of charge. However, you are charged for resources such as vCPUs, memory, storage, public bandwidth, and snapshots. For more information, see #unique_4.
Obtain Aliyun Linux 2

You can use the following methods to obtain Aliyun Linux 2:

- ECS instances
  - When creating an ECS instance, select **Public Image** and then select Aliyun Linux and its version. For more information, see #unique_22.
  - Update the operating system of an existing ECS instance to Aliyun Linux 2 by replacing the instance system disk. For more information, see #unique_14.
- On-premises environments such as a KVM-based virtualization environment

Download the Aliyun Linux 2 image, install the image, and start the system. For more information, see Use Aliyun Linux 2 images in an on-premises environment.

Use Aliyun Linux 2

- View or modify system parameters

You can run the `sysctl` command to view or modify the runtime parameters of Aliyun Linux 2. Aliyun Linux 2 has updated the following kernel configuration parameters in the `/etc/sysctl.d/50-aliyun.conf` file.

<table>
<thead>
<tr>
<th>System parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>kernel.hung_task_timeout_secs = 240</td>
<td>Increases the kernel hung_task timeout seconds to avoid frequent hung_task prompts.</td>
</tr>
<tr>
<td>kernel.panic_on_oops = 1</td>
<td>Throws the kernel panic exception when the kernel is experiencing an Oops error. Crash details are automatically captured if kdump is configured.</td>
</tr>
<tr>
<td>kernel.watchdog_thresh = 50</td>
<td>Increases the thresholds for events such as hrtimer, NMI, soft lockup, and hard lockup to avoid possible kernel false positives.</td>
</tr>
<tr>
<td>kernel.hardlockup_panic = 1</td>
<td>Throws the kernel panic exception when the kernel is experiencing a hard lockup error. Crash details are automatically captured if kdump is configured.</td>
</tr>
</tbody>
</table>
• View kernel parameters

Aliyun Linux 2 has updated the following kernel parameters. You can run the `cat /proc/cmdline` command to view the kernel parameters of Aliyun Linux 2 at runtime.

<table>
<thead>
<tr>
<th>Kernel parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>crashkernel=0M-2G:0M,2G-8G:192M,8G-:256M</td>
<td>Reserves memory space for the kdump feature.</td>
</tr>
<tr>
<td>cryptomgr.notests</td>
<td>Disables crypto self-check during kernel startup to speed up startup.</td>
</tr>
<tr>
<td>cgroup.memory=nokmem</td>
<td>Disables the kernel memory statistics function of memory cgroup to avoid potential kernel instability.</td>
</tr>
<tr>
<td>rcupdate.rcu_cpu_stall_timeout=300</td>
<td>Increases the timeout threshold of RCU CPU Stall Detector to 300 seconds to avoid kernel false positives.</td>
</tr>
</tbody>
</table>

• Roll back the kernel version

Aliyun Linux 2 is distributed with Alibaba Cloud kernel V4.19.y. The kernel version changes when you update the image. You can run the following commands to install and switch to a V3.10 series kernel that is compatible with CentOS 7 as needed.

**Note:**
Replacing the kernel version may result in a boot failure. Use caution when you perform this operation.

Run the following commands to roll back to the V3.10 kernel:

```bash
# Install a V3.10 kernel.
sudo yum install -y kernel-3.10.0
# Configure the GRUB driver.
sudo grub2-set-default "$(grep ^menuentry /boot/grub2/grub.cfg | grep 3.10.0 | awk -F\" '{ print $2 }')"
# Update the changes into the configuration file.
sudo grub2-mkconfig -o /boot/grub2/grub.cfg
# Restart the operating system for the new configurations to take effect.
sudo reboot
```

• Enable or disable kdump

Aliyun Linux 2 provides the kdump service. After this service is enabled, kernel errors can be captured to help you analyze kernel failures.

**Note:**
If the memory of the selected instance type is less than or equal to 2 GiB, the kdump service cannot be used.

- Run the following commands to enable the kdump service:

```
# Enable the kdump service first.
sudo systemctl enable kdump.service
# Restart the kdump service.
sudo systemctl restart kdump.service
```

- Run the following commands to return the memory address space reserved by the kdump service to the operating system and disable the kdump service:

```
# Change the configuration in the /sys/kernel/kexec_crash_size file.
sudo sh -c 'echo 0 > /sys/kernel/kexec_crash_size'
# Disable the kdump service.
sudo systemctl disable kdump.service
# Stop the kdump service.
sudo systemctl stop kdump.service
```

**Note:**

After the memory address space reserved by the kdump service is returned to the operating system, the operating system must be restarted to re-enable the kdump service.

- Configure the network

By default, Aliyun Linux 2 uses `systemd-networkd` to configure the network. The configuration file for DHCP or static IP addresses is located in the `/etc/systemd/network/` directory.

```
# Restart the network.
sudo systemctl restart systemd-networkd
```

- Obtain the Debuginfo package and the source code package

- Run the following commands to obtain the Debuginfo package:

```
# Install yum-utils.
sudo yum install -y yum-utils
# Install the Debuginfo package by replacing packageName with the name of the target software package in the following command:
sudo debuginfo-install -y <packageName>
```

- Run the following commands to obtain the source code package:

```
# Install the source code.
sudo yum install -y alinux-release-source
# Install yum-utils.
sudo yum install -y yum-utils
# Install the source code package by replacing sourcePackageName with the name of the target software package in the following command:
```
sudo yumdownloader --source <sourcePackageName>

- Use experimental software packages

Experimental software packages are provided by Alibaba Cloud, but are not rigorously tested. Alibaba Cloud does not guarantee the quality of these packages. Aliyun Linux 2 provides the following types of experimental packages:

- Experimental software packages that serve common purposes
  - Golang 1.12
  - Golang 1.13

Run the following commands to install an experimental software package that serves common purposes:

```bash
# Enable YUM repositories.
sudo yum install -y alinux-release-experimentals
# Install an experimental software package that serves common purposes by replacing packageName with the name of the target software package in the following command:
sudo yum install -y <packageName>
```

- Developments kits that support SCL plug-ins
  - The development kit based on GCC-7.3.1: devtoolset-7
  - The development kit based on GCC-8.2.1: devtoolset-8
  - The development kit based on GCC-9.1.1: devtoolset-9

Run the following commands to install an experimental software package that supports SCL plug-ins:

```bash
# Install scl-utils.
sudo yum install -y scl-utils
# Enable YUM repositories.
sudo yum install -y alinux-release-experimentals
# Install the packages that you need from the YUM repositories. The following sample commands also install all development kits supported by the SCL plug-ins.
sudo yum install -y devtoolset-7-gcc devtoolset-7-gdb devtoolset-7-binutils devtoolset-7-make
dsudio yum install -y devtoolset-8-gcc devtoolset-8-gdb devtoolset-8-binutils devtoolset-8-make
dsudio yum install -y devtoolset-9-gcc devtoolset-9-gdb devtoolset-9-binutils devtoolset-9-make
```

After the installation is completed, you can use the later version of GCC and related tools. The sample code is as follows:

```bash
# Specify the repository name to view an existing SCL. The following command uses repository devtoolset-7 as an example:
scl -l devtoolset-7
# Run the related SCL software.
```
scl enable devtoolset-7 'gcc --version'

**Update history**

- For the information about release notes of Aliyun Linux 2 images, see [Release notes of Aliyun Linux 2](#).
- For the information about CVE updates of Aliyun Linux 2, see [Aliyun Linux 2.1903 Security Advisories](#).

**Technical support**

Alibaba Cloud provides the following support for Aliyun Linux 2:

- Long-term support of five years such as security updates and vulnerability fixes are provided until the version lifecycle ends on March 31, 2024. You can obtain free technical support in the following ways:
  - submit a ticket
  - GitHub
- Images are updated every four months. Updates include new features, security updates, and vulnerability fixes.
- Security updates are provided from YUM repositories. You can run the `yum update` command to update to the latest version.
5.2 Release notes of Aliyun Linux 2

This topic describes the feature updates of Aliyun Linux 2 images in the order of their release time. Unless otherwise stated, the released updates apply to all Alibaba Cloud regions where Elastic Compute Service (ECS) is provided.
<table>
<thead>
<tr>
<th>Image ID</th>
<th>Release date</th>
<th>Description</th>
</tr>
</thead>
</table>
| aliyun_2_1 903_x64_20G_alibase_20200324.vhd | March 24, 2020 | • Images are updated to the latest software versions to be compatible with CentOS 7.7. Common Vulnerabilities and Exposures (CVEs) are fixed.  
  • The latest fixes for CVEs can be obtained
  • /etc/alinux-release is updated to Aliyun Linux release 2.1903 LTS (Hunting Beagle).  
  • The tuned service is enabled by default.
  • Kernel changes:
    - The kernel is updated to the kernel-4.19.91-18.al7 version.  
    - The NVMe driver is enabled.
    - THP support is enabled by default.
    - The io_uring interface is supported.
    - The Hygon CPU support is added.
    - The intel_idle driver is enabled.
    - guest halt polling is enabled.
    - ftrace syscalls is enabled.
    - Multiple Alibaba Cloud optimizations and bug fixes to the kernel including subsystems such as schedulers, memory, file systems, and block layers are open sourced.
    - Kernel security vulnerabilities are fixed.
<table>
<thead>
<tr>
<th>Image ID</th>
<th>Release date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>aliyun_2_1</td>
<td>February 21, 2020</td>
<td>• Images are updated to the latest software versions to be compatible with CentOS 7.7. CVEs are fixed.</td>
</tr>
<tr>
<td>903_x64_20</td>
<td></td>
<td>• IPv6 is enabled by default.</td>
</tr>
<tr>
<td>G_alibase_20200221.vhd</td>
<td></td>
<td>• Kernel changes:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• The kernel is updated to the kernel - 4.19.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Persistent memory is supported.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• The blk-iocost feature is provided. It is based on the cost model and the weight-based throttling function of blkio cgroup controllers. For more information, see Configure the weight-based throttling feature of blk-iocost.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• The Pressure Stall Information (PSI) feature is supported for the cgroup v1 interface. For more information, see Enable the PSI feature for the cgroup v1 interface.</td>
</tr>
</tbody>
</table>

60
Issue: 20200519
<table>
<thead>
<tr>
<th>Image ID</th>
<th>Release date</th>
<th>Description</th>
</tr>
</thead>
</table>
| aliyun_2_1903_x64_20G_alibase_20200114.qboot.vhd | January 14, 2020 | • Images are updated to the latest software version.  
- Kernel changes:  
  - The kernel is updated to the 4.19.81-17.ali7.x86_64 version.  
  - Quick boot with qboot is supported.  
- Applicable regions: China (Beijing), China (Hangzhou), and China (Hong Kong). |
<table>
<thead>
<tr>
<th>Image ID</th>
<th>Release date</th>
<th>Description</th>
</tr>
</thead>
</table>
| aliyun_2_1 903_64_20G_alibase_20190829.vhd | August 29, 2019 | • Images are updated to the latest software version.  
• Kernel changes:  
  - The kernel is updated to the kernel - 4.19.57-15.1.17.x86_64 version.  
  - The Spectre-V1 SWAPGS vulnerability is fixed.  
  - Issues with bio splitting code are fixed.  
• The default TCP congestion control algorithm is set to CUBIC.  
• The network is configured to 10-eth0.
<table>
<thead>
<tr>
<th>Image ID</th>
<th>Release date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>aliyun_2_1 903_64_20G_alibase_20190619.vhd</td>
<td>June 19, 2019</td>
<td>• Images are updated to the latest software version.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Kernel changes:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- The kernel is updated to the kernel - 4.19.43 - 13.2 - al7.x86_64 version.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- The cgroup writeback feature is supported.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- The policy-based routing is supported.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- The ss command from the iproute2 suite is supported by enabling the INET_DIAG kernel configuration.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- The configurable net.ipv4.tcp_tw_timestamp kernel interface is supported.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• The following network-related CVEs are fixed:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>■ CVE-2019-11477</td>
</tr>
<tr>
<td></td>
<td></td>
<td>■ CVE-2019-11478</td>
</tr>
<tr>
<td></td>
<td></td>
<td>■ CVE-2019-11479</td>
</tr>
<tr>
<td>Image ID</td>
<td>Release date</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>--------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>aliyun-2.1903-x64-20G-alibase-20190507.vhd</td>
<td>May 7, 2019</td>
<td>• Images are updated to the latest software version.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• The time synchronization delay that was present on instance startup is fixed.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• The kernel is updated to kernel-4.19.34-11.al7.x86_64 version.</td>
</tr>
<tr>
<td>Image ID</td>
<td>Release date</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>----------------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| aliyun-2.1903-x64-20G-alibase-20190327.vhd | March 27, 2019 | • Aliyun Linux 2 is released.  
• The kernel -4.19.24-9.al7.x86_64 kernel version is used in Aliyun Linux 2. |

### 5.3 Known issues about Aliyun Linux 2

This topic describes known issues of Aliyun Linux 2 images, the scope of these issues, and their corresponding solutions.

**Enabling the CONFIG_PARAVIRT_SPINLOCK kernel feature causes performance issues**

- **Problem description:** After you enable the `CONFIG_PARAVIRT_SPINLOCK` kernel feature, application performance is significantly affected when an ECS instance has a large number of vCPUs and a large number of lock contentions exist in applications. For example, timed-out connections deteriorate the performance of an NGINX application.
- **Solution:** The `CONFIG_PARAVIRT_SPINLOCK` kernel feature for Aliyun Linux 2 is disabled by default. And if you are not sure how to resolve the kernel problem, we recommend that you do not enable the `CONFIG_PARAVIRT_SPINLOCK` feature.
Setting the THP switch of kernel features to always causes affect system stability and performance issues

- Problem description: After you set the Transparent Hugepage (THP) switch in your production environment to always, the system becomes unstable and performance is deteriorated.

- Solution: Set the THP switch to madvise. In scenarios such as running performance benchmark testing by using test suites, system performance is deteriorated if this switch is set to madvise compared with always. However, these testing results might not be reliable or match real-world conditions. Therefore, we recommend that you retain the madvise setting to prevent the system from being affected by other contentions.

A delegation conflict occurs in NFS V4.0

- Problem description: A delegation conflict occurs in NFS V4.0. For more information, see Delegation in NFS Version 4.

- Solution: We recommend that you do not enable the Delegation feature when you use NFS V4.0. For information about how to disable this feature at the server side, see How to Select Different Versions of NFS on a Server.

Defects in NFS V4.1 or V4.2 cause applications not to exit

- Problem description: In NFS V4.1 or V4.2, if you use Asynchronous I/O (AIO) in applications to distribute requests and close the corresponding file descriptors before all I/O operations are returned, a livelock may be triggered and the corresponding process cannot be ended.

- Solution: This problem was fixed in kernel versions 4.19.30-10.al7 and later. Application exit failure is not likely to occur. Decide whether you need to upgrade the kernel to fix this issue. To upgrade the kernel version, run the `sudo yum update kernel -y` command.

Notice:

- Upgrading the kernel may result in system boot failure. Exercise caution when you perform this action.

- Before you upgrade the kernel, make sure you have created a snapshot or a custom image to back up data. For more information, see #unique_34 or Create a custom image by using an instance.
Fixing security vulnerabilities such as Meltdown and Spectre affects system performance

- Problem description: In the kernel of Aliyun Linux 2, the repair of important security vulnerabilities such as Meltdown or Spectre in processors is enabled by default, which affects system performance. As a result, performance may be deteriorated during performance benchmark testing.

- Solution: Meltdown and Spectre are two critical vulnerabilities in Intel chips. These vulnerabilities allow attackers to steal sensitive application data from the system memory. We recommend that you do not disable the repair function. However, if you need to maximize system performance, you can run the following commands to disable the repair function:

  1. Run the following commands to add nopti nospectre_v2 to the kernel startup parameters.

     ```bash
     sudo sed -i 's/(GRUB_CMDLINE_LINUX=".*")/\1 nopti nospectre_v2"/g' /etc/default/grub
     sudo grub2-mkconfig -o /boot/grub2/grub.cfg
     ```

  2. Run the following command to restart the system.

     ```bash
     sudo reboot
     ```

5.4 Features and interfaces supported by Aliyun Linux 2

5.4.1 Use Aliyun Linux 2 images in an on-premises environment

Aliyun Linux 2 provides local images in various formats that contain the built-in cloud-init package. This topic describes how to use Aliyun Linux 2 images in an on-premises environment.

Context

Aliyun Linux 2 images can only run on Kernel-based Virtual Machines (KVMs). Aliyun Linux 2 images cannot start KVMs directly. You must configure a boot image. In this topic, the local operating system is Linux. Aliyun Linux 2 is used to create a KVM, and cloud-init is used to initialize the system settings of the KVM. For more information about cloud-init, visit cloud-init official website - Alibaba Cloud (AliYun). The NoCloud data source is then used to create local configuration files. After the configuration files are attached to the KVM as a virtual disk, the KVM can be started.
This topic is applicable to users who are familiar with KVMs.

**Step 1: Download the Aliyun Linux 2 image to your local computer**

You can download the Aliyun Linux 2 image to your local computer from Aliyun Linux 2 On-premise Image. Aliyun Linux 2 images in the VHD or qcow2 format are available.

**Step 2: Generate the seed.img boot image from your local computer**

You must configure the network, account, and YUM repository of the boot image. Typically, the image name is set to seed.img. You can set another name for the image, but we recommend that you do not.

⚠️ **Notice:**

The seed.img image only contains the configuration files that are required to start cloud-init. The image does not contain Aliyun Linux 2 system files.

You can use one of the following methods to generate the seed.img image:

- Use the image file prepared by Aliyun Linux 2 to generate the seed.img image. You can download the image file from Aliyun Linux 2 On-premise Image. On the Aliyun Linux 2 On-premise Image page, click seed.img to download the image.

  You cannot change the configuration information in the boot image. Therefore, this image file is not ideal for all scenarios. Before you use this method to generate the seed.img image, make sure that you are already familiar with the image file.

- Use the NoCloud data source to manually generate the seed.img image. Perform the following steps:

  1. In the same local directory, create two configuration files `meta-data` and `user-data`.

     a) Create a directory named `seed` and go to the directory.

     ```
     mkdir seed
cd seed/
     ```

     b) Create the meta-data configuration file.

     The following example describes the configuration file content. You can modify the configuration as needed.

     ```
     #cloud-config
     #vim:syntax=yaml
     local-hostname: alinux-host
     # FIXME: doesn’t work for systemd-networkd
     #network-interfaces: |
     #  iface eth0 inet static
     ```
c) Create the user-data configuration file.

The following example describes the configuration file content. You can modify the configuration as needed.

```yaml
#cloud-config
#vim:syntax=yaml

# Create a user named alinux who is authorized to run sudo commands.
users:
  - default
  - name: alinux
    sudo: ['ALL=(ALL)   ALL']
    plain_text_passwd: aliyun
    lock_passwd: false

# Create the YUM repository for Aliyun Linux 2.
yum_repos:
  base:
    baseurl: https://mirrors.aliyun.com/alinux/$releasever/os/$basearch/
    enabled: true
    gpgcheck: true
    gpgkey: https://mirrors.aliyun.com/alinux/RPM-GPG-KEY-ALIYUN
    name: Aliyun Linux - $releasever - Base - mirrors.aliyun.com
  updates:
    baseurl: https://mirrors.aliyun.com/alinux/$releasever/updates/$basearch/
    enabled: true
    gpgcheck: true
    gpgkey: https://mirrors.aliyun.com/alinux/RPM-GPG-KEY-ALIYUN
    name: Aliyun Linux - $releasever - Updates - mirrors.aliyun.com
  extras:
    baseurl: https://mirrors.aliyun.com/alinux/$releasever/extras/$basearch/
    enabled: true
    gpgcheck: true
    gpgkey: https://mirrors.aliyun.com/alinux/RPM-GPG-KEY-ALIYUN
    name: Aliyun Linux - $releasever - Extras - mirrors.aliyun.com
  plus:
    baseurl: https://mirrors.aliyun.com/alinux/$releasever/plus/$basearch/
    enabled: true
    gpgcheck: true
    gpgkey: https://mirrors.aliyun.com/alinux/RPM-GPG-KEY-ALIYUN
    name: Aliyun Linux - $releasever - Plus - mirrors.aliyun.com

# Using cloud-init or systemd-networkd may cause the steps to fail when you create the meta-data configuration file. The alternative network configurations are as follows:
write_files:
  - path: /etc/systemd/network/20-eth0.network
    permissions: 0644
    owner: root
    content: |
      [Match]
      Name=eth0

      [Network]
      Address=192.168. *.*/24
```
Gateway=192.168. *.1
# You can also use the following alternative network configurations:
runcmd:
- ifdown eth0
- systemctl restart systemd-networkd

2. Install the cloud-utils software package on your local computer.

```bash
yum install -y cloud-utils
```

3. In the seed directory, run the following command to generate the seed.img image.

```bash
cloud-localds seed.img user-data meta-data
```

**Step 3: Start the KVM**

You can use one of the following methods to start the KVM. Then, use the account information in the `user-data` configuration file to log on to the KVM.

- Use libvirt to start the KVM.

1. Create a configuration file of the XML format on your local computer. The name of the sample file is `alinux2.xml`. The content of the file is as follows. You can modify the XML-formatted configuration file as needed.

```xml
<domain type='kvm'>
  <name>alinux2</name>
  <memory>1048576</memory> <!-- 1 GB memory -->
  <vcpu>1</vcpu>
  <os>
    <type arch='x86_64'>hvm</type>
    <boot dev='hd'/>
  </os>
  <clock sync="localtime"/>
  <on_poweroff>destroy</on_poweroff>
  <on_reboot>restart</on_reboot>
  <on_crash>restart</on_crash>
  <devices>
    <emulator>/usr/bin/qemu-kvm</emulator>
    <disk type='file' device='disk'>
      <!-- Specify the type parameter based on the image format. Set type to qcow2 for the qcow2 format and vpc for the VHD format -->
      <driver name='qemu' type='qcow2' cache='none' dataplane='on' io='native'/>
      <!-- If you want to create a snapshot of the qcow2 format, you must disable dataplane. -->
      <source file='path'/>
    </disk>
    <disk type='file' device='disk'>
      <target dev='vda' bus='virtio'/>
    </disk>
    <disk type='file' device='disk'>
      <target dev='vdb' bus='virtio'/>
    </disk>
  </devices>
</domain>
```

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2. Run the virsh command to start the KVM. The sample command is as follows:

```
virsh define alinux2.xml
virsh start KVMName    # Enter the actual name of the KVM.
```

- Run the qemu-kvm command line to start the KVM. You must add the following parameter information to the command line. Change the file parameter to the actual absolute path of the seed.img image.

```
-drive file=/path/to/your/seed.img,if=virtio,format=raw
```

For more information about how to use the libvirt and qemu-kvm commands, visit Installing Virtualization Packages Manually.

- Use the graphical interface (virt-manager) to start the KVM. Before you start the KVM, find the configuration file of the KVM on your local computer and add the absolute path of the seed.img image file to the configuration file.

### 5.4.2 Enable the cgroup writeback feature

Aliyun Linux 2 supports the cgroup writeback feature for the cgroup v1 kernel interface in the kernel version 4.19.36-12.al7. This feature allows you to limit buffered I/O when you use the cgroup v1 kernel interface.

**Context**

cgroup refers to control group and consists of v1 and v2. For more information, visit What are Control Groups. This topic describes how to enable the cgroup writeback feature for cgroup v1 to limit buffered I/O of processes.

**Limits**

After you enable cgroup writeback, check whether the mapping between the memory subsystem (memcg) and the I/O subsystem (blkcg) conforms to the following rule. If yes, limit buffered I/O of processes.
memcg and blkcg must work together to enable the cgroup writeback feature. Then the cgroup writeback feature limits buffered I/O. However, by default, the control subsystems of the cgroup v1 kernel interface do not work together. Therefore, memcg and blkcg must be associated together through a certain rule. The rule is: each memcg must map a unique blkcg. The mapping between memcg and blkcg can be one-to-one or many-to-one, but can never be one-to-many or many-to-many.

For example, to limit buffered I/O of Processes A and B, you must take note of the following items:

- If A and B belong to two different memcg subsystems, the two memcg subsystems can each be mapped to different blkcg subsystems. For example, A belongs to memcg1 and blkcg1. B belongs to memcg2 and blkcg0.
- If A and B belong to two different memcg subsystems, the two memcg subsystems can also be mapped to the same blkcg subsystem. For example, A belongs to memcg1 and B belongs to memcg2. Both A and B can be mapped to blkcg2.
- If A and B belong to the same memcg, the memcg can only be mapped to the same blkcg. For example, assume both A and B belong to memcg0 and are mapped to blkcg3.

After you enable the cgroup writeback feature and before you limit buffered I/O of a process, we recommend that you configure the cgroup.procs interface of blkcg by writing a process ID to this interface to avoid exceptions and ensure that the memcg maps to a unique blkcg. You can also use a tool to view the mapping between memcg and blkcg. For more information, see Verify the mapping between memcg and blkcg.

During O&M, a process may move to another cgroup. Based on the preceding rule, if the process moves between two memcg subsystems, no issue occurs. If the process moves between two blkcg subsystems, an exception occurs. To avoid exceptions, the code of the cgroup writeback feature defines the following rule: If a process in a running blkcg moves between two blkcg subsystems, the original memcg maps to the root blkcg. Typically, no throttling threshold is set for the root blkcg. When the original memcg maps to the root blkcg, the throttling does not take effect.

**Notice:**

Although the kernel code defines the rule to avoid exceptions, we recommend that you prevent processes from moving between two blkcg subsystems.
Enable cgroup writeback

The cgroup writeback feature in the cgroup v1 interface is disabled by default. To enable this feature, complete the following steps:

1. Add the cgwb_v1 field to the grubby command to enable the cgroup writeback feature.

   In this example, the kernel version is 4.19.36-12.al7.x86_64. Enter your actual kernel version during this operation. To query your kernel version, run the `uname -a` command.

   ```bash
   sudo grubby --update-kernel="/boot/vmlinuz-4.19.36-12.al7.x86_64" --args="cgwb_v1"
   ```

2. Restart the system to allow the cgroup writeback feature to take effect.

   ```bash
   sudo reboot
   ```

3. Run the following command to read the `/proc/cmdline` kernel file. You can see that the command line parameter of the kernel contains the cgwb_v1 field. This indicates that the blkio.throttle.write_bps_device and blkio.throttle.write_iops_device interfaces in blkcg can limit buffered I/O.

   ```bash
   cat /proc/cmdline | grep cgwb_v1
   ```

Verify the mapping between memcg and blkcg

Before you limit buffered I/O of a process, you can use one of the following methods to check whether the mapping between memcg and blkcg is one-to-one or many-to-one.

- Run the following command to view the mapping between memcg and blkcg.

  ```bash
  sudo cat /sys/kernel/debug/bdi/bdi_wb_link
  ```

The following sample response shows that the mapping between the memcg and blkcg conforms to the one-to-one mapping rule.

```
memory  <---  blkio
```
memcg1: 35 <--> blkcg1: 48

- Use the ftrace kernel monitoring tool.

1. Enable the ftrace tool.

   ```bash
   sudo bash -c "echo 1 > /sys/kernel/debug/tracing/events/writeback/insert_memcg_blkcg_link/enable"
   ```

2. View the output interface.

   ```bash
   sudo cat /sys/kernel/debug/tracing/trace_pipe
   ```

   The following sample response contains `memcg_ino=35 blkcg_ino=48`, which indicates that the mapping between the memcg and blkcg conforms to the one-to-one mapping rule.

   ```
   <...> -1537 [006] .... 99.511327: insert_memcg_blkcg_link: memcg_ino=35 blkcg_ino=48 old_blkcg_ino=0
   ```

**Verify whether cgroup writeback is effective**

In this example, two processes that generate I/O are simulated to verify whether the cgroup writeback feature is effective.

**Note:**

- Because the `dd` command is responding quickly and the screen rolls too fast to view, run the `iostat` command to view the result.
- Because the `dd` command displays response data in sequence, 1 MB of data is generated for sequential I/O refresh. Therefore, you must set the threshold of `blkio.throttle.write_bps_device` to a value no less than 1 MB (1048576 bytes). If you set `blkio.throttle.write_bps_device` to a value less than 1 MB, I/O hangs may occur.

1. Simulate two processes that generate I/O, and firstly set the `cgroup.procs` interface of `blkcg` based on the preceding limits.

   ```bash
   sudo mkdir /sys/fs/cgroup/blkio/blkcg1
   sudo mkdir /sys/fs/cgroup/memory/memcg1
   sudo bash -c "echo $$ > /sys/fs/cgroup/blkio/blkcg1/cgroup.procs"  # $$ is your process ID.
   ```
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2. Use the `blkio.throttle.write_bps_device` interface in blkcg to limit buffered I/O.

```
sudo bash -c "echo 254:48 10485760 > /sys/fs/cgroup/blkio/blkcg1/blkio.throttle.write_bps_device"  # Configure writeback throttling of the disk to 10 MB/s based on the device number.
```

3. Use the `dd` command that does not contain the `oflag=sync` parameter to generate buffered I/O.

```
sudo dd if=/dev/zero of=/mnt/vdd/testfile bs=4k count=10000
```

4. Use the `iostat` tool to query results. View the `wMB/s` output column. If the value is 10 MB/s, the cgroup writeback feature has taken effect.

```
iostat -xdm 1 vdd
```

5.4.3 Configure the weight-based throttling feature of blk-iocost

Aliyun Linux 2 provides the weight-based throttling feature (blk-iocost) based on the cost model since the kernel version 4.19.81-17.al7.x86_64. blk-iocost improves the weight-based disk throttling feature of the I/O subsystem (blkcg) within a kernel. Both cgroup v1 and cgroup v2 interfaces support blk-iocost in Aliyun Linux 2. This topic describes the interfaces that implement throttling.
### Interface description

<table>
<thead>
<tr>
<th>Interface</th>
<th>Description</th>
<th>Configuration item</th>
</tr>
</thead>
</table>
| cost.qos  | A read/write interface whose file is only stored in the root group of blkcg. The full name of the file is blkio.cost.qos in cgroup v1 and io.cost.qos in cgroup v2. This interface provides the blk-iocost feature and limits the rate of I/O quality of service (QoS) based on the latency weight. After blk-iocost is enabled, the kernel calculates the proportion of requests that exceed the read and write latency rlat|wlat to all requests. When the proportion is greater than rlat|wlat, the kernel considers the device saturated and reduces the number of requests sent to the disk. By default, the value of rlat|wlat is set to 0, indicating that the rlat|wlat feature is disabled. | Each line of configuration in the interface file starts with the Major and Minor numbers of the device in the MAJ:MIN format, followed by other configuration items. The following describes configuration items:  
  - **enable**: specifies whether to enable the blk-iocost controller, that is, whether to enable blk-iocost. The default value 0 indicates that blk-iocost is disabled. A value of 1 indicates that blk-iocost is enabled.  
  - **ctrl**: the control mode. Valid values: auto and user. When the control mode is set to auto, the kernel automatically detects the device type and uses built-in parameters. When the control mode is set to user, you must specify the following QoS control parameters.  
    - **rpct**: read latency percentile. Valid values: 0 to 100.  
    - **rlat**: read latency threshold. Unit: microseconds.  
    - **wpct**: write latency percentile. Valid values: [0,100].  
    - **wlat**: write latency threshold. Unit: microseconds.  
    - **min**: minimum scaling percentage. Valid values: 1 to 10000.  
    - **max**: maximum scaling percentage. Valid values: 1 to 10000. |
<table>
<thead>
<tr>
<th>Interface</th>
<th>Description</th>
<th>Configuration item</th>
</tr>
</thead>
<tbody>
<tr>
<td>cost. model</td>
<td>A read/write interface whose file is only stored in the root group of blkcg. The full name of the interface file is blkio.cost.model in cgroup v1 and io.cost.model in cgroup v2. The interface is used to set the cost model.</td>
<td>Each line of configuration in the interface file starts with the Major and Minor numbers of the device in the MAJ:MIN format, followed by other configuration items. The following describes configuration items:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• ctrl: the control mode. Specifies whether to enter model parameters by the user. Valid values: auto and user.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• model: the model parameter. Valid value: linear. You must define the following modeling parameters when the value of the model parameter is linear:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- [r</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- [r</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- [r</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Note:</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>You can use the tools/cgroup/iocost_coef_gen.py script in the kernel source code to generate the preceding parameters and then write these parameters to the interface file of cost.model to configure the cost model.</td>
</tr>
<tr>
<td>cost. weight</td>
<td>A read/write interface whose file is only stored in the sub-group of blkcg. The full name of the interface file is blkio.cost.weight in cgroup v1 and io.cost.weight in cgroup v2. This interface is used to set the weight of a sub-group. Default value: 100. Valid values: 1 to 10000. The interface can be used to set a weight for each device or change the default weight of a sub-group.</td>
<td>• If you set the weight of the interface to &lt;weight&gt;, the default weight of blkcg is changed to &lt;weight&gt;.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• If you set the port number and weight of the interface to MAJ:MIN &lt;weight&gt;, the weight of blkcg on the device MAJ:MIN is changed.</td>
</tr>
</tbody>
</table>
Precautions

The blk-iocost feature supports the system to automatically configure the IO monitoring (ctrl=auto). To use this feature, you must disable the rotational interface (echo 0 >) for Alibaba Cloud ultra disks, standard SSDs, enhanced SSDs, or local NVMe SSDs.

```bash
echo 0 > /sys/block/[$DISK_NAME]/queue/rotational  # Replace [$DISK_NAME] with the actual disk name.
```

Example 1

Use the cost.qos interface to enable the blk-iocost feature for the 254:48 device. If over 95% of requests have a latency (rlat|wlat) of over 5 milliseconds, the disk is considered saturated. The kernel will adjust the speed of the disk to send requests at a speed between 50% and 150% of the original speed. The commands for the cgroup v1 and cgroup v2 interfaces are as follows:

- The command for cgroup v1:

```bash
echo "254:48 enable=1 ctrl=user rpct=95.00 rlat=5000 wpct=95.00 wlat=5000 min=50.00 max=150.00" > /sys/fs/cgroup/blkio/blkio.cost.qos
```

- The command for cgroup v2:

```bash
echo "254:48 enable=1 ctrl=user rpct=95.00 rlat=5000 wpct=95.00 wlat=5000 min=50.00 max=150.00" > /sys/fs/cgroup/io.cost.qos
```

Example 2

Use the cost.model interface to configure a model on the device 254:48 based on the linear modeling parameters. The commands for the cgroup v1 and cgroup v2 interfaces are as follows:
• The command for cgroup v1:

```bash
echo "254:48 ctrl=user model=linear rbps=2706339840 rseqiops=89698 rrandiops=110036 wbps=1063126016 wseqiops=135560 wrandiops=130734" > /sys/fs/cgroup/blkio/blkio.cost.model
```

• The command for cgroup v2:

```bash
echo "254:48 ctrl=user model=linear rbps=2706339840 rseqiops=89698 rrandiops=110036 wbps=1063126016 wseqiops=135560 wrandiops=130734" > /sys/fs/cgroup/io.cost.model
```

**Example 3**

Use the cost.weight interface to change the default weight of blkcg1 to 50 and then set the weight of blkcg1 on the device 254:48 to 50. The commands for the cgroup v1 and cgroup v2 interfaces are as follows:

• The command for cgroup v1:

```bash
echo "50" > /sys/fs/cgroup/blkio/blkcg1/blkio.cost.weight    # Change the default weight to 50.
echo "254:48 50" > /sys/fs/cgroup/blkio/blkcg1/blkio.cost.weight    # Set the weight of blkcg1 on the device to 50.
```

• The command for cgroup v2:

```bash
echo "50" > /sys/fs/cgroup/cg1/io.cost.weight    # Change the default weight to 50.
echo "254:48 50" > /sys/fs/cgroup/cg1/io.cost.weight    # Set the weight of blkcg1 on the device to 50.
```

**Common monitoring tools**

• iocost monitor script

The tools/cgroup/iocost_monitor.py script in the kernel source code uses the drgn debugger to directly obtain kernel parameters and then provides the I/O performance monitoring data. For more information about drgn, see drgn. The script is used as follows:

Run the following command to monitor the I/O performance data of the vdd disk.

```
./iocost_monitor.py vdd
```

A sample response is as follows:

```
vdd RUN    per=500.0ms  cur_per=3930.839:v14620.321 busy= +1 vrate=6136.22%
params=hdd
  active    weight    hweight%    inflt%    dbt    delay    usages%
blkcg1                *    50/   50    9.09/   9.09    0.00    0    0*000009:009:009
```

Issue: 20200519
The Aliyun Linux 2 kernel provides the blk-iocost statistics interface under the cgroup v1 interface. The interface file of the statistics interface records the QoS data of each controlled device. Run the following command to view the interface document:

```
cat /sys/fs/cgroup/blkio/blkcg1/blkio.cost.stat
```

A sample response is as follows:

```
254:48 is_active=1 active=50 inuse=50 hweight_active=5957 hweight_inuse=5957 vrate =159571
```

**ftrace monitoring tool**

The Aliyun Linux 2 kernel provides the ftrace tool related to blk-iocost for kernel-side analytics. The ftrace monitoring tool is used as follows:

1. Set the enable property to 1 to enable the ftrace tool.

```
echo 1 > /sys/kernel/debug/tracing/events/iocost/enable
```

2. View the output information.

```
cat /sys/kernel/debug/tracing/trace_pipe
```

A sample response is as follows:

```
dd-1593 [008] d... 688.565349: iocost_iocg_activate: [vdd:/blkcg1] now=689065289:57986587662878 vrate=137438 period=22->22 vtime=0->5798636515 0756 weight=50/50 hweight=65536/65536
dd-1593 [008] d.s. 688.575374: iocost_ioc_vrate_adj: [vdd] vrate=137438->137438 busy=0 missed_ppm=0 rq_wait_pct=0 lagging=1 shortages=0 surpluses=1
<idle>-0 [008] d.s. 688.608369: iocost_ioc_vrate_adj: [vdd] vrate=137438->137438 busy=0 missed_ppm=0 rq_wait_pct=0 lagging=1 shortages=0 surpluses=1
dd-1594 [006] d... 688.620002: iocost_iocg_activate: [vdd:/blkcg2] now=689119946:57994099611644 vrate=137438 period=22->26 vtime=0->5799341242 1644 weight=250/250 hweight=65536/65536
<idle>-0 [008] d.s. 688.631367: iocost_ioc_vrate_adj: [vdd] vrate=137438->137438 busy=0 missed_ppm=0 rq_wait_pct=0 lagging=1 shortages=0 surpluses=1
<idle>-0 [008] d.s. 688.642368: iocost_ioc_vrate_adj: [vdd] vrate=137438->137438 busy=0 missed_ppm=0 rq_wait_pct=0 lagging=1 shortages=0 surpluses=1
<idle>-0 [008] d.s. 688.653366: iocost_ioc_vrate_adj: [vdd] vrate=137438->137438 busy=0 missed_ppm=0 rq_wait_pct=0 lagging=1 shortages=0 surpluses=1
<idle>-0 [008] d.s. 688.664366: iocost_ioc_vrate_adj: [vdd] vrate=137438->137438 busy=0 missed_ppm=0 rq_wait_pct=0 lagging=1 shortages=0 surpluses=1
```

### 5.4.4 Enable the PSI feature for the cgroup v1 interface

In the Linux kernel, only the cgroup v2 interface supports the Pressure Stall Information (PSI) feature. Aliyun Linux 2 supports the PSI feature for the cgroup v1 interface in the kernel version 4.19.81-17.al7 to allow you to monitor the CPU, memory, and I/O performance. This
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topic describes how to enable the PSI feature in the cgroup v1 interface and query relevant information.

Context

PSI is a kernel feature that can be used to monitor the CPU, memory, and I/O performance. For more information about the PSI feature, see the kernel document Documentation/accounting/psi.txt. The kernel document is contained in the Debuginfo package and source code package of Aliyun Linux 2. For information about how to download the Debuginfo package and source code package, see Use Aliyun Linux 2.

Enable the PSI feature for the cgroup v1 interface

By default, the PSI feature of the cgroup v1 interface is disabled. You can complete the following steps to enable the PSI feature:

1. Run the grubby command to change the startup parameter.

   The default value of the args parameter is "psi=1", which indicates that the PSI feature has been enabled for cgroup v2. Change the value of the parameter to "psi=1 psi_v1=1 ", which indicates that the PSI feature is enabled for cgroup v1 in Aliyun Linux 2. In this example, the kernel version is 4.19.81-17.al7.x86_64. You must use your actual kernel version during the operation. To query the kernel version, run the uname -a command.

   ```
   sudo grubby --update-kernel="/boot/vmlinuz-4.19.81-17.al7.x86_64" --args="psi=1 psi_v1=1"
   ```

2. Restart the system to apply the change.

   ```
   sudo reboot
   ```

Verify that the PSI feature has been enabled for the cgroup v1 interface

After the system restarts, you can run the following command to verify that the PSI feature has been enabled for the cgroup v1 interface in /proc/cmdline of the kernel.

```
   cat /proc/cmdline | grep "psi=1 psi_v1=1"
```

Query the monitoring data of the CPU, memory, and I/O performance

When you enable the PSI feature for the cgroup v1 interface, the PSI monitoring data of the CPU, memory, and I/O performance are all transferred to the cpuacct controller. You can query detailed monitoring data by running the following commands:

```
   cat /sys/fs/cgroup/cpuacct/cpu.pressure
   cat /sys/fs/cgroup/cpuacct/memory.pressure
```
5.4.5 Change the timeout period of TCP TIME-WAIT

In the Linux kernel, the TIME-WAIT state of TCP/IP lasts for 60 seconds and the period cannot be changed. However, in some scenarios such as when the TCP load is heavy, being able to shorten this period will greatly improve network performance. Therefore, Aliyun Linux 2 has added a kernel interface to the kernel version 4.19.43-13. al7 to change the timeout period of TCP TIME-WAIT. This topic describes how to use the kernel interface.

Context

By default, the TCP/IP stack keeps the socket open for 60 seconds after an application sends a request to close the socket. This state is the TCP/IP TIME-WAIT state and ensures that data transmission between the server and the client is complete. However, if too many connections are in the TIME-WAIT state, network performance can be compromised. Therefore, Aliyun Linux 2 provides an interface that can change the timeout period of TIME-WAIT and improve network performance in scenarios such as high-concurrency business. The value range of the interface is 1 to 600 seconds. The default value of the timeout period of TIME-WAIT is 60 seconds.

Precautions

Setting a timeout period less than 60 seconds contradicts the quiet time concept of TCP/IP and may result in the system receiving old data as new data or rejecting copied new data as old data. Make adjustments based on the advice of network technicians of Alibaba Cloud. For information about the quiet time of TCP/IP, see IETF RFC 793.

Configuration methods

You can use one of the following methods to change the timeout period of TIME-WAIT. Specify the \[$TIME\_VALUE\]$ parameter to set a new timeout period for TIME-WAIT.
• Run the `sysctl` command to change the timeout period of TIME-WAIT:

```bash
sysctl -w "net.ipv4.tcp_tw_timeout={$TIME_VALUE}"
```

• Run the `echo` command as the root user and change the timeout period in the `/proc/sys/net/ipv4/tcp_tw_timeout` interface.

```bash
echo {$TIME_VALUE} > /proc/sys/net/ipv4/tcp_tw_timeout
```

### 5.4.6 Enhance the monitoring of block I/O throttling

To better monitor Linux block I/O throttling, Aliyun Linux 2 provides an interface in the kernel version 4.19.81-17.al7 to collect more statistics on block I/O throttling. This topic describes the new interface and how to use it.

**Context**

Linux block I/O throttling (bit/s or IOPS) is required in multiple scenarios, especially those where cgroup writeback is enabled. Aliyun Linux 2 provides an interface that enhances the monitoring of block I/O throttling to facilitate your operations.

**Interface description**

<table>
<thead>
<tr>
<th>Interface</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>blkio.throttle.io_service_time</td>
<td>The duration of time from when I/O operations are issued from the block I/O throttling layer to when the operations are completed. Unit: ns.</td>
</tr>
<tr>
<td>blkio.throttle.io_wait_time</td>
<td>The duration of throttling at the block I/O throttling layer. Unit: ns.</td>
</tr>
<tr>
<td>blkio.throttle.io_completed</td>
<td>The number of completed I/O operations. The parameter is used to calculate the average latency of the block I/O throttling layer. Unit: counts.</td>
</tr>
<tr>
<td>blkio.throttle.total_io_queued</td>
<td>The number of I/O operations that were throttled in the history. The number of I/O operations that were throttled in the current cycle can be calculated based on periodic monitoring and be used to analyze whether an I/O latency is related to throttling. Unit: counts.</td>
</tr>
<tr>
<td>blkio.throttle.total_bytes_queued</td>
<td>The total bytes of I/O that were throttled in the history. Unit: bytes.</td>
</tr>
</tbody>
</table>
The path of the preceding parameters is `/sys/fs/cgroup/blkio/<cgroup>/`, where `<cgroup>` is the control group.

**Example**

You can obtain the average I/O latency of a disk by using the interface that enhances the monitoring of block I/O throttling. In this example, the average I/O write latency of the vdd disk between two points in time five seconds away from each other is monitored. Then the average I/O latency of the vdd disk is calculated. The following table describes relevant parameters.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>write_wait_time&lt;N&gt;</td>
<td>Obtains the duration of throttling at the block I/O throttling layer.</td>
</tr>
<tr>
<td>write_service_time&lt;N&gt;</td>
<td>Obtains the duration of time from when I/O operations are issued from the block I/O throttling layer to when the operations are completed.</td>
</tr>
<tr>
<td>write_completed&lt;N&gt;</td>
<td>Obtains the number of completed I/O operations.</td>
</tr>
</tbody>
</table>

1. Obtain the monitoring data at the T1 time.

```bash
write_wait_time1 = `cat /sys/fs/cgroup/blkio/blkcg1/blkio.throttle.io_wait_time | grep -w "254:48 Write" | awk '{print $3}'`
write_service_time1 = `cat /sys/fs/cgroup/blkio/blkcg1/blkio.throttle.io_service_time | grep -w "254:48 Write" | awk '{print $3}'`
write_completed1 = `cat /sys/fs/cgroup/blkio/blkcg1/blkio.throttle.io_completed | grep -w "254:48 Write" | awk '{print $3}'`
```

2. Wait for five seconds and obtain the monitoring data at the T2 (T1 + 5s) time.

```bash
write_wait_time2 = `cat /sys/fs/cgroup/blkio/blkcg1/blkio.throttle.io_wait_time | grep -w "254:48 Write" | awk '{print $3}'`
write_service_time2 = `cat /sys/fs/cgroup/blkio/blkcg1/blkio.throttle.io_service_time | grep -w "254:48 Write" | awk '{print $3}'`
```
3. Calculate the average I/O latency during the five seconds.

Average I/O latency = (Total I/O duration at the T2 time - Total I/O duration at the T1 time)/(Number of completed I/O operations at the T2 time - Number of completed I/O operations at the T1 time).

```
avg_delay = `echo "((write_wait_time2 + write_service_time2) - (write_wait_time1 + write_service_time1)) / (write_completed2 - write_completed1)" | bc`
```

5.4.7 Use the JBD2 optimization interface

As the kernel thread of the ext4 file system, JBD2 often experiences the shadow (BH_Shadow) state during its use that can affect system performance. To solve this problem, Aliyun Linux 2 optimizes JBD2. This topic describes the interfaces that optimize JBD2.

**Context**

ext4 is one of the most common journaling file systems. The kernel thread of ext4 for updating journals is JBD2. JBD2 is a global resource for the ext4 file system. When the JBD2 kernel thread attempts to obtain write access permissions from the cache, the cache page may be in the shadow state. Because of this, JBD2 may take an extended period of time waiting for the cache page to write back to the disk. To solve this problem, Aliyun Linux 2 adds the kernel interface `force_copy` to JBD2. The interface allows you to enable the optimization function. The system then copies cache pages, reducing the time that JBD2 has to wait for cache pages while in the shadow state to write back to the disk. In addition, to analyze the QoS issues related to the file system, Aliyun Linux 2 added the information statistics interface `stats` to JBD2.

**Interface description**

<table>
<thead>
<tr>
<th>Interface</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>force_copy</td>
<td>The interface file is stored in <code>/proc/fs/jbd2/&lt;device&gt;-8/force_copy</code>, where the variable device indicates the name of the block storage device. Valid values: 1 and 0. After you enable the <code>force_copy</code> interface, the system will force copy data, which reduces the waiting time of JBD2. Notice: Running the interface will consume memory.</td>
</tr>
</tbody>
</table>
Interface | Description
---|---
stats | The interface file is stored in /proc/fs/jbd2/<device>-8/stats. The interface helps to determine whether quality of service (QoS) issues in the file system are caused by JBD2.

Examples

The examples of force_copy and stats interfaces are as follows:

- By default, the force_copy interface is disabled. You can set the value of the interface to 1 to call the interface or set the value to 0 to disable the interface.

```bash
echo 1 > /proc/fs/jbd2/nvme0n1-8/force_copy    # Call the interface.
```

- Run the following command to query the stats interface.

```bash
cat /proc/fs/jbd2/nvme0n1-8/stats
```

A sample response is as follows:

```
337 336 65536 0 14837 1701504 16 0 20058 5 33082732 605 942 1000 1000
```

The following table describes the fields in the preceding sample response:

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>The first field</td>
<td>The ID of the event.</td>
</tr>
<tr>
<td>The second field</td>
<td>The number of events requested.</td>
</tr>
<tr>
<td>The third field</td>
<td>The maximum number of cached events.</td>
</tr>
<tr>
<td>The fourth field</td>
<td>The event wait time.</td>
</tr>
<tr>
<td>The fifth field</td>
<td>The latency of the event request.</td>
</tr>
<tr>
<td>The sixth field</td>
<td>The amount of time that the event ran.</td>
</tr>
<tr>
<td>The seventh field</td>
<td>The amount of time that the event was locked.</td>
</tr>
<tr>
<td>The eighth field</td>
<td>The amount of time that it took to refresh the event.</td>
</tr>
<tr>
<td>The ninth field</td>
<td>The amount of time that it took to log on to the event.</td>
</tr>
<tr>
<td>The tenth field</td>
<td>The average submission time.</td>
</tr>
<tr>
<td>The eleventh field</td>
<td>The number of handles contained in the event.</td>
</tr>
</tbody>
</table>
### 5.4.8 Create a hard link across project quotas

By default, the ext4 file system contains constraints. You are not allowed to create hard links across project quotas. However, in practice certain scenarios will require the creation of hard links. Aliyun Linux 2 provides a custom interface that can bypass the constraints of the ext4 file system to create hard links across project quotas. This topic describes the interface for the function and the sample interface.

**Context**

Linux distributions support the following disk quota modes: user quota, group quota, and project quota. Compared with user quota and group quota, project quota provides a more fine-grained disk quota. Project quota identifies directories and files within the file system by project ID. This topic describes how to create a hard link across project ID directories in the ext4 file system.

**Interface description**

The default value of the `/proc/sys/fs/hardlink_cross_projid` interface is 0. In this case, hard links cannot be created across project quotas. If the `/proc/sys/fs/hardlink_cross_projid` interface is set to 1, you can bypass the constraints of the ext4 file system to create hard links across project quotas.

For more information about the interface, see `Documentation/sysctl/fs.txt`. You can obtain the kernel document from the Debuginfo package and the source code package provided by Aliyun Linux 2. For more information, see Use Aliyun Linux 2.
Example

You can run the following command to query the value of the `/proc/sys/fs/hardlink_cross_projid` interface:

```bash
cat /proc/sys/fs/hardlink_cross_projid
```

A value of 0 is returned, indicating that hard links cannot be created across project quotas.

You can change the value from 0 to 1 to create hard link across project quotas.

```bash
echo 1 > /proc/sys/fs/hardlink_cross_projid
```

5.4.9 Track I/O latency

Aliyun Linux 2 optimizes the `/proc/diskstats` interface, which is the raw data source of the I/O latency analysis tool `iostat`. Aliyun Linux 2 can calculate the duration of time in read, write and special I/O (discard) on the device. In addition, Aliyun Linux 2 provides the `bcc` tool to track I/O latency. This topic describes the optimized `/proc/diskstats` interface and the `bcc` tool.

Interface description

The `/proc/diskstats` interface in Aliyun Linux 2 allows you to query the I/O information on a disk and the amount of time spent on read, write, and discard operations on a device.

Example: query the `/proc/diskstats` interface as a root user.

```bash
cat /proc/diskstats
```

A sample response is as follows:

```
254       0 vda 6328 3156 565378 2223 1610 424 25160 4366 0 1358 5332 0 0 0 0 2205 3347
```

In the response, the last three domains are new domains added in Aliyun Linux 2. The following table describes the three domains:

<table>
<thead>
<tr>
<th>Domain</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>The sixteenth domain</td>
<td>The read duration on the device. Unit: milliseconds.</td>
</tr>
<tr>
<td>The seventeenth domain</td>
<td>The write duration on the device. Unit: milliseconds.</td>
</tr>
<tr>
<td>The eighteenth domain</td>
<td>The discard duration on the device. Unit: milliseconds.</td>
</tr>
</tbody>
</table>
**Note:**

For information about other domains, see the kernel document `Documentation/iostats.txt`. You can obtain the kernel document from the Debuginfo package and the source code package of Aliyun Linux 2. For more information, see [Use Aliyun Linux 2](#).

### bcc

Aliyun Linux 2 provides the bcc tool that helps you track I/O latency. You must download the tool before you use it. The download command is as follows:

```
yum install -y bcc-tools
```

You can run one of the following commands to query the description of the bcc tool.

- Run the following command to query the description of the bcc tool.

  ```
  /usr/share/bcc/tools/alibiolatency -h
  ```

The description is as follows:

```
usage: alibiolatency [-h] [-d DEVICE] [-i [DIS_INTERVAL]]
                    [-t [AVG_THRESHOLD_TIME]] [-T [THRESHOLD_TIME]] [-r]

optional arguments:
  -h, --help             show this help message and exit
  -d DEVICE, --device DEVICE
                          inspect specified device
  -i [DIS_INTERVAL], --dis_interval [DIS_INTERVAL]
                          specify display interval
  -t [AVG_THRESHOLD_TIME], --avg_threshold_time [AVG_THRESHOLD_TIME]
                          display only when average request process time is
greater than this value
  -T [THRESHOLD_TIME], --threshold_time [THRESHOLD_TIME]
                          dump request life cycle when single request process
time is greater than this value
  -r, --dump_raw         dump every io request life cycle
```

Examples:

- `./alibiolatency` # summarize block I/O latency (default display interval is 2s)
- `./alibiolatency -d sda3` # inspect specified device /dev/sda3
- `./alibiolatency -i 2` # specify display interval, 2s
- `./alibiolatency -t 10` # display only when average request process time is greater than 10ms
- `./alibiolatency -T 20` # dump request life cycle when single request process time is greater than 20ms
Run the `man` command to query the description of the `bcc` tool.

```
./alibiolatency -r          # dump every io request life cycle
```

### 5.4.10 Detect I/O hangs of file systems and block layers

An I/O hang occurs when the system becomes unstable or even goes down due to time-consuming I/O requests. To accurately detect I/O hangs, Aliyun Linux 2 extends the core data structure and provides the function to quickly locate and detect I/O hangs with low system overhead. This topic describes the interfaces for this function and the usage examples of these interfaces.

#### Interface description

<table>
<thead>
<tr>
<th>Interface</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>/sys/block/&lt;device&gt;/queue/hang_thres hold</code></td>
<td>The interface can detect the threshold for I/O hangs. Unit of the threshold: milliseconds. Default value: 5000. The interface allows you to define the threshold for detecting I/O hangs.</td>
</tr>
<tr>
<td><code>/sys/block/&lt;device&gt;/hang</code></td>
<td>The interface can return the number of I/O operations that exceeds the threshold for I/O hangs on the device.</td>
</tr>
<tr>
<td><code>/sys/kernel/debug/block/&lt;device&gt;/rq_hang</code></td>
<td>The interface can query details about I/O hangs.</td>
</tr>
<tr>
<td><code>/proc/&lt;pid&gt;/wait_res</code></td>
<td>The interface can query the information about the resources that a process is waiting for.</td>
</tr>
<tr>
<td><code>/proc/&lt;pid&gt;/task/&lt;tid&gt;/wait_res</code></td>
<td>The interface can query the information about the resources that a thread is waiting for.</td>
</tr>
</tbody>
</table>

#### Variables in the interface.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>&lt;device&gt;</code></td>
<td>The name of the Block Storage device.</td>
</tr>
<tr>
<td><code>&lt;pid&gt;</code></td>
<td>The ID of the process.</td>
</tr>
<tr>
<td><code>&lt;tid&gt;</code></td>
<td>The ID of the thread.</td>
</tr>
</tbody>
</table>
Example 1

You can call the `/sys/block/<device>/queue/hang_threshold` interface to change the threshold for detecting I/O hangs. In this example, the threshold is changed from 5,000 ms (the default value) to 10,000 ms.

1. Change the detection threshold for the vdb disk to 10,000 ms.

   ```
   echo 10000 > /sys/block/vdb/queue/hang_threshold
   ```

2. View the result of the detection threshold change.

   ```
   cat /sys/block/vdb/queue/hang_threshold
   ```

   A sample response is as follows:

   ```
   10000
   ```

Example 2

You can call the `/sys/block/<device>/hang` interface to query the number of I/O operations that have I/O hangs on a disk. In this example, the queried disk is vdb.

The query command is as follows:

```
cat /sys/block/vdb/hang
```

A sample response is as follows:

```
0 1  # The value on the left indicates the number of read operations that have I/O hangs. The value on the right indicates the number of write operations that have I/O hangs.
```

Example 3

You can call the `/sys/kernel/debug/block/<device>/rq_hang` interface to query the details of I/O hangs. In this example, the vdb disk is used.

The query command is as follows:

```
cat /sys/kernel/debug/block/vdb/rq_hang
```

A sample response is as follows:

```
ffff9e50162fc600 {.op=WRITE, .cmd_flags=SYNC, .rq_flags=STARTED|ELVPRIV|IO_STAT|STATS, .state=in_flight, .tag=118, .internal_tag=67, .start_time_ns=1260981417094, .io_start_time_ns=1268458297417, .current_time=1268458297417, .bio = ffff9e4907c31c00, .bio_pages = { ffffc8596068740 }, .bio = ffff9e4907c31500, .bio_pages = { ffffc85960
```
The preceding response shows the details of an I/O operation. The start time of the I/O request, \texttt{io\_start\_time\_ns} is assigned a value. This indicates that the I/O request was not processed in time, leading to prolonged I/O consumption.

**Example 4**

You can call the \texttt{/proc/<pid>/wait\_res} interface to query information about resources that a process is waiting for. In this example, the 577 process is used.

The query command is as follows:

\begin{verbatim}
cat /proc/577/wait_res
\end{verbatim}

A sample response is as follows:

\begin{verbatim}
1 0000000000000000 4310058496 4310061448 # 1 is the value of Field 1, 0000000000000000 the value of Field 2, 4310058496 the value of Field 3, and 4310061448 the value of Field 4.
\end{verbatim}

**Response parameters.**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field 1</td>
<td>The type of the resources for which the process is waiting. A value of 1 indicates pages in the file system. A value of 2 indicates the block I/O layer.</td>
</tr>
<tr>
<td>Field 2</td>
<td>The address of the resource (page or block I/O layer) for which the process is waiting.</td>
</tr>
<tr>
<td>Field 3</td>
<td>The time at which the process began waiting for resources.</td>
</tr>
<tr>
<td>Field 4</td>
<td>The current time when the file is read. The difference between Field 4 and Field 3 is the time consumed while waiting for the resource.</td>
</tr>
</tbody>
</table>

**5.5 Knowledge base about Aliyun Linux 2**

This topic provides the troubleshooting and solutions about Aliyun Linux 2 issues.

- How do I configure the Kdump file in an Aliyun Linux 2 system?
- There is a delay in system time synchronization after the ECS instance Aliyun Linux 2. 1903 the image is started or restarted.
• You cannot run the `yum` command on Aliyun Linux 2 ECS instances of the classic network system.

• A segfault error occurs when the ECS instances of the Aliyun Linux 2 system are running Docker images of earlier versions.

• The route information cannot be queried or configured on the ECS instance of the Aliyun Linux 2 system.

• The application on the ECS instance occasionally suffers packet loss and the kernel Log (dmesg) contains the error message "kernel: nf_conntrack: table full, dropping packet".

• Aliyun Linux 2 ECS instances fail to create a large number of processes after a large number of processes are created.

• Influence of TCP congestion control algorithm BBR on network performance in Aliyun Linux 2 system

• The Buffer I/O write performance of the Ext4 file system in the ECS instance of the Aliyun Linux 2 is not as expected.

• The Aliyun Linux 2 field value returned when the ECS instance of the Send-Q system runs the `ss` command is 0

5.6 FAQ about Aliyun Linux 2

This topic describes the frequently asked questions (FAQ) about Aliyun Linux 2 images and their solutions.

• What are the differences between Aliyun Linux and Aliyun Linux 2?

• How do I use Aliyun Linux 2 in Alibaba Cloud public cloud?

• Will I be charged for using Aliyun Linux 2 in Alibaba Cloud ECS?

• Which ECS instance types does Aliyun Linux 2 support?

• Does Aliyun Linux 2 support 32-bit applications or libraries?

• Does Aliyun Linux 2 provide a graphical user interface (GUI) desktop?

• Can I view the source code of Aliyun Linux 2 components?

• Is Aliyun Linux 2 backward-compatible with the current Aliyun Linux version?

• Can I use Aliyun Linux 2 on an on-premises environment?

• Which third-party applications can run on Aliyun Linux 2?

• What are the advantages of Aliyun Linux 2 compared with other Linux operating systems?

• How does Aliyun Linux 2 protect data security?
• Does Aliyun Linux 2 support data encryption?
• How do I grant permissions to manage Aliyun Linux 2?

What are the differences between Aliyun Linux and Aliyun Linux 2?

Aliyun Linux 2 differs in the following aspects:

• Aliyun Linux 2 is optimized for containers to better support cloud-native applications.
• Aliyun Linux 2 is equipped with an updated Linux kernel and updated user-mode packages.

How do I use Aliyun Linux 2 in Alibaba Cloud public cloud?

Alibaba Cloud provides public images for Aliyun Linux 2. You can choose Public Image > Aliyun Linux, and then select a version of Aliyun Linux 2 image when you create an ECS instance.

Will I be charged for using Aliyun Linux 2 in Alibaba Cloud ECS?

No, Aliyun Linux 2 images are free of charge. You will only be charged for the ECS instances to which the images are applied.

Which ECS instance types does Aliyun Linux 2 support?

Aliyun Linux 2 supports most ECS instance types, including ECS Bare Metal Instance types.

Note:
Aliyun Linux 2 does not support instances on the Xen virtual machine monitor.

Does Aliyun Linux 2 support 32-bit applications or libraries?

No. Aliyun Linux 2 does not support 32-bit applications or libraries.

Does Aliyun Linux 2 provide a graphical user interface (GUI) desktop?

No. Aliyun Linux 2 does not provide a GUI desktop.

Can I view the source code of Aliyun Linux 2 components?

Yes. Aliyun Linux 2 is open source. You can use the yumdownloader tool or visit the official Alibaba Cloud download pages to download the source code package. You can also download the source code tree of the Aliyun Linux kernel from GitHub. For more information, visit Github.

Is Aliyun Linux 2 backward-compatible with the current Aliyun Linux version?

Yes. Aliyun Linux 2 is compatible with Aliyun Linux 17.01.
Note:
You may need to re-compile a compiled kernel module on Aliyun Linux 2 before it can be used.

Can I use Aliyun Linux 2 on an on-premises environment?

Yes, you can use Aliyun Linux 2 on an on-premises environment. Aliyun Linux 2 provides local images in the qcow2 format. These images are supported only for Kernel-based virtual machines (KVMs). For more information, see Use Aliyun Linux 2 images in an on-premises environment.

Which third-party applications can run on Aliyun Linux 2?

Aliyun Linux 2 is binary compatible with CentOS 7.6.1810. Applications that can run on CentOS can also run on Aliyun Linux 2.

What are the advantages of Aliyun Linux 2 compared with other Linux operating systems?

Aliyun Linux 2 is binary compatible with CentOS 7.6.1810 and provides differentiated operating system features.

Compared with CentOS and RHEL, Aliyun Linux 2 has the following advantages:

- Updates are released at a faster pace. Updated Linux kernels, user-mode software, and toolkits are provided.
- Aliyun Linux 2 works out of the box and requires minimal configuration.
- Aliyun Linux 2 is optimized to work with the optimized hypervisor and maximizes performance for users.
- Unlike RHEL, Aliyun Linux 2 does not have any runtime charges. Different from CentOS, Alibaba Cloud provides commercial support for Aliyun Linux 2.

How does Aliyun Linux 2 protect data security?

Aliyun Linux 2 is binary compatible with CentOS 7.6.1810 and RHEL 7.6 and complies with the RHEL safety specifications. Aliyun Linux 2 uses the following tools to protect your data:

- Uses industry-standard vulnerability scan and security test tools to perform periodical security scanning.
- Periodically assesses the CVE patch updates of CentOS 7 to fix operating system security vulnerabilities.
- Supports existing solutions of Alibaba Cloud for operating system security hardening.
• Uses the same mechanism as CentOS 7 to release user security alerts and patch updates.

Does Aliyun Linux 2 support data encryption?

Yes. Aliyun Linux 2 uses the CentOS 7 data encryption toolkit implemented by Key Management Service (KMS) to encrypt data.

How do I grant permissions to manage Aliyun Linux 2?

You can grant management permissions in Aliyun Linux 2 in the same manner as you would in CentOS 7. This means the same commands can be used to grant management permissions in both Alibaba Cloud CentOS 7 images and Aliyun Linux 2.
6 Custom image

6.1 Create custom image

6.1.1 Create a custom image by using a snapshot

This topic describes how to create a custom image by using a snapshot. A custom image typically contains the operating system and data environment of an ECS instance that you can use to create multiple, identical ECS instances. You can also change the configurations of ECS instances created by a custom image as needed.

You can also use an instance to create an image. For more information, see Create a custom image by using an instance.

To enhance the security of custom images created from snapshots, see Security suggestions for Alibaba Cloud custom image.

Limits

Before you proceed, note the following:

- Custom images must be created from system disk snapshots (or system disk snapshots and data disk snapshots). Data disk snapshots alone cannot be used to create custom images.
- Both encrypted and unencrypted snapshots can be used to create custom images.
- Custom images cannot be used across regions. However, you can copy custom images to the destination region for later use. For more information, see Copy custom images.
- Custom images are created independently from the billing methods of the instances from which they were created. For example, custom images created from Subscription instances can be used for creating Pay-As-You-Go instances. The converse method also applies.
• You can upgrade the instance created from a custom image, including upgrading the CPU, memory, bandwidth, and disks.

• You can change the operating system of an instance created from a custom image, and the custom image remains usable. For more information, see Change the system disk (custom image).

• If the ECS instance used for creating a custom image expires or is released, the custom image and the ECS instances created from the custom image are not affected. However, automatic snapshots are cleared when an ECS instance is released.

Procedure

1. Log on to the ECS console.

2. In the left-side navigation pane, choose Instances & Images > Images.

3. In the top navigation bar, select a region.

4. Find the target instance and click its instance ID, or click Manage in the Actions column.

5. In the left-side navigation pane, click Instance Snapshots. Find a snapshot whose Disk Type is system disk and then click Create Custom Image in the Actions column.

6. In the Create Custom Image dialog box, complete the following:
   - Confirm the snapshot ID.
   - Enter a name and description of the custom image.
   - (Optional) Check Add Data Disk Snapshot, select multiple snapshots of data disks for the image, and click Add.

Note:

- If no data disk snapshot is selected (namely, no data disk snapshot ID is selected), an empty data disk is created with a default capacity of 5 GiB.
- If a data disk snapshot is selected, the disk size is the same as the snapshot size.
- We recommend that you remove sensitive data from the data disk before creating a custom image to guarantee data security.

- (Optional) Attach tags to custom images for classification. For more information, see Tags.

Create Custom Image

System Snapshot ID: [Enter]

* Custom Image Name: [test_custom-image]
The name can be 2 to 128 characters in length and can contain periods (.), underscores (_), and hyphens (-). It cannot start with a special character or number.

* Custom Image Description: Create a custom image by using a snapshot

It can be 2 to 256 characters in length and cannot start with http:// or https://.

Resource Group: [Select]

Add Data Disk Snapshot

Snapshot Details:

<table>
<thead>
<tr>
<th>Snapshot ID</th>
<th>Device Name</th>
<th>Disk Size</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>[System Disk]</td>
<td>/dev/xvda</td>
<td>40 GB</td>
<td>Delete</td>
</tr>
</tbody>
</table>

1. Leaving the snapshot ID blank will create an empty disk. The default disk size is 5 GB. The maximum disk size is 1,000 GB.
2. If a snapshot ID has been selected, the default disk size equals the snapshot size.
3. If no device name has been specified, the system randomly assigns a name.

Tag: [Select a key or enter a new one] [Select a value or enter a new one]

You can also choose Storage & Snapshots > Snapshots, and select a snapshot whose Disk Type is System Disk to create a custom image.
What to do next

After you create a custom image, you can:

- Use it to create instances. For more information, see Create an instance by using a custom image.
- Use it to replace the system disk of an instance. For more information, see Replace a system disk (non-public image).

6.1.2 Create a custom image by using an instance

This topic describes how to create a custom image by using an instance. After creating an instance, you can customize the instance according to your service needs and create a custom image for it. New instances created from the custom image inherit all the customizations you have made for the original instance.

During custom image creation, snapshots are automatically created for all disks of the instance, including the system disk and data disks. All the created snapshots compose a new custom image. The following figure details this process.

The instance and the custom image that is created from this instance must belong to the same region. For example, if the instance is located in China East 1, the custom image must
also be located in China East 1. If you need to use the image in another region, you must first copy the image to that region. For more information, see Copy custom images.

If your instance expired or is released, you can also use the system disk snapshots of the instance to create a custom image, and then use this image to create a new instance to retrieve data in the original instance. For more information, see Create a custom image by using a snapshot.

Considerations

- Make sure you have deleted all confidential data in the ECS instance before creating a custom image to guarantee data security.
- You can create a custom image without stopping the instance. During creation, do not change the status of the instance. Specifically, do not stop, start, or restart the instance.
- The time required for creating a custom image depends on the disk size of the instance.
- If your custom image contains snapshots of data disks, new data disks are created based on the snapshots. If you create a data disk along with an ECS instance, data on the new data disk duplicates the data disk snapshot according to the mount device.

Precautions for Linux instances

Before creating a custom image using a Linux instance, follow these instructions:

- Do not load data disk information to the /etc/fstab directory. Otherwise, instances created from the custom image cannot be started.
- We strongly recommended that you umount all the file systems mounted on the Linux instance before creating a custom image. Otherwise, instances created from the custom image may not be started or used.
- Do not upgrade the kernel or operating system unless other required.
- Do not adjust system disk partitions. Currently, the system disk supports only one root partition.
- Ensure that the system disk has available space.
- Do not modify key system files such as /sbin, /bin, and /lib.
- Do not modify the default login username root.

Procedure

1. Find the target instance.
2. In the Actions column, choose More > Disk and Image > Create Custom Image.
3. In the displayed dialog box, enter a name and description for the image.
4. Click **Create**.

The image is available after all snapshots of all disks have been created.

**What to do next**

Create an instance by using the custom image.

### 6.1.3 Use Packer to create a custom image

This topic provides information about how to install and use Packer to create a custom image.

**Prerequisites**

You must have an AccessKey.

**Note:**

Do not use the AccessKey of your Alibaba Cloud account. Instead, use the RAM account to create the necessary AccessKey to maintain account security.

**Step 1. Install Packer**

Go to the official Packer download page where you can choose required version of Packer for your operating system.

To install Packer on a Linux server
1. Connect and log on to the Linux server. If the server you want to connect to is an ECS Linux instance, see connect to a Linux instance by using a password.

2. Run `cd /usr/local/bin` to go to the `/usr/local/bin` directory.

Note:
The `/usr/local/bin` directory is an environment variable directory. You can install Packer to this directory or another directory that has been added to the environment variable.

3. Run `wget https://releases.hashicorp.com/packer/1.1.1/packer_1.1.1_linux_amd64.zip` to download the Packer installer. You can visit the official download page of Packer to download installers for other versions of Packer.

4. Run `unzip packer_1.1.1_linux_amd64.zip` to unzip the package.

5. Run `packer -v` to verify Packer’s installation status. If the Packer version number is returned, you have successfully installed Packer. If error `command not found` is returned, Packer has not been correctly installed.

To install Packer on a Windows server

The following examples uses Windows Server 2012 64-bit:

1. Connect and log on to the Windows server. If the server you want to connect to is an ECS Windows instance, see connect to a Windows instance.

2. Open the official download page of Packer and select an appropriate Packer installer for 64-bit Windows.

3. Unzip the package to a specified directory and install Packer.

4. Define the directory for Packer in the PATH environment variable.
   a. Open the Control Panel.
   b. Select All Control Panel Items > System > Advanced System Settings.
   c. Click Environment Variable.
   d. Find Path in the system variable list.
   e. Add the Packer installation directory to the Variable Value, such as C:\Packer as seen in this example. Separate multiple directories with half-width semicolons (;). Click OK.

5. Run `packer.exe -v` in CMD to verify Packer’s installation status. If the Packer version number is returned, you have successfully installed Packer. If error `command not found` prompt is returned, Packer has not been correctly installed.
Step 2. Define a Packer template

Note:
To create a custom image by using Packer, you must first create a JSON format template file. In the template, you must specify the Alibaba Cloud Image Builder and Provisioner for the custom image to be created. Packer offers a diverse range of provisioners for you to choose from when configuring the content generation mode of the custom image. In the following JSON file example, the Shell provisioner is used as an example to illustrate how to define a Packer template.

Create a JSON file named alicloud and paste the following content:

```json
{
   "variables": {
      "access_key": "{{env 'ALICLOUD_ACCESS_KEY'}}",
      "secret_key": "{{env 'ALICLOUD_SECRET_KEY'}}"
   },
   "builders": [
      {
        "type": "alicloud-ecs",
        "access_key": "{{user 'access_key'}}",
        "secret_key": "{{user 'secret_key'}}",
        "region": "cn-beijing",
        "image_name": "packer_basic",
        "source_image": "centos_7_02_64_20G_alibase_20170818.vhd",
        "ssh_username": "root",
        "instance_type": "ecs.n1.tiny",
        "internet_charge_type": "PayByTraffic",
        "io_optimized": "true"
      }
   ],
   "provisioners": [
      {
        "type": "shell",
        "inline": [
          "sleep 30",
          "yum install redis.x86_64 -y"
        ]
      }
   ]
}
```

Note:
Customize the values of the following parameters according to your actual requirements.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>access_key</td>
<td>Your AccessKey ID. For more details, see create an Accesskey.</td>
</tr>
<tr>
<td>secret_key</td>
<td>Your AccessKey Secret. For more information, see create an AccessKey.</td>
</tr>
</tbody>
</table>
Step 3. Create a custom image by using Packer

To specify the Packer template file and create a custom image, follow these steps:

1. Run `export ALICLOUD_ACCESS_KEY=your AccessKeyID` to import your AccessKey ID.
2. Run `export ALICLOUD_SECRET_KEY=your AccessKeySecret` to import your AccessKey Secret.
3. Run `packer build alicloud.json` to create the custom image.

The following example creates a custom image containing ApsaraDB for Redis and runs as follows:

```bash
alicloud-ecs output will be in this color.
=> alicloud-ecs: Prevalidating alicloud image name...
=> alicloud-ecs: Found image ID: centos_7_02_64_20G_alibase_20170818.vhd
=> alicloud-ecs: Start creating temporary keypair: packer_59e44f40-c8d6-0ee3-7fd8-b1ba08ea94b8
=> alicloud-ecs: Start creating alicloud vpc
---------------------------
=> alicloud-ecs: Provisioning with shell script: /var/folders/3q/w38xx_js6cl6k5mwkrqs
nw7w0000gn/T/packer-shell257466182
alicloud-ecs: Loaded plugins: fastestmirror
---------------------------
alicloud-ecs: Total                                              1.3 MB/s | 650 kB 00:00
alicloud-ecs: Running transaction check
---------------------------
=> alicloud-ecs: Deleting temporary keypair...
Build 'alicloud-ecs' finished.
=> Builds finished. The artifacts of successful builds are:
---> alicloud-ecs: Alicloud images were created:
```
What to do next

Use this custom image to create an ECS instance. For more information, see create an instance from a custom image.

References

- For more information, visit packer-provider, the Packer repository of Alibaba Cloud Github.
- See the Packer official documents to learn more about how to use Packer.

6.1.4 Create and import on-premises images by using Packer

Packer is a convenient open-source tool to create on-premises image files. It runs on the most major operating systems.

By using Packer, you can create identical on-premises images for multiple platforms from a single source configuration. This topic details steps to create an on-premises image for CentOS 6.9 on an Ubuntu 16.04 server and to upload it to Alibaba Cloud. For actual scenarios, you can customize your Packer templates as required.

Prerequisites

- You must have an AccessKey for the configuration file.

  ![Note:]

  Do not use the AccessKey of your Alibaba Cloud account. Instead, #unique_60 and use the RAM account to create the necessary AccessKey to maintain account security.

- You must have purchased OSS.

Example of creating and importing an on-premises image

1. Run `egrep "(^|\s)(svm|vmx)" /proc/cpuinfo` to check whether your on-premises server or virtual machine supports KVM. If the following output returns, KVM is supported.

```
pat pse36 clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpe1gb rtscp
  lm constant_tsc art arch_perfmon pebs bts rep_good noplapic xtopology nonstop_tsc
  aperfmperf tsc_known_freq pni pclmulqdq dtes64 monitor ds_cpl vmx est tm2 ssse3
  sdbg fma cx16 xtrunc pdcm pcd sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer
  aes xsave avx f16c rdrand lahf_lm abm 3dnowprefetch epb intel_pt pr_shadow vnmi
  flexpriority ept vpid fsgsbase tsc_adjust bmi1 avx2 smep bmi2 erms invpcid mpx
  rseed adx smap clflushopt xsaveopt xsavec xgetbv1 xsave dtherm ida arat pln pts
  hwp hwp_notify hwp_act_window hwp_epp
```

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cn-beijing: m-2ze12578be1oa40vs6r9

Issue: 20200519
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2. Run the following commands to install the KVM:

```bash
sudo apt-get install qemu-kvm qemu virt-manager virt-viewer libvirt-bin bridge-utils
# Install KVM and related dependencies.
sudo virt-manager # Enable virt-manager.
```

If a GUI runs in the VM console window, you have successfully installed the KVM.

3. Install Packer.

To install Packer, see use Packer to create a custom image.

4. Run the following commands to define a Packer template.

**Note:**
The on-premises image created in the following configuration is for the CentOS 6.9 operating system only. To create images for other operating systems, customize the configuration file centos.json as required.

```bash
cd /user/local # Switch the directory.
wget https://raw.githubusercontent.com/alibaba/packer-provider/master/examples/alibaba/local/centos.json # Download file centos.json that is released by Alibaba Cloud.
mkdir -p http/centos-6.9 # Create a directory.
mv ks.cfg http/centos-6.9/ # Move file ks.cfg to the http/centos-6.9 directory.
```

5. Run the following commands to create an on-premises image.

```bash
export ALICLOUD_ACCESS_KEY= SpecifyYourAccessKeyIdHere # Import your AccessKeyId.
export ALICLOUD_SECRET_KEY= SpecifyYourAccessKeySecretHere # Import your AccessKeySecret.
packer build centos.json # Create an on-premises image.
```

An example result is as follows.

qemu output will be in this color.

```bash
===> qemu: Downloading or copying ISO
    qemu: Downloading or copying: http://mirrors.aliyun.com/centos/6.9/isos/x86_64/CentOS-6.9-x86_64-minimal.iso

................................................
===> qemu: Running post-processor: alicloud-import
    qemu (alicloud-import): Deleting import source https://oss-cn-beijing.aliyuncs.com/packer/centos_x86_64
Build 'qemu' finished.
===> Builds finished. The artifacts of successful builds are:
---> qemu: Alicloud images were created:
```

---
6. Wait for a few minutes, log on to the ECS console and check your custom image in the image list that is in the corresponding region. In this example, the region is cn-beijing, i.e. China (Beijing).

**Customize a Packer template**

In this example, the following JSON file is customized based on the template used to create an image for the CentOS 6.9.

```json
{"variables": {
    "box_basename": "centos-6.9",
    "build_timestamp": "{{isotime "20060102150405\""}}",
    "cpus": "1",
    "disk_size": "4096",
    "git_revision": "__unknown_git_revision__",
    "headless": "",
    "http_proxy": "{{env 'http_proxy'}}",
    "https_proxy": "{{env 'https_proxy'}}",
    "iso_checksum_type": "md5",
    "iso_checksum": "af4axxxxxxxxxxxxxxxxxx129a2",
    "iso_name": "CentOS-6.9-x86_64-minimal.iso",
    "ks_path": "centos-6.9/ks.cfg",
    "memory": "512",
    "metadata": "floppy/dummy_metadata.json",
    "mirror": "http://mirrors.aliyun.com/centos",
    "mirror_directory": "6.9/isos/x86_64",
    "name": "centos-6.9",
    "no_proxy": "{{env 'no_proxy'}}",
    "template": "centos-6.9-x86_64",
    "version": "2.1.TIMESTAMP"
},
"builders": [
    {
      "boot_command": [
        "<tab> text ks=http://{{ .HTTPPIP }}/\{{ .HTTPPort }}/\{{user `ks_path`\}}<enter><wait>"
      ],
      "boot_wait": "10s",
      "disk_size": "{{user `disk_size`}}",
      "headless": "{{user `headless`}}",
      "http_directory": "http",
      "iso_checksum": "{{user `iso_checksum`}}",
      "iso_checksum_type": "{{user `iso_checksum_type`}}",
      "iso_url": "{{user `mirror`}}/{{user `mirror_directory`}}/{{user `iso_name`}}",
      "output_directory": "packer-{{user `template`}}-qemu",
      "shutdown_command": "echo 'vagrant'|sudo -S /sbin/halt -h -p",
      "ssh_password": "vagrant",
      "ssh_port": 22,
      "ssh_username": "root",
      "ssh_wait_timeout": "10000s",
      "type": "qemu",
      "vm_name": "{{user `template`}}.raw",
      "net_device": "virtio-net",
      "disk_interface": "virtio",
      "format": "raw"
    }
  ],
"provisioners": [
    {
      "type": "shell",
    }
]}
```
Parameters in a Packer builder

QEMU builder is used in the preceding example to create a virtual machine image. Required parameters for the builder are as follows.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>iso_checksum</td>
<td>String</td>
<td>The checksum for the OS ISO file. Packer verifies this parameter before starting a virtual machine with the ISO attached. Make sure you specify at least one of the iso_checksum or iso_checksum_url parameters. If you have specified the iso_checksum parameter, the iso_checksum_url parameter is automatically ignored.</td>
</tr>
</tbody>
</table>
| iso_checksum_type | String   | The type of the checksum specified in iso_checksum. Optional values:  
  - none: If you specify none for iso_checksum_type, the checksuming is ignored. This value is not recommended.  
  - md5  
  - sha1  
  - sha256  
  - sha512  |
| iso_checksum_url  | String   | A URL that points to a GNU or BSD style checksum file that contains the ISO file checksum of an operating system. It may come in either the GNU or BSD pattern. Make sure you specify either the iso_checksum or the iso_checksum_url parameter. If you specify the iso_checksum parameter, the iso_checksum_url parameter is automatically ignored. |
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<table>
<thead>
<tr>
<th>Parameter</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
</table>
| iso_url      | String | A URL that points to the ISO file, and contains the installation image. This URL may be an HTTP URL or a file path:  
  - If it is an HTTP URL, Packer downloads the file from the HTTP link and caches the file for later.  
  - If it is a file path to the IMG or QCOW2 file, QEMU directly starts the file. If you have the file path specified, set parameter `disk_image` to true. |
| headless     | boolean| By default, Packer starts the virtual machine GUI to build a QEMU virtual machine. If you set `headless` to True, a virtual machine without any console is started. |

For more information, see Packer [QEMU Builder](#).

### Parameters in a Packer provisioner

The provisioner in the preceding example contains a Post-Processor module that enables automated upload of on-premises images to Alibaba Cloud. Required parameters for the provisioner are as follows:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>access_key</td>
<td>String</td>
<td>Your AccessKeyId. The AccessKey has a high privilege. We recommend that you first <a href="#">unique_60</a> and use the RAM account to create an AccessKey to maintain security of your Alibaba Cloud account.</td>
</tr>
<tr>
<td>secret_key</td>
<td>String</td>
<td>Your AccessKeySecret. The AccessKey has a high privilege. We recommend that you first <a href="#">unique_60</a> and use the RAM account to create an AccessKey to maintain security of your Alibaba Cloud account.</td>
</tr>
<tr>
<td>region</td>
<td>String</td>
<td>Select the region where you want to upload your on-premises image. In this example, the region is cn-beijing. For more information, see <a href="#">regions and zones</a>.</td>
</tr>
<tr>
<td>image_name</td>
<td>String</td>
<td>The name of your on-premises image. The name must be 2 to 128 characters in length and can contain letters, numbers, Chinese characters, periods (.), colons (:), underscores (_), and hyphens (-). It must start with a letter or a Chinese character.</td>
</tr>
<tr>
<td>Parameter</td>
<td>Type</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------</td>
<td>---------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>oss_bucket_name</td>
<td>String</td>
<td>The OSS bucket name. If you specify a bucket name that does not exist, Packer creates a bucket automatically with the specified oss bucket name when uploading the image.</td>
</tr>
<tr>
<td>image_os_type</td>
<td>String</td>
<td>Image type. Optional values:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• linux</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• windows</td>
</tr>
<tr>
<td>image_platform</td>
<td>String</td>
<td>Distribution of the image. For example, CentOS.</td>
</tr>
<tr>
<td>image_architecture</td>
<td>String</td>
<td>The instruction set architecture of the image. Optional values:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• i386</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• x86_64</td>
</tr>
<tr>
<td>format</td>
<td>String</td>
<td>Image format. Optional values:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• RAW</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• VHD</td>
</tr>
</tbody>
</table>

For more information, see Packer Alicloud Post-Processor.

**Next step**

You can use the created image to create an ECS instance. For more information, see create an instance from a custom image.

**References**

- For more information about how to use Packer, see Packer documentation.
- For more information about release information, visit the Packer repository on GitHub packer.
- For more information about Alibaba Cloud open source tools, visit the Alibaba Cloud repository on GitHub opstools.
- For more information about Alibaba Cloud and Packer project, visit the Alibaba Cloud & Packer repositories on GitHub packer-provider.
- For more information about configuration file ks.cfg, see Anaconda Kickstart.
6.2 Update a custom image

This topic describes how to update custom images by using Operation Orchestration Service (OOS). OOS provides public templates to automate image updating. To create a random or scheduled O&M task, you only need to select a source image and specify required parameters, such as the Cloud Assistant scripts in a public template. The O&M task is then automatically executed based on the definitions in the template.

Context

The ACS-ECS-UpdateImage template defines the order in which the following tasks are executed to update the image:

1. Check whether the name of the new custom image exists and make sure that it complies with the naming conventions.
2. Create and launch a temporary ECS instance based on parameters such as the instance type, source image ID, and security group ID you have configured.
3. Check whether the Cloud Assistant client has been installed on the temporary ECS instance. If not, install the Cloud Assistant client.
4. Run scripts by using the Cloud Assistant client to update the system environment of the instance.

Note:
OOS calls Cloud Assistant API operations to run Shell, Bat, or PowerShell scripts to update the system environment of ECS instances. For more information, see #unique_69.

5. Stop the temporary ECS instance.
6. Create a custom image from the temporary ECS instance.
7. Release the temporary ECS instance.

Procedure

1. Log on to the ECS console.
2. In the left-side navigation pane, choose Instances & Images > Images.
3. In the top navigation bar, select a region.
4. On the Images page, click the Custom Images tab and find the target image. In the Actions column, choose More > Update Image.
5. Go to the OOS console and perform the following operations:
   
a) In the **Basic Information** step, retain the default settings and click **Next: Parameter Settings**.
   
b) In the **Parameter Settings** step, specify parameters to automate the creation or updating of custom images. The following table describes these parameters.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>targetImageName</td>
<td>The name for the new custom image. The name must comply with the regular expression <code>^[A-Za-z0-9\-_]*$</code>, and cannot be the same as an existing image name.</td>
<td><code>add_testtxt_20191010</code></td>
</tr>
<tr>
<td>sourceImageId</td>
<td>The ID of the image you want to update.</td>
<td><code>m-bp13y4of6m doqw******</code></td>
</tr>
<tr>
<td>instanceType</td>
<td>The type of the temporary ECS instance to create. For more information, see #unique_40.</td>
<td><code>ecs.g5.xlarge</code></td>
</tr>
<tr>
<td>securityGroupId</td>
<td>The ID of the security group to which the temporary ECS instance belongs.</td>
<td><code>sg-bp1azttqpldxg *****</code></td>
</tr>
<tr>
<td>vSwitchId</td>
<td>The ID of the VSwitch to which the temporary ECS instance belongs. The VSwitch and security group must be in the same VPC.</td>
<td><code>vsw-bp1s5fnvk4 gn2tw*****</code></td>
</tr>
<tr>
<td>Parameter</td>
<td>Description</td>
<td>Example</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td><code>commandType</code></td>
<td>The type of script you plan to execute by using the Cloud Assistant client.</td>
<td>RunShellScript</td>
</tr>
<tr>
<td></td>
<td>• RunShellScript: Shell script for Linux-based instances.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• RunBatScript: Bat script for Windows-based instances.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• RunPowerShellScript: PowerShell script for Windows-based instances.</td>
<td></td>
</tr>
<tr>
<td><code>commandContent</code></td>
<td>The content of the script to execute on the temporary ECS instance.</td>
<td>echo &quot;hello world&quot; &gt;/root/test.txt.</td>
</tr>
<tr>
<td><code>Permissions</code></td>
<td>Optional. Valid values:</td>
<td>Use Existing Permissions from a Current Account</td>
</tr>
<tr>
<td></td>
<td>• <strong>Use Existing Permissions of Current Account</strong>: This is the default value.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>You have all the permissions granted to your account. Make sure that you</td>
<td></td>
</tr>
<tr>
<td></td>
<td>have the permissions to call the ECS API operations required for creating</td>
<td></td>
</tr>
<tr>
<td></td>
<td>custom images.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• <strong>Specify RAM Role and Use Permissions Granted to This Role</strong>: If a RAM</td>
<td></td>
</tr>
<tr>
<td></td>
<td>role is specified, OOS performs O&amp;M tasks by assuming that RAM role.</td>
<td></td>
</tr>
</tbody>
</table>
c) Click **Next: Preview**.

d) Confirm O&M task details and high-risk operations. Then, click **Confirm and Create**.

6. In the left-side navigation pane, click **Executions** to view the created O&M task.

**Result**

If the O&M task is created and its execution status is **Running**, the custom image is being updated. If **Execution Status** changes to **Succeeded**, the image is updated. You can view the ID of the new image on the Execution Result page.
Note:
To view the progress of the image updating operations, click Details of the O&M task to view Execution Logs.

References
Introduction to OOS

6.3 Modify custom images

This topic describes how to modify the name and description of your custom images.

Procedure

To modify the name and description of a custom image, follow these steps:

1. Log on to the ECS console.
2. In the left-side navigation pane, choose Instances & Images > Images.
3. In the top navigation bar, select a region.
4. Find the target custom image and then click the icon.
5. Enter a new name for the custom image.
6. In the Actions column, click Modify Description.
7. In the displayed dialog box, enter a **Custom Image Description**

8. Click **Save**.

Alternatively, you can modify the name and description of a custom image by calling the ECS API **ModifyImageAttribute**.

### 6.4 Import images

#### 6.4.1 Image import procedure

Importing a local image file is applicable to scenarios where your business is deployed on the cloud. You can use the imported custom image to create an ECS instance or replace the system disk. This topic describes how to import an image.

**Linux image import procedure**

The Linux image import procedure is as follows:

1. Complete the following preparations on the source server before creating a custom image:
   
   a. Install an image compliance tool and use it to automatically check whether Linux settings meet the import requirements. For more information, see Use the image compliance tool.
   
   b. Install cloud-init to allow instances running the image to complete the initialization configuration. For more information, see Install cloud-init.
   
   c. Install VirtIO drivers to allow ECS instances created from the image to start. For more information, see Install virtio driver.

2. Read **Instructions for importing images**.

3. Convert the image file format (except for RAW, VHD, and qcow2 image files). For more information, see Convert the image file format.

4. **Import custom images**.

   If the operating system of the custom image is not supported by Alibaba Cloud and cloud-init cannot be installed, you can select Customized Linux when importing a custom image. For more information, see Customize Linux images.

**Windows Image import procedure**

The Windows image import procedure is as follows:

1. **Install virtio driver**
2. Instructions for importing images
3. Convert the image file format
4. Import custom images

6.4.2 Use the image compliance tool

Before you import custom images, we recommend that you use the image compliance tool to check whether the Linux operating system configurations meet import requirements. This topic describes how to use the image compliance tool provided by Alibaba Cloud to check the validity of a custom Linux image.

Background information

ECS allows you to create instances from imported custom images. You must import custom images to ECS before you can create instances from them. Custom images can be created based on on-premises servers, virtual machines (VMs), or cloud servers of other service providers. Custom images must meet certain requirements before they can be used in Alibaba Cloud. For more information, see Instructions for importing images.

We recommend that you use the image compliance tool of ECS to reduce the time needed to create a custom image. The image compliance tool is designed to automatically validate configuration items in a Linux server environment to identify non-compliant items, generate detection reports in TXT and JSON formats, and provide troubleshooting actions if required.

This topic uses a server running the CentOS 7.4 64-bit OS as an example.

Application scope

The image compliance tool only supports Linux images, such as Ubuntu, CentOS, Debian, Red Hat, SUSE Linux Enterprise Server (SLES), openSUSE, FreeBSD, and CoreOS.

Procedure

1. Log on to your server, VM, or cloud server.
2. Run the following command to download the image compliance tool to the current directory of your server:

   wget http://docs-aliyun.cn-hangzhou.oss.aliyun-inc.com/assets/attach/73848/cn_zh/1557459863884/image_check

   You can also download the image compliance tool directly.
3. Run the image compliance tool with root privileges to ensure that it can read permission-restricted configuration files.

```bash
chmod +x image_check
sudo <Path of the image compliance tool>/image_check -p [Destination path]
```

In the preceding code example, `<Path of the image compliance tool>` is also the path where to generate the detection report. Therefore, run the following command to start the image compliance tool:

```bash
sudo ./image_check
```

**Note:**
You can use `-p [Destination path]` to specify the path where to generate the detection report. If this parameter is not specified, the detection report will be generated in the same path as the image compliance tool.

4. Wait for the image compliance tool to check the system configurations.

```
Begin check your system......
The report is generating.
---------------------------------------
The information you need to input when you import your image to Alibaba Cloud website:
Current system: CentOS
Architecture: x86_64
System disk size: 42 GB
---------------------------------------
Check driver                                               [  OK  ]
Check shadow file authority                                [  OK  ]
Check security                                              [  OK  ]
Check qemu-ga                                               [  OK  ]
Check network                                               [  OK  ]
Check ssh                                                   [  OK  ]
Check firewall                                               [  OK  ]
Check filesystem                                            [  OK  ]
Check device id                                              [  OK  ]
Check root account                                          [  OK  ]
Check password                                              [  OK  ]
Check partition table                                       [  OK  ]
Check lib                                                   [  OK  ]
Check disk size                                             [  OK  ]
Check disk use rate                                         [  OK  ]
Check inode use rate                                        [  OK  ]
---------------------------------------
16 items are OK.
0 items are failed.
0 items are warning.
---------------------------------------
```
5. View the detection report.

The path of the detection report is displayed in the output of tool execution. In this example, the report is stored in the /root directory. The report is named in the format of image_check_report_date_time.txt or image_check_report.json.

Detection items

The compliance tool detects the following configuration items to ensure that ECS instances created from your custom image will be fully functional.

<table>
<thead>
<tr>
<th>Detection item</th>
<th>Non-compliance issue</th>
<th>Suggestion</th>
</tr>
</thead>
<tbody>
<tr>
<td>driver</td>
<td>The ECS instance cannot start correctly.</td>
<td>Install the virtualization driver. For more information, see Install cloud-init.</td>
</tr>
<tr>
<td>/etc/shadow</td>
<td>The password file cannot be modified. As a result, you cannot create an ECS instance from the custom image.</td>
<td>Do not run the chattr command to lock the /etc/shadow file.</td>
</tr>
<tr>
<td>SElinux</td>
<td>The ECS instance cannot start correctly.</td>
<td>Do not start SELinux by modifying /etc/selinux/config.</td>
</tr>
<tr>
<td>qemu-ga</td>
<td>Some services required by ECS are unavailable, and the instance is not fully functional.</td>
<td>Uninstall qemu-ga.</td>
</tr>
<tr>
<td>network</td>
<td>Network functions of the ECS instance are unstable.</td>
<td>Disable or delete Network Manager and enable the network service.</td>
</tr>
<tr>
<td>ssh</td>
<td>You cannot connect to the ECS instance from the console.</td>
<td>Enable the SSH service and do not set PermitRootLogin.</td>
</tr>
<tr>
<td>firewall</td>
<td>The system does not automatically configure your ECS instance environment.</td>
<td>Disable firewalls such as iptables, firewalld, IPFilter (IP), IPFireWall (IPFW), or PacketFilter (PF).</td>
</tr>
<tr>
<td>Detection item</td>
<td>Non-compliance issue</td>
<td>Suggestion</td>
</tr>
<tr>
<td>---------------</td>
<td>--------------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>file system</td>
<td>You cannot resize the disk.</td>
<td>• We recommend that you use the XFS, ext3, and ext4 file systems.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• The ext2, UFS, and UDF file systems are supported.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Do not use the 64 bit feature for the ext4 file system.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Note:</strong> The 64 bit feature is one feature of the ext4 file system. You can run the <code>man ext4</code> command to view detailed descriptions.</td>
</tr>
<tr>
<td>device id</td>
<td>The ECS instance cannot start correctly.</td>
<td>Clean up the fstab file and remove unneeded device IDs from the file to make sure that the device IDs in use appear in the output of the blkid command.</td>
</tr>
<tr>
<td>root</td>
<td>The username and password cannot be used to connect to the ECS instance.</td>
<td>Reserve the root account.</td>
</tr>
<tr>
<td>passwd</td>
<td>You cannot add users to the ECS instance.</td>
<td>Retain the passwd command or reinstall the password file.</td>
</tr>
<tr>
<td>Partition table</td>
<td>The ECS instance cannot start correctly.</td>
<td>Use MBR partitioning.</td>
</tr>
<tr>
<td>/lib</td>
<td>The ECS instance cannot be configured automatically.</td>
<td>The /lib and /lib64 files cannot be stored in absolute paths. Modify the storage paths of the /lib and /lib64 files to their relative paths.</td>
</tr>
<tr>
<td>system disk</td>
<td>N/A</td>
<td>Increase the system disk capacity. The optimal system disk capacity is 40 GiB to 500 GiB. When you import images, configure the system disk capacity based on the virtual file size of images, instead of the size of images.</td>
</tr>
<tr>
<td>disk usage</td>
<td>Required drivers or services cannot be installed for the ECS instance.</td>
<td>Make sure that sufficient disk space is available.</td>
</tr>
</tbody>
</table>
The image compliance tool provides **OK**, **FAILED**, or **WARNING** detection result based on detection items.

- **OK**: The detection items all comply with requirements.
- **FAILED**: The detection items do not comply with requirements, which means ECS instances created from the custom image will not be able to start correctly. We recommend that you rectify the non-compliant items and create a new image to improve instance startup efficiency.
- **WARNING**: The detection items do not comply with requirements, which means ECS instances created from the custom image will be able to start correctly, but ECS cannot use valid methods to configure your instance. You can choose to immediately rectify the non-compliant items or temporarily retain the items and create an image.

### Output items

The image compliance tool generates detection reports in both TXT and JSON formats in the destination path.

<table>
<thead>
<tr>
<th>Detection item</th>
<th>Non-compliance issue</th>
<th>Suggestion</th>
</tr>
</thead>
<tbody>
<tr>
<td>inode usage</td>
<td>Required drivers or services cannot be installed for the ECS instance.</td>
<td>Make sure that sufficient inode resources are available.</td>
</tr>
</tbody>
</table>

**Note:**

You can use `-p [Destination path]` to specify the path where to generate the detection report. If this parameter is not specified, the detection report will be generated in the same path as the compliance tool.

- Reports in TXT format are named `image_check_report_date_time.txt`. The reports include server configuration information and detection results. The following example uses a server running the CentOS 7.4 64-bit OS.

The information you need to input when you import your image to Alibaba Cloud Website:
- Current system is: CentOS #Server operating system
- Architecture: x86_64 #System architecture
- System disk size: 42 GB #Server system disk capacity

<table>
<thead>
<tr>
<th>Check driver</th>
<th>Detection item name</th>
<th>Detection result</th>
</tr>
</thead>
<tbody>
<tr>
<td>kvm drive is exist</td>
<td>#Detection item name</td>
<td>Detection result</td>
</tr>
<tr>
<td>Alibaba Cloud supports kvm virtualization technology</td>
<td>#Detection item name</td>
<td>Detection result</td>
</tr>
</tbody>
</table>
We strongly recommend installing kvm driver.

- Reports in JSON format are named `image_check_report.json`. The reports include server configuration information and detection results. The following example uses a server running the CentOS 7.4 64-bit OS.

```
"platform": "CentOS", "Server operating system"
"os_big_version": "7", "Operating system version number (major)"
"os_small_version": "4", "Operating system version number (minor)"
"architecture": "x86_64", "System architecture"
"system_disk_size": "42", "Server system disk capacity"
"version": "1.0.2", "Compliance tool version"
"time": "2018-05-14_19-18-10", "Detection time"
"check_items": [{
  "name": "driver", "Detection item name"
  "result": "OK", "Detection result"
  "error_code": "0", "Error code"
  "description": "Pass: kvm driver exists.", "Description"
  "comment": "Alibaba Cloud supports kvm virtualization technology. We strongly recommend installing kvm driver."
}]
```

**What to do next**

1. View [Instructions for importing images](#).
2. Install virtio driver.
3. Optional. Convert the image file format.
4. Import custom images.
5. #unique_10.

### 6.4.3 Instructions for importing images

To improve image importing efficiency and the availability of imported images, we recommend that you read the following instructions before you import an image.

**Windows images**

Considerations

- Verify the integrity of the file system.
- Do not modify critical system files.
- Make sure that the system disk has sufficient storage space.
- Configure the system disk size based on the virtual disk size rather than the image size.
  - The system disk size can be 40 GiB to 500 GiB.
- Disable the firewall and allow access to RDP port 3389.
- The logon password for the administrator account must be 8 to 30 characters in length and must contain at least three of the following character types: uppercase letters,
lowercase letters, digits, and special characters. Special characters include ( ) ` ~ ! @ # $ % ^ & * - _ + = | { } [ ] : ; ' < > , . ? / . In addition, the password cannot start with a forward slash (/).

Items not supported

• ISO image files are not supported. Before importing ISO images to ECS, use tools such as VirtualBox installed on premises to create ISO images, and then convert the images to RAW, VHD, or qcow2 format.

• Do not install qemu-ga in an imported image. If it is installed, some of the services that ECS needs may be unavailable.

• Images running the following operating systems cannot be imported: Windows XP, Windows 7 (professional and enterprise editions), Windows 8, and Windows 10.

Items supported

• Multi-partition system disks.

• NTFS file systems and MBR partitions.

• Images in RAW, qcow2, or VHD format. If the target image is not in one of the preceding formats, convert the image file format before you import it. For more information, see Convert image formats.

• Images running the following operating systems:
  - Microsoft Windows Server 2016
  - Microsoft Windows Server 2012 R2
  - Microsoft Windows Server 2012
  - Microsoft Windows Server 2008 R2
  - Microsoft Windows Server 2008
  - Windows Server 2003 Service Pack 1 or later

Linux images

Considerations

• Verify the integrity of the file system.
• Do not modify critical system files, such as /sbin, /bin, and /lib*.
  - Do not modify /etc/issue*. Otherwise, the system release cannot be identified by ECS, leading to system creation failures.
  - Do not modify /boot/grub/menu.lst. Otherwise, the ECS instance cannot be started.
  - Do not modify /etc/fstab. Otherwise, the exception partition cannot be loaded and the ECS instance cannot be started.
  - Do not change /etc/shadow to read-only. Otherwise, the password file cannot be modified, leading to system creation failures.
  - Do not enable SELinux by modifying /etc/selinux/config. Otherwise, the system cannot start.
• Make sure that the system disk has sufficient storage space.
• Disable the firewall and allow access to SSH port 22.
• Enable Dynamic Host Configuration Protocol (DHCP).
• Install XEN or KVM virtualization drivers. For more information, see Install the virtio driver.
• We recommend that you use cloud-init to configure the hostname, NTP source, and yum source. For more information, see Install cloud-init.
• The logon password for the root account must be 8 to 30 characters in length and must contain at least three of the following character types: uppercase letters, lowercase letters, digits, and special characters. Special characters include ( ) ~ ! @ # $ % ^ & * - _ + = | { } [ ] : ; ' < > , . ? /.

Items not supported
• ISO image files are not supported. Before importing ISO images to ECS, use tools such as VirtualBox installed on premises to create ISO images, and then convert the images to RAW, VHD, or qcow2 format.
• Multiple network interfaces.
• IPv6 addresses.
• Do not adjust system disk partitions. Only disks with a single root partition are supported.
• Do not install qemu-ga in an imported image. If it is installed, some of the services that ECS needs may be unavailable.

Items supported
• Images in RAW, qcow2, or VHD format. If the target image is not in one of the preceding formats, convert the image file format before you import it. For more information, see Convert image formats.

• xfs, ext3, and ext4 file systems, and MBR partitions.

**Note:**
The ext4 file system cannot contain the 64bit feature. The project and quota features cannot appear in pairs. To view the list of features contained in the ext4 file system, run the `tune2fs -l ext4 file system disk directory | grep features` command.

• Images running the following operating systems:
  - Aliyun Linux
  - CentOS 5/6/7
  - CoreOS 681.2.0 or later
  - Debian 6/7
  - FreeBSD
  - OpenSUSE 13.1
  - Red Hat
  - Red Hat Enterprise Linux (RHEL)
  - SUSE Linux 10/11/12
  - Ubuntu 10/12/13/14/16/18

**Non-standard Linux images**

Linux images that are not listed as ECS public images are considered non-standard images. Such images are developed on a standard OS platform but do not comply with ECS requirements for a standard operating system, such as critical system configuration files, basic system environments, and applications. If you want to use a non-standard platform image, select one of the following image types and perform corresponding operations:

• Others Linux: ECS identifies all images of this type as other Linux systems and does not process the instances created from such images. If you enable DHCP before you create an image, ECS automatically configures your network. If DHCP is not enabled, you must connect to the created instance by using the Management Terminal in the ECS console, and then manually configure the IP address, IP route, and password.
Elastic Compute Service
Images / 6 Custom image

- Customized Linux: After importing a customized Linux image, configure the network and password of the instance according to the standard system configuration of ECS. For more information, see Customize Linux images.

6.4.4 Install cloud-init

To ensure that the ECS instance running an image can complete the initialization configuration, we recommend that you install cloud-init on the server when you create a custom Linux image. This topic describes how to install Alibaba Cloud cloud-init and the native cloud-init.

Context

cloud-init is open-source software used by cloud platforms to initialize Linux virtual machines. All major public cloud platforms such as Alibaba Cloud, Amazon Web Services (AWS), Microsoft Azure, and OpenStack support cloud-init. Alibaba Cloud cloud-init initializes the configurations of instances during their startup and executes user data scripts. These configurations include NTP, software sources, hostname, and SSH key pairs. For more information, visit cloud-init Documentation.

By default, cloud-init is installed for all Alibaba Cloud public images. To ensure that instances created from custom images can automatically initialize system configurations, we recommend that you install Alibaba Cloud cloud-init on your Linux server in the following scenarios:

- Linux servers will be migrated to the cloud but are not installed with cloud-init.

Note:
Proceed with caution when you install cloud-init on servers that you do not plan to migrate to the cloud.

- Linux servers are installed with cloud-init of versions earlier than 0.7.9.
- Alibaba Cloud ECS instances are not installed with cloud-init.

Description of cloud-init version

Different cloud platforms may use different versions of cloud-init. Select the appropriate version and configure it with the appropriate data source (datasource). The latest version of Alibaba Cloud cloud-init is 19.1.2, and the data source is Aliyun.

Notice:
After cloud-init has been installed, it will automatically start during startup. If the installed version of cloud-init is not compatible with the operating system of the server or the data source is not configured properly, cloud-init may not run normally and the instance may start slowly or even fail to start the next time you restart the instance. Therefore, you must select a later version of cloud-init and an appropriate data source such as Aliyun.

When you use cloud-init, note the following differences among different versions:

- **0.7.6a**: the initial version of Alibaba Cloud cloud-init, which depends on python2.7 for the Python environment. Some early public images still use cloud-init 0.7.6a.

  **Note:**
  The Python community no longer provides technical support for python2.7. Therefore, we recommend that you use later versions of cloud-init to avoid potential risks associated with the dependency library.

- **0.7.9 and earlier**: initial versions of the native cloud-init, which are not applicable to initialize ECS instances and must be upgraded.

- **18**: cloud-init 18 and later automatically initialize network configurations. The code for network configuration is `BOOTPROTO=dhcp DEVICE=eth0 ONBOOT=yes STARTMODE=auto TYPE=Ethernet USERCTL=no`. If you want to customize network configurations after you install cloud-init, see the Optional. Customize network configuration. section in this topic.

- **19.1**: Alibaba Cloud public images are upgrading to be installed with cloud-init 19.1, which depends on python3.6 for the Python environment.

**Check the cloud-init version**

1. Log on to the source server.

2. Run the following command to check whether cloud-init is installed:

   ```bash
   which cloud-init
   ```

   If the output contains no path information, cloud-init is not installed. Install Alibaba Cloud cloud-init first.

3. Run the following command to check the version of cloud-init:

   ```bash
   cloud-init --version
   ```

   If the returned version is earlier than 0.7.9, install Alibaba Cloud cloud-init.

4. Back up data on the server.
Recommended. Install Alibaba Cloud cloud-init

Perform the following operations to download cloud-init 19.1.2 whose source code is Aliyun:

1. Ensure that the python-pip dependency library is installed on the source server.

   Run the following commands to install the python3-pip dependency library for some Linux distributions:
   - CentOS and Red Hat Enterprise Linux:
     ```
yum -y install python3-pip
     ```
   - Ubuntu and Debian:
     ```
     apt-get -y install python3-pip
     ```
   - openSUSE and SUSE:
     ```
     zypper -n install python3-pip
     ```

2. Run the following command to install Alibaba Cloud cloud-init:

   ```
   ```

3. Run the following command to decompress the cloud-init installation package to the current directory:

   ```
   tar -zxvf cloud-init-19.1.2.tgz
   ```

4. Go to the tools directory of the cloud-init file.

5. Run the following command to execute the deploy.sh script to install cloud-init:

   ```
   bash ./deploy.sh <issue> <major_version>
   ```

The following table describes the parameters and values in the deploy.sh script.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>issue</td>
<td>The type of the operating system. Valid values: centos, redhat, rhel, debian, ubuntu, opensuse, and sles. The parameter values are case-sensitive. sles stands for SUSE and SLES.</td>
<td>centos</td>
</tr>
<tr>
<td>major_version</td>
<td>The major version number of the operating system.</td>
<td>The major version number of CentOS 6.5 is 6.</td>
</tr>
</tbody>
</table>
6. Check whether cloud-init is installed.

If "description": "success" is returned, Alibaba Cloud cloud-init is installed.

```json
{
  "status_code": 0,
  "description": "success"
}
```

The following sample shell scripts used to install Alibaba Cloud cloud-init are provided for your reference. Adapt the scripts based on your actual operation system.

- CentOS 6 and CentOS 7:

  ```bash
  # Check whether the python3-pip dependency library has been installed. If not, install it.
  if ! python3 -c 'import setuptools' >& /dev/null; then
    yum -y install python3-pip
  fi

  # Back up cloud-init of an earlier version.
  test -d /etc/cloud && mv /etc/cloud /etc/cloud-old

  # Download and decompress Alibaba Cloud cloud-init.
  tar -zxvf ./cloud-init-19.1.2.tgz

  # Install cloud-init.
  issue_major=$( cat /etc/redhat-release | grep -Eo '[0-9]+\.[0-9]*' | head -1 | awk -F'.' '{printf $1}' )
  bash ./cloud-init/*/tools/deploy.sh centos "$issue_major"
  ```

- Red Hat Enterprise Linux 6 and Red Hat Enterprise Linux 7:

  ```bash
  # Check whether the python3-pip dependency library has been installed. If not, install it.
  if ! python3 -c 'import setuptools' >& /dev/null; then
    yum -y install python3-pip
  fi

  # Back up cloud-init of an earlier version.
  test -d /etc/cloud && mv /etc/cloud /etc/cloud-old

  # Download and decompress Alibaba Cloud cloud-init.
  tar -zxvf ./cloud-init-19.1.2.tgz

  # Install cloud-init.
  issue_major=$( cat /etc/os-release | grep VERSION_ID | grep -Eo '[0-9]+\.[0-9]*' | head -1 | awk -F'.' '{printf $1}' )
  bash ./cloud-init/*/tools/deploy.sh rhel "$issue_major"
  ```

- Ubuntu 14, Ubuntu 16, and Ubuntu 18:

  ```bash
  # Check whether the python3-pip dependency library has been installed. If not, install it.
  if ! python3 -c 'import setuptools' >& /dev/null; then
    apt-get install python36 python3-pip -y
  fi

  # Back up cloud-init of an earlier version.
  test -d /etc/cloud && mv /etc/cloud /etc/cloud-old

  # Download and decompress Alibaba Cloud cloud-init.
  ```
tar -zxvf ./cloud-init-19.1.2.tgz
# Install cloud-init.
issue_major=$( cat /etc/os-release | grep VERSION_ID | grep -Eo '[0-9]+\.[0-9]+\.[0-9]+' | head -1 | awk -F'\.' '{print $1}')
bash ./cloud-init-* /tools/deploy.sh ubuntu "$issue_major"

• Debian 8 and Debian 9:

# Check whether the python3-pip dependency library has been installed. If not, install it.
if ! python3 -c 'import setuptools' && /dev/null; then
  apt-get -y install python3-pip
fi
# Back up cloud-init of an earlier version.
test -d /etc/cloud && mv /etc/cloud /etc/cloud-old
# Download and decompress Alibaba Cloud cloud-init.
tar -zxvf ./cloud-init-19.1.2.tgz
# Install cloud-init.
issue_major=$( cat /etc/os-release | grep VERSION_ID | grep -Eo '[0-9]+\.[0-9]+\.[0-9]+' | head -1 | awk -F'\.' '{print $1}')
bash ./cloud-init-* /tools/deploy.sh sles "$issue_major"

• SUSE 11 and SUSE 12:

# Check whether the python3-pip dependency library has been installed. If not, install it.
if ! python3 -c 'import setuptools' && /dev/null; then
  zypper -n install python3-pip
fi
# Back up cloud-init of an earlier version.
test -d /etc/cloud && mv /etc/cloud /etc/cloud-old
# Download and decompress Alibaba Cloud cloud-init.
tar -zxvf ./cloud-init-19.1.2.tgz
# Install cloud-init.
issue_major=$( cat /etc/os-release | grep VERSION_ID | grep -Eo '[0-9]+\.[0-9]+\.[0-9]+' | head -1 | awk -F'\.' '{print $1}')
bash ./cloud-init-* /tools/deploy.sh sles "$issue_major"

• openSUSE 13 and openSUSE 42:

# Check whether the python3-pip dependency library has been installed. If not, install it.
if ! python3 -c 'import setuptools' && /dev/null; then
  zypper -n install python3-pip
fi
# Back up cloud-init of an earlier version.
test -d /etc/cloud && mv /etc/cloud /etc/cloud-old
# Download and decompress Alibaba Cloud cloud-init.
tar -zxvf ./cloud-init-19.1.2.tgz
# Install cloud-init.
issue_major=$( cat /etc/os-release | grep VERSION_ID | grep -Eo '[0-9]+\.[0-9]+\.[0-9]+' | head -1 | awk -F'\.' '{print $1}')
bash ./cloud-init-*/tools/deploy.sh opensuse"$issue_major"

**Optional. Install the native cloud-init**

1. Make sure that you have installed the Git, Python, and python-pip dependency libraries for the source server.
   
   Run the following commands to install Git, python3.6, and python3-pip dependency libraries for some Linux distributions:

   - CentOS and Red Hat Enterprise Linux:
     
     yum -y install git python36 python3-pip
   
   - Ubuntu and Debian:
     
     apt-get -y install git python36 python3-pip
   
   - openSUSE and SUSE:
     
     zypper -n install git python36 python3-pip

2. Run the following command to download the cloud-init source code package from Git:
   
   git clone https://git.launchpad.net/cloud-init

3. Go to the cloud-init directory.
   
   cd ./cloud-init

4. Run the following command to install all the dependency libraries:
   
   pip3 install -r ./requirements.txt

5. Run the following command to install cloud-init:
   
   python3 setup.py install

6. Modify the cloud.cfg configuration file.
a) Open the configuration file.

```
vi /etc/cloud/cloud.cfg
```

b) Modify the configuration before `cloud_init_modules:` as follows:

```bash
# Example datasource config
# The top level settings are used as module
# and system configuration.
# A set of users which may be applied and/or used by various modules
# when a 'default' entry is found it will reference the 'default_user'
# from the distro configuration specified below
users:
  - default

user:
  name: root
  lock_passwd: False

# If this is set, 'root' will not be able to ssh in and they
# will get a message to login instead as the above $user
disable_root: false

# This will cause the set+update hostname module to not operate (if true)
preserve_hostname: false

# Example datasource config
# datasource:

   ec2:
      metadata_urls: ['blah.com']
      timeout: 5 # (defaults to 50 seconds)
      max_wait: 60 # (defaults to 120 seconds)

# The modules that run in the 'init' stage
cloud_init_modules:
```

```bash
AliYun:
  support_xen: false
  timeout: 5 # (defaults to 50 seconds)
  max_wait: 60 # (defaults to 120 seconds)
  metadata_urls: ['blah.com']
```
**cloud_init_modules:**

**Optional. Customize network configuration.**

1. After cloud-init is installed, open the /etc/cloud/cloud.cfg file.

   ```
   vim /etc/cloud/cloud.cfg
   ```

2. Add the `disabled` configuration before Example datasource config.

   ```
   network:
   config: disabled
   ```

**Note:**

After the configuration is added, you must manage the network configuration under the `/etc/sysconfig/network-scripts/` directory.

Troubleshooting

- The libraries that are missing may vary with images. You can use pip to install the libraries and then install cloud-init again.

- If the default software package manager (such as yum) and the pip manager have been installed with different versions of dependency libraries, library version conflicts may
occur and cause cloud-init to run abnormally. We recommend that you download the dependency libraries based on the error message.

<table>
<thead>
<tr>
<th>Error message</th>
<th>Cause</th>
<th>Troubleshooting command</th>
</tr>
</thead>
<tbody>
<tr>
<td>no setuptools module in python</td>
<td>The python setuptools module is not installed.</td>
<td>The following example uses python3.6:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• CentOS and Red Hat: <code>yum -y install python3-pip</code></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Ubuntu and Debian: <code>apt-get -y install python3-pip</code></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• openSUSE and SUSE: <code>zypper -n install python3-pip</code></td>
</tr>
<tr>
<td>File &quot;/root/cloud-init/cloudinit/log.py&quot;, line 19, in &lt;module&gt; import six ImportError: No module named six</td>
<td>The six dependency library is not installed.</td>
<td>pip3 install six</td>
</tr>
<tr>
<td>File &quot;/root/cloud-init/cloudinit/url_helper.py&quot;, line 20, in &lt;module&gt; import oauthlib.oauth1 as oauth1 ImportError: No module named oauthlib.oauth1</td>
<td>The oauthlib dependency library is not installed.</td>
<td>pip3 install oauthlib</td>
</tr>
<tr>
<td>No uninstalled dependency libraries specified</td>
<td>The error message is not mapped.</td>
<td>Run the following command to install all dependency libraries that are listed in the requirements.txt file of cloud-init: <code>pip3 install -r requirements.txt</code></td>
</tr>
</tbody>
</table>

What’s next

- For Linux servers that will be migrated to the cloud:

You can migrate the servers by using the Cloud Migration tool or importing the custom images. For more information, see Migrate your server to Alibaba Cloud by using the Cloud Migration tool or Import custom images.
• For Alibaba Cloud ECS instances that already run Linux custom images:

You can restart the system to check the installation result. If the system automatically configures the hostname, software sources, and NTP, cloud-init is installed. For example, if the network configuration file shows the following content, cloud-init is installed:

```
[root@iZbp1ios3psx4hoi******Z ~]# cat /etc/sysconfig/network-scripts/ifcfg-eth0
# Created by cloud-init on instance boot automatically, do not edit.
# BOOTPROTO=dhcp
DEVICE=eth0
ONBOOT=yes
STARTMODE=auto
TYPE=Ethernet
USERCTL=no
```

**Related topics**
cloud-init official website - Alibaba Cloud (AliYun)

### 6.4.5 Install virtio driver

This topic details which images do and do not require the virtio driver to be installed on the source server before import.

**Images requiring no manual installation**

After you import custom images, if the operating systems of your images are listed as follows, Alibaba Cloud automatically processes the virtio driver for you:

- Windows Server 2008
- Windows Server 2012
- Windows Server 2016
- CentOS 6/7
- Ubuntu 12/14/16
- Debian 7/8/9
- SUSE 11/12

You can skip to recover the temporary root file system of initramfs or initrd.

**Images requiring manual installation**

For Linux images that are not included in the preceding list, you must install the virtio driver on-premises before importing the images.

**To check the availability of virtio driver on a server**
1. Run `grep -i virtio /boot/config-$(uname -r)` to inspect whether the virtio driver is already built in the kernel of your server.

Note:

- If VIRTIO_BLK and VIRTIO_NET do not exist in the output, the virtio driver is not built in the kernel. You must install and configure the virtio driver on your server to compile and install virtio driver.
- If the values of parameter `CONFIG_VIRTIO_BLK` and parameter `CONFIG_VIRTIO_NET` are `y`, the virtio driver is already built in the kernel. For more information, see notes for importing images and import custom images.
- If the values of parameter `CONFIG_VIRTIO_BLK` and parameter `CONFIG_VIRTIO_NET` are `m`, continue to step 2.

2. Run `lsinitrd /boot/initramfs-$(uname -r).img | grep virtio` to make sure the virtio driver has been compiled in the temporary root file system of initramfs or initrd.

Note:

- According to the preceding figure, the virtio_blk driver, including its dependency virtio.ko, virtio_pci.ko and virtio_ring.ko, has been compiled in the temporary root file system initramfs. For more information, see notes for importing images and import custom images.
If the virtio driver is unavailable in the initramfs, you must recover the temporary root file system of initramfs or initrd before importing images or migration.

**To recover the temporary root file system**

If the virtio driver is supported by the kernel but not compiled in the temporary root file system, you must recover the temporary root file system. The following example uses CentOS:

- **CentOS/RedHat 5**
  
  ```bash
  mknitrd -f --allow-missing 
  --with=xen-vbd --preload=xen-vbd 
  --with=xen-platform-pci --preload=xen-platform-pci 
  --with=virtio_blk --preload=virtio_blk 
  --with=virtio_pci --preload=virtio_pci 
  --with=virtio_console --preload=virtio_console 
  
  /boot/initramfs-$(uname -r).img $(uname -r)
  ```

- **CentOS/RedHat 6/7**
  
  ```bash
  mknitrd -f --allow-missing 
  --with=xen-blkfront --preload=xen-blkfront 
  --with=virtio_blk --preload=virtio_blk 
  --with=virtio_pci --preload=virtio_pci 
  --with=virtio_console --preload=virtio_console 
  
  /boot/initrd-$(uname -r).img $(uname -r)
  ```

- **Debian/Ubuntu**

  ```bash
  echo -e 'xen-blkfront\nvirtio_blk\nvirtio_pci\nvirtio_console' >> 
  /etc/initramfs-tools/modules
  mknitramfs -o /boot/initrd.img-$(uname -r)
  ```

**To compile and install virtio driver**

The following example uses a Red Hat server:

**To download the kernel package**

1. Run `yum install -y ncurses-devel gcc make wget` to install necessary components to compile the kernel.

2. Run `uname -r` to query the kernel version of your server, such as `4.4.24-2.a17.x86_64`.
3. Visit published Linux Kernel Archives to download the source codes of kernel, for example, the download link of kernel version starting with 4.4.24 is https://www.kernel.org/pub/linux/kernel/v4.x/linux-4.4.24.tar.gz.

4. Run `cd /usr/src/` to change the directory.


6. Run `tar -xzf linux-4.4.24.tar.gz` to decompress the package.

7. Run `ln -s linux-4.4.24 linux` to establish a link.

8. Run `cd /usr/src/linux` to change the directory.

To compile the kernel

1. Run the following commands to compile the driver into the kernel.

   ```bash
   make mrproper
   symvers_path=$(find /usr/src/ -name "Module.symvers")
   test -f $symvers_path && cp $symvers_path .
   cp /boot/config-$uname -r ./.config
   make menuconfig
   ```

2. Configure the corresponding settings of virtio driver in the following windows:

   ```bash
   Note:
   ```
Select * to build the driver in the kernel, select m to compile it as a module.

a. Press the space bar to select Virtualization.

Make sure that you have selected the option of KVM (Kernel-based Virtual Machine).

Processor type and features --->
[*] Paravirtualized guest support --->
--- Paravirtualized guest support
(128) Maximum allowed size of a domain in gigabytes
[*] KVM paravirtualized clock
Device Drivers  --->
[*] Block devices  --->
  <M> Virtio block driver (EXPERIMENTAL)
  -*- Network device support  --->
    <M> Virtio network driver (EXPERIMENTAL)

b. Press the Esc key to exit the kernel configuration windows, and save changes to file .config according to the dialog box.

c. Inspect whether all the corresponding settings of virtio driver has been correctly configured or not.

d. (Optional) If no configuration of virtio driver is settled after the inspect, run the following commands to edit the file .config manually.

```
make oldconfig
make prepare
make scripts
make
make install
```

e. Run the following commands to check whether the virtio driver is installed.

```
find /lib/modules/"$(uname -r)"/ -name "virtio.*" | grep -E "virtio.*"
grep -E "virtio.*" < /lib/modules/"$(uname -r)"/modules.builtin
```

**Note:**
If any of the output includes virtio_blk and virtio_pci.virtio_console, your server has correctly installed the virtio driver.

**What to do next**

After compiling the virtio driver, you can migrate your server to Alibaba Cloud by using the Cloud Migration Tool.
### 6.4.6 Customize Linux images

If the selected OS is not supported by Alibaba Cloud and cloud-int cannot be installed, you can select Customized Linux when importing a custom image. Alibaba Cloud regards customized Linux images as an unrecognized OS type. You must add a parsing script to the custom image before the import to automatically configure the instance when it is first started.

**Limits**

Customized Linux images have the following limits:

- The first partition must be writable.
- The type of the first partition must be FAT32, ext2, ext3, ext4, or UFS.
- The size of the virtual file of the customized Linux image must be larger than 5 GiB.

Customized Linux images have the following security requirements:

- No important vulnerabilities can be remotely exploited.
- When logging on to an instance for the first time through the Management terminal of the ECS console, you are required to change the initial password (if there is any) before you can perform any other actions.
- There is no default SSH key pair. The initial SSH private key pair must be randomly generated by Alibaba Cloud.

**Procedure**

Before creating and importing a customized Linux image, you must make the following configurations:

1. Create the aliyun_custom_image directory in the root directory of the first partition of the server from which the image is created.

   When the instance created from the customized Linux image is started for the first time, Alibaba Cloud writes instance configurations to the os.conf file in the aliyun_custom_image directory. If the os.conf file does not exist, Alibaba Cloud will automatically create one.

2. Create a parsing script in the image to parse the os.conf file to implement instance configurations. For more information about how to compile a script, see Considerations for the parsing script and Example of the parsing script.
Example of the os.conf file

The following section shows examples of the os.conf files for instances in classic networks and instances in VPCs.

- Instances in classic networks:

```ini
hostname=<yourHostName>
password=<yourPassword>
eth0_ip_addr=10.0.0.2
eth0_mac_addr=00:xx:xx:xx:xx:23
eth0_netmask=255.255.255.0
eth0_gateway=10.0.0.1
eth0_route="10.0.0.0/8 10.0.0.1;172.16.0.0/12 10.0.0.1"
eth1_ip_addr=42.0.0.2
eth1_mac_addr=00:xx:xx:xx:xx:24
eth1_netmask=255.255.255.0
eth1_gateway=42.0.0.1
eth1_route="0.0.0.0/0 42.0.0.1"
dns_nameserver="7.7.7.7 8.8.8.8"
```

The following table describes the parameters in the preceding example.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>hostname</td>
<td>The hostname.</td>
</tr>
<tr>
<td>password</td>
<td>The password, which is a Base64-encoded string.</td>
</tr>
<tr>
<td>eth0_ip_addr</td>
<td>The IP address of the eth0 NIC.</td>
</tr>
<tr>
<td>eth0_mac_addr</td>
<td>The MAC address of the eth0 NIC.</td>
</tr>
<tr>
<td>eth0_netmask</td>
<td>The network mask of the eth0 NIC.</td>
</tr>
<tr>
<td>eth0_gateway</td>
<td>The default gateway of the eth0 NIC.</td>
</tr>
<tr>
<td>eth0_route</td>
<td>The eth0 internal routes that are separated by semicolons (;) by default.</td>
</tr>
<tr>
<td>eth1_ip_addr</td>
<td>The IP address of the eth1 NIC.</td>
</tr>
<tr>
<td>eth1_mac_addr</td>
<td>The MAC address of the eth1 NIC.</td>
</tr>
<tr>
<td>eth1_netmask</td>
<td>The network mask of the eth1 NIC.</td>
</tr>
<tr>
<td>eth1_gateway</td>
<td>The default gateway of the eth1 NIC.</td>
</tr>
<tr>
<td>eth1_route</td>
<td>The eth1 Internet routes that are separated by semicolons (;) by default.</td>
</tr>
<tr>
<td>dns_nameserver</td>
<td>The DNS address list, in which addresses are separated by spaces by default.</td>
</tr>
</tbody>
</table>

- Instances in VPCs:

```ini
hostname=<yourHostName>
password=<yourPassword>
```
The following table describes the parameters in the preceding example.

<table>
<thead>
<tr>
<th><strong>Parameter</strong></th>
<th><strong>Description</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>hostname</td>
<td>The hostname</td>
</tr>
<tr>
<td>password</td>
<td>The password, which is a Base64-encoded string.</td>
</tr>
<tr>
<td>eth0_ip_addr</td>
<td>The IP address of the eth0 NIC.</td>
</tr>
<tr>
<td>eth0_mac_addr</td>
<td>The MAC address of the eth0 NIC.</td>
</tr>
<tr>
<td>eth0_netmask</td>
<td>The network mask of the eth0 NIC.</td>
</tr>
<tr>
<td>eth0_gateway</td>
<td>The default gateway of the eth0 NIC.</td>
</tr>
<tr>
<td>eth0_route</td>
<td>The eth0 internal and internet routes that are separated by semicolons (;) by default.</td>
</tr>
<tr>
<td>dns_nameserver</td>
<td>The DNS address list, in which addresses are separated by spaces by default.</td>
</tr>
</tbody>
</table>

**Considerations for the parsing script**

In normal cases, when an instance is started for the first time, Alibaba Cloud automatically writes instance configurations to the os.conf file. The os.conf file is in the aliyun_custom_image directory in the root directory of the first partition. However, you must create a predefined parsing script for a customized Linux image. The script will read the configurations from the os.conf file to configure the instance.

The parsing script must meet the following conditions:

<table>
<thead>
<tr>
<th><strong>Condition</strong></th>
<th><strong>Description</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Automatic start at system startup</td>
<td>Set the parsing script to be automatically started at system startup by placing the script in the /etc/init.d/ directory.</td>
</tr>
<tr>
<td>Values for configuration items</td>
<td>As shown in Example of the os.conf file, instances in classic networks and instances in VPCs differ in the number of configuration items and values of some configuration items.</td>
</tr>
<tr>
<td>Condition</td>
<td>Description</td>
</tr>
<tr>
<td>-----------</td>
<td>-------------</td>
</tr>
<tr>
<td>Path for the configuration file</td>
<td>Device names allocated to the first partition for instances created from the customized Linux image vary depending on whether the instances are I/O optimized. As a best practice, include uuid or label in your parsing code to identify the device allocated for the first partition. Because the user password is a Base64-encoded string, it must also be Base64-encoded in the parsing script.</td>
</tr>
</tbody>
</table>
| Network type | When determining the network type, the parsing script can check whether there are `eth1_route` or other `eth1`-related configuration items. The script will parse and process the instance accordingly based on the network type.  
  - Instances in VPCs are configured with the default Internet route and default internal route that are specified by the `eth0_route` parameter in the os.conf file.  
  - Instances in classic networks are configured with the default Internet route that is specified by the `eth1_route` parameter in the os.conf file, and with the default internal route that is specified by the `eth0_route` parameter. |
| Configuration optimization | Configurations in the os.conf file are executed only once during the instance lifecycle. We recommend that you delete the os.conf file after the parsing script is executed. The parsing script will not execute the configurations in the os.conf file if the script does not read any. |
| Customized image processing | When a custom image is created based on a customized Linux image, the automatic startup script is also included. Alibaba Cloud will write configurations to the os.conf file when the instance is started for the first time. Then, the parsing script immediately executes the configurations upon detection. |
| Configuration change processing | When instance configurations are changed through the Alibaba Cloud console or API operations, Alibaba Cloud writes new configurations to the os.conf file. Then, the parsing script runs again to issue the changes. |

**Example of the parsing script**

This section uses a parsing script for CentOS as an example. You must change the script content based on your operating system. Make sure to debug the script before you execute it.

```
#!/bin/bash
### BEGIN INIT INFO
# Provides:          os-conf
```
# Required-Start: $local_fs $network $named $remote_fs
# Required-Stop:
# Should-Stop:
# Default-Start: 2 3 4 5
# Default-Stop: 0 1 6
# Short-Description: The initial os-conf job, config the system.
### END INIT INFO

first_partition_dir='/boot/
os_conf_dir=${first_partition_dir}/aliyun_custom_image
os_conf_file=${os_conf_dir}/os.conf

load_os_conf() {
    if [[ -f $os_conf_file ]]; then
        . $os_conf_file
        return 0
    else
        return 1
    fi
}

cleanup() {
    # ensure $os_conf_file is deleted, to avoid repeating config system
    rm $os_conf_file >/dev/null
    # ensure $os_conf_dir exists
    mkdir -p $os_conf_dir
}

config_password() {
    if [[ -n $password ]]; then
        password=$(echo $password | base64 -d)
        if [[ $? == 0 && -n $password ]]; then
            echo "root:$password" | chpasswd
        fi
    fi
}

config_hostname() {
    if [[ -n $hostname ]]; then
        sed -i "s/^HOSTNAME=. */HOSTNAME=$hostname/" /etc/sysconfig/network
        hostname $hostname
    fi
}

config_dns() {
    if [[ -n $dns_nameserver ]]; then
        dns_conf=/etc/resolv.conf
        sed -i '/^nameserver.*/d' $dns_conf
        for i in $dns_nameserver; do
            echo "nameserver $i" >> $dns_conf
        done
    fi
}

is_classic_network() {
    # vpc: eth0
    # classic: eth0 eth1
    grep -q 'eth1' $os_conf_file
}

config_network() {
    /etc/init.d/network stop
    config_interface eth0 ${eth0_ip_addr} ${eth0_netmask} ${eth0_mac_addr}
    config_route eth0 "${eth0_route}"
if is_classic_network; then
    config_interface eth1 ${eth1_ip_addr} ${eth1_netmask} ${eth1_mac_addr}
    config_route eth1 "${eth1_route}"
fi
/etc/init.d/network start
}

config_interface() {
    local interface=$1
    local ip=$2
    local netmask=$3
    local mac=$4
    interface_cfg="/etc/sysconfig/network-scripts/ifcfg-${interface}"
    cat "< EOF > "$interface_cfg"
    DEVICE=$interface
    IPADDR=$ip
    NETMASK=$netmask
    HWADDR=$mac
    ONBOOT=yes
    BOOTPROTO=static
    EOF
}

config_default_gateway() {
    local gateway=$1
    sed -i "s/^GATEWAY=. */GATEWAY=$gateway/" /etc/sysconfig/network
}

config_route() {
    local interface=$1
    local route="$2"
    route_conf="/etc/sysconfig/network-scripts/route-${interface}"
    cat > $route_conf
    echo $route | sed 's/;/\n/' | \
    while read line; do
        dst=$(echo $line | awk '{print $1}"
        gw=$(echo $line | awk '{print $2}"
        if ! grep -q "$dst" $route_conf 2> /dev/null; then
            echo "$dst via $gw dev $interface" >> $route_conf
        fi
        if [[ "$dst" == "0.0.0.0/0" ]]; then
            config_default_gateway $gw
        fi
        done
    }
}

# sysvinit service portal

start() {
    if load_os_conf; then
        config_password
        config_network
        config_hostname
        config_dns
        cleanup
        return 0
    else
        echo "not load $os_conf_file"
        return 0
    fi
}

RETVAL=0
6.4.7 Convert the image file format

ECS can only import image files in the RAW, VHD, or qcow2 format. If you want to import image files in other formats, you must first convert their formats. This topic describes how to use the qemu-img tool to convert other image file formats to VHD or RAW.

Context

The qemu-img tool supports the following formats:

- Convert images from the RAW, qcow2, qcow1, VMDK, VDI, VHD (VPC), VHDX, or QED format to the VHD format.
- Convert between RAW and VHD.

Note:

The qemu-img tool cannot convert ISO images to the VHD or RAW format. To convert the image format, install the ISO image to VHD or RAW media, and then create an image in the specified format.

Windows

To install qemu-img and convert the image file format, perform the following steps:

1. Download and install qemu-img.
   
   This example uses installation path C:\Program Files\qemu. Visit qemu-img to download the qemu-img tool.
2. Create an environment variable for qemu-img.
   a) Choose Start > Computer, right-click Computer, and choose Properties from the shortcut menu.
   b) In the left-side navigation pane, click Advanced System Settings.
   c) In the System Properties dialog box that appears, click the Advanced tab and then click Environment Variables.
   d) In the Environment Variables dialog box that appears, find the Path variable from the System Variables section and then click Edit. If the Path variable does not exist, click New.
   e) Add a system variable value.
      - In the Edit System Variable dialog box that appears, add C:\Program Files\qemu to the Variable Value field. Use semicolons (;) to separate different variable values.
      - In the New System Variable dialog box that appears, enter Path in the Variable Name field and enter C:\Program Files\qemu in the Variable Value field.

3. Check whether the environment variable is properly configured.
   a) Open Command Prompt in Windows.
   b) Run the qemu-img --help command.
      If the command output is displayed, the environment variable is properly configured.

4. In Command Prompt, run the cd [Directory of the source image file] command to switch to a new file directory, for example, cd D:\ConvertImage.

5. Run the qemu-img convert -f qcow2 -O raw centos.qcow2 centos.raw command to convert the image file format.
   - The -f parameter is followed by the source image format.
   - The -O parameter (uppercase is required) is followed by the target image format, source file name, and target file name.
      When the conversion is complete, the target file will appear in the directory where the source image file is located.

Linux

To install qemu-img and convert the image file format, perform the following steps:
1. Install the qemu-img tool.

   Example:
   
   • For Ubuntu, run the `apt-get install qemu-utils` command.
   
   If the error `Unable to locate package qemu-utils` is returned during the installation on Ubuntu, run the following commands to install the qemu-img tool:
   
   ```
   apt-get update #Update the package list.
   apt-get install qemu-utils #Install the qemu-img tool.
   ```
   
   • For CentOS, run the `yum install qemu-img` command.

   Run `pip install -r requirements.txt` to install all of the dependent libraries based on the libraries contained in the requirements.txt file of cloud-init.

2. Run the `qemu-img convert -f qcow2 -O raw centos.qcow2 centos.raw` command to convert the image file format.

   • The `-f` parameter is followed by the source image format.
   
   • The `-O` parameter (uppercase is required) is followed by the target image format, source file name, and target file name.

   When the conversion is complete, the target file will appear in the directory where the source image file is located.

What's next

6.4.8 Import custom images

This topic describes how to import on-premises image files to your ECS environment. You can use imported images to create ECS instances or change the system disks of ECS instances.

Prerequisites

Before importing custom images, make sure that the following requirements have been met:

• You understand the limits for importing an on-premises image specified in Instructions for importing images, Customize Linux images, and Convert the image file format.

• You have #unique_65.
- If you are using a RAM user account, ensure that this account has been granted the permission for the AliyunECSImageImportDefaultRole role by the corresponding Alibaba Cloud account.

**Context**

When you import an image, a snapshot is automatically generated. You can view the snapshot information on the Snapshots page of the ECS console. Before the import image task is complete, the status of the snapshot is displayed as **Failed**. After the task is complete, the status automatically changes to **Successful**. The snapshot capacity is the size of the imported image file, regardless of the system disk size that was set when you import the image. The snapshot service is a paid service. For more information, see #unique_85.

The import image function allows you to select a license type to activate the source operating system. This can reduce your image usage costs on the cloud. For more information about license types, see Parameters for image import.

**Procedure**

1. Use a third-party OSS client or the OSS API to upload the prepared custom image file. If the file is larger than 5 GiB, see #unique_86.
2. Log on to the ECS console.
3. In the left-side navigation pane, choose **Instances & Images > Images**.
4. In the top navigation bar, select a region.
5. Authorize ECS to access your OSS resources.
   a) On the **Images** page, click **Import Image**.
   
   b) In the **Import Image** dialog box, click **Confirm Address** in step 3 shown in the following figure.

   ![Import Image](https://via.placeholder.com/150)

   *How to import an image:*
   1. Perform the following: Activate OSS
   2. Upload the image file to the bucket in the same region that the image will be imported to.
   3. Make sure that you have authorized ECS to access your OSS.
   4. Check if the image meets Notes

   c) On the **Cloud Resource Access Authorization** page, select AliyunECSImageImportDefaultRole and AliyunECSExportDefaultRole and click **Confirm Authorization Policy**.
6. Import the custom image.

   a) Go back to the Images page and click Import Image.

   b) In the Import Image dialog box, configure the following parameters:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Required</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Region of Image</strong></td>
<td>Yes</td>
<td>This field is automatically populated with the current region. To change the region, close the Import Image dialog box and select a new region in the top navigation bar of the Images page. You can then click Import Image again to configure other parameters.</td>
</tr>
<tr>
<td><strong>OSS Object Address</strong></td>
<td>Yes</td>
<td>Copy the object address of the image file from the OSS console. For more information, see #unique_87.</td>
</tr>
<tr>
<td><strong>Image Name</strong></td>
<td>Yes</td>
<td>Enter a name for the custom image. The name must be 2 to 128 characters in length and must start with a letter. It can contain letters, digits, periods (.), underscores (_), colons (:), and hyphens (-).</td>
</tr>
<tr>
<td><strong>Operating System</strong></td>
<td>Yes</td>
<td>Select the operating system of your image. Valid values: Windows</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If you want to import a non-standard platform image, select Linux.</td>
</tr>
<tr>
<td><strong>System Disk Size</strong></td>
<td>Yes</td>
<td>Specify the system disk size. Valid values: 40 GiB to 500 GiB.</td>
</tr>
<tr>
<td><strong>System Architecture</strong></td>
<td>Yes</td>
<td>Select x86_64 for 64-bit operating systems and i386 for 32-bit operating systems.</td>
</tr>
<tr>
<td><strong>Platform</strong></td>
<td>Yes</td>
<td>The options depend on your selected Operating System. Select a system platform for the image to be imported.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Linux: CentOS, SUSE, Ubuntu, Debian, FreeBSD, CoreOS, Aliyun, Customized Linux, and Others Linux. (Submit a ticket to confirm the selected edition is supported.)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• If your image operating system is a custom edition developed from Linux kernel, Submit a ticket.</td>
</tr>
<tr>
<td>Parameter</td>
<td>Required</td>
<td>Description</td>
</tr>
<tr>
<td>--------------------</td>
<td>----------</td>
<td>-----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Image Format</td>
<td>No</td>
<td>The qcow2, RAW, and VHD formats are supported. We recommend that you use the qcow2 and VHD formats.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Note:</strong> The ISO format is not supported. You can use offline tools such as VirtualBox to create an ISO image file and convert it to the RAW, VHD, or qcow2 format. You can also use Packer to create and import a local image. For more information, see <a href="#unique_88">Create and import on-premises images by using Packer</a>.</td>
</tr>
<tr>
<td>License Type</td>
<td>No</td>
<td>Select a license type to activate the source operating system after the image is imported. Valid values:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• <strong>BYOL</strong>: the license that is provided by the source operating system. When this option is selected, make sure that your license key can be used by Alibaba Cloud.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• <strong>Alibaba Cloud</strong>: the Alibaba Cloud software license. When this option is selected, the Alibaba Cloud license is applied to your selected Platform.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• <strong>Automatic</strong>: the default value. When this option is selected, Alibaba Cloud will automatically detect the source operating system and allocate a license. In this mode, the system automatically checks whether an Alibaba Cloud software license exists in your selected Platform and then performs the following actions:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- If a license exists, the system allocates the license to the imported image.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- If no license exists, the system switches the license type to <strong>BYOL</strong>.</td>
</tr>
<tr>
<td>Image Description</td>
<td>No</td>
<td>Enter a description for the custom image.</td>
</tr>
<tr>
<td>Add Images of Data Disks</td>
<td>No</td>
<td>Select this option if you want to import an image that contains data disks. Supported data disk capacity ranges from 5 GiB to 2,000 GiB.</td>
</tr>
</tbody>
</table>

c) Click **OK**. The system will create a task to import the custom image.
7. Optional: You can view the task progress in the image list of the destination region. Before the task is complete, you can find the imported custom image on the Tasks page in the ECS console and cancel the import task if needed. For more information, see Tasks.

The amount of time it takes to import a custom image depends on the size of the image file and the number of image import tasks in the queue.

What’s next

References

Create and import on-premises images by using Packer

Packer is a convenient open-source tool to create on-premises image files. It runs on the most major operating systems.

Image FAQ

Change the operating system

6.5 Copy custom images

This topic describes how to copy a custom image that is under your Alibaba Cloud account. This action enables you to create identical ECS instances across regions, allowing you to implement seamless data backups of the target instances.

Background information

An image is a regional resource, and a custom image belongs to the region where it is created. The following table lists the different scenarios of using custom images.

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Procedure</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copy images across regions under the same account</td>
<td>See Copy images.</td>
<td>When an image is copied, the corresponding snapshot is generated in the target region at the same time. After the copy operation is completed, a new image is generated in the target region, and it has a unique image ID.</td>
</tr>
<tr>
<td>Copy images across regions under different accounts</td>
<td>See Copy images and Share images.</td>
<td>An image is copied to the target region and then shared with the target account.</td>
</tr>
<tr>
<td>Scenario</td>
<td>Procedure</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>-----------</td>
<td>-------------</td>
</tr>
<tr>
<td>Share images in the same region under different accounts</td>
<td>See Share images.</td>
<td>This operation does not create a new image. The shared image still belongs to you.</td>
</tr>
</tbody>
</table>

**Limits**

Before you copy a custom image, note the following:

- Only custom images can be copied across regions. If you need to copy an image of another type, you need to first use that image to create an instance and then use that instance to create a custom image. Afterwards, you can copy the newly created custom image to the target region.

- When an image is copied, a corresponding snapshot is generated in the target region at the same time, and then a custom image is generated based on the snapshot. Therefore, data traffic occurs between the source and target regions. Currently, no fees are charged for this traffic. For the latest billing details, see the official Alibaba Cloud website for announcements.

- The created custom image in the target region has the same configuration as the original custom image. However, the related role authorization and service authorization information is not copied, nor are the settings of instance user data.

- The task completion time depends on the image size, the network transmission speed, and the number of concurrent tasks in the queue.

- Images with encrypted snapshots cannot be copied across regions.

**Procedure**

1. Log on to the ECS console.

2. In the left-side navigation pane, choose Instances & Images > Images.

3. In the top navigation bar, select a region.

4. Select the custom image to be copied. Note that Type must be Custom Image. Then, in the Actions column, click Copy Image.

**Note:**

If your custom image is larger than 500 GiB, when you click Copy image, you will be directed to open a ticket to complete the operation.
5. In the **Copy Image** dialog box, verify the ID of the selected image is the target image, and then complete the following configurations:

   a. Select the **Target Region**.

   b. Enter **Custom Image Name** and **Custom Image Description** that are shown in the target region.

   c. Click **OK**.

6. (Optional) Switch to the target region and check the progress. When 100% is displayed, the image is copied successfully.

   **Note:**

   If **Progress** is not 100%, **Status** is **Creating**. In this case, you can click **Cancel Copy** to cancel the operation. After the operation is canceled, the image information is removed from the target region.

   ![Image Name](image.png)

   You can also call the `CopyImage` and `CancelCopyImage` API actions to perform the preceding operations.

**What to do next**

When a copied image is in the **Available** state, you can use it to **create an instance** or **change the system disk**.

You can also view the copied snapshot in the target region.

**6.6 Share or unshare custom images**

This topic describes how to share or unshare custom images. After you create a custom image, you can share it with other Alibaba Cloud accounts. The Alibaba Cloud accounts can create ECS instances from the shared image. You can also unshare custom images from Alibaba Cloud accounts to which they were shared.

**Prerequisites**

Before you share an image, ensure that all sensitive data and files have been removed from the image.
Context

Images shared to an account are not counted against the image quota assigned to the account. Alibaba Cloud does not charge an account for images shared to it.

Only users who create an ECS instance from the shared custom image are charged. For more information about the billing of shared images, see Images.

Users can only use the shared image and cannot delete it directly. If you want to delete the shared image, you must first unshare and then delete it. For more information, see Delete custom images.

Before you share a custom image with an Alibaba Cloud account, note the following limitations:

- You can share only the custom images created under your account. You cannot share custom images that were created and shared by other accounts.
- Each custom image can be shared with up to 50 accounts.
- You can share images between the accounts on the China (aliyun.com), International (alibabacloud.com), and Japan (jp.alibabacloud.com) sites. However, the custom images that were created from Alibaba Cloud Marketplace images cannot be shared.
- Custom images cannot be shared across regions. If you want to share a custom image across regions, you must copy the image to the target region first. For more information, see Copy custom images.
- ECS cannot guarantee the integrity and security of shared images. Before you use the shared images, ensure that the images are from trusted users or accounts. You must assume all risks.

Share custom images

You can perform the following steps to share your custom image with an Alibaba Cloud account.

1. Log on to the ECS console.
2. In the left-side navigation pane, choose Instances & Images > Images.
3. In the top navigation bar, select a region.
4. On the Custom Images tab, select the custom image that you want to share. Choose More > Share Image in the Actions column.
5. In the **Share Image** dialog box that appears, select **Alibaba Cloud Account ID** from the **Account Type** drop-down list, enter the account ID with which you want to share images in the **Account** field, and click **Share Image**.

How to obtain the account ID: Move the pointer over the profile picture in the upper-right corner of the Alibaba Cloud console. Select **Security Settings** from the drop-down list. The account ID is displayed on the **Security Settings** page.

After you share a custom image with an account, the account can view the shared image from the ECS console by choosing **Instances & Images > Images > Shared Images** in the same region. The account that receives the shared image can perform the following operations:

- Create one or more ECS instances from the shared image.
  
  When you create an ECS instance, you can select Shared Image in the Image section. For more information, see #unique_22.
- Replace the system disk of an ECS instance with the shared image.
  
  For more information, see #unique_15.

### Unshare custom images

You can perform the following steps to unshare your custom image from an Alibaba Cloud account.

**Notice:**

After you unshare the custom images:

- The account that received the shared image cannot query the image from the ECS console or by calling the API operation.
- The account that received the shared image cannot create ECS instances or replace the system disk by using the image.
- The system disks of ECS instances that were created from the shared image cannot be reinitialized.

1. Log on to the **ECS console**.
2. In the left-side navigation pane, choose **Instances & Images > Images**.
3. In the top navigation bar, select a region.
4. On the **Custom Images** tab, select the custom image that you want to unshare. Choose **More > Share Image** in the **Actions** column.
5. In the **Share Image** dialog box that appears, select the account ID and click **Unshare**.

<table>
<thead>
<tr>
<th>Share Image</th>
</tr>
</thead>
<tbody>
<tr>
<td>You have already shared this image with 1 accounts.</td>
</tr>
<tr>
<td><strong>Account Type:</strong> Alibaba Cloud Account ID <strong>Account:</strong></td>
</tr>
<tr>
<td><strong>Alibaba Cloud Account ID</strong></td>
</tr>
<tr>
<td>5212345678</td>
</tr>
<tr>
<td><strong>Cancel Sharing</strong></td>
</tr>
<tr>
<td><strong>Total:</strong> 1 item(s), <strong>Per Page:</strong> 1 item(s)</td>
</tr>
</tbody>
</table>

**Related topics**
- #unique_94
- #unique_95

### 6.7 Export a custom image

You can export the custom images you created to OSS buckets, and then download the images to local computers. This topic describes the considerations for exporting custom images and how to export custom images.

**Prerequisites**

- An OSS bucket is available in the same region as that of the custom image to be exported.

If you have not created any OSS buckets, #unique_96 first.

**Note:**

Exporting a custom image will incur OSS storage fees and traffic fees for image download. For more information, see #unique_97.
• The custom image to be exported meets the following requirements:
  - It was not created from an Alibaba Cloud Marketplace image.
  - It does not contain a Windows Server operating system.
  - It does not contain snapshots of more than four data disks. The size of each data disk does not exceed 500 GiB.

Context

Before you export a custom image, note the following points:

• The time it takes to export a custom image depends on the size of the image and the number of ongoing export tasks in the queue.
• If an exported custom image contains data disk snapshots, multiple objects appear in your OSS bucket.
  The objects whose names contain system are system disk snapshots. The objects whose names contain data are data disk snapshots. The identifier of a data disk snapshot is the mount point of the source data disk, for example, xvdb and xvdc.
• To use the exported image to create identical Linux instances, make sure that the storage location and storage space division of files recorded in /etc/fstab are consistent with the exported data disk snapshot information.

Procedure

1. Log on to the ECS console.
2. In the left-side navigation pane, choose Instances & Images > Images.
3. In the top navigation bar, select a region.
4. Allow ECS to access your OSS resources.
   a) Find the custom image that you want to export. In the **Actions** column corresponding to the image, choose **More > Export Image**.
   b) In the **Export Image** dialog box that appears, click **Verify**.

![Export Image dialog box]

   c) In the **Cloud Resource Access Authorization** dialog box, click **Confirm Authorization Policy** to allow ECS to access your OSS resources.

5. In the left-side navigation pane, choose **Instances & Images > Images**.

6. On the **Custom Images** tab, find the target image. In the **Actions** column corresponding to the image, choose **More > Export Image**.
7. In the **Export Image** dialog box, set the following parameters:

- **Image Format**: Select a format to which the custom image is to be exported. The RAW, VHD, QCOW2, VDI, and VMDK formats are supported.
- **OSS Bucket Address**: Select an OSS bucket that belongs to the same region as the custom image.
- **OSS Object Prefix**: Set the prefix of the object name for the custom image. For example, if you set Demo as the prefix, the exported image is named Demo-[automatically generated object name] in the OSS bucket.

8. Click **OK** to export the custom image.

   You can cancel an image export task at any time before the task is completed. Go to the **Tasks** page in the ECS console, find the relevant task in the specified region, and cancel the task.

**What's next**

Download the custom image. For more information, see [Download objects](#).

**Note:**

If you select RAW as the image format, the default file name extension of the exported custom image is `.raw.tar.gz`, and the file name extension of the decompressed image is `.raw`. If your local computer runs a Mac OS X system, we recommend that you use GNU Tar to decompress the image.

**Related topics**

#unique_98
#unique_99

### 6.8 Delete custom images

This topic describes how to delete a custom image. You can delete a custom image if you no longer need it. Deleting a custom image does not impact the instances created from the image or images copied from this image. Similarly, deleting image copies of a custom image has no impact on this custom image.

**Limits**

- After a custom image is deleted, it cannot be used to create new ECS instances. However, ECS instances created from the deleted custom image can still run normally (that is, continue to incur fees), but these instances cannot reinitialize their cloud disks.
• If the to be deleted custom image has been shared to other accounts, you must remove all permissions that allow shared access to the custom image before you can delete the image. After a shared image is deleted:
  - Users who are using the shared image will no longer be able to find the image through the ECS console or ECS API, nor can they use the image to create ECS instances or replace cloud disks.
  - ECS instances that are created from the shared image cannot reinitialize their cloud disks.

Procedure

1. Log on to the ECS console.
2. In the left-side navigation pane, choose Instances & Images > Images.
3. In the top navigation bar, select a region.
4. On the Custom Images tab page, select the image you want to delete. Note that the image type must be Custom Image.

![Custom Images tab page](image.png)

5. Click Delete Image.
6. In the displayed dialog box, select the deletion method.
   - **Delete**: Delete a custom image by following the general procedures.
   - **Force Delete**: Forcibly delete a customer image. Select this option if you have created ECS instances by using this image.

![Warning](notice.png)

Notice:
After a custom image is forcibly deleted, instances created by using this image cannot reinitialize their cloud disks.

7. Click OK.

You can also call DeleteImage to delete a custom image.
7 Marketplace images

This topic provides an overview of Alibaba Cloud Marketplace images and the related operations. You can use Marketplace images to obtain a pre-installed running environment or application on an ECS instance.

Background information

Alibaba Cloud Marketplace offers a variety of pre-installed, secure images and related services that are provided by independent software vendors (ISVs). These images integrate software and functions such as Hypertext Preprocessor (PHP) and control panel into operating systems.

Note:
After you create an ECS instance from a Marketplace image, the system may send you a message stating that your license has expired. In this case, contact your image provider for technical support.

Purchase a Marketplace image

1. Log on to the ECS console.
2. In the left-side navigation pane, choose Instances & Images > Instances.
3. Select a region.
4. On the Instances page, click Create Instance to go to the ECS purchase page.
5. Complete basic configurations.

Note that in the Image section you need to click Marketplace Image and then Select from image market (including operating system).

6. In the dialog box that is displayed, select the image you need, or enter keywords in the search bar to search for the image.

7. Complete the other configurations as prompted and click Create Order. Then, you can create an ECS instance according to #unique_93.

Create an ECS instance from a Marketplace image

1. Log on to the Alibaba Cloud Marketplace.
2. Select the image you need, and click Deploy Now.
3. Optional. If you have not logged on to the Alibaba Cloud console, log on before you can proceed.
4. Finish the other configurations as prompted and click Create Order. Then, create an ECS instance according to #unique_93.

Note:
On the Pay page that is displayed after you click Create Order, you must confirm and pay off the required fees before you can create the ECS instance from the image.

After you purchase a Marketplace image, you can go to the Account Overview page to view your bill.

**Change the system disk of an ECS instance by using a Marketplace image**

To change the image of an ECS instance you have purchased to a Marketplace image, you must change the system disk of this ECS instance.

**Note:**
After you change the image, the data on the system disk is lost. Therefore, we recommend that you back up the data before you change the system disk. For more information, see #unique_34.

To change the system disk, you need to navigate to the Replace System Disk page, select Marketplace Image in the Image Type section, click Select from image market (including operating system) in the Image Name section, and then in the displayed Image market dialog box select the image you need. For more information, see #unique_15.
8 Open source tools
9 Change the operating system

You can convert the OS running on your ECS instance to another supported OS through the ECS console.

To change the operating system, you must change the system disk of an instance:

- If you want to use a custom image, see change the system disk (custom image).
- If you want to use a public image, see change a system disk (public image).

Note:
Currently, instances that are hosted in regions outside of mainland China do not support swapping between Linux and Windows OSs. If your instance is hosted in one of these regions, you can only change its version of Windows OS to another version of Windows, or replace its current Linux OS with another Linux OS.
10 Image FAQ

This topic provides answers to frequently asked questions (FAQ) about ECS images.

- FAQ about Aliyun Linux 2
  - What are the differences between Aliyun Linux and Aliyun Linux 2?
  - How do I use Aliyun Linux 2 in Alibaba Cloud public cloud?
  - Will I be charged for using Aliyun Linux 2 in Alibaba Cloud ECS?
  - Which ECS instance types does Aliyun Linux 2 support?
  - Does Aliyun Linux 2 support 32-bit applications or databases?
  - Does Aliyun Linux 2 provide a graphical user interface (GUI) desktop?
  - Can I view the source code of Aliyun Linux 2 components?
  - Is Aliyun Linux 2 backward-compatible with the current Aliyun Linux version?
  - Can I use Aliyun Linux 2 on local computers?
  - Which third-party applications can run on Aliyun Linux 2?
  - What are the advantages of Aliyun Linux 2 compared with other Linux operating systems?
  - How does Aliyun Linux 2 ensure data security?
  - Does Aliyun Linux 2 support data encryption?
  - How do I grant permissions to manage Aliyun Linux 2?

- Common FAQ
  - Can I replace the selected image of an ECS instance?
  - Do the system disks of ECS instances support KMS encryption? How do I use KMS encryption through Terraform or Packer?
  - What are the differences and relationships between snapshots and images?
• FAQ about custom images

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- How do I view the data disk usage?
- How do I unmount file systems and delete disk table data?
- How do I confirm that a data disk has been unmounted and that a new custom image can be created?
- Does a custom image still exist after its corresponding instance is released?
- Is the custom image from which an instance is created affected when the instance expires or its data is deleted? Is the instance created from the custom image affected?
- Can I replace the operating system of an instance that is created from a custom image? Can the custom image still be used after the replacement?
- Can I select a custom image with a different operating system when I replace the system disk of an instance?
- Can I use a custom image to overwrite the system disk data of an ECS instance?
- Can I upgrade the CPU, memory, bandwidth, and hard disks of an ECS instance that is created from a custom image?
- Can I use a custom image across regions?
- Can a custom image that is created from a subscription instance be used to create a pay-as-you-go instance?
- When I create an ECS instance from a custom image, I specify a greater capacity for the instance system disk than the size of the system disk snapshot contained in the image. However, when I log on to the new ECS instance, I find that the system disk capacity is not expanded. What can I do?
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- How do I configure and use a private Docker image registry?
- How do I clone an ECS instance?
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  - Are there any size limits on copying an image?
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  - How do I migrate data from regions outside mainland China to regions inside mainland China?

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  - After an account shares an image to me, can I share this image to another account?
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  - What kinds of licenses can be used when I import custom images?
  - How are images imported with BYOLs charged?
  - How are BYOLs authenticated and subscribed through Alibaba Cloud when their subscription expires?
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  - I want to export an image to my local computer for testing. What can I do?

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  - Can I delete a custom image from my account after I share the image to another account?
  - If I unshare custom image M to Account A, what will happen?
  - When deleting an image, I am prompted with a message similar to "The specified image cannot be deleted because it is associated with instances." Why?

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  - When I replace a system disk, can I select an image that contains data disks for the new system disk?
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  - What server environments and scenarios do Alibaba Cloud Marketplace images support?
  - Are Alibaba Cloud Marketplace images safe?
  - What can I do if I encounter a problem when installing or using an Alibaba Cloud Marketplace image?
  - How do I purchase an Alibaba Cloud Marketplace image?
  - How long can I use a purchased image?
  - Are Alibaba Cloud Marketplace images refundable?
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  - I bought an Alibaba Cloud Marketplace image in the China (Hangzhou) region. Can I use it to create an ECS instance or replace a system disk in the China (Beijing) region?
  - My ECS instance is created from an Alibaba Cloud Marketplace image. Do I need to make further payments when I upgrade or renew my ECS instance?
  - My ECS instance is created from an Alibaba Cloud Marketplace image. After my ECS instance is released, can I continue to use that image free of charge when I purchase a new ECS instance?
  - I created an ECS instance from an Alibaba Cloud Marketplace image and then created a custom image from the instance. Do I need to pay for the custom image when I use it to create an ECS instance?
  - If I copy an Alibaba Cloud Marketplace image that I bought to another region to create an ECS instance, do I need to pay for the image?
  - I created an ECS instance from an Alibaba Cloud Marketplace image and then created a custom image from that instance. If I share the custom image to Account B, does
Account B need to pay for the custom image when it uses the image to create an ECS instance?

- Is a fee charged if I replace a system disk by using an Alibaba Cloud Marketplace image or an image that derives from an Alibaba Cloud Marketplace image?

- My ECS instance is using an Alibaba Cloud Marketplace image. Is a fee charged if I replace the system disk?

- How do I call an ECS API operation to use an Alibaba Cloud Marketplace image or a custom or shared image that derives from an Alibaba Cloud Marketplace to create an ECS instance or replace a system disk?

- If I do not purchase an Alibaba Cloud Marketplace image or an image that derives from an Alibaba Cloud Marketplace image, will an error be reported when I call an ECS API operation to use the image to create an ECS instance or replace a system disk?

- My Auto Scaling (ESS) service is configured to automatically create a number of ECS instances from 10 to 100. What can I do with Alibaba Cloud Marketplace images to ensure that ECS instances are created to suit my computing needs?

- Can I purchase multiple Alibaba Cloud Marketplace images at a time?

- If an Alibaba Cloud Marketplace image such as jxsc000010 or jxsc000019 that is previously in use no longer exists, what can I do to ensure that ECS instances are properly created based on the corresponding scaling configuration within an existing scaling group?

- Can one product code support images of different regions?

- I bought 100 images with the same product code. Can I use them within any region?

- After I select I/O Optimized, I cannot select Alibaba Cloud Marketplace images when I purchase an ECS instance. What is the cause and how can I resolve this issue?
FAQ about subscription Alibaba Cloud Marketplace images

- What are yearly, monthly, and weekly subscription Alibaba Cloud Marketplace images?
- In which ECS instances can I use a subscription image?
- How do I purchase a subscription image? Can I purchase it separately?
- How do I pay for subscription images?
- Can I use a subscription image after it expires? How do I continue to use it?
- After purchasing a subscription image, can I request a refund if I no longer want to use it?
- What can I expect when a refund is made?
- Can a subscription image be converted to a pay-as-you-go image?
- Can I replace a subscription image with an image of another type or vice versa? How is the fee calculated?
- Where do I view and manage the subscription images that I purchased?
- Is a fee charged for creating a custom image from a subscription image? How will created custom images be affected if their corresponding subscription images expire?
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  - Why cannot I select a Windows operating system for some ECS instances?
  - Does Alibaba Cloud support Windows Server 2008 and Windows Server 2008 R2?
  - The operating system of my instance is Windows Server. I am prompted with a message indicating that the operating system is not genuine. What can I do?
  - Is a fee charged for the operating system of an ECS instance?
  - Can I install or upgrade my operating system?
  - Do operating systems have a graphical interface?
  - How do I choose an operating system?
  - Do public images come with the FTP service?
  - Which SUSE versions do Alibaba Cloud public images support?
  - What service support is available for SUSE operating systems?
  - If an image was manually created from an ECS instance, can I retrieve the instance data after the instance is released upon expiration?
  - I have an ECS instance and I want to create another ECS instance from the image of the current ECS instance. What can I do?
  - I have purchased an ECS instance. How do I restore my shared image to the newly purchased instance?
  - I have multiple Alibaba Cloud accounts. I want to transfer an instance from Account A to Account B or migrate the environment and applications of an instance under Account A to an instance under Account B. What can I do?
  - How do I migrate data between ECS instances?
  - Can ECS instances in different VPCs communicate with each other?
  - How do I handle a CentOS DNS resolution timeout?
  - Why does ECS disable virtual memory and leave Swap partitions unconfigured by default?
  - How do I enable the kdump service in a public image?
  - How do I enable or disable the Meltdown and Spectre patches for Linux images?
  - After I use an ECS instance without restarting it for an extended period of time that exceeds the specified threshold, the instance is disconnected from the network, the
network is no longer available, or the public or private IP address of the instance cannot be pinged. What can I do?

- The "UNEXPECTED INCONSISTENCY; RUN fsck MANUALLY." error is reported when an ECS instance starts. What can I do?
- How do I upgrade Red Hat Enterprise Linux (RHEL) 7 to RHEL 8?

What are the differences between Aliyun Linux and Aliyun Linux 2?

Aliyun Linux 2 differs from Aliyun Linux in the following aspects:

- Aliyun Linux 2 is optimized for containers to better support cloud-native applications.
- Aliyun Linux 2 is equipped with an updated Linux kernel and updated user-mode packages.

How do I use Aliyun Linux 2 in Alibaba Cloud public cloud?

Alibaba Cloud provides an official public image for Aliyun Linux 2. You can select this image when you create an ECS instance.

Will I be charged for using Aliyun Linux 2 in Alibaba Cloud ECS?

No. You will not be charged for using Aliyun Linux 2 in Alibaba Cloud ECS. Aliyun Linux 2 images are free of charge. You will only be charged for the ECS instances to which the images are applied.

Which ECS instance types does Aliyun Linux 2 support?

Aliyun Linux 2 supports most ECS instance types, including ECS Bare Metal Instances.

Note:

Aliyun Linux 2 cannot be used with ECS instances that use the Xen virtual machine platform or with ECS instances in classic networks. Aliyun Linux 2 will not be displayed as an option on the page for creating these instances.

Does Aliyun Linux 2 support 32-bit applications or databases?

No. Aliyun Linux 2 does not support 32-bit applications or databases.

Does Aliyun Linux 2 provide a graphical user interface (GUI) desktop?

No. Aliyun Linux 2 does not provide a GUI desktop.
Can I view the source code of Aliyun Linux 2 components?

Yes. Aliyun Linux 2 is open source. You can use the yumdownloader tool or visit the official Alibaba Cloud download pages to download the source code package. You can also download the source code tree of the Aliyun Linux kernel from GitHub.

Is Aliyun Linux 2 backward-compatible with the current Aliyun Linux version?

Yes. Aliyun Linux 2 is compatible with Aliyun Linux 17.01.

Note:
You may need to re-compile a compiled kernel module on Aliyun Linux 2 before it can be used.

Can I use Aliyun Linux 2 on local computers?

No. Aliyun Linux 2 supports only Alibaba Cloud ECS, not third-party virtualization platforms.

Which third-party applications can run on Aliyun Linux 2?

Aliyun Linux 2 is binary compatible with CentOS 7.6.1810. Applications that can run on CentOS can also run on Aliyun Linux 2.

What are the advantages of Aliyun Linux 2 compared with other Linux operating systems?

Aliyun Linux 2 is binary compatible with CentOS 7.6.1810 and provides differentiated operating system features.

Compared with CentOS and RHEL, Aliyun Linux 2 has the following advantages:

• Updates are released at a faster pace. Updated Linux kernels, user-mode software, and toolkits are provided.
• Aliyun Linux 2 works out of the box and requires the minimal configuration.
• Aliyun Linux 2 is optimized to work with the optimized hypervisor and maximizes performance for users.
• Unlike RHEL, Aliyun Linux 2 does not have any runtime charges. Different from CentOS, Alibaba Cloud provides commercial support for Aliyun Linux 2.

How does Aliyun Linux 2 ensure data security?

Aliyun Linux 2 is binary compatible with CentOS 7.6.1810 and RHEL 7.6 and complies with the RHEL safety specifications. Aliyun Linux 2 uses the following tools to protect your data:

• Uses industry-standard vulnerability scan and security test tools to perform periodical security scanning.
• Periodically assesses the CVE patch updates of CentOS 7 to fix operating system security vulnerabilities.
• Supports existing solutions of Alibaba Cloud for operating system security enhancement.
• Uses the same mechanism as CentOS 7 to release user security alerts and patch updates.

**Does Aliyun Linux 2 support data encryption?**

Yes. Aliyun Linux 2 uses the CentOS 7 data encryption toolkit that is implemented by Key Management Service (KMS) to encrypt data.

**How do I grant permissions to manage Aliyun Linux 2?**

You can grant management permissions in Aliyun Linux 2 in the same manner as you would do in Alibaba Cloud CentOS 7. This means the same commands can be used to grant management permissions in both CentOS 7 and Aliyun Linux 2.

**Can I replace the selected image of an ECS instance?**

Yes. In the ECS console, you can replace the image of your ECS instance by selecting Replace System Disk. Note that replacing an image will result in the loss of system disk data. Make sure that you have backed up your data before you replace the system disk.

**Do the system disks of ECS instances support KMS encryption? How do I use KMS encryption through Terraform or Packer?**

The system disks of ECS instances support KMS encryption. After you select KMS encryption, ECS automatically creates a dedicated CMK in the region where KMS is used. For more information, see #unique_101.

BYOK encryption and Packer encryption will be supported soon.

In Terraform, you can set the encrypted parameter to enable or disable KMS encryption. For more information, see alicloud_disks.

**What are the differences and relationships between snapshots and images?**

Images and snapshots differ in the following ways:
• Images can be directly used to create ECS instances, while snapshots cannot.
• A snapshot can be a data backup of either the system disk or a data disk of an ECS instance, while an image must contain the system disk data of an ECS instance.
• A snapshot can be used only to restore data of the current ECS instance disk, while an image can be used to replace the system disk of any ECS instance or create a new ECS instance.

• Snapshots cannot be used across regions. To restore instance data in other regions, you can use a custom image. For more information, see Copy custom images.

• Images and snapshots apply to different scenarios. Here are a few scenarios where snapshots and custom images are used:

Scenarios for snapshots

- Regular backup of data. Automatically create snapshots to back up data on a daily, weekly, or monthly basis based on automatic snapshot policies.

- Temporary backup of data. Examples:
  ■ Before a temporary system change such as system update and application release, manually create a snapshot to back up the system data.
  ■ Create a snapshot to back up data before the system disk is resized.
  ■ To migrate data to another disk, create a snapshot of the source disk and use the snapshot to overwrite the data on the destination disk.

Scenarios for custom images

- Back up systems that will not change in a short term, such as applications and systems that have been released or updated.

- Create new ECS instances. For example, you can use a custom image to create an ECS instance with multiple applications deployed.

- Migrate systems and data. For example, you can migrate ECS instances from classic networks to VPCs.

- Restore systems across regions and zones.

The relationships between snapshots and images are as follows:

When you create a custom image from an instance, ECS creates a snapshot for each disk of the instance. The custom image that is created contains the snapshots of all the disks of this ECS instance. For more information, see Create a custom image by using an instance.

You can also create custom images by using system disk snapshots. For more information, see Create a custom image by using a snapshot.
Can I use a snapshot of a data disk to create a custom image?

Only system disks can be used to create custom images. Data disks cannot be used to create custom images.

However, you can add a snapshot of a data disk when you use a snapshot of a system disk to create a custom image. For more information, see Create a custom image by using a snapshot.

How do I view the data disk usage?

You can run the `df` command to view the data disk usage and where file systems are mounted. Example: `df -lh`.

You can run the `fdisk` command to view the partition information of a data disk. Example: `fdisk -l`.

How do I unmount file systems and delete disk table data?

Assume that `/dev/hda5` is mounted to `/mnt/hda5`. You can run any of the following commands to unmount the file systems that were mounted:

```
umount /dev/hda5
umount /mnt/hda5
umount /dev/hda5 /mnt/hda5
```

 `/etc/fstab` is an important profile in Linux systems. It contains detailed information about file systems and storage devices that are mounted to the system at system startup.

If you do not want to mount a partition when you start an instance, you must delete the corresponding statement from the `/etc/fstab` file. For example, after the following statement is deleted from the `/etc/fstab` file, `xvdb1` will not be loaded at system startup.

```
/dev/xvdb1 /leejd ext4 defaults 0 0
```

The following table lists other important profiles in Linux systems.

<table>
<thead>
<tr>
<th>Profile</th>
<th>Description</th>
<th>Risk of modifying the profile</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>/etc/issue*</code>, <code>/etc/*-release</code>, <code>/etc/*_version</code></td>
<td>The system release profile</td>
<td>Modifying <code>/etc/issue*</code> causes system creation and release recognition failures.</td>
</tr>
<tr>
<td>Profile</td>
<td>Description</td>
<td>Risk of modifying the profile</td>
</tr>
<tr>
<td>-------------------------</td>
<td>--------------------------------------------------</td>
<td>---------------------------------------------------------------------</td>
</tr>
<tr>
<td>/boot/grub/menu.lst, /boot/grub/grub.conf</td>
<td>The system boot profile</td>
<td>Modifying /boot/grub/menu.lst causes kernel load and system boot failures.</td>
</tr>
<tr>
<td>/etc/fstab</td>
<td>The profile for mounting partitions at system startup</td>
<td>Modifying /etc/fstab causes partition load and system boot failures.</td>
</tr>
<tr>
<td>/etc/shadow</td>
<td>The system password-related profile</td>
<td>Changing /etc/shadow to read-only causes password file modification and system creation failures.</td>
</tr>
<tr>
<td>/etc/selinux/config</td>
<td>The system security policy profile</td>
<td>Modifying /etc/selinux/config to enable SELinux causes system boot failures.</td>
</tr>
</tbody>
</table>

How do I confirm that a data disk has been unmounted and that a new custom image can be created?

You can perform the following steps:

1. Confirm that the statement used to automatically mount data disk partitions has been deleted from the /etc/fstab file.
2. Run the `mount` command to view the mount information of all devices. Confirm that information about corresponding data disk partitions is not displayed in the command output.

Does a custom image still exist after its corresponding instance is released?

Yes.

Is the custom image from which an instance is created affected when the instance expires or its data is deleted? Is the instance created from the custom image affected?

No. The custom image and the instance are not affected.

Can I replace the operating system of an instance that is created from a custom image? Can the custom image still be used after the replacement?

Yes. You can replace the operating system of an instance that is created from a custom image. The custom image can still be used after the replacement.
Can I select a custom image with a different operating system when I replace the system disk of an instance?

Yes. For more information, see #unique_15.

**Note:**
When a custom image is used to replace a system disk, all of the original system disk data is overwritten.

Can I use a custom image to overwrite the system disk data of an ECS instance?

Yes. For more information, see #unique_15.

**Note:**
The custom image will overwrite all data in the system disk of the ECS instance.

Can I upgrade the CPU, memory, bandwidth, and hard disks of an ECS instance that is created from a custom image?

Yes.

Can I use a custom image across regions?

No. A custom image can be used only within a single region. For example, a custom image that is created from an instance in the China (Hangzhou) region cannot be used to create an ECS instance in the China (Shanghai) region.

If you want to use a custom image across regions, you can copy the image to the destination region. For more information, see Copy custom images.

Can a custom image that is created from a subscription instance be used to create a pay-as-you-go instance?

Yes. The usage of custom images has nothing to do with the billing methods of instances.

When I create an ECS instance from a custom image, I specify a greater capacity for the instance system disk than the size of the system disk snapshot contained in the image. However, when I log on to the new ECS instance, I find that the system disk capacity is not expanded. What can I do?

The system disk capacity of an instance that is created from a custom image may fail to expand due to any of the following reasons: the cloud-init service is not installed, the cloud-init service fails, or the file systems do not support the capacity expansion.
You can manually expand the system disk capacity.

**Why do I need to comment out mounted items when I create a custom image or an ECS instance?**

When you create an ECS instance from a custom image, the following conditions can cause disks to fail to be mounted:

- The ECS instance that is created does not have a data disk.
- The data disk is a new disk and is not formatted or partitioned.
- The mounted disks are not commented out in the /etc/fstab file in the custom image that is created.

The following content describes an example of data disk mounting failure. In this example, the data disk of an ECS instance that is created from a custom image is not partitioned, and the mounted disks are not commented out in the /etc/fstab file in the custom image.

1. The data disk of the ECS instance is not partitioned, as shown in the following figure.

```
[root@test ~]# fdisk -l

Disk /dev/xvda: 21.5 GB, 21474836480 bytes
255 heads, 63 sectors/track, 2610 cylinders
Units = cylinders of 16065 * 512 = 8225280 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk identifier: 0x00078f9c

  Device  Boot   Start   End     Blocks  Id  System
/dev/xvda1   *       1    2611    20970496   83  Linux

Disk /dev/xvdb: 10.7 GB, 10737418240 bytes
255 heads, 63 sectors/track, 1305 cylinders
Units = cylinders of 16065 * 512 = 8225280 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disk identifier: 0x00000000
```
2. In the ECS instance, the mounted disks are not commented out in /etc/fstab, as shown in the following figure.

```
[root@test ~]# cat /etc/fstab
# /etc/fstab
# Created by anaconda on Thu Aug 14 21:16:42 2014
# Accessible filesystems, by reference, are maintained under '/dev/disk'
# See man pages fstab(5), findfs(8), mount(8) and/or blkid(8) for more info
#
UUID=966a83f0-6baf-4c01-b45e-4e4a2780e39c / ext4 defaults,barrier=0 1 1
tmpfs /dev/shm tmpfs defaults 0 0
devpts /dev/pts devpts gid=5,mode=620 0 0
sysfs /sys sysfs defaults 0 0
proc /proc proc defaults 0 0
/dev/xvdb1 /alidata ext4 defaults 0 0
```

3. When the instance starts, the data disk is mounted based on the configurations in /etc /fstab. However, the mount operation fails because the data disk is not partitioned, as shown in the following figure.

```
[root@test ~]# mount -a
mount: special device /dev/xvdb1 does not exist
[root@test ~]#
```

When you are creating an ECS instance with data disks from the snapshots of partitioned and formatted data disks, you do not need to comment out the mounted disks.

If the problem persists, we recommend that you submit a ticket.

**How do I configure and use a private Docker image registry?**

Image management is at the core of Docker. To allow organizations to share images internally, Docker has created the open source docker-registry on GitHub to act as a repository of private Docker images.

Start docker-registry that supports Alibaba Cloud OSS. You can download docker-registry from GitHub and install it, and run the `pip install docker-registry-driver-alioss` command to install the OSS driver.
1. Run docker-registry.
   
   ```
   docker run -e OSS_BUCKET=-e STORAGE_PATH=/docker/ -e OSS_KEY=-e OSS_SECRET=-p 5000:5000 -d chrisjin/registry:ali_oss
   ```

2. Configure config.yml.
   
   ```
   local: &local
   <<: *common
   storage: alioss
   storage_path: _env:STORAGE_PATH:/devregistry/
   oss_bucket: _env:OSS_BUCKET[:default_value]
   oss_accessid: _env:OSS_KEY[:your_access_id]
   oss_accesskey: _env:OSS_SECRET[:your_access_key]
   ```

   
   ```
   DOCKER_REGISTRY_CONFIG=[your_config_path] gunicorn -k gevent -b 0.0.0.0:5000 -w 1 docker_registry.wi:application
   ```

   If the problem persists, we recommend that you submit a ticket.

**How do I clone an ECS instance?**

You can clone the environment and data of an existing ECS instance under your account to create identical ECS instances within the same region.

1. Log on to the **ECS console**.
2. Select the ECS instance that you want to clone and create snapshots for its system disk and data disks. For more information, see #unique_34.

   **Note:**

   To ensure data consistency, create snapshots only when the instance is in the **Stopped** state.

3. Use the system disk snapshot to create a custom image. In the Create Custom Image dialog box, select **Add Data Disk Snapshot** and click **Add** to add one or more data disk snapshots to the image. For more information, see Create a custom image by using a snapshot.
4. Create an ECS instance by following the instructions in #unique_22. During the creation process, note the following parameters:

- **Region**: You must select the same region as that of the cloned instance.
- **Image**: Select **Custom Image** as the image type. Then, select the custom image that you created in the previous step from the drop-down list.

**Note:**
If the selected custom image contains one or more data disk snapshots, an equal number of data disks are automatically created from these snapshots. Each disk has the same size as the snapshot from which it is created. You can increase the size of a data disk but cannot decrease it.

In addition, you can use Operation Orchestration Service (OOS) to perform automated cloning:

- For cross-region cloning, go to ACS-ECS-CloneInstancesAcrossRegion. In the top navigation bar, select the region where the instance is located. Use the ACS-ECS-CloneInstancesAcrossRegion public template to clone the ECS instance across regions.
- For cloning within a region, go to ACS-ECS-CloneInstancesAcrossAZ. In the top navigation bar, select the region where the instance is located. Use the ACS-ECS-CloneInstancesAcrossAZ public template to clone the ECS instance across zones.

**Some custom images cannot be used to create I/O optimized instances. What can I do?**

Some custom images cannot be used to create I/O optimized instances. If you want to use such a custom image to create an I/O optimized instance, we recommend that you submit a ticket that contains the image name.

**Where do I view the progress of an image being imported? How long does it take to import an image?**

You can view the progress of an image being imported on the Images page in the ECS console. It may take an extended period of time to import a custom image. The amount of time it takes to import an image depends on the image size and the number of concurrent import tasks in the queue.
**Where do I view the progress of an image being created? How long does it take to create an image?**

You can view the progress of an image being created on the Images page in the ECS console. The amount of time it takes to create an image depends on the size of the disk from which the image is created.

**When do I need to copy a custom image?**

Custom images can be used only within the same region and cannot be used directly across regions. You can copy custom images to achieve the following goals:

- Deploy applications in ECS instances to multiple regions.
- Migrate ECS instances to other regions.
- Use custom images across regions.

You can copy a custom image from one region to another and use the custom image to create the same application environment within the destination region.

**Which images can be copied?**

Only custom images can be copied. Public images, Alibaba Cloud Marketplace images, and images shared by others cannot be copied.

**Which regions support copying custom images?**

All Alibaba Cloud regions support copying custom images.

**How long does it take to copy a custom image?**

Copying a custom image will transmit the image files from one region to another through the network. The amount of time it takes depends on the network transmission speed and the number of transmission tasks in the queue.

**How am I charged when I copy a custom image?**

You must perform the following operations to copy a custom image:

1. Copy the snapshot from which the custom image is created from the source region to the destination region.
2. Create a custom image from the snapshot in the destination region.

The preceding operations may incur the following fees:
• Fees for traffic between the two regions. Alibaba Cloud has not started charging for cross-region traffic. For the latest billing details, see the official Alibaba Cloud website for announcements.
• The copied snapshot consumes snapshot capacity. For the latest snapshot billing details, see the official Alibaba Cloud website for announcements.

What are the limits on the original and new images during the copy process?

The original image cannot be deleted during the copy process. The copy process can be canceled, but the new image cannot be used to replace a system disk or create an ECS instance.

How do I copy the images under my Alibaba Cloud account to other regions under other Alibaba Cloud accounts?

You must copy your own images to the destination regions and then share the images to the intended Alibaba Cloud accounts. After the images are shared, they are displayed in the shared image lists of those accounts.

Are there any size limits on copying an image?

No. There are no size limits on copying an image. However, if you click Copy Image in the ECS console to copy an image whose size exceeds 500 GiB, you will be prompted to submit a ticket.

Can I copy a custom image that is created from an Alibaba Cloud Marketplace image across regions?

If an Alibaba Cloud Marketplace image is available in the destination region, you can copy the custom image that is created from the Alibaba Cloud Marketplace image to the destination region. Otherwise, the following error message is displayed when you copy the custom image.
How do I migrate data from regions outside mainland China to regions inside mainland China?

You can do this by copying custom images. For more information, see Copy custom images.

How many images can be shared to me?

100.

To how many users can an image be shared?

50.

I have accounts on different Alibaba Cloud sites. Can I share images between these accounts?

Yes. Any images, except for the custom images that are created from Alibaba Cloud Marketplace images, can be shared between your accounts on the China site (aliyun.com), International site (alibabacloud.com), and Japan site (jp.alibabacloud.com).

Do shared images consume my image quota?

No. Shared images do not consume the image quota.

Are geographical limits available for creating instances from shared images?

Yes. Instances can only be created in the same regions as the shared images from which the instances are created.

What are the risks of creating an instance from a shared image?

The image owner can view how the image is shared and can delete the image. After a shared image is deleted by its owner, the system disks of the ECS instances that use this image cannot be reinitialized.

Alibaba Cloud does not guarantee the integrity and security of images shared by other accounts. We recommend that you select images shared by trusted accounts. After you
create an ECS instance from a shared image, you must log on to the ECS instance to check the security and integrity of the shared image.

**What are the risks if I share a custom image to other accounts?**

There is a risk that data and software may be leaked or stolen. Before you share a custom image to other accounts, check whether the image contains any sensitive or important data. After you share your image to other accounts, they can use the shared image to create ECS instances, which can then be used to create more custom images. Over this process, data can be spread repeatedly, creating a risk of data being disclosed beyond your original intentions.

**After an account shares an image to me, can I share this image to another account?**

No. Only the owner of an image can share it to other accounts.

**After I share an image to others, can I still use this image to create an instance?**

Yes. After you share an image to another account, you can still use the image to create an ECS instance. You can also continue to create a custom image from the ECS instance.

**Can an image that is created from Instance A in one region be shared to Instance B in a different region?**

- If the instances A and B belong to the same account, you can copy the image to the region of Instance B and apply it to Instance B. For more information, see Copy custom images.
- If the instances A and B belong to different accounts, you can copy the image to the region of Instance B and share the image to the account of Instance B. For more information, see Copy custom images and Share or unshare custom images.

**Can Bring Your Own Licenses (BYOL) be used when I import custom images?**

Yes. You can configure the license types by using the image import feature in the ECS console or by calling the `ImportImage` operation. For more information, see `#unique_84` and `#unique_102`.

**What kinds of licenses can be used when I import custom images?**

The following licenses can be used when you import custom images:

- Aliyun licenses

  The licenses provided by Alibaba Cloud, mainly the licenses for Windows Server operating systems. If cloud-init is installed on the imported image, Alibaba Cloud...
will use Key Management Service (KMS) to activate the operating system and provide Windows Server Update Services (WSUS).

- BYOLs

BYOLs are mainly used in the following scenarios:

  - Microsoft BYOLs

    Microsoft BYOLs are used in the following scenarios:

    ■ BYOLs implemented through Software Assurance (SA)

    Software programs that support License Mobility, such as SQL Server and SharePoint, can implement BYOLs by creating ECS instances.

    ■ Windows operating systems

    Windows Client Access Licenses (CALs) do not support License Mobility, so existing Windows licenses cannot be used in the shared hardware environment. You must deploy the Windows operating system in a dedicated physical environment, which can be an Alibaba Cloud dedicated host or an ECS Bare Metal Instance. For more information, see Dedicated host documentation and ECS Bare Metal Instance documentation.

    For this ECS instance type, Alibaba Cloud does not provide KMS, WSUS, and software technical support. You can contact Microsoft for software technical support.

    ■ No SA or BYOLs implemented through SA are not supported

    This scenario is similar to the Windows operating system scenario. You can reuse software licenses that you have purchased and download and deploy software programs in a dedicated hardware environment.

  - Red Hat BYOLs

    Red Hat provides the Cloud Access program. If your Red Hat subscription to be migrated uses Bring Your Own Subscription (BYOS), you can register with Red Hat Cloud Access. For more information, see Enroll in the Red Hat Cloud Access program.
• Auto licenses

The default values are used. Depending on your operating system to be imported, a license type is configured automatically.

- For the operating systems that Alibaba Cloud has signed licensing agreements and can provide official licenses, such as Windows Server operating systems, the license type will be Aliyun.

- For other operating systems, such as noncommercial Linux images, the license type will be BYOL. Alibaba Cloud does not provide software technical support for these operating systems.

How are images imported with BYOLs charged?

No fees are charged for operating system components of images that are imported with BYOLs. This rule is applicable to ECS instances that are newly created, renewed, or reinitialized and ECS instances with their configurations changed.

How are BYOLs authenticated and subscribed through Alibaba Cloud when their subscription expires?

You can change images imported with BYOLs to images imported with Aliyun licenses.

• For Windows Server operating systems, you can use the official images of Alibaba Cloud. For more information about the official images of Alibaba Cloud, see Overview.

• For SQL Server and Red Hat images, you can obtain them in Alibaba Cloud Marketplace. For more information, see Marketplace images.

I want to export an image to my local computer for testing. What can I do?

By default, image files are exported as .raw.tar.gz files from which you can extract .raw files. You can search for the relevant documentation for using images in .raw format. Alibaba Cloud has no limits on how to use images in .raw format.

Can I delete a custom image after I use it to create an ECS instance?

You can select Force Delete to forcibly delete the image. However, after you delete the image, the cloud disks of the ECS instances that are created from the image cannot be reinitialized. For more information, see Reinitialize a cloud disk.
Can I delete a custom image from my account after I share the image to another account?

Yes. However, after you delete the shared image, the system disks of all ECS instances that are created from the image cannot be reinitialized. We recommend that you revoke all permissions that allow shared access to the custom image before you delete the image.

If I unshare custom image M to Account A, what will happen?

Account A can neither query Image M in the ECS console or by calling ECS API operations, nor use Image M to create ECS instances or replace system disks. If Account A has created ECS instances from Image M before the image is unshared, the system disks of these instances cannot be reinitialized.

When deleting an image, I am prompted with a message similar to "The specified image cannot be deleted because it is associated with instances." Why?

You may have created the image from a snapshot. To delete this image, you must select **Force Delete**. After you forcibly delete the image, instances that are created from it are still available, but their cloud disks cannot be reinitialized. For more information, see [Delete custom images](#).

When I replace a system disk, can I select an image that contains data disks for the new system disk?

No. If you need to use a new image to replace a system disk, we recommend that you use the image to create a pay-as-you-go ECS instance and create a snapshot for the system disk of the new instance. Use the snapshot to create a custom image that contains only the system disk. Then, select the custom image when you replace the system disk.

I want to replace the operating system of my ECS instance by using an existing image. What can I do?

For information about how to use an existing image to replace the operating system of an ECS instance, see [Change the operating system](#).

**Note:**

We recommend that you create snapshots to back up data before you proceed.

Can an image that is created from an instance under Account A be used to replace a disk under Account B?

Yes. You can share the image to Account B and then replace the disk. For more information, see [Share or unshare custom images](#).
Notice:
To use an image to replace a system disk, ensure that the image contains only a system disk.

I am creating an ECS instance. Why is the total instance cost displayed when I select a custom image higher than that displayed when I select a public image?

This situation may occur in the following circumstances:
- The custom image contains data disks. When such an image is selected, the costs of the data disks cause the total cost of the instance to be higher than that of an instance created by using a public image.
- The custom image is created from a paid public image such as Windows Server or Red Hat Enterprise Linux (RHEL).

What features do Alibaba Cloud Marketplace images provide?
A software environment such as the PHP, .NET, JAVA, or LAMP runtime environment and a variety of features such as control panel and website building systems are preinstalled on the operating systems in Alibaba Cloud Marketplace images. You can use Alibaba Cloud Marketplace images to deploy runtime environments or software applications to ECS instances.

What are the benefits of Alibaba Cloud Marketplace images?
You can use an Alibaba Cloud Marketplace image to create an ECS instance and deploy the preinstalled system environment or software of the image to the ECS instance. This eliminates the need to configure the environment or install software manually and enables you to create a ready-to-run runtime environment and conveniently build and manage services.

What server environments and scenarios do Alibaba Cloud Marketplace images support?
Alibaba Cloud Marketplace provides hundreds of high-quality third-party images. These images not only cover the deployment of runtime environments such as PHP, .NET, JAVA, LAMP, and Docker virtual containers, but can also meet personalized demands for website building, application development, and visual management.

Are Alibaba Cloud Marketplace images safe?
Our image service providers have a wealth of experience in system maintenance and environment configuration. All images are made based on the official Alibaba Cloud
operating systems that are installed with Alibaba Cloud Security. All images have passed strict security reviews and are safe to use.

What can I do if I encounter a problem when installing or using an Alibaba Cloud Marketplace image?

You can view the service information on the purchase page and contact the image service provider by TradeManager, phone, or email. They will answer your questions promptly.

How do I purchase an Alibaba Cloud Marketplace image?

You can purchase an Alibaba Cloud Marketplace image either from Alibaba Cloud Marketplace, or from the ECS instance purchase page when you create an ECS instance.

How long can I use a purchased image?

Theoretically, a purchased image can be used indefinitely. However, an image is a piece of software and has its own lifecycle. In addition, image providers only provide services over a limited period of time, which is described in the commodity details.

Are Alibaba Cloud Marketplace images refundable?

Alibaba Cloud Marketplace images support money-back guarantee refunds within a certain period of time based on the Alibaba Cloud Marketplace rules. However, you will not receive a refund in the following situations:

- You have deployed the purchased image to an ECS instance within the money-back guarantee period.
- You have deployed the purchased image to an ECS instance before your application for a refund for this image is approved.
- You can receive refunds only for images that have not been used.

Will any free Alibaba Cloud Marketplace images be available after Alibaba Cloud Marketplace images are commercialized?

A certain number of free Alibaba Cloud Marketplace images are still available. However, you must them to your purchase at USD 0.00 before you can use them.

I bought an Alibaba Cloud Marketplace image in the China (Hangzhou) region. Can I use it to create an ECS instance or replace a system disk in the China (Beijing) region?

No. Alibaba Cloud Marketplace images are region-specific. You can only use it to create ECS instances or replace system disks within that region.
My ECS instance is created from an Alibaba Cloud Marketplace image. Do I need to make further payments when I upgrade or renew my ECS instance?

No. You do not need to make any further payments. You can use a purchased image to create as many instances as you like.

My ECS instance is created from an Alibaba Cloud Marketplace image. After my ECS instance is released, can I continue to use that image free of charge when I purchase a new ECS instance?

Yes.

I created an ECS instance from an Alibaba Cloud Marketplace image and then created a custom image from the instance. Do I need to pay for the custom image when I use it to create an ECS instance?

Yes. You must pay the original price of the Alibaba Cloud Marketplace image.

If I copy an Alibaba Cloud Marketplace image that I bought to another region to create an ECS instance, do I need to pay for the image?

Yes. You must pay the original price of the Alibaba Cloud Marketplace image.

I created an ECS instance from an Alibaba Cloud Marketplace image and then created a custom image from that instance. If I share the custom image to Account B, does Account B need to pay for the custom image when it uses the image to create an ECS instance?

Yes. Account B must pay the original price of the Alibaba Cloud Marketplace image.

Is a fee charged if I replace a system disk by using an Alibaba Cloud Marketplace image or an image that derives from an Alibaba Cloud Marketplace image?

It depends. If the current image of your ECS instance is a different version of the replacement image, no fees are charged. Otherwise, a fee is charged.

My ECS instance is using an Alibaba Cloud Marketplace image. Is a fee charged if I replace the system disk?

No.
How do I call an ECS API operation to use an Alibaba Cloud Marketplace image or a custom or shared image that derives from an Alibaba Cloud Marketplace to create an ECS instance or replace a system disk?

1. Check whether the image in use is an Alibaba Cloud Marketplace image or an image that derives from an Alibaba Cloud Marketplace image. Call the `DescribeImages` operation to query the image information.

   If the product ID (ProductCode) of your image is not empty, your image is an Alibaba Cloud Marketplace image or a custom or shared image that derives from an Alibaba Cloud Marketplace image. For example, the ProductCode of your image is `abcd000111`, you can access the image at `http://market.aliyun.com/products/123/abcd000111.html`.

2. Select the version and region of the image and purchase the image.

   An image that is purchased in a region can only be used in ECS instances in that region. In addition, you can purchase only one image at a time. If you need to create multiple ECS instances, you must purchase multiple images.

3. You can use the image that you purchase to create an ECS instance or replace a system disk.

If I do not purchase an Alibaba Cloud Marketplace image or an image that derives from an Alibaba Cloud Marketplace image, will an error be reported when I call an ECS API operation to use the image to create an ECS instance or replace a system disk?

Yes. An error will be reported with the `QuotaExceed.BuyImage` error code.

My Auto Scaling (ESS) service is configured to automatically create a number of ECS instances from 10 to 100. What can I do with Alibaba Cloud Marketplace images to ensure that ECS instances are created to suit my computing needs?

If you need to automatically create n instances that use the same image, you must purchase n images from Alibaba Cloud Marketplace in advance.

Can I purchase multiple Alibaba Cloud Marketplace images at a time?

No.

If an Alibaba Cloud Marketplace image such as `jxsc000010` or `jxsc000019` that is previously in use no longer exists, what can I do to ensure that ECS instances are properly created based on the corresponding scaling configuration within an existing scaling group?

We recommend that you select a suitable replacement image from Alibaba Cloud Marketplace to ensure that ECS instances are properly created in your scaling group.
Can one product code support images of different regions?

Yes, as long as the regions already support the images.

I bought 100 images with the same product code. Can I use them within any region?

Alibaba Cloud Marketplace images are region-specific. If you want to use an image within a specific region, we recommend that you purchase the image within that region.

After I select I/O Optimized, I cannot select Alibaba Cloud Marketplace images when I purchase an ECS instance. What is the cause and how can I resolve this issue?

The cause of and solution to this problem are as follows:

• Problem description: When I purchase an ECS instance on the official Alibaba Cloud website, I cannot select any Alibaba Cloud Marketplace images.
• Cause: If you select I/O Optimized when you purchase an ECS instance, you cannot select Alibaba Cloud Marketplace images.

I/O optimized ECS instances provide better network capabilities between instances and disks compared with non-I/O optimized ECS instances, maximizing the storage performance of standard SSDs. However, not all images support I/O optimized instances because the related optimization operations involve the corresponding network, storage, and internal drives.
• Solution: When you purchase an I/O optimized instance, we recommend that you select an official standard image supported by the instance and then deploy the business environment.

If the problem persists, we recommend that you submit a ticket.

What are yearly, monthly, and weekly subscription Alibaba Cloud Marketplace images?

Yearly, monthly, or weekly subscription Alibaba Cloud Marketplace images are images that are purchased from Alibaba Cloud Marketplace and billed on a recurring basis. These images are developed and maintained by image providers, who are responsible for both pre-sales consultation and after-sales services. In this topic, these images are collectively referred to as subscription images.

In which ECS instances can I use a subscription image?

A subscription image can only be used in a subscription instance with the same billing cycle.
How do I purchase a subscription image? Can I purchase it separately?

You cannot purchase a subscription image separately.

You can purchase a subscription image in either of the following ways:

- When you create an ECS instance, set Billing Method to Subscription, select an image from Alibaba Cloud Marketplace, and then set Duration.

  **Note:**
  Then, you must pay for both the instance and image. The instance is created upon successful payment for both the image and instance.

- If you want to use a subscription image in an existing subscription ECS instance, you can use this image to replace the operating system of the instance. In this case, you must set the image billing cycle to be the same as the instance billing cycle. For more information, see #unique_15.

  **Note:**
  In this case, you only need to pay for the image.

How do I pay for subscription images?

Subscription images require upfront payment. The billing cycle of a subscription image must be the same as that of the subscription instance in which the image is used.

Image prices are set by their providers.

Can I use a subscription image after it expires? How do I continue to use it?

When a subscription image expires, it cannot be used if it is not renewed in time.

You cannot renew a subscription image separately. If you want to continue using the image, you must renew the image with the corresponding ECS instance. You can resume use of the image after it is renewed.

After purchasing a subscription image, can I request a refund if I no longer want to use it?

The image provider will determine whether to make a refund. You can consult the image provider before your purchase the image.

What can I expect when a refund is made?

If a refund is available, the image provider will make the refund based on your usage.
Can a subscription image be converted to a pay-as-you-go image?

Subscription images cannot be converted to pay-as-you-go images. This function is currently under development for release in the future. Stay updated on the official Alibaba Cloud website.

Can I replace a subscription image with an image of another type or vice versa? How is the fee calculated?

Yes. You can replace images when you replace system disks of ECS instances. You can make the following replacements:

- Replace an image of another type (such as public image, custom image, and shared image) with a subscription image. After the image is replaced, the system will calculate the actual cost based on the image cost and the remaining billing cycle of the ECS instance.

- Replace a subscription image with an image of another type (such as public image, custom image, and shared image). If the image provider allows for refunds, a refund will be made based on your actual usage.

- Replace Subscription Image A with Subscription Image B. After the image is replaced, if a refund is available for Image A, the refund will be made based on the refund policy. The actual cost of Image B will be calculated based on the image price and the remaining billing cycle of the ECS instance.

Where do I view and manage the subscription images that I purchased?

You can log on to the ECS console. In the left-side navigation pane, choose Instances & Images > Images. Then, click the Marketplace Images tab to view and manage the subscription images that you purchased.

Is a fee charged for creating a custom image from a subscription image? How will created custom images be affected if their corresponding subscription images expire?

When you use a custom image that is created from a subscription image to create an instance or replace a system disk, you are re-ordering the subscription image on Alibaba Cloud Marketplace. Therefore, the custom image is not affected by whether the original subscription image expires.
Why cannot I select a Windows operating system for some ECS instances?

When you create an ECS instance from a Windows operating system, ensure that the instance memory is greater than or equal to 1 GiB. For ECS instances with less than 1 GiB of memory, you can only select Linux and Windows Server 1709 images.

Does Alibaba Cloud support Windows Server 2008 and Windows Server 2008 R2?

From January 14, 2020, Microsoft stopped providing support for Windows Server 2008 and Windows Server 2008 R2 operating systems. Therefore, Alibaba Cloud no longer provides technical support for ECS instances that use the preceding operating systems. If you have ECS instances that use the preceding operating systems, upgrade them to Windows Server 2012 or later in a timely manner.

The operating system of my instance is Windows Server. I am prompted with a message indicating that the operating system is not genuine. What can I do?

Activate the Windows operating system. For more information, see How to activate the VPC-Connected Windows instances using KMS servers.

Is a fee charged for the operating system of an ECS instance?

The Windows Server and Red Hat operating systems of public images are charged. Their fees depend on instance types. Other public images are free of charge. For more information about the fees for other types of images, see Image types.

Can I install or upgrade my operating system?

No. You cannot install or upgrade your operating system. An ECS instance must use an image that is provided by Alibaba Cloud, which you cannot add or upgrade on your own. However, you can perform the following operations:

- Replace a system disk and select a new operating system. For more information, see Change the operating system.
- Create an ECS instance from a custom image that is imported from a local computer. For more information about how to import an image, see Instructions for importing images. For more information about how to create an ECS instance by using a custom image, see Create an instance by using a custom image.
- Patch an operating system.
Do operating systems have a graphical interface?

Windows operating systems (except for the Windows Server Semi-Annual Channel instances) offer a management desktop. For more information about how to use Windows Server Semi-Annual Channel operating systems, see Manage Windows Server Semi-Annual Channel images and instances.

Linux operating systems offer a command line interface. You can install a graphical desktop as needed.

How do I choose an operating system?

See Select an image.

Do public images come with the FTP service?

No. You must configure the FTP service on your own. For more information, see #unique_106 and #unique_107.

Which SUSE versions do Alibaba Cloud public images support?

Alibaba Cloud public images support SUSE versions. For more information, see the "Aliyun Linux images" section in Public image overview.

What service support is available for SUSE operating systems?

SUSE Linux Enterprise Server (SLES) operating systems that are sold on Alibaba Cloud Marketplace are synchronized with SUSE update sources regularly. For instances that are created from Alibaba Cloud SLES public images, the support for their operating systems is covered by the Alibaba Cloud enterprise-grade support service. If you have purchased the enterprise-grade support service and encounter a problem when you use an SLES operation system, submit a ticket to contact the Alibaba Cloud technical support personnel.

If an image was manually created from an ECS instance, can I retrieve the instance data after the instance is released upon expiration?

Yes. You can retrieve instance data in either of the following ways:

- Create a new instance from the previously created image. For more information, see #unique_10.
- Use the previously created image to replace the system disk of the current instance. For more information, see #unique_15.

Notice:
When you replace a system disk, note the following items:

- All current system disk data will be lost, and the system disk will be restored to the state of the image.
- The image must be in the same region as the current instance.

I have an ECS instance and I want to create another ECS instance from the image of the current ECS instance. What can I do?

You can create a custom image from the current ECS instance and then use the custom image to create a new ECS instance. For more information, see Create a custom image by using an instance and #unique_10.

I have purchased an ECS instance. How do I restore my shared image to the newly purchased instance?

Make sure that you have shared the image to the account of the newly purchased instance. Use either of the following methods as needed:

- If the shared image and the instance are located in the same region, replace the system disk of the instance and select the shared image for the new system disk. For more information, see #unique_15.
- If the shared image and the instance are not located in the same region, copy the image to the region where the instance is located. Then replace the instance system disk, and select this image for the new system disk. For more information, see Copy custom images and #unique_15.

Notice:

The following risks are associated with replacing the system disk of an instance:

- The original system disk will be released. We recommend that you create a snapshot to back up your data in advance.
- Replacing the system disk requires stopping the instance, which can interrupt your services.
- After replacing the system disk, you must re-deploy the service environment on the new system disk. Your services may be interrupted for an extended period of time.
- Replacing a system disk will re-allocate a system disk to your instance, and the disk ID will change. Snapshots that are created from the original system disk cannot be used to roll back the new system disk.
I have multiple Alibaba Cloud accounts. I want to transfer an instance from Account A to Account B or migrate the environment and applications of an instance under Account A to an instance under Account B. What can I do?

You can perform the following steps:

1. Create a custom image from the instance under Account A. For more information, see Create a custom image by using an instance.
2. Share the image to Account B. For more information, see Share or unshare custom images.
3. Create an instance under Account B from the shared image. For more information, see #unique_10.

How do I migrate data between ECS instances?

You can perform the following steps to migrate data from one ECS instance to another:

1. Create a custom image from the source ECS instance.
2. Copy or share the custom image.
   - If the source and destination instances are located in the same region and belong to the same account, go to the next step.
   - If the source and destination instances are located in different regions but belong to the same account, copy the image to the region where the destination instance is located. For more information, see Copy custom images.
   - If the source and destination instances are located in the same region but belong to different accounts, share the custom image to the account of the destination instance. For more information, see Share or unshare custom images.
   - If the source and destination instances are located in different regions and belong to different accounts, copy the image to the region where the destination instance is located, and share the image to the account of the destination instance. For more information, see Copy custom images and Share or unshare custom images.
3. Use the shared image to create a new ECS instance or replace the image of the destination instance. For more information, see #unique_10 or Change the operating system.

Note:

If you want to replace the image of the destination instance, you must ensure that the original image does not contain any data disk snapshots.
If the preceding steps are not applicable, see #unique_108 for more information about how to migrate data between ECS instances.

**Can ECS instances in different VPCs communicate with each other?**

Express Connect and Cloud Enterprise Network (CEN) can be used to allow VPCs to connect to each other. For more information, see #unique_109. ECS instances in interconnected VPCs can then communicate with each other.

**How do I handle a CentOS DNS resolution timeout?**

The CentOS DNS resolution timeout problem is analyzed and fixed as follows:

- **Cause**

  The DNS resolution mechanism of CentOS 6 and CentOS 7 has changed. A DNS resolution timeout may occur in CentOS 6 or CentOS 7 instances that were created before February 22, 2017 or created from custom images that were created before February 22, 2017.

- **Solution**

  You can perform the following steps to fix this problem:

  1. Download the fix_dns.sh script.
  2. Place the downloaded script in the /tmp directory of the CentOS system.
  3. Run the `bash /tmp/fix_dns.sh` command to execute the script.

- **Script role**

  The script determines whether the /etc/resolv.conf file contains the options > single-request-reopen configuration. For more information, see `resolv.conf - resolver configuration file`.

  The DNS resolution mechanism of CentOS 6 and CentOS 7 uses the same 5-tuple to send IPv4 and IPv6 DNS requests, for which purpose the single-request-reopen option must be added. After the option is added, when two requests from the same port are handled, the resolver closes the socket after sending the first request and opens a new socket before sending the second request. The option will take effect immediately after being added. You do not need to restart the instance.
• Script logic

1. Determine whether the operating system of the instance is CentOS.
   - If the operating system is not CentOS (for example, the operating system is Ubuntu or Debian), the script stops working.
   - If the operating system is CentOS, the script continues working.

2. Query the options configuration in the /etc/resolv.conf file.
   - If the options configuration is unavailable:
     Use the Alibaba Cloud options configuration (options timeout:2 attempts:3 rotate single-request-reopen).

   - If the options configuration is available:
     - If the single-request-reopen option does not exist, append this option to the options configuration.
     - If the single-request-reopen option exists, the script stops working and the DNS nameserver configuration does not change.

Why does ECS disable virtual memory and leave Swap partitions unconfigured by default?

When physical memory is insufficient, the memory manager temporarily stores the memory data that has been inactive for an extended period of time to a Swap partition or virtual memory file. This mechanism helps increase the available memory.

However, if the memory usage is already high and I/O performance is poor, the mechanism will decrease the available memory instead. Alibaba Cloud ECS disks use distributed file systems for storage and provide multiple strongly consistent replicas for each piece of data. This mechanism ensures the security of user data but deteriorates the storage and I/O performance of local disks by tripling the number of I/O operations.

Because of this, virtual memory is not enabled for Windows, and Swap partitions are not configured for Linux by default to avoid further decreasing I/O performance when the system resources are insufficient.

How do I enable the kdump service in a public image?

By default, the kdump service is disabled in public images. If you want your instance to generate a core file when the instance is down so that you can analyze the downtime cause
based on the file, you can perform the following steps to enable the kdump service. These steps use the CentOS 7.2 public image as an example.

1. Configure the directory in which to generate the core file.
   - a. Run the `vim /etc/kdump.conf` command to open the kdump profile.
   - b. Run the `path` command to configure the directory in which to generate the core file. In this example, the directory is `/var/crash`, and the following `path` command is used:

   ```
   path /var/crash
   ```

   - c. Save and close the `/etc/kdump.conf` file.

2. Enable the kdump service.

   Use either of the following methods based on the operating system to enable the kdump service. In this example, the kdump service in CentOS 7.2 is enabled by using method 1.

   - Method 1: Run the following commands to enable the kdump service:

     ```
     systemctl enable kdump.service
     systemctl start kdump.service
     ```

   - Method 2: Run the following commands to enable the kdump service:

     ```
     chkconfig kdump on
     service kdump start
     ```

3. Run the following command to simulate the scenario in which the instance is down:

   ```
   echo c > /proc/sysrq-trigger
   ```

   **Note:**
   After the command is executed, the instance is disconnected from the network. You must reconnect the instance to the network to perform the subsequent operations.
4. Analyze the core file.

a. Run the following command to install the Crash Analysis tool:

   ```
   yum install crash
   ```

b. Download the debug-info installation package.

   Run the `uname -r` command to view the operating system kernel version and download the debug-info installation package that matches the kernel version.

   • kernel-debuginfo-common-x86_64-<Kernel version>.rpm
   • kernel-debuginfo-<Kernel version>.rpm

   In this example, the kernel version is 3.10.0-514.26.2.el7.x86_64. The following download commands are used:

   ```
   wget http://debuginfo.centos.org/7/x86_64/kernel-debuginfo-common-x86_64-3.10.0-514.26.2.el7.x86_64.rpm
   wget http://debuginfo.centos.org/7/x86_64/kernel-debuginfo-3.10.0-514.26.2.el7.x86_64.rpm
   ```

c. Run the following commands to install the debug-info package:

   ```
   rpm -ivh kernel-debuginfo-common-x86_64-3.10.0-514.26.2.el7.x86_64.rpm
   rpm -ivh kernel-debuginfo-3.10.0-514.26.2.el7.x86_64.rpm
   ```

d. Run the following commands to use the Crash Analysis tool to analyze the core file:

   ```
   cd <core file directory>
   crash /usr/lib/debug/lib/modules/<kernel version>/vmlinux vmcore
   ```

   In this example, the core file directory is /var/crash/127.0.0.1-2019-07-08-15:52:25, and the kernel version is 3.10.0-514.26.2.el7.x86_64. The following commands are used:

   ```
   cd /var/crash/127.0.0.1-2019-07-08-15:52:25
   crash /usr/lib/debug/lib/modules/3.10.0-514.26.2.el7.x86_64/vmlinux vmcore
   ```

How do I enable or disable the Meltdown and Spectre patches for Linux images?

For information about the security vulnerabilities and public images involved as well as how to enable or disable security vulnerability patches, see [How do I enable or disable the Meltdown and Spectre patches for Linux images?](#).
After I use an ECS instance without restarting it for an extended period of time that exceeds the specified threshold, the instance is disconnected from the network, the network is no longer available, or the public or private IP address of the instance cannot be pinged. What can I do?

For more information about the cause of and solution to this issue, see Troubleshoot IP address faults in CentOS 7 instances and Windows instances.

The "UNEXPECTED INCONSISTENCY; RUN fsck MANUALLY." error is reported when an ECS instance starts. What can I do?

This indicates that a file system error occurs due to data loss in the memory of the ECS instance, which may be caused by conditions such as poweroff. For more information about the problem and the solution to the problem, see How to solve the "UNEXPECTED INCONSISTENCY; RUN fsck MANUALLY." error returned when the ECS instance operating system fails to start.

How do I upgrade Red Hat Enterprise Linux (RHEL) 7 to RHEL 8?

For more information, see Upgrading to RHEL 8.
11 FAQ

11.1 Manage Windows Server Semi-Annual Channel images and instances

This topic describes how to manage an ECS instance that is created from a Windows Server Semi-Annual Channel image.

Context

Windows Server Semi-Annual Channel runs in Server Core mode and is entirely command-line based. Windows Server Semi-Annual Channel offers some significant advantages, such as support for remote management, lower requirements for hardware, and a reduction in the need for updates. Windows Server Semi-Annual Channel instances exclude Resource Manager, Control Panel, and Windows Explorer. The instances do not support the \*.msc command-line option such as devmgmt.msc. You can manage servers by using tools such as Sconfig, Server Manager, PowerShell, and Windows Admin Center.

When you create an instance, you can view the following Windows Server Semi-Annual Channel images in the public images list:

• Windows Server Version 1809 Datacenter Edition
• Windows Server Version 1709 Datacenter Edition
• Windows Server Version 1903 Datacenter Edition
• Windows Server Version 1909 Datacenter Edition

Windows Server Semi-Annual Channel runs in Server Core mode. We recommend that you use advanced management tools such as PowerShell and Windows Admin Center. For more information, visit Manage a Server Core server in Microsoft Docs.

Manage an instance by using PowerShell

PowerShell runs on .NET Framework and uses object-oriented scripts, allowing you to manage Windows instances in the same manner as you do with SSH. For example, if the public IP address of your instance is 172.16.1XX.183, you can perform the following steps to manage your instance by using PowerShell:

1. Connect to a Windows instance. For more information, see #unique_63.
2. Enter PowerShell on the command line to start PowerShell.
3. Run the following commands in PowerShell:

   ```powershell
   Enable-PSRemoting -Force
   Set-NetFirewallRule -Name "WINRM-HTTP-In-TCP-PUBLIC" -RemoteAddress Any
   ```

4. Add rules to the security group to which the instance belongs to allow access over HTTP port 5985 and HTTPS port 5986. For more information about how to add rules to a security group, see #unique_112.

5. Enter **PowerShell** on the command line of the client to start PowerShell.

6. Run the following command in PowerShell:

   ```powershell
   Set-Item WSMan:\localhost\client\trustedhosts -value 172.16.1XX.183 -Force
   ```

   **Note:**

   172.16.1XX.183 indicates that only your instance is trusted. You can use * to indicate that all PCs are trusted.

7. Run `Enter-PSSession '172.16.1XX.183' -Credential:'administrator'` in PowerShell and enter the password of the instance as prompted.

Now you can manage your Windows instances on the client PC.

**Install Windows Admin Center**

Windows Admin Center is a browser-based GUI management tool. It can replace server management tools or Microsoft Management Console (MMC) when the Server Core mode is used. For example, if the public IP address of your instance is 172.16.1XX.183, you can use one of the following methods to install Windows Admin Center:

- Use commands

1. Connect to a Windows instance. For more information, see #unique_63.
2. Add rules to the security group to which the instance belongs to allow access over HTTP port 5985 and HTTPS port 5986. For more information, see #unique_112.
3. Enter **PowerShell** on the command line to start PowerShell.
4. Run the following commands in PowerShell:

   ```powershell
   Enable-PSRemoting -Force
   Set-NetFirewallRule -Name "WINRM-HTTP-In-TCP-PUBLIC" -RemoteAddress Any
   ```

5. Run the following commands to download Windows Admin Center:

   ```powershell
   ```
6. Run the `cat log.txt` command to check the download progress.

When information similar to the following content is displayed in the log file,

Windows Admin Center is installed:

```
MSI (s) (14:44) [09:48:37:885]: Product: Project 'Honolulu'(Technical Preview) --
Installation completed successfully.
MSI (s) (14:44) [09:48:37:885]: Windows Installer installed this product. Product
name: Project 'Honolulu' (Technical Preview). Product version: 1.1.10326.0. Product
language: 1033. Manufacturer: Microsoft Corporation. Installation success or error
status: 0.
```

• Use a browser
  
  - Prerequisites
    
    PowerShell is configured and can be used to manage instances. If you want to install
    Windows Admin Center by using a browser, you must complete the installation on the
    client PC. For more information, see Manage an instance by using PowerShell.
  
  - Procedure
    
    1. Download and install Windows Admin Center.
    
    2. Open `https://localhost/` after the installation is complete.
    
    3. Click Add. In the dialog box that appears, add the IP address of the instance.

Now you can use Windows Admin Center to manage instances by using Microsoft Edge
or Chrome.

FAQ

Question 1: How do I copy files to a Windows Server Semi-Annual Channel instance?

If the files to be copied are stored on your client PC, and Windows Admin Center is installed, 
or PowerShell is configured to manage instances, you can copy files to the instance by 
using one of the following methods:

• Use a Remote Desktop (RDP) application

  1. Connect to a Windows instance. For more information, see #unique_63.
  
    2. Copy the target files on the client PC.
    
    3. Enter notepad on the command line of the instance.
  
    4. Choose File > Open. In the dialog box that appears, right-click the destination 
       directory and choose Paste from the shortcut menu.
• Use PowerShell

1. Start the target Windows instance.
2. Enter **PowerShell** on the command line of the client PC to start PowerShell.
3. Use PowerShell to manage the target instance. For more information, see Manage an instance by using PowerShell.
4. Run the following commands on the client PC:

   ```powershell
   $session = New-PSSession -ComputerName 172.16.1XX.183
   Copy-Item -ToSession $session -Path C:\1.txt -Destination c:\2.txt
   ```

   **Note:**
   
   `C:\1.txt` is the source file directory on the client PC. `C:\2.txt` is the destination file directory on the Windows instance.

• Use Windows Admin Center

1. Start the target Windows instance.
2. Configure Windows Admin Center. For more information, see Install Windows Admin Center.
3. Start Windows Admin Center and click the target instance. Click **File**, select the file, and then click **Upload**.

**Question 2:** How do I stop or restart a Windows Server Semi-Annual Channel instance?

• Use an RDP application

1. Connect to a Windows instance. For more information, see #unique_63.
2. Enter `sconfig` on the command line, select 13 to restart the instance or 14 to stop the instance, and then press the Enter key.

• Use PowerShell

1. Connect to a Windows instance. For more information, see #unique_63.
2. Enter **PowerShell** on the command line to start PowerShell.
3. Run one of the following commands to restart or stop the instance:

   ```powershell
   shutdown -r -t 00 :: This command will restart the instance in 0 seconds.
   shutdown -s -t 00 :: This command will stop the instance in 0 seconds.
   Stop-Computer -Force # This PowerShell command will stop the instance instantly.
   ```
**Restart-Computer -Force # This PowerShell command will restart the instance instantly.**

- **Use PowerShell**
  
  1. Start the target Windows instance.
  2. Enter **PowerShell** on the command line of the client PC to start PowerShell.
  3. Use PowerShell to manage the target instance. For more information, see [Manage an instance by using PowerShell](#).
  4. Run the following commands to restart or stop the instance:

```powershell
Enter-PsSession -ComputerName 172.16.1XX.183
Restart-Computer -Force # Restart the instance.
Stop-Computer -Force # Stop the instance.
```

- **Use Windows Admin Center**
  
  1. Start the target Windows instance.
  2. Configure Windows Admin Center. For more information, see [Install Windows Admin Center](#).
  3. Start Windows Admin Center and select the target instance. Click **Overview** in the left-side navigation pane. On the Overview page that appears, click **Restart** or **Shutdown**.

**Question 3: How do I install the IIS service?**

- **Use an RDP application**
  
  1. Connect to a Windows instance. For more information, see [unique_63](#).
  2. Enter **PowerShell** on the command line to start PowerShell.
  3. Run the following commands to install IIS:

```powershell
Import-Module ServerManager
Add-WindowsFeature Web-Server, Web-CGI, Web-Mgmt-Console
```

- **Use PowerShell**
  
  1. Start the target Windows instance.
  2. Enter **PowerShell** on the command line of the client PC to start PowerShell.
  3. Use PowerShell to manage the target instance. For more information, see [Manage an instance by using PowerShell](#).
  4. Run the following PowerShell commands on the client PC:

```powershell
Enter-PsSession -ComputerName 172.16.1XX.183
Import-Module ServerManager
```
Add-WindowsFeature Web-Server, Web-CGI, Web-Mgmt-Console

- Use Windows Admin Center

1. Start the target Windows instance.
2. Configure Windows Admin Center. For more information, see Install Windows Admin Center.
3. Start Windows Admin Center and select the target instance. Click Roles and Features in the left-side navigation pane. On the Roles and Features page that appears, click Web Server. Choose the suitable features based on your needs and click Yes.

Question 4: How do I reopen a command line window that I accidentally closed during an RDP session?

If a command line window is accidentally closed during an RDP session, the remote application shows a black screen and operations cannot be performed. In this case, you can perform the following steps:

1. Press Ctrl+Alt+End if an MSTSC connection is used. In other cases, press Ctrl+Alt+Del.
2. Select Task Manager on the page that appears, and press the Enter key.
3. In Task Manager, choose File > New Task. Enter cmd and click OK.

References
Windows Server Semi-Annual Channel overview
Introducing Windows Server, version 1709
Windows Admin Center
About Remote Troubleshooting

11.2 Install GRUB in a Linux server

If you use Server Migration Center (SMC) to migrate a Linux source server running on an early kernel version (such as CentOS 5 and Debian 7), the version of the built-in system boot program GRUB is earlier than v1.99, and the "Do Grub Failed" error message appears in the log file, you must upgrade GRUB to v1.99 or later.

Context
This topic uses GRUB v1.99 or v2.02 as an example to describe how to install GRUB on a Linux server. The procedure to install GRUB of other versions is similar. The difference is that you need to install the source code package corresponding to the GRUB version. For more information, visit Index of /gnu/grub.

Procedure
1. Log on to the Linux source server.
2. Run the following commands to view the original grub, grub-install, and grub-mkconfig paths:

```bash
# which grub
# which grub-install
# which grub-mkconfig
```

3. Run the `mv` command to rename the old versions of grub, grub-install, and grub-mkconfig to back up these files.

After you use SMC to migrate the server, you can reinstate the original files by changing their names back to the original ones.

```bash
# mv /sbin/grub /sbin/grub-old
# mv /sbin/grub-install /sbin/grub-install-old
# mv /sbin/grub-mkconfig /sbin/grub-mkconfig-old
```

4. Install the GRUB dependencies including bison, gcc, and make.

```bash
# yum install -y bison gcc make
```

5. Run the following commands to install flex:

```bash
# test -d /root/tools || mkdir -p /root/tools
# cd /root/tools
# wget https://github.com/westes/flex/releases/download/v2.6.4/flex-2.6.4.tar.gz
# tar xzf flex-2.6.4.tar.gz
# cd flex-2.6.4
# mkdir -p build
# cd build
# ../configure
# make && make install
# ln -s /usr/local/bin/flex /usr/bin/flex
```

6. Run the following commands to install GRUB and the corresponding dependencies:

- Upgrade GRUB to v1.9 or later in the operating systems of early versions such as CentOS 5, Red Hat Enterprise Linux 2, or Debian 7.

```bash
# test -d /root/tools || mkdir -p /root/tools
# cd /root/tools
# wget https://alpha.gnu.org/gnu/grub/grub-1.99~rc1.tar.gz
# tar xzf grub-1.99~rc1.tar.gz
# cd grub-1.99~rc1
# mkdir -p build
# cd build
# ../configure
# sed -i -e "s/-Werror//" ./grub-core/Makefile
# sed -i -e "s/-Werror//" ./Makefile
# make & make install
# ln -s /usr/local/sbin/grub-install /sbin/grub-install
# ln -s /usr/local/sbin/grub-mkconfig /sbin/grub-mkconfig
```

- Upgrade GRUB to v2.02 or later in Amazon Linux operating systems.

```bash
# test -d /root/tools || mkdir -p /root/tools
```
```bash
# cd /root/tools
# wget https://alpha.gnu.org/gnu/grub/grub-2.02~rc1.tar.gz
# tar xzf grub-2.02~rc1.tar.gz
# cd grub-2.02~rc1
# mkdir -p build
# cd build
# ../configure
# sed -i -e "s/-Werror//" ./grub-core/Makefile
# sed -i -e "s/-Werror//" ./Makefile
# make && make install
# ln -s /usr/local/sbin/grub-install /sbin/grub-install
# ln -s /usr/local/sbin/grub-mkconfig /sbin/grub-mkconfig
```

**Note:**

If the `-Werror` error is reported during compilation, find the error in the makefile file, remove the `-Werror` option, and then try again.

7. Run the `grub-install --version` command to check whether the GRUB version is updated.

**What's next**

- After you have upgraded GRUB, you can use SMC to migrate the server to Alibaba Cloud. For more information, see the #unique_114 topic in SMC documentation.
- Optional. After the migration is complete, run the following commands to restore GRUB to the original version:

```bash
# rm /sbin/grub-install
# rm /sbin/grub-mkconfig
# rm /boot/grub/grub.cfg
# mv /sbin/grub-old /sbin/grub
# mv /sbin/grub-install-old /sbin/grub-install
```

### 11.3 How do I enable or disable the Meltdown and Spectre patches for Linux images?

This topic describes how Alibaba Cloud ECS responds to the Meltdown and Spectre vulnerabilities. You can learn about our measures for protecting ECS instances against these vulnerabilities.

**Context**

The Meltdown and Spectre vulnerabilities exist in the Intel chips. Caused by the design flaw of the chip hardware, the vulnerabilities may lead to problems such as leakage of operating system kernel information, unauthorized access to system kernel data by applications, and more. You can go to the CVE website to check the vulnerability IDs:

- CVE-2017-5753
• **CVE-2017-5715**
• **CVE-2017-5754**

On January 20, 2018, Alibaba Cloud released a security vulnerability notice, describing the vulnerability details and impacts.

This topic describes the Alibaba Cloud public images that have been patched against these vulnerabilities, and how to disable the patches for better instance performance. The default security policy is as follows:

• To protect against the Meltdown vulnerability, Page Table Isolation (PTI) is enabled by default.
• To protect against the Spectre vulnerability, by default No Indirect Branch Restricted Speculation (NOIBRS) is enabled and is integrated with Retpoline and Indirect Branch Prediction Barriers (IBPB).

**How to enable or disable the Meltdown patch**

The following public images have enabled the Meltdown patch (PTI On):

• CentOS 7.5/7.6
• Debian 9.6/8.10
• Red Hat 7.5/7.6
• SUSE Linux 15
• Ubuntu 18.04
• CoreOS 1911.3.0
• FreeBSD 11.2
• OpenSUSE 15

The above list is subject to change due to updates of Alibaba Cloud public images.

If you find enabling PTI impacts your instance performance, or you have other protective measures, you can disable PTI by following the steps below:

1. Connect to your instance.
2. Do the following according to your Linux distribution:

   • CentOS, Debian, OpenSUSE, Red Hat, SUSE Linux and Ubuntu: Add the kernel parameter nopti.
   • CoreOS: Run `vi /usr/share/oem/grub.cfg` to configure `pti=off`.
   • FreeBSD: Run `vi /boot/loader.conf` to configure `vm.pmap.pti=0`. 
3. Restart the instance.

**How to enable or disable the Spectre patch**

Alibaba Cloud currently allows you to configure Indirect Branch Restricted Speculation (IBRS) and IBPB. By default, public images are protected against Spectre through Reptpoline and IBPB. Moreover, IBRS is disabled through the noibrs parameter. The following public images are involved:

- CentOS 7.5/7.6
- Debian 9.6/8.10
- Red Hat 7.5/7.6
- SUSE Linux 15
- Ubuntu 18.04
- CoreOS 1911.3.0
- FreeBSD 11.2
- OpenSUSE 15

The above list is subject to change due to updates of Alibaba Cloud public images.

If you need to restore the default settings of your operating system, or you find the current settings impact your instance performance, or you have other protective measures, you can disable the Spectre patch by following the steps below:

1. Connect to your instance.
2. Perform the corresponding operation according to the instructions in the following table.

<table>
<thead>
<tr>
<th>Linux distribution</th>
<th>To restore the default settings of Alibaba Cloud images</th>
<th>To restore the default settings of operating systems</th>
<th>To disable the Spectre patch</th>
</tr>
</thead>
<tbody>
<tr>
<td>CentOS</td>
<td>Add the kernel parameter noibrs.</td>
<td>Remove the kernel parameter noibrs.</td>
<td>Add the kernel parameter spectre_v2=off.</td>
</tr>
<tr>
<td>Red Hat</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CoreOS</td>
<td>Run vi /usr/oem/share/grub.cfg to add the kernel parameter spectre_v2=off.</td>
<td>Remove the kernel parameter spectre_v2=off.</td>
<td></td>
</tr>
<tr>
<td>OpenSUSE</td>
<td>Add the kernel parameter spectre_v2=off.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Linux distribution</td>
<td>To restore the default settings of Alibaba Cloud images</td>
<td>To restore the default settings of operating systems</td>
<td>To disable the Spectre patch</td>
</tr>
<tr>
<td>--------------------</td>
<td>--------------------------------------------------------</td>
<td>--------------------------------------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>Debian</td>
<td>Retpoline and IBPB are enabled by default.</td>
<td>No need to modify the settings.</td>
<td></td>
</tr>
<tr>
<td>Ubuntu</td>
<td>Retpoline is enabled by default.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SUSE Linux</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FreeBSD</td>
<td>Add the kernel parameter hw.ibrs_disable.</td>
<td>Remove the kernel parameter hw.ibrs_disable.</td>
<td>Add the kernel parameter hw.ibrs_disable.</td>
</tr>
</tbody>
</table>

**Note:**
The kernel parameter noibrs does not work for OpenSUSE and CoreOS. You need to set spectre_v2=off for them.

3. Restart the instance.

**How to detect whether protections are enabled**

1. Connect to your instance.
2. From GitHub spectre-meltdown-checker Repo, obtain the spectre-meltdown-checker.sh script.
3. Run the following commands in your instance:

   ```bash
   chmod +x spectre-meltdown-checker.sh
   sudo bash spectre-meltdown-checker.sh
   ```
4. Judge whether the Meltdown or Spectre patch has been enabled according to the script prompts.

**Reference**

For the following operating systems, you can go to their website for more details:

- Red Hat
- SUSE Linux
- Ubuntu